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Colorado Highways

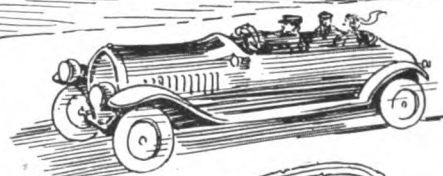
BULLETIN

Issued by the State Highway Department



Completion of the Fall River road over the Highline Drive was one of the projects included by the State Highway Commission in this year's budget. The road on the Western Slope side.

January, 1919



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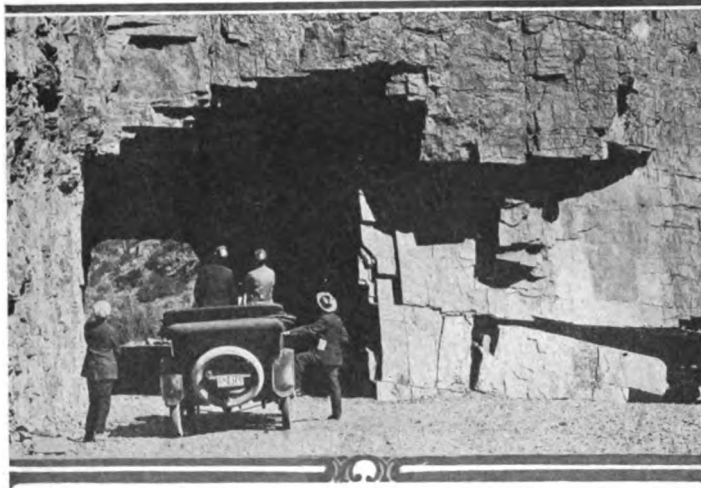
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Close-up view of tunnel on the Cache la Poudre Canyon road, Larimer County.

CONTENTS

	Page
The \$20,000,000 Highway Bond Issue	5
Mountain States Ask Liberal Treatment—H. C. Allen.....	6
Our Unoccupied Lands and the Settler—State Imm. Dept..	7
The Proposed State Motor-Vehicle Law—James R. Noland..	8
May Increase Federal Aid Appropriations—Logan Waller	Page 9
Prairie Schooner, Texas Dogle Motor Car	10
Digest of Proposed Motor-Truck Law	11
National Transport Bureau Recommended.....	12
State Highway Appropriations—1919	13
Road Outlook of Forestry Service—U. S. Forestry Service...	14
Grade Limits and Traffic Conditions.....	16
Editorial	18
Development Thruout Eastern Colorado—State Imm. Dept..	20
The Dairy Industry in Eastern Colorado—State Imm. Dept..	21
How Colorado People Saved \$140,000,000—State Imm. Dept..	22
Facts for Investors—State Immigration Department.....	23
A Real Basis for Immigration Work—State Imm. Dept.....	26
The Blue Lodge of Colorado Road Builders.....	29
Highway News and Notes on Work in Field.....	30
Road Work and Road Builders	31

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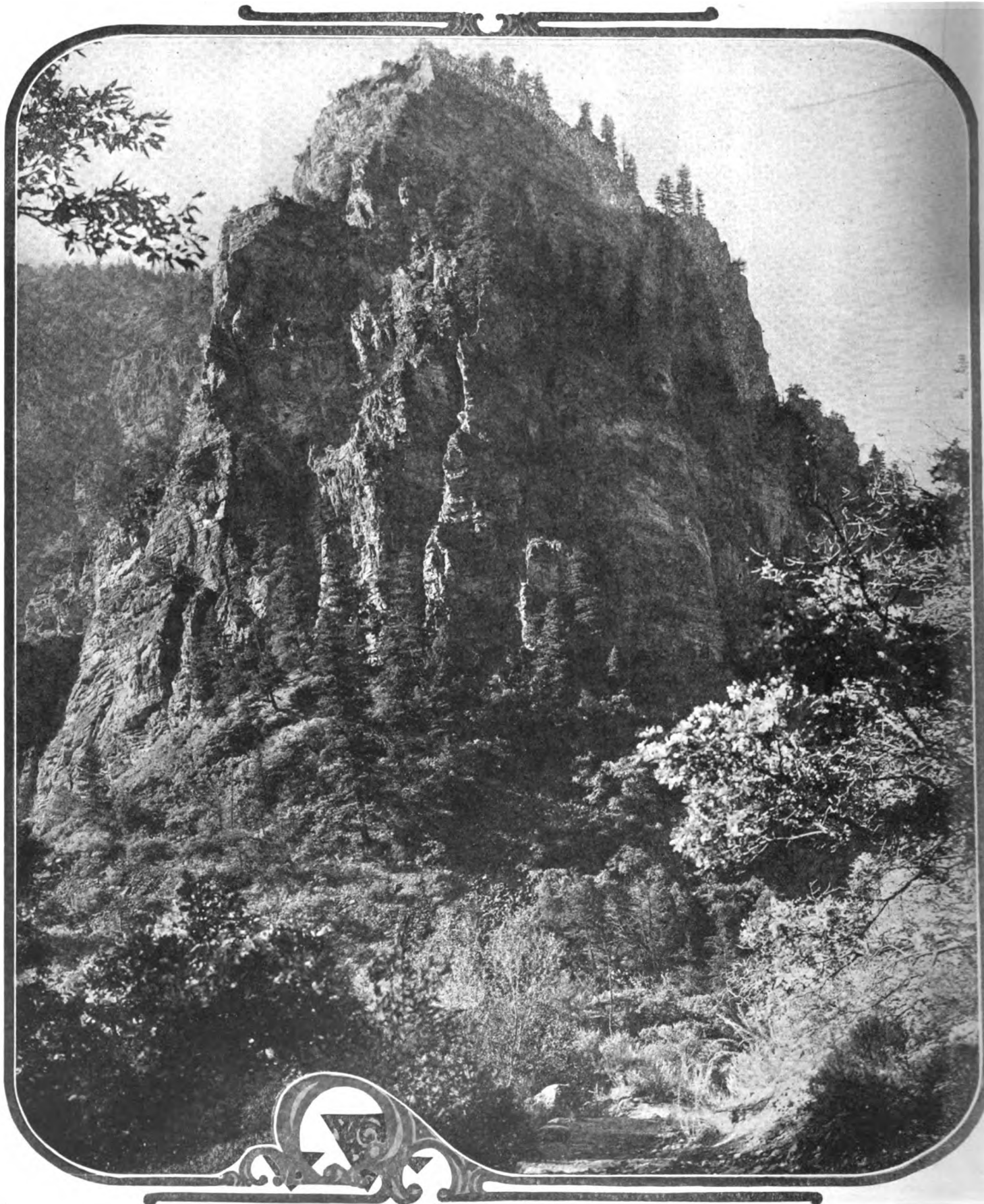
With the approval of the Colorado State Auditing Board.

Address all communications to Colorado Highway Department, attention Pyke Johnson, editor, Colorado Highways Bulletin.

Owing to the necessarily limited edition of this publication it will be impossible to distribute it free to any persons or institutions other than state and county officials actually engaged in the planning or construction of highways, instructors in highway engineering, newspapers and periodicals and civic associations. Others desiring to obtain Colorado Highways can do so by sending 10 cents for each number desired. Associations desiring to distribute the magazine can obtain it at cost in lots of from 500 copies up.

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Frowning, Implacable, Rear Anon Vast Bulks, the Warders of the Grand



One of the stupendous pinnacles which are encountered thruout Glenwood Canyon in Garfield County.



COLORADO HIGHWAYS BULLETIN

Vol. II

JANUARY, 1919

No. 1

The \$20,000,000 Highway Bond Issue

Colorado's After-the-war Road Program

IN accordance with the spirit of the times the Highways Transport Committee civic and road organizations have determined that, instead of asking a \$10,000,000 bond issue for the construction of better roads in Colorado, it will ask \$20,000,000. The joint resolution for the submission of an amendment to the state constitution authorizing the bond issue has been framed and will be introduced at the coming session of the legislature. A thorough educational campaign is to be conducted to acquaint the voters with the value of good roads. The people will not be asked to vote the bond issue, not upon the haphazard statements of the past, such as the citation of isolated instances wherein some farmer was able to move his crop to market with the minimum of time and labor because of the motor truck and surfaced roadway, but upon actual operating costs over given roads for a given period of time.

The voters of Colorado are not asked to do the extraordinary in voting this bond issue. A bill is to be presented in Congress for an amendment to the present federal aid road act which will, if passed, provide \$500,000,000 for work on the highways of the United States during the next seven years; Illinois is voting \$60,000,000; Pennsylvania, \$50,000,000; Washington, \$33,000,000. Colorado has gained the reputation of being one of the most progressive states in the Union on the road question. It is imperative that she keep this position, for in addition to the necessity of encouraging highways industries this state must provide for the enormous tourist travel that inevitably will flow thru the scenic gateway of the West.

It is a well known fact that, with all its ills, war

brings compensating benefits to humanity. Highway improvement that will double and treble the productiveness of the soil, advance civilization and provide work for the men temporarily withdrawn from industry, must and will be the great benefit derived from this war.

It was so in the days of Rome. Roman roads, radiating from the Eternal City to all sections of Europe, advanced civilization more rapidly than her armies, her laws or her art. The Appian Way is just as famous, and has been infinitely more useful to civilization than the Coliseum.

The resolution, which will be passed by the legislature and submitted to the people of the state for a vote, is in accordance with a nation-wide movement. It is an amendment to Section 3, Article II of the Constitution, and in describing the urgent necessity for the bond issue, the following language is used: "Whereas, the prosperity and comfort of the citizens of the State of Colorado, as the state develops, are becoming more and more dependent upon the condition of the public highways of the state, and under existing law it is impracticable and often impossible to construct and maintain highways thruout the state so that the same shall be permanent and capable of the highest and best utility and service" The amendment then follows.

After quoting the provisions under which bonds may be issued, the proposed amendment provides that "in addition to the amount of debt that may be incurred as above, the state may contract a debt by loan for the purpose of creating a fund to be expended as provided by law, by the State Highway Commission for the construc-

tion and improvement of public highways in the State of Colorado; said debt to be evidenced by registered coupon interest-bearing bonds not exceeding \$20,000,000.

"Said bonds, to an extent not exceeding million dollars, shall be dated June 1, 1921; not exceeding million dollars, dated June 1, 1922; and not exceeding one million dollars, dated June 1 of each year thereafter, until not exceeding the total amount of

million dollars has been issued, but no bonds shall be issued after June 1, 1925; and said bonds shall be payable at the option of the State of Colorado at any time after ten years from their respective dates, and shall be absolutely due and payable fifty years after their respective dates, and shall be of the denomination of one hundred dollars each, or any multiple thereof. The interest on said bonds shall be payable semi-annually at the rate of five per cent per annum, at the office of the State Treasurer, or at some place in the City of New York, U. S. A., and the principal of said bonds shall be payable at the office of the State Treasurer.

"The general assembly shall, as by law provided, enact all such laws as may be necessary with reference to

said bonds and with reference to carrying out the projects and purposes herein specified."

There is another angle to the question which will carry a local appeal. The vast, uncultivated lands of the West must continue to lie idle until adequate transportation facilities are afforded so that they can be profitably worked. The West does not have the network of railroads possessed in the East, and consequently it must develop a great highway feeder system if it is to take its proper place in the progress of the Union. To develop such a feeder system the West must be able to meet the requirements of the federal aid act if it is to participate in the allotments from the \$500,000,000 federal aid appropriation. It cannot do this, Colorado cannot do this, unless the State Highway Commission is given funds with which to match the federal aid appropriations. Colorado cannot afford to stand still while other states around it, benefiting from federal aid and their own efforts, go forward by leaps and bounds and leave the now dominant state of the inter-mountain region far behind in the march of progress. Not only would it be humiliating, but ruinous to the commonwealth.

Mountain States Ask Liberal Treatment

By H. C. Allen, Engineer Idaho Highway Commission

THAT the United States government should adopt a more liberal policy toward the states in its appropriation for road funds and that the old plan of requiring the state to raise a dollar for each dollar spent by the government, should be discarded, was the opinion expressed by H. C. Allen, state highway engineer of Idaho, who was in Denver to meet L. W. Page, of the U. S. Bureau of Public Roads, recently.

"Our property and valuation will not permit of our meeting the government on an even basis when funds of millions of dollars are under consideration," said Mr. Allen, "and certainly most of the other mountain states are in the same plight.

"Mr. Page, I understand, agrees with our opinion in this, but it cannot be too strongly emphasized, and the members to congress who represent the West should make it a point to insist upon modifications of the present rulings, at an early date."

Idaho is face to face with a difficult problem in its road construction, according to Mr. Allen.

"Our funds are derived from a \$1,000,000 bond issue passed in 1917, to apply on so-called permanent construction work. This bond issue is taken care of by a special tax levy which applies on interest and sinking fund.

"The money itself is expended upon 2,000 miles of designated state highways which we are opening up only slowly as we have much expensive construction, little road material and a constant demand for maintenance and improvement.

"Our automobile tax ranges from \$15.00 for the small cars to about \$30.00 based upon weight. Of this fund, however, only 25 per cent. goes to the state, the rest being turned over to the counties for road work in their highway districts. We have no supervision over this work at all, but have established a plan of co-operation whereby the state districts divide the expense, the work then being done under our office.

"The biggest problem now confronting us is the construction of links of highways seriously needed. We have only trunk lines in our state system with connecting links between them. These must be built up in order to develop our resources, particularly the mining section of the state, and the problem is too much for the limited funds at hand.

"One of the handicaps which we have to face in common with other states is an increase in motor truck traffic. In Idaho this class of travel is especially important as we must depend upon it in a large measure for our transportation, but in consequence of the appearance of heavy units upon the roads, we are faced by an ever-increasing need of maintenance.

"It is my personal belief, and it cannot be too strongly emphasized to suit me, that the vehicle which does the damage to the road should be the one to pay for the maintenance, or some reasonable part of it anyway.

"Hence I favor a graduated tax on the motor truck which shall be based upon its tonnage of weight and which will serve to give back some part of the sum which the truck's travel costs us in repairs."

Our Unoccupied Lands and the Settler

By the Colorado Department of Immigration

FOR the first time in history Colorado is putting under way an active campaign for a more intelligent program in the settlement and development of her great unoccupied areas, including both those now classed as a part of the public domain and those now privately owned but unproductive.

Early in December Governor Gunter called a meeting for the purpose of considering the problem and suggesting to the General Assembly plans in this direction, summoning to the conference men who have more than casual interest in state development and who have given thought to the best way in which it is to be promoted. Among those present in the Senate chamber when the meeting was called to order were representatives of the United States Reclamation Service, the State Board of Immigration, the Colorado Development Federation, the Denver Civic and Commercial Association, the State Land Board, the State Agricultural College, the State University, the Railroad Immigration Service and several citizens who are interested in the work.

After an all-day conference, former Governor Ammons, who presided, named a committee to consider and recommend legislation by which Colorado may avail itself of the proposal of Secretary Lane of the Department of the Interior and to consider ways and means of bringing into operation in Colorado a plan somewhat similar to that now in operation in California, by which the state reclaims and develops the land and sells it to settlers on annual installments covering a long period of years. These installments are little more than crop payments, but they eventually wipe out the entire principal.

The committee, which is composed of Governor Gunter, former Governor Ammons, Governor-elect Shoup, John E. Field, engineer of the State Land Board; George W. Martin of the Rock Island Railroad, Cass E. Harrington of the Colorado Development Federation, President A. A. Edwards of the State Board of Agriculture and Edward D. Foster, commissioner of the State Board of Immigration, met in another all-day session during the following week and resolved itself into smaller committees to care for the details of both plans. Definite plans probably will not be announced until the measures are submitted to the Legislature, but it is certain that the proposed legislation will be in the direction of a more progressive, intelligent program than ever will be possible under the present laws of the state.

Under the Lane plan the state and Federal governments co-operate, the former providing the land and the latter doing the reclamation work. It is anticipated that the Federal aid will go beyond the point of furnishing water for the irrigation of arid land and will provide for the erection of suitable buildings, fences, etc., so that the farm may be in shape for immediate work on the part of

the settler, thus solving one of the gravest problems of immigration work.

As a general rule, the new settler has but little money. He brings his brains and his energy and pits them against the fortunes of the elements and the hardships of pioneering. Here it is expected that the newcomer will find the land ready for the plow, the farm ready for his family. Payments will be arranged on an amortization plan which will give him years in which to pay off his debt to the government, paying a little each year, his payments carrying the interest and a portion of the principal. In this way he will be able to pay for his farm and improvements in 30 or 40 years, the annual payments amounting to little more than ordinary crop payments.

Such a plan enables the settlement of unoccupied lands by earnest, intelligent men who have families to support and whose cash capital is not much more than enough to provide them with the necessary farming equipment and to maintain their families until the land shall have begun to pay dividends. It may safely be said that fully half of the total number of immigrants coming to the West each year are of this class. They have intelligence and energy but small capital, and usually they have families dependent upon them for support during the years while they are earning farms of their own.

Both plans—the California plan and that suggested by Secretary Lane—contemplate a financing provision of this sort, and it is possible that the state plan may go even further and provide that the settler may borrow a stipulated amount over and above the amount still due on the land after the first payment is made. By a provision of that sort any man with ordinary talent and industry cannot fail if he selects land capable of production and is not himself ignorant of the problems of farming.

While nothing definite has been announced as to the manner in which the Lane plan can best be carried into effect in Colorado, it is believed the committee may determine to seek Federal aid in the settlement of lands under government reclamation projects already settled, rather than to seek the construction of new projects at the present time. By adopting such a plan the work will be greatly facilitated, as the land can be made ready for returning soldiers and sailors and other settlers within a short time, while the planning and completion of an irrigation system is necessarily a matter of years.

The long delay which Secretary Lane's program involves is one of the principal objections to it, and thus far the objections have been met only with the statement that the prospective settler can find employment on the projects under construction and can thus earn and save enough to make an initial payment on the land after the completion of the project. It is a fair answer but it is doubtful if the great mass of prospective farmers will be

(Continued on page 24)

The Proposed State Motor Vehicle Law

NEXT to highways, Colorado's big acknowledged need today is an equitable and comprehensive motor-vehicle law. Without such an enactment that will safeguard the interests of the roadbuilders, the autoists and the public alike, it is a waste of good money to construct and maintain highways.

Our present auto law was enacted in 1913. At that period we had approximately 8,000 automobiles in Colorado. Furthermore, the auto even in that late date was considered by many as a "passing fad." Since then it has become a commercial and domestic necessity by leaps and bounds until today we have more than 90,000 auto motor-vehicles of one sort and another operating in Colorado—and with the ending of the war we will have 20,000 more here within the next twelve months.

It became my duty in 1909, as secretary of the Fire and Police Board of Denver, to issue and control the motor-vehicle licenses of Denver—there then being no state law. As I remember it, when I retired in June, 1912, we thought we were "going some" because we had 5,000 autos on the license rolls here. We now have about 20,000.

Following my election as secretary of state two years ago it again became my official duty to take supervision of the motor-vehicle business, not only in Denver, but thruout the state. It required only a brief experience with the state law to show that it was entirely inadequate. But the legislators had not yet been educated to the importance of the question, and the appeal by the highway commission, the county commissioners and myself for a new enactment fell upon deaf ears.

Since then a concerted effort has been in progress for better roads and better auto laws by all who are interested in Colorado's advancement; and because of my official experience in handling the automobile license business it fell to me to draw up a rough draft for submission to the State Highway Commission, the county commissioners and various auto and commercial clubs, preliminary to a new and satisfactory enactment being presented to the legislature in January.

A careful study of the laws of all of the other states shows that no two are alike. Some are as slipshod as our own. Others are worse. Two or three, California, New York and Illinois, contain the best features. What is needed, and what we will have during the course of the next five years, will be a uniform law in each state—local conditions, of course, varying some minor rulings. For the present we can only do our best to have enacted in Colorado a set of motor-vehicle laws that will be a model for those of other states.

First and foremost, we must consider rules and regulations governing the operations of autos of all classes, from the flivver to the monster truck. These rules and regulations, as set out in the draft of the new law, are

*By James R. Noland,
Secretary of State*

made so elastic that the State Highway Commission, either on its own initiative or on written complaint from a majority of any board of county commissioners, may limit the speed and the weight of the load that may be operated over any highway. The State Highway Commission is also empowered to fix the width of tires on trucks and trailers.

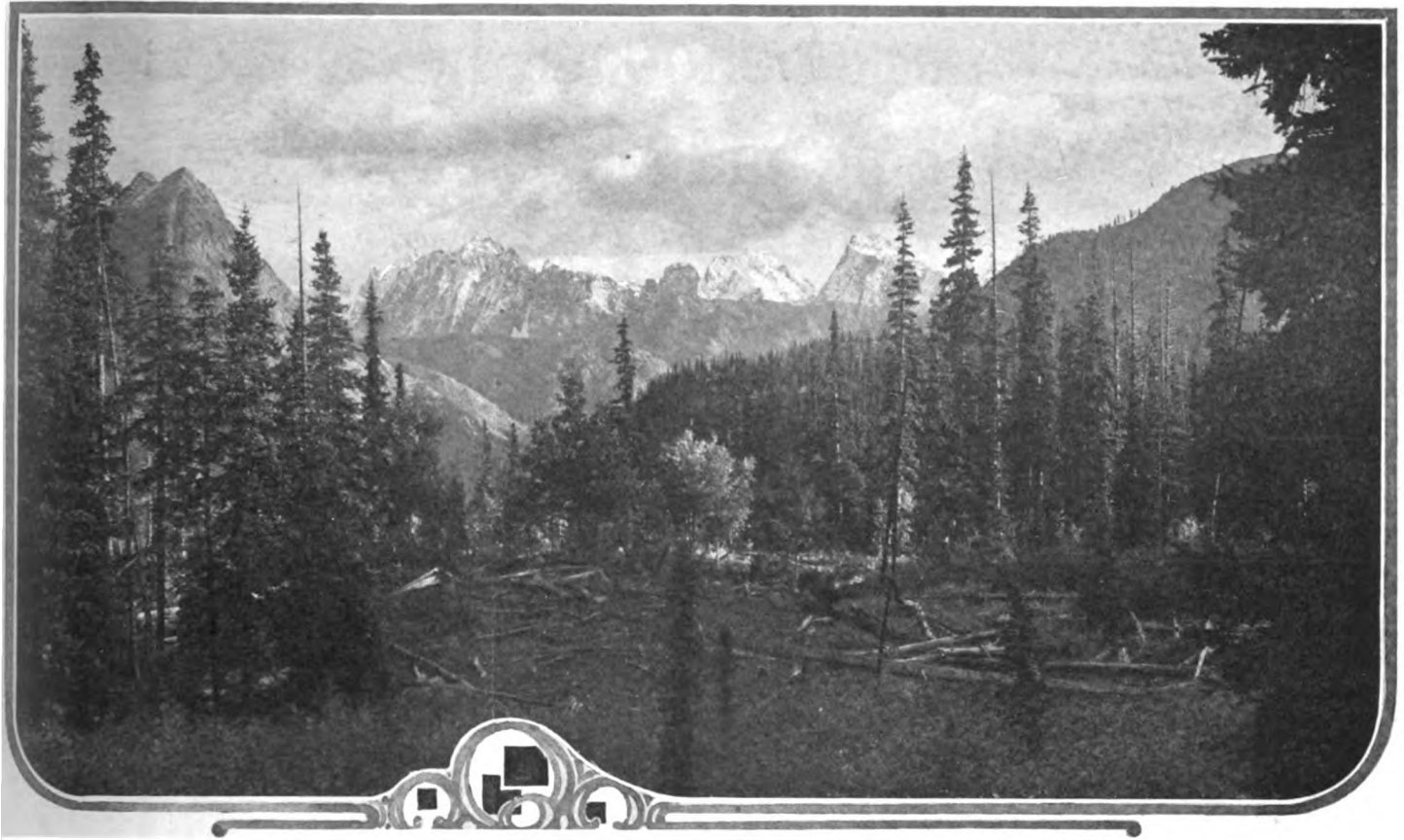
No general speed limit is fixed other than that the bill as drafted reads: "Every person operating a motor-vehicle of any description on a public highway of this state shall drive the same in a careful and prudent manner, having regard to the width, traffic and use of the highway, and at a rate of speed so as not to endanger the property of another, **or the life or limb of any person** (which includes the operator); provided further, any city or town within the state may make and enforce reasonable ordinances, rules and regulations concerning the speed of such motor-vehicles within such city or town, provided that no such ordinance, rule or regulation shall limit the speed of such motor-vehicles to less than the rate of eight miles an hour in crossing highway intersections, or less than the rate of fifteen miles an hour in other parts of such city or town; **provided further**, the State Highway Commission is hereby authorized and empowered to limit the speed of such motor-vehicles on any thoroughfare over which such commission has control * * * and the State Highway Commission or the properly constituted authorities of any county, city or town may set apart driveways, speedways or boulevards under their control for the exclusive use of passenger or other motor-vehicles * * * and the speed of motor-vehicles being operated on any mountain roads shall be limited to 30 miles an hour on level stretches for the distance of half a mile, to 20 miles an hour on grades of more than 2 per cent., to 15 miles an hour on wide curves and to 8 miles an hour on sharp turns or curves."

A section is incorporated making it unlawful for any person while under the influence of liquor or of any exhilarating or stupefying drug, to operate a motor-vehicle.

The nearest justice of the peace or other proper trial court is designated to hear a complaint against any person violating any of the provisions of the proposed new law—the county road fund and the state road fund each to receive one-half of any fine that may be imposed. A limited number of state auto license inspectors are provided for, both with and without pay, and are given full police powers when acting under bond to the state. This is one of the very urgent needs of the new law.

In the early days, a horse-thief stealing a ten-dollar cow-pony was chased for days, if need be, and when caught was hanged to the nearest tree. In these days any old thief seems at liberty to steal a \$500 or \$5,000 au-

(Continued on page 28)



When this jagged skyline meets the motorist's eye as he travels over the Durango-Silverton road, he knows instinctively that he is gazing upon the famous Needles of the San Juan.

May Increase Federal Aid Appropriations

By Logan Waller Page, Late Chief U. S. Public Roads Service

INCREASE in the Federal Aid road act appropriation, coupled with modifications of the act which will make its provisions more flexible and more equitable were forecast by Logan Waller Page, late Director of the U. S. Bureau of Public Roads, and one of the foremost authorities on roads in the United States, on the occasion of his recent visit to this city, and just before his death in Chicago.

"Everywhere in the United States the demand for good roads is crystallizing," said Mr. Page, "people who had not thought of the subject a few years ago, today recognize the economic value of better highways, and it is my belief that this sentiment will soon find its reflection in Congress.

"At the present time the Post Office and Post Roads Committee of the Senate has under consideration amendments to the Federal Aid act which will, if passed, add some \$500,000,000 to the road fund to be expended over a term of years. which with the state and local funds will aggregate probably \$1,000,000,000.

"Thus it is proposed to make immediately available the sum of \$50,000,000, the sum of \$75,000,000 which will become available July 1, 1919, a similar amount for use beginning July 1, 1920, and in the four years following

the sums of \$100,000,000 annually are to be provided for road work.

"These expenditures, the bill provides, will be made under the Federal Aid act provisions with two new amendments.

"The first of these would make possible the expenditure of these funds on other than roads designated as rural post routes, thus eliminating the limitation which has worked much hardship on state departments in the past since there are many important highways which do not come within the post route definition.

"The second and more important of the two refers to the clause which now provides that the states shall meet each government appropriation on a dollar for dollar basis. There are seven mountain states which cannot meet the provisions of the new appropriation, since a limited valuation does not give them enough funds. There are other states not quite so badly situated but still unable to cope with the proposed increase.

"Accordingly the senate committee has under consideration a classification of states according to their valuations and mileage, under which it is probable that there will be roughly speaking, four classes as follows:

(Continued on page 27)

NOT all of the travel which makes Colorado its goal each year is directed to the mountains. True it is that thousands annually seek recreation and health in the cooling breezes of the pine-clad hills, but there are other thousands whose purpose is more directly concerned with the more practical side of life and who come here in search of land on which they may farm and produce.

To such a class the billowing plains of the eastern section of the state have made a strong appeal in the past and while it cannot be said that the land there is available for homesteading, there are always opportunities for purchase presenting themselves to the thrifty farmer and possessing possibilities of a sure income.

Years ago Eastern Colorado was considered chiefly as a means to an end. It was on the direct route of travel to the Pike's Peak region in the early gold rush, and hunters and gold seekers passed through in 1858, 1859 and 1860 with scarcely a thought to the potential source of wealth under their feet.

From points along the hog back as far as seventy miles away, the first view of Pike's Peak was to be had, and with that point as a goal the travelers pushed forward, intent upon nothing but getting to the famous mountain as quickly as possible. Incidentally it was Pike's Peak which was always the mecca for gold seekers in early days, and as pioneers have said, years before gold was discovered in the Cripple Creek district the feeling, almost an intuition, existed that the peak was the depository for untold wealth.

As the rush continued, there grew a consequent demand for supplies, and in the wake of the miners came the cattle men. In Eastern Colorado they found an ideal location for their herds, miles upon miles of open range, few fences, good watering spots and a long open season.

So to a time which extended to as late as 1900 cattle grazing was the chief industry and thousands of Texas longhorn cattle grazed on the open prairie.

But the evolution continued. Homesteaders were attracted as the lands in the East became exhausted and the constant crops of natural grass gave rise to the belief that something more could be raised. One by one the homesteaders edged their way into the reserves of the cattle growers, acre by acre the land was broken and tilled, and gradually the cattle men saw their stock of rangy Texas steers reduced, while in their place came herds of pure bred stock. Today scarcely a longhorn remains of the thousands which once roamed at will throughout the district.

As the settlers increased in number the counties grew in wealth. Roads were called for and the trails were broken through, linking up the settlements. Farm pro-

Prairie Schooner, Texas Dogie and Motor Car

A Kaleidoscope of Eastern Colorado

duction increased steadily and with it there was a perceptible growth in the volume of dairy produce. Denver and the cities close to the range called for food, and Eastern Colorado produced it in variety and in quantity.

At first the homes were nondescript in character. Some lived in dugouts, others raised "shanties" built of the most convenient material at hand. Today these have either disappeared or are used as storehouses. Fine homes and prosperous farms dot the section, and dairying on an intensive scale is under way.

Prosperity has set its seal on the section and yet the development has just begun.

With the increase in road work and the gradual advertisement of Colorado as a state of fine scenery, health-giving ozone and opportunity, travel turned to the Centennial state. Nine-tenths or more of this today enters through one of the eastern gateways and in consequence the automobile travel is reaching enormous proportions. Not all of this is through travel, as has been pointed out. But whether it is or not, each traveler who goes through buys a meal here and there, purchases fuel, tires or some other supply, leaves some wealth behind him. Small individually, the sum in the aggregate has become considerable, any the revenue, while perhaps not noticed now, would be missed if cut off.

But the plans for the future do not forecast such action. Instead there is an increasing demand for good roads everywhere in Eastern Colorado. Primarily the farmer wants them as a means of transportation which will enable him to get his produce to market. The advent of the motor truck as a commercially practical vehicle has widened his marketing range, has stimulated his production and at the same time has called his attention to the fact that he must have good roads. Hence he is demanding them and he is getting them as may be attested to by the fact that all of the counties have increased their road funds in the past five years to a very marked extent, while the call for more aid from state and nation daily becomes more insistent.

As these roads are constructed they afford, in turn, diverse routes for the automobile traveler. They permit him to venture from the main highways, to penetrate into points off the main line, little known in the past, but possessing none the less some of the finest farms in the section. In consequence the farmer finds the value of his property enhanced. The prospective purchaser is able to see it, knows that it is accessible to a main highway and is accordingly, more ready to enter into a bargain for it.

Today there are three chief routes into the eastern section: The Platte Valley road, which cuts thru from the northeastern section into Greeley and the main north and
(Continued on page 27)

Digest of Proposed Motor Truck Law

For Regulation of Common Carriers

ONE of the bills to be presented at the coming session of the general assembly as a subsidiary measure in connection with the \$20,000,000 bond issue for better roads, and backed by the Highways Transport committee, the State Highway Commission and motor interests of the state, is the so-called "motor truck" bill.

This bill, if enacted into law, would give the Public Utilities Commission of the state "power and authority to supervise and regulate every transportation company in this state; to fix the rates, fares, charges, classifications, rules and regulations of each such transportation company; to regulate the accounts, service and safety of operations of each such transportation company; to require the filing of annual and other reports and of other data by such transportation companies; and to supervise and regulate transportation companies in all other matters affecting the relationship between such companies and the traveling and shipping public."

The definition of the term "transportation company" is given in the bill as "every corporation or person, their lessees, trustees, receivers or trustees appointed by any court whatsoever, owning, controlling, operating or managing: (a) any automobile, auto truck, stage or auto stage used in the transportation of persons or property as a common carrier for compensation over any public highway in this state between fixed termini or over a regular route, and (b) any automobile, auto truck, stage or auto stage used in the transportation of persons for compensation over any public highway in any city, town or city and county, and affording a means of transportation similar to that afforded by street railways and in competition therewith, by indiscriminately accepting and discharging passengers; provided, that the term 'transportation company,' as used in this act, shall not include corporations or persons, their lessees, trustees, receivers or trustees appointed by any court whatsoever, insofar as they own, control, operate or manage taxicabs or hotel busses, or any other carrier which does not come within the term 'transportation company,' as herein defined."

In defining the jurisdiction of the Public Utilities Commission the proposed act says: "The Public Utilities Commission of the State of Colorado, in the exercise of the jurisdiction conferred upon it by this act, shall have power and authority to make orders and to prescribe rules and regulations affecting transportation companies, notwithstanding the provisions of any ordinance, franchise or permit of any incorporated city or town, city and county, or county, and in case of conflict between such order, rule or regulation and any such ordinance, franchise or permit, the order, rule or regulation of the Public Utilities Commission of the State of Colorado shall in each instance prevail."

The act does not apply to interstate commerce except as permitted by the constitution of the United States and the acts of Congress. In further definition of the term "common carrier," the bill says: "The term 'com-

mon carrier,' when used in this act, includes every railroad corporation, street railroad corporation, express corporation, dispatch, sleeping car, dining car, drawing room car, freight, freight-line, refrigerator, oil, stock, fruit, car loaning, car renting, car loading and transportation companies as defined in section 1 (c) of this act; and every other car corporation or person, their lessees, trustees, receivers or trustees appointed by any court whatsoever, operating for compensation within this state."

For violation of its provision the bill provides a fine of \$1,000 or imprisonment in the county jail not exceeding one year, or by both such fine and imprisonment, and further provides that anyone who refuses to obey any rule, order or regulation of the Public Utilities Commission is guilty of a misdemeanor and punishable by the penalties just named.

The safety and emergency clauses are attached to the bill.

Distribution of Bond Issue

The State Highway Commission made up a tentative budget for consideration in connection with the distribution of a \$10,000,000 bond issue. The figures used will, of course, have to be doubled if the \$20,000,000 issue is adopted by the people, and the highway budget accepted as satisfactory. In arriving at its basis of distribution the commission sought to arrive at a conclusion fair to all counties in the State. It first distributed the fund upon a valuation basis in each of the five road districts, distributed upon a road mileage basis and averaged:

District No. 1 (14 counties)	\$5,210,259
District No. 2 (10 counties)	\$1,340,024
District No. 3 (11 counties)	\$1,653,696
District No. 4 (17 counties)	\$1,041,859
District No. 5 (10 counties)	\$ 755,438

If proportioned by State road mileage:

District No. 1	\$2,215,447
District No. 2	\$1,906,158
District No. 3	\$1,873,724
District No. 4	\$2,300,559
District No. 5	\$1,703,506

Or, if the two last computations are averaged:

District No. 1	\$3,712,853
District No. 2	\$1,623,391
District No. 3	\$1,763,710
District No. 4	\$1,671,201
District No. 5	\$1,229,472



At first glance this scene might suggest the cotton fields of the Sunny South—but, actually, it shows the harvesting of a bumper bean crop in Weld County, Colorado.

National Transport Bureau Recommended

Results of Chicago Meeting Summarized

Creation of a permanent national bureau of transportation, together with continuance of state organizations, was recommended as one of the most important steps in the work of reconstruction at the meeting of highway transport officials from all parts of the United States in Chicago.

As a result of the deliberations of the meeting, upon a motion introduced by the Colorado delegate and seconded by Michigan, the committee went on record as favoring these points:

The enactment by Congress of an amendment to the present federal aid road act which would provide \$500,000,000 for work on the roads of the United States during the next seven years.

The creation of a federal road commission of five skilled engineers, who should have charge of the expenditure of this fund in conference with the highway commissioners of the various states.

The construction of a national system of highways, the location of which is to remain in charge of the state highway departments.

Changes in the present federal aid act which would do away with the restrictions now limiting federal aid to roads on 70 per cent of the mileage of which there is post delivery and of the limitation of \$10,000 per mile under federal aid.

Reports from all sections of the country showed that it has been possible to bring about a marked increase in marketing through improved transportation wherever the road would stand the traffic. The conclusions reached were that all that is necessary today to add untold wealth to the resources of the country, together with an enormously stimulated production of all kinds of supplies, is a road system which will not only open up the virgin territories of the West and South, but which will quicken the pulse of trade in the most congested districts of the East.

In standing by the creation of a federal road commission, the officials of the body expressed their belief in the

feeling now generally prevalent throughout the United States among road men, that the time has come when transportation on the highways is deserving of more substantial recognition than that accorded it as a bureau, which, while it has been as efficient as the limitations of the laws have permitted, would be dignified if elevated to the rank of a commission, and would make possible representation of five different districts of the United States with their diverse needs.

As for the future of the highways transport committee, the work already done by the voluntary organizations has opened such a vast field for research in the economic life of the country that it is believed this work should be continued as a branch under the proposed road commission by salaried men who should be experts in the field, and who would give all of their time to a close development of the problems which the present committee has thus far only had time to uncover. In this field are classified the subjects of utmost importance to the future development of the United States, as follows:

A study of the relationship of transportation to the cost of living.

A study of the development of the railroad lines through a vast new business which would be brought to them through the utilization of every highway as a "feeder."

A study of the relationship between the cost of transportation on an earth road as compared with that on gravel and hard-surfaced highways with the idea of placing before the residents in every community what the improvement of the road means to the business of each one of them, whether he be in the city or the country.

An analysis of the traffic limitations imposed by grades and research which would disclose at what point it becomes cheaper to carry a smaller load up a steeper grade than to carry a larger load a longer distance at a lower grade. The effect which utilization of highways for

(Continued on page 28)



A peaceful farm scene in Adams County, with the Continental Divide looming grandly on one side, and a hard-curfaced road gradually approaching from Denver on the other.

State Highway Appropriations--1919

More Than \$1,000,000 Included in Budget

MORE than \$1,000,000 was appropriated by the State Highway Commission for highway work at its meeting from December 17 to 19, 1918. It is to be noted, however, that the fund derived from the Federal Aid Road Act, amounting to \$320,819.83, is to be considered as a resource and expended in conjunction with the particular project funds appropriated from the state road funds, so that the total amount to be expended in connection with the State Highway Commission's work will be approximately \$1,360,000.

The estimated receipts from all sources for the fiscal year ending November 30, 1919, to be expended under the direction of the highway department, are as follows:

Internal Improvement Income Fund, and		
Internal Improvement Permanent Fund	\$	125,000.00
Fund from the licensing of automobile trucks and motorcycles		205,000.00
Fund from the one-half mill state levy, 98½%		700,685.45
Interest and miscellaneous		12,500.00
Total	\$	1,043,185.45
Estimated amount to be expended for Administration purposes being 4% of \$1,043,185.45	\$	41,727.42
Leaving a net balance available for the State Highway work of 1919	\$	1,001,458.03
Amount required for meeting the obligations of the state during the year 1919:		
Federal Aid Postal Road Funds	\$	320,819.83
Federal Aid Forestry Funds		99,738.50
	\$	420,558.33
TENTATIVE PLANS FOR FEDERAL AID PROJECTS FOR		
THE STATE TO PROVIDE ONE-HALF	\$	397,492.12
		198,746.06
DISTRICT 1.	Preliminary Estimate	State to Provide
LARIMER COUNTY—Improvement of Road 51—Big Thompson Canon, to Estes Park—20 miles	\$90,000.00	\$45,000.00
ADAMS COUNTY—Pavement on Brighton Road—2 miles	43,000.00	21,500.00
YUMA COUNTY—Grading and Drainage, Wray to Idalia—15 miles.....	10,000.00	5,000.00

WELD COUNTY—Pavement from Greeley city limits, 1 mile south.....	21,000.00	10,500.00
BOULDER COUNTY—Pavement, Boulder city, East ½ mile; Longmont city, South ½ mile	21,000.00	10,500.00
LOGAN COUNTY—Pavement, Sterling city, South ½ mile	11,000.00	5,500.00
MORGAN COUNTY—Pavement, Ft. Morgan to Brush, ½ mile	11,000.00	5,500.00
		\$103,500.00
DISTRICT 2.	Preliminary Estimate	State to Provide
EL PASO COUNTY—Pavement, Colorado Springs, North ½ mile	\$31,500.00	\$15,750.00
DISTRICT 3.	Preliminary Estimate	State to Provide
PUEBLO COUNTY—Pavement, Pueblo East—2 miles	\$44,000.00	\$22,000.00
PROWERS COUNTY—Grading and drainage, 30 miles, Lamar South.....	12,000.00	6,000.00
BACA COUNTY—Grading and drainage, 15 miles, Springfield North	6,000.00	3,000.00
OTERO COUNTY—Pavement from Rocky Ford, East ½ mile	11,000.00	5,500.00
Pavement from La Junta, ½ mile West	11,000.00	5,500.00
		\$42,000.00
DISTRICT 4.	Preliminary Estimate	State to Provide
DELTA COUNTY—Pavement from Delta South ½ mile	\$11,000.00	\$5,500.00
COSTILLA COUNTY—Grading and drainage, Ft. Garland to San Luis—17 miles	10,200.00	5,100.00
MONTROSE COUNTY—Pavement from Montrose, North ½ mile	11,000.00	5,500.00
OURAY COUNTY—Bear Creek section—Grading on new location	18,000.00	9,000.00
		\$25,100.00
DISTRICT 5.	Preliminary Estimate	State to Provide
MESA COUNTY—Pavement, Grand Junction, East ½ mile	\$11,000.00	\$5,500.00

(Continued on page 19)

Road Outlook of Forestry Service

By the U. S. Forestry Service

PENETRATING into the forest depths, edging their way along the sides of dizzy cliffs, chancing the perils of swamp and glade, the men of the U. S. Forest Service are today acting as the advance guard of the road builders of the country. Where other agencies devote most of their effort toward the reconstruction or improvement of roads already constructed, the Forest Service is still engaged in pioneer work and many a tale of adventure has come out of their work.

Last year, the work of the service was the first to be cut down by the war, since for the purposes of immediate war-making their task was of little importance. This year they will be on the job again with renewed life, and wherever the national forests are to be found, there will be seen the forest gangs at it harder than ever. All told \$5,750,000 will be expended on this work this year, of which \$2,800,000 will be derived from the funds of the service, the rest from the co-operative funds of states and counties.

Out in Oregon, for example, we find a crew engaged in clearing a way for a road along the south side of Lake Quinalt in the Olympic peninsula. Trees of enormous diameter block the way, but back of this timber is production and the world needs food, so in the face of un-heard-of difficulties the work goes on.

Down in the southeastern part of Colorado rest the Needles of the San Juan, rated as among the most rugged points in the United States. There is a section of country which has never been opened to travel, thru solid rock and skirting a roaring creek. Seventeen miles of cliff must be dropped into the valley below, switchbacks and hairpin curves must be located, but the road will complete the last link in a 1,200-mile trip, and the men of the service do not turn back.

On the north side of the Columbia river in Washington locations have been completed for a connecting link in the main state trunk highway. A railroad must be re-located, cliffs must be tumbled down, dynamite in car-load lots will be needed. The work will be under construction with the first touch of spring.

From Canyonville to Galesville in Douglas county, Oregon, there is a trail today which leads thru the heart of the Umpqua forest. That trail must be widened that travel may flow freely along the Pacific highway.

Again in Oregon there is a stretch of road known as the Zigzag Government Camp way. The West is nothing if not blunt and the title is precise. Two stretches of that trail are impassable for machines today. Completed they will open up for Portland a circle trip to Crater lake of surpassing beauty. It is hoped that the work will be completed this year.

Down in Arizona there are two east-and-west main highways, but no connections between them from the Rio Grande river to the road from Phoenix to Ash Forks in Western Arizona and, moreover, people living at Clifton, but 30 miles away from the cool breezes of the range, must travel to California to escape the blaze of the summer sun. So, the Forest service, in conjunction with the counties, has projected a north-and-south road 94 miles long from Clifton to Springville, which will not only let people into the hills, but will open a market for millions of feet of matured timber which today can only be brought out by pack saddles.

In New Mexico the Tijeras canyon runs down to the east of Albuquerque. At its head lies a valley of grazing and farming lands. Firewood can be had there also in abundance. It must be brought out, and so a road 14 miles long will be pushed thru the canyon.

Where the Humboldt forest rests in northern Nevada, will be found one of the most promising new gold fields in the world. Isolated in the winter, but poorly linked up in summer, Elko county is not anywhere near capacity production. But it will be for a road 50 miles long, known as the Charleston-Jarbridge project, will probably be under way with spring.

One of the chief difficulties which travelers have encountered in entering Yellowstone Park from Wyoming has been the lack of good roads, so a project has been drawn up which will improve the road from Dubois to the western boundary of the Teton forest. This in turn will be linked up with the highway thru the Jackson hole country. At Dubois the road will connect up with three transcontinental routes and will thus afford the traveler an optional route of great charm in his journey to the famed park.

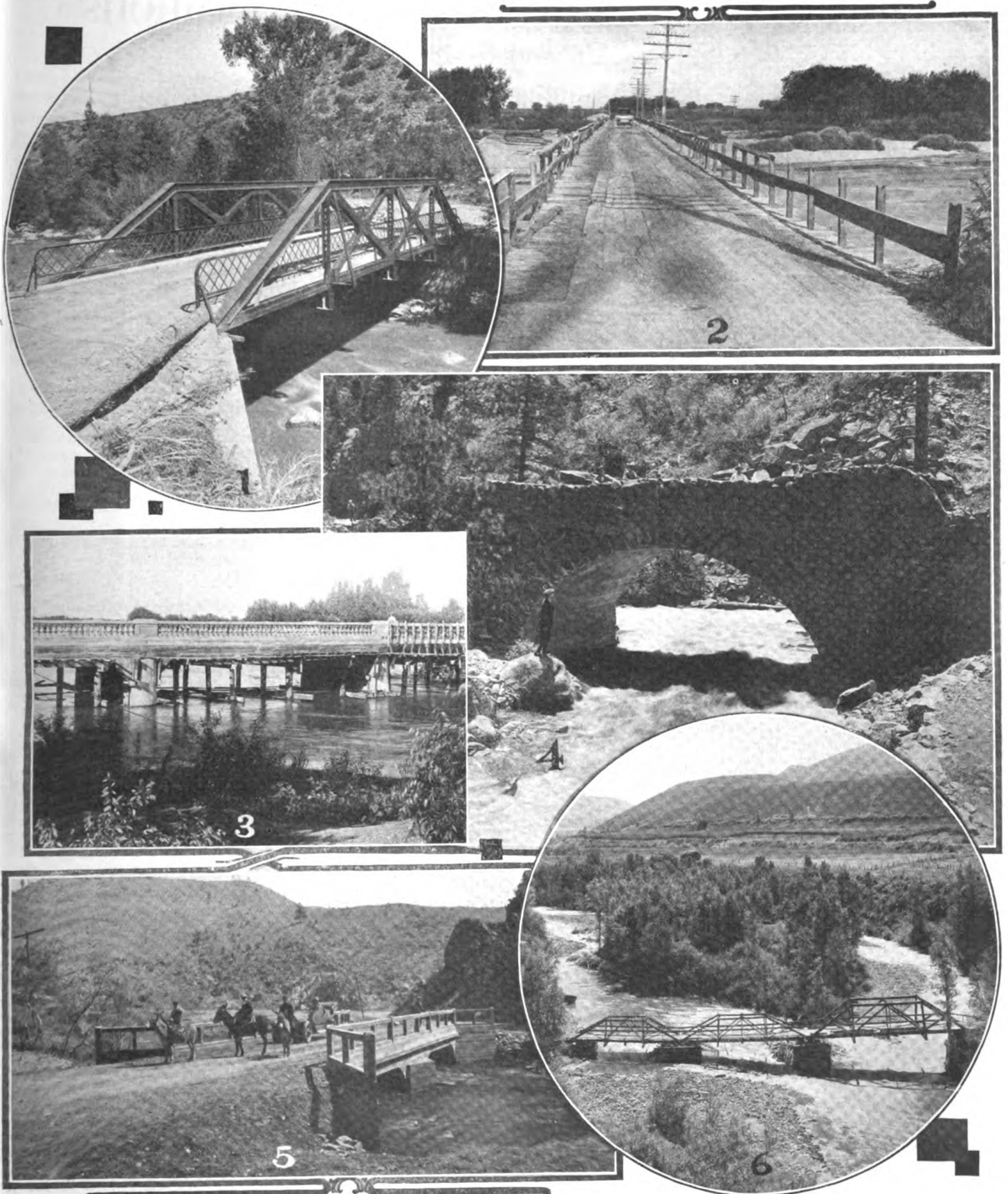
Another link in a transcontinental route which has been seriously needed will be constructed in Utah when the highway is pushed thru from Ephraim to Orangeville, a distance of 46 miles. This will link up with the road thru the noted Paradox valley of Colorado, where are mined the precious carnotite ores and will give the thru traveler an outlet both to the east and west.

Then we have Idaho. Here is the Galena-Summit section of the Ketchun Clayton road, not only a link in an important trunk highway, but a route which will open a new district for grazing, agriculture and mining—a land of beautiful background, diverse scenery and resources.

Finally the Service is planning to invade the notorious Nigger hill west of Missoula in Montana, and by a heavy construction operation will open a new road on grade.

And with the release of state funds made possible thru passage of the Bankhead bill, new sums of money will be at hand to aid the Service in its great work.

Bridges Are the Sign Posts Along the Highway of Motor Transportation



1 Modern bridge construction across the Roaring Fork, Pitkin County. 2 Old style bridge across the South Platte near Kersey, Weld County. 3 Unfinished concrete slab bridge to replace No. 2. 4 An example of picturesque bridge construction, suited to surroundings, Middle Boulder Canyon. 5 Slab construction bridge in Bear Creek, above Morrison, Jefferson County. 6 Solid steel railroad bridge on the Phantom Canyon Route, Fremont County. Nos. 1, 3 and 5 built by State Highway Commission.

Grade Limits and Traffic Conditions

By J. E. Maloney, Chief Engineer, State Highway Commission

THE tables published herewith are compiled from information gathered from many sources and we have endeavored to reduce them all to a common cost basis in order that the cost per ton-mile might be of value for comparison.

The loads carried are as originally recorded. In some of the items recorded the charges seem low, for instance, the gas consumption on the two heavy trucks.

The two trucks in use by the State Highway Commission show in detail the costs per mile and per ton-mile, of gross weight, except that the item of tires and repairs was spread over the entire work of the two trucks.

It will be noted that the average cost per ton-mile for the truck, both heavy and light, and the cost per ton-mile for the light and heavy touring cars agrees very closely.

Of the tests recently undertaken by Mr. A. U. Johnson, Consulting Engineer of Chicago for the Portland

Cement Association, the table published here presents only the results for what he calls "The Commercial Haul." This was very clearly the difference in the gas cost on the several classes of roads.

The use per ton-mile, gross weight, and also per ton-mile of pay load, is shown in the table.

The costs given in these tables are per ton-mile of weight of car, plus weight of load or gross weight. If it is desired to get the equivalent cost per ton-mile of pay load, it can be obtained by dividing the cost given, by the pay load in tons, and multiplying by the gross weight in tons. For instance, a five-ton truck, with a five-ton load one way—one mile=15 ton-miles gross,
pay load= 5 ton-miles,

if cost is given as \$0.10 per ton-mile, then,
0.10
—×15=\$0.30 per ton-mile pay load.
5

THESE TABLES GIVE ACTUAL RECORDED COSTS OF OPERATION OF TRUCKS AND TO
WEIGHT TONS
LOAD

Designation	Character of Road	Total Tons Hauled	No. Trips	Vehicle			Average		No. Miles Run
				Out	In	Average Weight	Average Weight		
No. 1	Paved streets	12 mo. 1,203	679	2.7500	1.7717	.....	0.8858	3.6358	7,103
No. 2	Paved streets	12 mo. 1,181	549	2.7500	2.1511	.....	1.0755	3.8255	6,522
No. 3	Graveled roads	10,836	10,561	2.8750	1.0260	.....	0.5130	3.3880	94,549
No. 4	Sand, adobe and gravel surfaced	6,621	5,790	3.1000	1.1435	.....	0.5717	3.6717	54,465
No. 5	Paved and gravel surfaced city streets	11,040	6,033	3.7250	1.8300	.....	0.9150	4.6400	54,337
No. 6	Paved and gravel surfaced city streets	10 mo. 7,359	1,423	4.7300	5.1714	.....	2.5857	7.3157	12,248
No. 7	Paved and gravel surfaced city streets	10 mo. 7,729	1,355	5.4375	5.7038	.....	2.8519	8.2894	11,747
No. 8	Paved and gravel surfaced city streets	12 mo. 12.35	52	0.8500	0.3500	0.1250	0.2375	1.0875	1,100
No. 9	Country and mountain roads	12 mo. ....	....	2.4000	.....	.....	0.4000	2.8000	9,982
No. 10	Country and Mountain roads	12 mo. ....	....	2.5000	.....	.....	0.4000	2.9000	9,687
No. 11	Country and mountain roads	12 mo. ....	....	2.5000	.....	.....	0.4000	2.9000	10,031
No. 12	Country and mountain roads	12 mo. ....	....	2.5000	.....	.....	0.4000	2.9000	10,103
No. 13	Country and mountain roads	12 mo. ....	....	2.2500	.....	.....	0.4000	2.6500	11,100
No. 14	Paved streets	12 mo. ....	....	2.3500	.....	.....	0.3500	2.7000	10,369
No. 15	Paved streets	12 mo. ....	....	2.3500	.....	.....	0.3500	2.7000	11,838
No. 16	Paved streets	12 mo. ....	....	2.3500	.....	.....	0.3500	2.9000	12,170

Nos. 1 to 5 inclusive, trucks hauling medium loads.
Nos. 6 and 7, heavy trucks hauling heavy loads. The very low cost per ton mile of these would seem to indicate that some of
No. 8, light trucks; package load, short trips.
Nos. 9 to 16, touring cars—passenger cars.
Nos. 3, 4 and 5 have the interest and depreciation included in the total.

THESE TWO TRUCKS USED IN CONSTRUCTION WORK AND HEAVY HAULING—THE DI

No.	Grade	Road Bed	Time	Weight in Tons			Miles Run	Days Worked	Total Ton Miles	Time Lost	
				Vehicle	Out	In				ac.	Ref
No. 17	1 to 5% grades	Heavy road bed, loose gravel	7 mo.	5.00	5.0	.....	1,382	27	10,427.50	30	11
No. 17	6 to 7% grades	Firm road bed, adobe	2 mo.	5.00	5.0	.....	1,611	39	12,025.00	30	4
No. 17	Light grades	Firm road bed, gravel	2½ mo.	5.00	5.0	.....	1,785	37	13,312.50	69	6
No. 18	1 to 5% grades	Heavy road bed, loose gravel	2 mo.	5.0	5.0	.....	1,189	24¾	9,022.50	45	2
No. 18	6 to 7% grades	Firm road bed, adobe	2 mo.	5.0	5.0	.....	780	27	5,850.00	2	1
No. 18	Light grades	Firm road bed, gravel	2½ mo.	5.0	5.0	.....	1,991	47	14,808.00	10	4

Average number miles per 8-hour day was 43.
For Truck 18 the average cost per mile was \$0.7245.
For Truck 17 the average cost per mile was \$0.7145.
In the Investment or Interest and Depreciation record, the life is assumed as 4 years, and interest is charged for the balance to
All of these figures are based on a cost of 28c per gallon for gasoline; 60c for cyl. and trans. oil, and 20c per lb. for grease; D

RECORDS OF COST OF OPERATION OF TOURING CARS
Weight of Machine and Load

No.	Description	Weight of Machine and Load	Miles Traveled
No. 19	5-passenger car—over all classes of roads and streets	4,850 lbs.	22,000 in 22 mos. 53,350 ton miles
No. 20	2-pass. Runabout, box body—Sandy and gravel roads; med. grades	1,800 lbs.	15,000 in 16 mos. 13,500 ton miles

If the pay load was carried both ways, the gross weight=20 ton-miles, pay load=10 ton-miles,

$$0.10 \times 20 = \$0.20 \text{ per ton-mile pay load.}$$

In our cost figures gasoline is charged at 28 cents per gallon, for Nos. 17, 18, 19, 20 and 21; for the others the price per gallon varies from 24 to 28 cents per gallon

(Editor's Note—The tables herewith presented are the first of the kind ever compiled, and will give a scientific basis for talking better roads. In his next article Mr. Maloney will draw his conclusions from the facts established.)

Tables Prepared by State Highway Department

TABLE OF EXPENSE OF ONE-TON AND TWO-TON TRUCK UNITS

Designation	WEIGHT		Per Mile Exp.					Per Mile					Per Gross		
	Unit	Vehicle Load	Av. Gross Wt.	1st Cost	Lic. & Taxes	Ins.	Int. & Depr'n	Gas & Oil	Tires	Repairs	Driver Misc.	Per Mi.	Ton Mi.		
21	1 Ton	3,000	1,000	2 Tons	\$1,936.00	\$0.0036	\$0.0048	\$0.0571	\$0.0204	\$0.0209	\$0.0133	\$0.0742	\$0.0074	\$0.2017	\$1.008
22	2 Ton	3,600	2,000	2.8 Tons	3,200.00	.0056	.0080	.0977	.0345	.0185	.0136	.1149	.0106	0.3034	.1083

This table was published in motor section of daily paper, and we have added the License, Tax and Insurance items. The ton-mile figure is for the gross weight. It was published as a maximum cost table for good road conditions.

From Engineering Record of November 7, 1918. Art. by A. U. Johnson, Consulting Engineer. Practical tests of the varying consumption of gasoline by 5-ton White trucks upon different classes of roads.

NOTE:—This table is based upon the records given by Mr. Johnson, but transposed to give an expression of the consumption in gallons of gasoline per ton-mile of gross weight and also for live or pay load. The "Commercial Haul" test only is used here.

Consumption of Gasoline per ton-mile in gallons for Gross Weight of 4.75.

Weight of Truck	Weight of Load	Total Load	Earth Clay	Gravel Fair	Gravel Good	Bituminous somewhat worn	Brick Fair	Brick Good	Concrete Good
2.75 tons	2.0 tons	4.75 tons	0.0364 gals.	0.0293 gals.	0.224 gals.	0.222 gals.	0.0213 gals.	0.0184 gals.	0.0179 gals.
2.75 tons	2.0 tons	.....	0.0865 gals.	0.0695 gals.	0.05315 gals.	0.0527 gals.	0.0506 gals.	0.04375 gals.	0.04295 gals.

Considering the live or pay load of 2 tons only, the consumption per ton-mile was:

OF DIFFERENT WEIGHTS—ALL COSTS PER TON MILE ARE FOR THE GROSS WEIGHT. EXPENSE

Cost	Gas and Oil	Tires	Repairs	Garage	Insurance	License and Taxes	Driver	Interest and Depreciation	Total	Per Mile	Cost per Ton Mile on Gross Weight	No.
1.00	\$ 441.32	\$ 180.00	\$ 18.60	\$108.00	\$140.00	\$ 80.00	\$ 1,200.00	\$1,062.00	\$ 3,229.92	\$0.4547	\$0.1251	1
2.00	368.07	180.00	.....	108.00	140.00	80.00	1,200.00	1,062.00	3,138.07	0.4811	0.1257	2
3.00	2,231.35	2,373.18	3,441.58	945.00	750.00	709.12	15,959.87	.....	26,410.10	0.2793	0.0824	3
4.00	1,546.80	931.35	566.44	550.00	421.87	517.42	9,792.81	.....	14,326.69	0.2630	0.0716	4
5.00	2,255.00	934.60	608.57	550.00	421.85	320.60	10,302.30	.....	15,392.92	0.2833	0.0610	5
6.00	753.12	200.00	3.50	100.00	136.75	92.52	1,750.00	1,339.32	4,375.21	0.3572	0.0488	6
7.00	863.79	200.00	133.50	100.00	130.30	88.40	1,750.00	1,276.16	4,542.15	0.3866	0.0466	7
8.00	23.00	17.00	2.50	10.00	6.00	5.00	125.00	15.98	204.48	0.1858	0.1709	8
9.00	405.79	516.31	467.14	188.95	121.25	87.60	957.57	1,430.75	4,175.36	0.4183	0.1494	9
10.00	328.00	426.35	294.05	148.55	125.00	90.00	830.58	1,475.00	3,717.53	0.3838	0.1323	10
11.00	382.04	607.59	590.64	150.85	125.00	90.00	666.99	1,475.00	4,088.11	0.4075	0.1405	11
12.00	316.97	748.62	265.90	156.85	125.00	90.00	827.06	1,475.00	4,005.40	0.3964	0.1367	12
13.00	372.00	688.61	185.89	167.50	85.00	64.40	1,011.78	1,003.00	3,578.18	0.3224	0.1216	13
14.00	301.68	366.30	440.08	146.00	73.12	56.80	947.16	862.87	3,194.01	0.3080	0.1141	14
15.00	372.20	211.75	291.47	160.50	73.02	56.80	1,299.54	862.87	3,328.25	0.2811	0.1041	15
16.00	430.47	411.43	267.13	164.00	73.12	56.80	961.07	862.87	3,226.89	0.2652	0.0982	16

Average of 16 items above \$0.108

Expense are not complete—gas, oil, tires and repairs being very low.

THREE PARTS FOR THE THREE PIECES OF WORK UNDER DIFFERENT CONDITIONS.

Expense per Ton-mile	Gas and Oil per Mile		Repairs and Tires per Mile		Investment per Ton-Mile		Taxes, License, Ins. per Ton Mile		Total Cost per Ton-Mile		No.
\$0.024	\$0.147	\$0.0195	\$0.166	\$0.022	\$0.2205	\$0.0296	\$0.038	\$0.005	\$0.7525	\$0.101	17
0.0207	0.157	0.0213	0.166	0.022	0.2205	0.0296	0.038	0.005	0.7425	0.1019	17
0.0209	0.121	0.016	0.166	0.022	0.2205	0.0296	0.038	0.005	0.7085	0.0935	17
0.028	0.190	0.024	0.166	0.022	0.2205	0.0296	0.038	0.005	0.7903	0.1074	18
0.035	0.154	0.021	0.166	0.022	0.2205	0.0296	0.038	0.005	0.8043	0.1114	18
0.019	0.112	0.015	0.166	0.022	0.2205	0.0296	0.038	0.005	0.6383	0.0894	18

For Truck 17 the average cost per ton-mile was \$0.0946.

For Truck 18 the average cost per ton-mile was \$0.0954.

car is in use. \$125.00 per mo.

UNABOUBTS USED BY THE HIGHWAY DEPARTMENT.

Expense	License, Taxes and Insurance	Repairs, Oil and Gas, and Garage	Depreciation and Interest	Total Expense	Per Mile	Per Ton-Mile
	\$423.00	\$2,624.75	\$1,705.83	\$4,748.58	\$0.216	\$0.089
	46.72	801.00	267.91	1,213.13	0.081	0.090



1919

COLORADO possesses many things to boast of and be thankful for: scenic beauties comparable with the most attractive spots on the earth; a climate unequalled anywhere; irrigated, agricultural lands, producing the most wonderful crops of alfalfa, sugar beets, wheat and other grains; fruit of all kinds of most delicious quality; thousands of acres of dry farm lands, yielding bountiful, profitable crops of forage and grains; millions of acres of pasture land over which ranges immense herds of the best bred cattle and sheep in America; great areas of col, oil, oil-shale lands; the richest of gold, silver, lead and zinc mines; unlimited water power.

Colorado is classified by the best authority in America as the ninth state in improved highways. Numerous and varied business opportunities—vast, undeveloped resources, with the most brilliant prospects for the future, surely sufficient to inspire every citizen with state pride and a get-together spirit, which, if crystallized into unselfish action, and an all-together push would place our state—**COLORADO**—in its entitled position “**IN THE SUN.**”

The Arteries of Commerce

Down in Baca County there is a certain ever-increasing volume of trade which flows out of Colorado into Kansas. Up in the northwestern fringe of the state, tonnage originating in Colorado seeks an outlet in Wyoming. In certain sections of the east and the west the tide is ebbing out instead of coming in. Why?

The answer reaches down into the fundamental principles of economics. It touches in a small, concrete way, upon the problems which today press more closely upon the nations of the world than at any earlier period in history. It presents an axiom which cannot be evaded and which must be fairly met.

Trade always follows the cheapest channel. If it costs less for the people of the western end of the state to trade in Utah, they will trade there. If Denver is not as accessible as Kansas City, then business will follow the course of lesser resistance.

We are living in an age of industrial miracles. In Indiana the city of Indianapolis, through a remarkable web of transportation lines, is gradually drawing to it the business of a wonder section of production. Trade which once flowed in other directions is being attracted to the Hoosier city more and more, and prosperity has set its insignia upon the aggressive Middle Western hive.

In a like manner arteries of trade once hardened by

inaction are being galvanized into life all over the country with the coming of the motor truck, and through this comparatively new medium of transportation, those centers which have been dormant for years, are suddenly springing to the forefront in the battle for commence.

It has been too much the habit to look upon the road as an end to pleasure. Loose thought has said “the road costs too much to build for the passenger travel. Let it go.” And it has been allowed to go, and as its capacity for tonnage decreased traffic has stagnated, production diminished or diverted, and the humming wheels of progress have slowed down, stopped, rusted.

These conditions must not be allowed to obtain in Colorado. All who live in this state desire to see Colorado the center of a vast area of activity. They who glimpse into the future see our lands settled and producing, our mountains of wealth developed, our cities crowded with throngs of travelers.

But they only see these things who know the meaning of the developed road. Without the road there can be no load. Without swiftly pulsing arteries the heart cannot beat, and in this case the road linked up with the rail lines must be the arteries—the cities, the heart.

Colorado must have more roads, more good roads, roads which will stand the smashing impact of the laden argosies of the prairies. We must build and build now if we are to meet the swiftly growing competition of our neighbors on all sides. We must provide a closely connected network of highways which shall penetrate into the mountain fastness, challenge the rushing creek with the roar of the traffic, ribbon the fertile valleys.

No detail is unimportant in this vast picture of Colorado resplendent. The time is at hand for the co-ordination of all our effort toward an efficient transportation. Let the by-ways feed the highways, the highways the railways.

Only if we center upon this plan with a broad vision for the future can we be successful.

Colorado needs roads. Let us have them NOW.

The State of Utah has completed the floatation of its \$1,200,000 bond issue for state road purposes, by the sale in one block of \$500,000 during the latter part of November. Up to that time \$700,000 of the issue had been sold, but the remainder of the issue had been held up by the capital issues committee in Washington. With the removal of restrictions the Palmer Bond & Mortgage company of Salt Lake took the entire remaining block of \$500,000.

State Highway Appropriations, 1919

(Continued from page 13)

SUMMIT COUNTY—Grading and drainage		
drainage	13,000.00	\$6,500.00
		\$12,000.00
Total		\$198,350.00
Addendum—There is also hereby appropriated to meet the Federal Aid Fund:		
For Project No. 2		\$25,000.00
For Project No. 4		2,590.00
SPECIAL STATE PROJECTS—		
Fall River Road — Construction in		
Grand and Larimer Counties.....	\$70,000.00	
Independence Pass	9,000.00	
South Golden Road Pavement	5,109.59	
Brighton Road	10,633.71	
Bear Creek Bridges	4,807.46	
Denver-Limon Road	554.01	
Golden Approach to Lookout Mountain	1,600.00	
		\$101,704.77
Total		\$522,263.10
Balance available for all other purposes.....		\$479,194.93

The following amounts are to be expended for construction improvement and maintenance of State Routes in the various counties of the state. The work is to be done by the Highway Department directly, or under agreements made, or to be made with the counties, or with the cities and towns, as provided in Section 5 of Article I of the Highway Act, and upon such parts of such routes as are designated, and for such purposes as are specified by the Highway Commission in making the appropriations; and all such work is to be in conformity with the rules and regulations of the Highway Department, and under the direction and supervision of the Highway Commissioner and subject to his approval. These amounts are exclusive of, and in addition to, expenditures for Federal Aid, Forestry and Special State Projects in the various counties. It is expected that each county will add from its county funds, in accordance with its ability, further funds for the work to which each of the following items relates, under agreements to be made between the department and the counties:

DISTRICT No. 1.

Equipment Fund—
To be used for the purchase of road machinery and operation of the same on the roads adjacent to Denver, either on construction or maintenance....\$30,000.00
The following funds to be used for construction and improvement of State Routes, and their maintenance in the counties named:

DISTRICT No. 1.

	Federal Aid	Road Fund
Blaine County	\$43,000.00	\$ 5,000.00
Chapahoe County		6,500.00
Crowder County	21,000.00	13,000.00
Deer Creek County		7,000.00
Georgetown-Silver		
Plume Road		1,500.00
Empire County		5,500.00
Jefferson County		3,900.00
Larimer County	90,000.00	5,000.00
Logan County	11,000.00	12,000.00
Organ County	11,000.00	9,000.00

Phillips County	4,000.00	
Sedgwick County	3,000.00	
Washington County	7,000.00	
Weld County	21,000.00	17,000.00
Yuma County	10,000.00	6,000.00
		\$135,400.00

DISTRICT No. 2. Federal Aid

	Federal Aid	Road Fund
Chaffee County		\$ 7,500.00
Cheyenne County		7,000.00
Douglas County		9,000.00
Elbert County		8,000.00
El Paso County	\$31,500.00	10,000.00
Kit Carson County		10,000.00
Lake County		6,000.00
Lincoln County		10,000.00
Park County		4,500.00
Teller County		10,000.00
		\$ 82,000.00

DISTRICT No. 3. Federal Aid

	Federal Aid	Road Fund
Baca County	\$ 6,000.00	\$ 2,300.00
Bent County		8,000.00
Crowley County		4,000.00
Custer County		3,000.00
Fremont County		9,000.00
Huerfano County		6,000.00
Kiowa County		7,000.00
Las Animas County.....		7,000.00
For Federal Aid Work on Road 29, from Trinidad N. E.		
		10,000.00
Otero County	22,000.00	3,500.00
Prowers County	12,000.00	4,000.00
Pueblo County	44,000.00	9,500.00
		\$ 73,300.00

DISTRICT No. 4. Federal Aid

	Federal Aid	Road Fund
Alamosa County		\$ 3,000.00
Archuleta County		6,500.00
Wolf Creek Pass		1,000.00
Conejos County		6,000.00
Costilla County	\$10,200.00	2,000.00
Delta County	11,000.00	3,000.00
Dolores County		5,000.00
Gunnison County		13,500.00
Hinsdale County		2,000.00
La Plata County		2,000.00
Mineral County		5,000.00
Wolf Creek Pass		1,000.00
Montezuma County		8,000.00
Montrose County	11,000.00	3,000.00
Ouray County	18,000.00	1,000.00
Rio Grande County		2,000.00
Saguache County		7,000.00
San Juan County		1,000.00
San Miguel County		16,000.00
		\$ 88,000.00

DISTRICT No. 5. Federal Aid

	Federal Aid	Road Fund
Eagle County		\$ 21,000.00
Garfield County		16,800.00
Grand County		5,000.00
Jackson County		5,000.00
Mesa County	\$11,000.00	10,000.00
Moffat County		18,000.00
Pitkin County		4,000.00
Rio Blanco County		1,000.00
Routt County		9,000.00
Summit County	13,000.00	1,000.00
		\$ 90,800.00
Contingent Fund		\$ 9,694.93

Development Thruout Eastern Colorado

By the State Immigration Department

TWENTY-EIGHT counties lying wholly or partly in the plains district of eastern Colorado have an area of 31,534,060 acres, or about 47.5 per cent of the area of the state. These counties in 1909, as shown by the reports of the U. S. Census Bureau, produced crops valued at \$32,119,595, or 63 per cent of the value of the state's entire crop output that year.

These counties include the two largest irrigated districts in Colorado, the South Platte watershed and the Arkansas Valley. Increase in cultivated acreage in these two districts has been comparatively small in the past nine years, the increase in the value of crops raised in 1918 being due more to increased prices than to increased production. Ten of these counties, with an area of 10,391,520 acres, or a little more than one-third the area of the entire district, produced crops in 1909 worth \$21,718,274, or about two-thirds of the value of the crops produced in the twenty-eight counties. These nine counties are Bent, Boulder, Jefferson, Larimer, Logan, Morgan, Prowers, Sedgwick, Weld and Otero, the last named at that time including what is now Crowley County.

Since 1909 the other counties in this district, which make up the great non-irrigated region of eastern Colorado, have enjoyed a wonderful development. Agriculture is their principal industry, supplemented by dairy-farming, stock-raising and poultry-raising. The acreage of land cultivated in these counties has increased perhaps 200 per cent in the past nine years, so that today the twenty-eight eastern Colorado counties produce more than 70 per cent of the farm crops grown in the state, and the value of all their crops for 1918 was approximately \$103,000,000, or more than twice the value of all crops produced in the state in 1909.

These figures are given to illustrate the magnitude of the advance made in this part of Colorado within the past decade. All agricultural sections of Colorado have enjoyed remarkable progress in this period; but no district, with the possible exception of parts of northwest Colorado, have shown such remarkable increases in acreage of land under cultivation or in the value of farm output. This increase has been due largely to the development of farming without irrigation along scientific lines, and the wide introduction of dairy herds and poultry to supplement the income of the farmer from his regular cash crops.

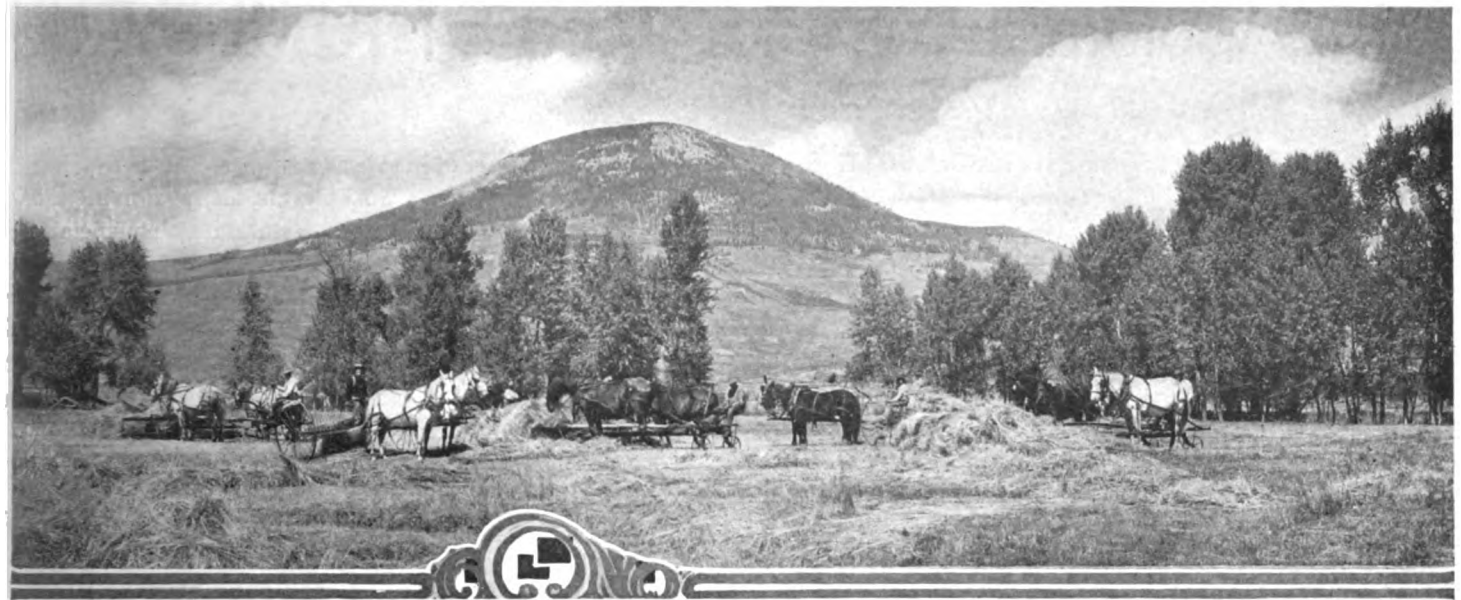
Bank deposits are perhaps the best index of the prosperity of any community. The bank deposits of these counties, exclusive of Denver, on November 1, 1918, were approximately \$95,000,000, or about 63 per cent of the deposits of the entire state exclusive of Denver. No data are available on bank deposits for preceding years earlier than 1916, but in many of the counties there were no banks in 1909 and the deposits of the district, exclusive of

Denver, Colorado Springs and Pueblo, have increased more than 150 per cent in the past decade.

A natural result of this development has been a very substantial increase in population in this district in the past decade. Scores of new towns have been established here in the past few years, and the older towns have shown remarkable progress in business activities and in the character of public improvements. One very noticeable indication of the prosperity this section of Colorado is enjoying is the large increase in the number of school buildings and of teachers employed, and a marked improvement in the character of school buildings. While there is much room for improvement in this direction in some parts of the district, principally those lying far from railroads, it is no more than fair to say that there is perhaps no agricultural section of the United States where the population is so small per square mile of area that enjoys better school facilities.

Another result of the large increase in cultivated acreage and the consequent increased demand for farm lands has been a very marked increase in land prices. Of course the increase in land prices has not been peculiar to Colorado. The high prices for farm products resulting from the war have pushed up land values in nearly every agricultural district in the country, but in very few sections have the increases been more marked than they have in eastern Colorado. The reasons for this are that much of this land a few years ago was regarded as of no value except for grazing purposes, and its price was fixed accordingly. Experience in the past decade has shown that a very large percentage of the land in eastern Colorado can be farmed profitably, which has resulted in the fixing of an entirely new standard of land values.

While highway extensions and improvements have been rapid in this section of the state in recent years, they have hardly kept pace with the general development, and much work along this line is needed that farmers may market their crops at the lowest possible expense. In parts of eastern Colorado excellent farm lands are being cultivated at a distance of 40 miles or more from railways, though this section of the state is far more adequately supplied with railroads than the mountain sections and the Western slope. In order that farmers raising crops this far from shipping points may market them at a profit, it is essential that highways be well improved and in good condition. A few years ago the opinion was quite generally held that plain earth roads, well graded, would always be sufficient to care for the needs of this part of the state. Recent experience has shown, however, that as motor transportation increases, and especially truck service for the hauling of crops, some sort of surfacing of a fairly permanent character will be required here, just as in other parts of Colorado.



Making hay on one of the fine mountain ranches of Gunnison County. No better hay is grown in the West than that which comes from Colorado's mountain ranches.

The Dairy Industry in Eastern Colorado

By the Colorado Department of Immigration

IN no section of Colorado has the dairy farming industry shown more rapid development in the past five years than in the non-irrigated counties in the eastern part of the state. During the same period farmers in these counties have been uniformly prosperous, and perhaps no single factor has had more to do with this prosperity than this same increase in the number of milch cows on the farms.

Reports of county assessors made to the State Tax Commission showed a total of 73,768 milch cows in the state in 1913. Reports from the same sources show a total of 137,126 milch cows for 1918, an increase of 72.3 per cent. The following figures give the increases in the number of dairy cattle shown by assessors' reports in nine of the leading dry farming counties during the same period:

	1918	1913
Baca	2,020	34
Cheyenne	1,981	....
Elbert	5,703	4,548
Kiowa	1,683	....
Kit Carson	5,353	4,225
Las Animas	1,790	910
Lincoln	3,172	....
Washington	2,445	....
Yuma	2,905	....
Total	26,052	9,717

The increase in the number of dairy cattle in these nine counties, in the past five years, based upon assessors' reports, is 168.1 per cent. There are always discrepancies between the number of dairy cattle for the entire state as reported by county assessors and by the U. S. Department

of Agriculture, but whether or not these figures show accurately the number of milch cattle in the counties named, they undoubtedly show with reasonable accuracy the percentage of increase for the period covered.

It is quite generally agreed that the increase in dairy farming in this district in the next five years should be even more marked than it has been since 1913. A considerable number of creameries, cheese factories and like establishments have been put in here within the past few years, and every county in the district is now seeking to interest local and outside capital in further developments in this direction. The success that has attended dairy-farming operations here since 1914 is the best evidence of what may be expected from further increases in the industry.

Scarcely a well-established farmer in any of these counties now is without one or more dairy cows, and the number of silos for preserving winter feed for milch cows has increased with wonderful rapidity since 1911. Yet the counties named alone could well support fully four times as many dairy cattle as they have at present, and undoubtedly nearly all farmers in this section would be benefited by increasing their dairy herds and raising larger acreages of forage and other feed crops in proportion to the acreages planted to wheat and other small grains.

As another evidence of the increase in prosperity in this district in the past five years, which has been due largely to increased dairy-farming activities, it should be noted that the assessed value of all property in these nine counties in 1913 was \$93,781,780. In 1918 the assessed value of all property in the same counties was \$164,090,605.

How Colorado People Saved \$140,000,000

By the State Immigration Department

MANY conservative bankers and other business and professional men who are close students of financial and economic conditions were genuinely alarmed during the summer of 1918 at the rapidity with which Colorado money was being taken to meet national demands, with no clearly apparent compensating current of cash coming into the state. They feared that this state would not be able to meet the heavy demands for the purchase of Liberty Bonds and War Savings Stamps, and to continue making liberal contributions to the Red Cross and associated war agencies without impairing its cash reserves and perhaps dangerously weakening its banks.

Others who gave the subject little study only wondered how all this money could be taken from the state without injuring business. Whenever the total amount the state was expected to subscribe in a new Liberty Loan was announced, hundreds of people held up their hands in despair and proclaimed that Colorado would simply never be able to raise that amount.

But Colorado never failed. Its quota was subscribed in every Liberty Bond campaign, it met all requirements for the Red Cross, the Y. M. C. A., the Salvation Army and for all other war work funds, and usually exceeded the amount expected of it by a few million dollars.

Up to date this state has purchased Liberty Bonds and War Savings Stamps and has subscribed to war funds to the amount of approximately \$140,000,000. This amount of money has been taken out of the state, much of it to be spent in Europe and in transporting troops and supplies across the Atlantic, yet Colorado people have seldom been more prosperous than they have been in the year just ended. Bank deposits on November 1, as reported on the call of the comptroller of the currency, were approximately \$258,000,000, or nearly \$1,000,000 more than they were on the November call for 1917!

This is a record that few states can equal. Colorado has not enjoyed any large amount of war business, as have Eastern, Northern and Southern states and the Pacific slope territory. Its manufacturers have done a considerable amount of war contract work, but the total has not run into hundreds of millions of dollars, as has been the case in other sections of the country.

Yet the people of Colorado have met all demands made upon them for the support of the war, and have done it proudly and eagerly. They have sent \$140,000,000 into other states and other countries, most of it never to return, and yet at the close of business for the year just ended they have more cash in their banks than they had a year ago!

No finer tribute could be paid to the resources of this state and to the loyalty and industry of its people. They

have raised the money necessary to meet the heavy added obligation of the year by working harder, producing more, bringing latent resources of the state into beneficial use and by saving as they have never saved before. Of course prices for nearly everything Colorado produced were much higher than they are normally, but the same was true of everything Colorado people had to buy. The experience of the year just ended has shown something of the benefits to be derived from a further development of Colorado's resources, for much of the money necessary to meet the extraordinary obligations caused by the war was made available from the cultivation of land that many Colorado people have long thought would never be farmed profitably, from working mines that had been declared "played out," and from opening up new fields of manufacturing and other industry.

Of course all the money subscribed for various war activities did not go out of Colorado in 1918, but it has all been taken within the past two years. Bank deposits are \$30,000,000 more at the close of this year than they were at the close of 1917. Loans and discounts on the books of the banks are slightly in excess of what they were a year ago, but the increase has been less than \$2,000,000 for the entire state.

The records of the State Immigration Department show that the increase in area of land cultivated in 1918 was approximately 550,000 acres over that of 1916. This is a partial explanation of how Colorado has been able to meet its added obligations and to have more money than it had before. The state's farms produced crops valued at about \$147,000,000 in 1918, against \$91,000,000 in 1916. The factories of the state produced nearly \$200,000,000 worth of goods in 1918, against \$136,000,000 in 1914.

Stockraisers received perhaps \$5,000,000 more for their stock marketed in 1918 than for that sold in the preceding year, and the total for the preceding year was the highest on record to date. The reports of the U. S. Department of Agriculture showed a very material increase of all classes of livestock on hands on January 1, 1918, over the same date in 1917, and there will perhaps be further increases shown for January 1, 1919.

These data give some idea of how the people of Colorado have been able to make the showing they did in 1918. But they show even more forcibly what should be accomplished in the near future through further development of latent resources. Mining has been at rather a low ebb in the state during the past year, chiefly because of labor shortage and other conditions growing out of the war, yet large companies have perhaps never done more development work in a single year than they did in 1918, and the results of this work will show in increased production for 1919.

Facts For Investors

There's urgent need in Colorado for legislation that will make possible the collection of accurate data on crop yields, livestock output, farm profits, etc., for every county in the state, so that prospective settlers may be correctly informed.



A fair farmerette helping to gather a fine oats crops in Montrose County.

BECAUSE of the rapid increase in cultivated acreage in Colorado, and because of the constantly changing relations between the acreage of irrigated and non-irrigated land cultivated, there is exceptional need in Colorado for annual reports from every county on the acreage and yields of all crops and on the amount of livestock marketed.

Under existing conditions such a report in this state is available only once in ten years, when the federal census report is compiled. These reports are made for the year preceding that in which the census is taken, so that the latest detailed report of this nature is for 1909. Since that time there has been a large increase in the acreage of non-irrigated land in cultivation, with a comparatively small increase for irrigated land.

For these reasons and others it is extremely difficult to make accurate reports of the acreage and production of crops for the entire state each year without accurate annual reports from all the counties. In 1909 the acreage of irrigated land in cultivation was very high in proportion to the acreage of non-irrigated land, and the average yields per acre were therefore exceptionally high. Since that time the large increase in non-irrigated land in cultivation has resulted in a very considerable reduction in the average yields per acre, but it is impossible to calculate these yields accurately without detailed annual county reports.

The bureau of estimates of the U. S. Department of Agriculture is constantly confronted with this difficulty, as are all other agencies that make any effort to show crop production in Colorado each year. Recent checks on the figures for 1918, made through reports from threshers in the various counties, under federal supervision, show that there are considerable errors in estimates for the year, both in average yields per acre and in acreage cultivated, for all grain crops grown in the state. Undoubtedly there are like discrepancies in estimates for other crops.

Average yields used by the various agencies making estimates are in nearly all cases too high. In many cases the estimates on acreage in cultivation are too low. The result is that the information which the State of Colorado is furnishing to people in other states, with a view of

bringing them here to make their homes, is inaccurate and misleading.

Errors of this kind can be corrected only through some system of accurate annual reports from each county, such as are available in states like Kansas, Iowa, Missouri, Wisconsin and many others, which obtain and compile accurate reports by counties each year. In most states collecting such data annually the county reports are compiled by assessors when they make their assessments.

If there is need for the collection and compilation of such statistics in thickly populated counties such as those in the states named, there is certainly much more need for the same class of work in counties of a state like Colorado, where the acreage in cultivation is being increased each year, and where the state itself and most of its commercial organizations are constantly working to obtain new settlers and to bring vacant arable lands under cultivation. Colorado should be in a position to tell prospective settlers accurately what yields of all farm crops they may reasonably expect to make in every county in the state. If information of this kind furnished is inaccurate, and especially if it is more encouraging than the facts justify, then Colorado must plead guilty to obtaining many of its new settlers under false pretenses.

A law has been on the statute books of Colorado for a good many years providing for the collection of data of this nature by county assessors. Apparently this law is not workable, for it has never been enforced. Undoubtedly a bill will be introduced before the state legislature this month intended to correct the faults in the present law.

Our Unoccupied Lands and The Settler

(Continued from page 7)

content to work as day laborers for four or five years as a condition precedent to entering upon actual farming operations.

California has met with almost complete success in the trial of the colonization plans first tried by Australia, New Zealand and other progressive countries. The plan adopted there has been found to meet most of the difficulties which face any definite campaign of colonization, providing adequate facilities to the new settler on terms which make it possible for him to live while bringing his land to a productive state.

The financial problem unquestionably is one of the most important to be considered in any immigration campaign, and unless some method of overcoming the financial embarrassments of the average settler is discovered and included in the campaign it is bound to fall far short of the volume of the results which will follow the adoption of a more intelligent plan. Naturally, most of the immigration into the West comes from those who have small means. The man of wealth is not to be expected to go voluntarily into the arduous work of pioneering. He leaves that to those less comfortably endowed with this world's goods. The history of pioneering and the settlement of the West points conclusively to the fact that most of the pioneer work is done by the man who comes with little and counts on the opportunities of the future to "cash in" his intelligence and energy.

This is the very class of man which the West wants, but without substantial help such men can scarcely hope to succeed. The time is gone when they could select from millions of fertile acres. Today the quantity of unoccupied land which is of such quality that the state can conscientiously give it to the newcomer and encourage him to develop it is small indeed. Vast areas of government land are still open, but most of the land is subject to some material objection and practically every acre has been scanned by homesteaders in the past, who went on to other and more promising fields.

The past ten years have worked marvelous changes in the West. They have seen hundreds of thousands of acres of the best land taken over by the settler, leaving that which is good only for grazing by reason of lack of rainfall, altitude or character of the soil and surface, or fair farm land in districts remote from railroads. Land in the latter districts is essentially good for stock-growing and for little else until railroad development comes, for a farmer cannot raise and market crops at a distance of many miles from the railroad. He must drive his crop to market.

As the only logical solution of the problem of diminishing farm land areas open to the settler, the progressive state must take on itself the burden of making farm lands

of lands now not suitable for cultivation and of making it possible for the newcomer to locate on the uncultivated lands with the chances favoring success, not failure. In other words, when the once bountiful supply of free farm lands is gone or materially diminished, the state must make farms, and on those lands now suitable for farming, if properly developed, it must do that development work and so arrange the financial problems that wealthy pioneers are not necessary to settlement. A wealthy pioneer is an anomaly.

Colorado has shown splendid form during the war period of nearly two years. It has shown a degree of public spirit and foresightedness which no one thought possible in the routine days before the war. It remains now only to maintain that spirit, to appreciate the fact that upon the program adopted today depends the state's development for the next half century. The opportunity is here; nothing is needed save the ability to grasp it, to capitalize it by adding those elements which convert opportunity into accomplishment.

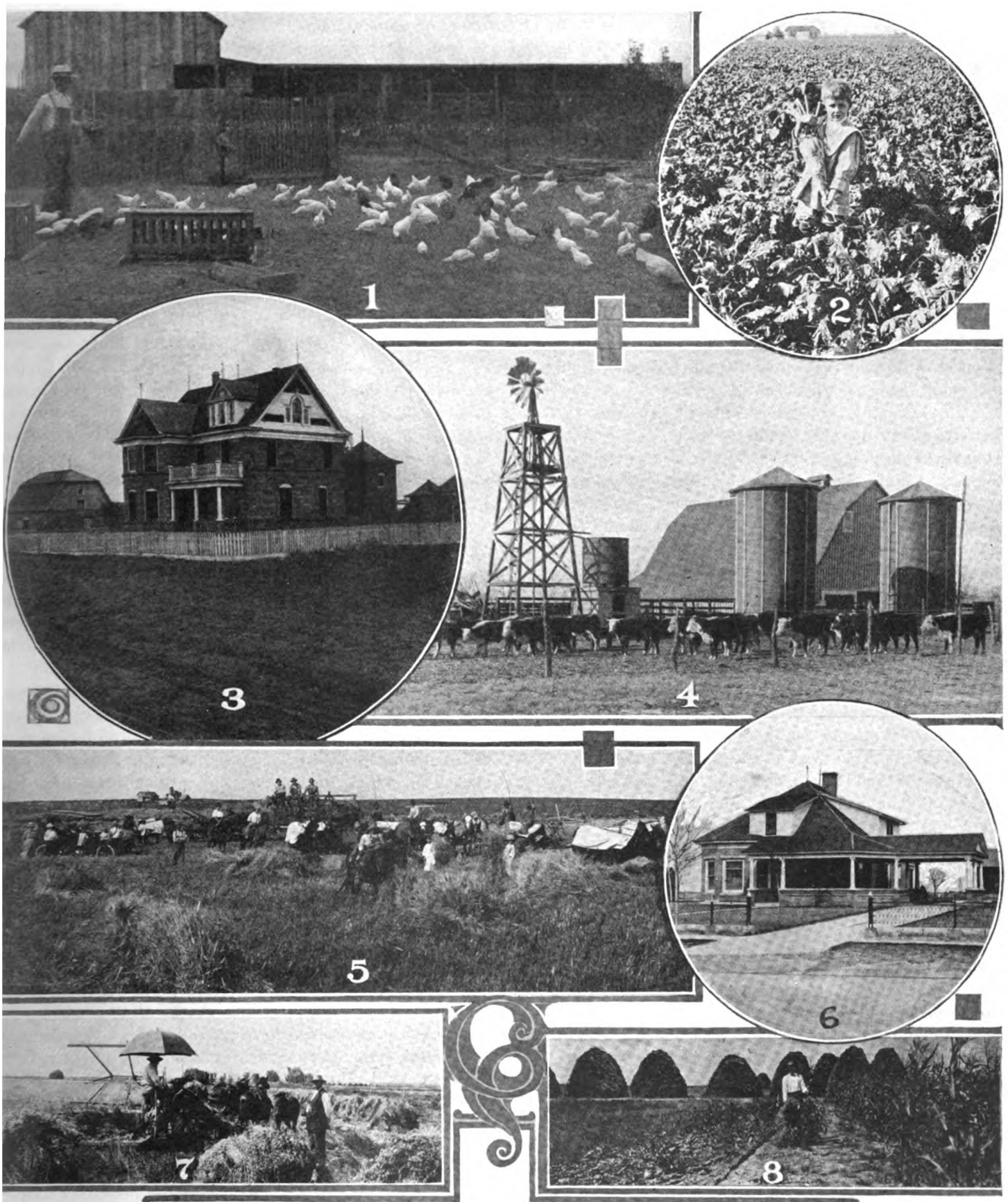
Men experienced in the problems of land settlement and the reclamation of unoccupied areas have found new inspiration in the possibilities which a comprehensive policy of development offers. California has learned from New Zealand and Australia, and today is leading the states of this country in the only sort of development work which can follow the golden era of the vast public domain, now gone forever.

The time is gone when Colorado can say to the returning armies, "Here are millions of fertile acres within reach of market; take them and make your own fortunes." Today the public domain of the state is isolated or unfit for farming, with few exceptions. The good land near the railroads is gone forever. Railroad development will open still more areas, but the great future of settlement lies in the intensive policies adopted by progressive countries. Farms must be made and turned over to the soldier or sailor, not as a gift, but as an opportunity which he can capitalize successfully with little more than his brains and his muscle.

In that sort of development the future of Colorado lies. The Federal government is beginning to appreciate the fact, and Colorado, to profit most and to do most for her soldiers and sailors, must put herself in the front ranks of the progressive states.

Among the states which have taken the lead in compiling and preserving accurate records of agricultural production and development are Kansas, Iowa, Wisconsin, Nebraska, Utah, New York and California. Within the past half dozen years a dozen or more states have provided for the collection of such data and many more have outlined plans for such work in their legislative programs for 1919.

How Some Eastern Colorado Farmers Increase Their Bank Balances



1 Poultry Farm near Sterling. 2 Field of Sugar Beets near Pueblo. 3 Farm Home in Cheyenne County. 4 Scene on a Prowers County Stock Farm. 5 Harvesting Wheat in Yuma County. 6 A Phillips County Farm Home. 7 Harvesting Oats in Prowers County. 8 Ready for the Thresher—a Washington County Wheat Crop.

A Real Basis For Immigration Work

By the Colorado Department of Immigration

THE first essential of intelligent immigration or colonization work is knowledge of the district which it is proposed to colonize. Without that knowledge the immigration agencies of a state cannot intelligently picture the advantages of the state or warn prospective settlers of the difficulties and handicaps they must overcome if they are to be successful, and it is as unwise to fail to know the discouraging features as it is not to know the encouraging features of land settlement and development. If he is to be treated fairly, the settler must know the good and the bad about the district in which he proposes to locate.

Time was when the settlement of lands was the only concern of the immigration agent; when he cared only for the small reward which early settlement of the land brought him and thought nothing of the future of the settler. That day, however, is gone, and rightly so. Today the intelligent, far-seeing immigration agent or colonizer knows that permanent success of his work can be built only on the permanent success of those who constitute his raw material. He is selling successful farming, rather than land, for land which has been shown to be good farming land sells itself.

The Colorado Department of Immigration recognizes that fact and uses every effort to prevent settlement of the state by men who, by reason of a lack of capital or experience, or both, are foreordained to failure. It appreciates the fact that settlement is encouraged as the settlers of today succeed. If they are successful the rest of the work is simple, for there is no greater immigration agency than the success of those who have come from other states and have succeeded in Colorado. Every successful immigrant is a walking advertisement for the state, and every failure is a lasting handicap to the work.

But intelligent information, covering both the encouraging and the discouraging features, can be given only in cases where the department itself is informed, and there is no greater weakness in the work of the department today than the fact that no person or state institution knows the real truth about Colorado—its unoccupied lands and their character and fitness for farming. Government soil surveys are inadequate because only a small portion of the state has been covered, and there is no state survey.

There is nothing to show where lands are capable of irrigation and where they must be farmed under approved dry-farming methods; what lands are suitable for grain and what for potatoes or fruit or sugar beets. There is no record of the vast tracts of privately owned land which offer the best solution of the land-settlement question, but which can not be colonized intelligently until their location, soil characteristics, terms of sale, etc., are known and charted.

With a view to gathering this sort of information and the information which shows crop yields in every district as a guide to the prospective settler, the Immigration Department will give its support in the Twenty-second General Assembly to two measures which are calculated to increase the immigration facilities of the state wonderfully and at the same time provide for securing the information which the government has sought so earnestly during the war and which was not and could not be made available.

One measure will seek to strengthen the present plan of gathering agricultural and industrial statistics by placing the authority in the hands of the county assessors and requiring strict compliance with their duties under suitable penalties. Another will deal with the initial problem of a state survey, providing an appropriation to make it possible for the state to take an accurate inventory of its opportunities. Both of these acts will provide for active co-operation between the department and the State Agricultural College.

The present law for the collection of statistics is wholly inefficient, as it provides merely additional duties for county assessors and makes no provision for compensation and provides no penalty for failure to comply with the law. Various efforts have been made to carry it into effect, but without avail. The legislation to be submitted in January will have the support of both the Immigration Department and the Agricultural College and will remedy many of the defects of the present law.

Since the outbreak of the war Colorado has been called upon repeatedly for statistical information—information on which the government authorities could base their estimates for the future, but the information given too frequently was the result of mere conjecture. In the more progressive states of the Union the statutes provide for the collection annually of information of this sort, and its value in a hundred directions has been proved repeatedly, particularly during the period of the war, when the federal government was forced to marshal all its assets and to judge of the future by the record of the past.

There is no difficulty in securing the attention of families in other states whose eyes are turned to Colorado. The Immigration Department hears every month from hundreds who want to come to Colorado and who await only that definite sort of help which can place them on the land to which they are best adapted and where their chances of success are best. The gravest problem with which the department has to cope is that of the hiatus between the time when the newcomer definitely determines to come to Colorado and the time when he advises the department that he has secured a permanent location here.

In that interval, without a comprehensive survey of the state and its possibilities, neither the Immigration nor any other department can give him real help. He must select for himself, taking the word of real estate dealers with only such additional information as this department can give him from its library of estimates and conjectures. Every effort is made to adhere to conservative encouragement, but definite knowledge is lacking. It can be supplied only by an accurate survey of the state and by the collection of statistics annually which will make a complete agricultural and industrial history of every section of the state.

The importance of this work is double in view of the tremendous westward tide of immigration which is to come. It cannot be stemmed, for only in the west are there great bodies of unoccupied lands suitable for agriculture. Colorado can profit immeasurably if it will proceed at once to put all its agencies at work to secure the sort of information which is essential to the intelligent direction and guidance of the new-comer. Without that information immigration work must always fall far short of its possibilities.

May Increase Federal Aid

(Continued from page 9)

"First, states where the government will spend not more than 80 per cent. to the state's 20; second, states where the government will spend not more than 70 per cent. to the state's 30; third, states where the government will spend not more than 60 per cent. to the state's 40, and fourth, where the government will spend not more than 50 per cent.

"With these amendments and with the greatly increased funds, so made available, it is my belief that the government will be in a position to aid the states very materially in one of the most important constructive works now facing the Union."

Asked for his opinion of the solution to the problem now presented by the enormous increase in heavy motor truck traffic, Mr. Page said that he is unalterably opposed to permitting motor trucks to travel on roads not designed to carry the load, a statement which applies to practically all of the highways in the country.

"The solution to this question rests in remedial legislation," said the director. "Motor trucks should possibly be limited to about 450 to 500 pounds dead weight to every running inch width of tire, which would provide a reasonable factor of safety on roads with a 6-inch base. It is unfair, unjust, to expect the taxpayer to pay for roads, then stand by and see them torn to pieces by commercial vehicles operated for the profit of the individual.

"Sooner or later this legislation will have to come or we may expect to see road work stopped. And that, of course, is impossible if the future prosperity of the nation is considered."

Regarding the establishment of a national system of highways, Mr. Page was of the opinion that the Federal road act contains ample authority for the building of

such a system by agreement between the Secretary of Agriculture and the State Highway Departments.

"The road problem is a state and local one" was his view. "We are not building our highways for transcontinental transportation, because the cost of such operations is too great to ever permit them to become competitors to the railroad.

"What this country needs is better county highways, better state highways. Each one reflects material benefit upon its community, and accordingly, upon the nation. Give us good county and state highways and immediately you have not one but a series of transcontinental highways if you care to designate them as such, since you will have complete communication across the country. But road building is not carried on for pleasure travel. We want that of course, but the fundamental, economic reason for the road, is its commercial value, which is and will always be local."

Mr. Page was in Denver for several days during which time he had conferences with the western district engineers of the U. S. Bureau of Public Roads. He also conferred with officials of the U. S. Forest Service concerning road construction in the national forests, as this work is conducted by the Bureau of Public Roads. Mr. Page met many state road officials and in general sought to get into touch with road conditions throughout the West, in which he was keenly interested.

Talking before the members of the Civic and Commercial Association, he praised Colorado's system of roads very highly, recalling his visit here of twelve years ago when roads existed chiefly in name and contrasting them with the network of highways which is gradually being built up in the state now.

He was accompanied by J. E. Pennybacker, of the Washington office, who also acted as secretary of the U. S. Highways Council during Mr. Page's tenure of office as chairman of that body, and by A. E. Lodes, also of the Washington office.

Prairie Schooner, Texas Dogie

(Continued from page 10)

south highway; the Union Pacific highway, which wends its way from Kansas thru the middle section, and the Arkansas Valley route on the south. Each of these roads is today in first-class condition.

Not long ago a trip on any of them would have been described in terms of superlatives, but not pleasant superlatives. Now with grading generally completed and heavy coatings of gravel packing in, the way is clear for a decided increase in traffic.

This is not enough, however. Sooner or later one of these roads must be hard-surfaced, perhaps all of them, and Eastern Colorado will not be content until that day comes. Passage of the proposed bond issue will clear the way. In the meantime maintenance and improvement work will be done to the utmost limits permitted by the present inadequate funds.

The Proposed State Motor Vehicle Law

(Continued from page 8)

tomobile and, if caught, he gets off with a lecture. If the legislature adopts the anti-thief law in the proposed new enactment, the joy-riding and other sort of auto thieves will get penal sentences. As one safeguard against thieves, it is proposed to have all garage and repair shop keepers maintain records of all machines stored or repaired when the owner of such auto is not a personally responsible resident of that immediate locality. And even tampering with an auto without the consent of an owner is made an offense.

Considerable may be said as to the proper license fee to be charged for motor-vehicles and motor trucks and trailers. For the passenger car I think the rating of the Society of American Engineers (known as the S. A. E.) is to be preferred. It is better known and is in many ways desirable. Taking this as the rating, and fixing a minimum charge of \$4 for autos rated up to and including 20 horsepower, then charging an additional 30 cents per horsepower, would not work a hardship. This would bring Fords and cars of that class within the minimum fee and carry some of the heavier and palatial cars up to as high as \$25. And with the present rapid growth of the auto business, we will collect in auto licenses for the highway funds of the state, from \$800,000 a year and up, starting in 1921, and without working a financial hardship on autoists.

The most equitable charge for trucks would seem to be a minimum charge of \$10 a year on all trucks having a combined weight capacity of truck and load of two tons or less. Over two tons, an added charge of \$5 per ton of combined weight and carrying capacity up to a truck having a combined weight capacity of truck and load of 14 tons. In excess of 14 tons, an additional fee of \$10 per ton should be charged. Provided further, "the State Highway Commission is hereby given full power and authority either on complaint of any board of county commissioners or upon its own initiative, to limit, restrict or prohibit the operation of any motor truck or trailer on any highway when in the judgment of such State Highway Commission the operation of such motor truck would be unduly injurious to such highway." A somewhat smaller charge is suggested for trailers, but they should be governed as trucks.

At a conference held between the secretaries of state of 25 different states, a year ago this fall, we devoted two days to automobile license laws and regulations. The only part of Colorado's law that was acknowledged to be superior is the section providing for the collection of fees and the delivery of license plates by county clerks. This works admirably, but I think the clerks should be allowed a fee, even tho small, for their extra trouble and labor, and I hope the legislature will view it in the same way. In one state, the secretary of state told me he employs more than 100 auto clerks and inspectors to collect \$1,

500,000 a year. I collected more than \$400,000 this year with the aid of the county clerks and a total of seven clerks and inspectors.

The proposed new Colorado law limits the expenses of auto clerks, inspectors, postage and printing to five per cent. of the total collected. Another section provides that the auto license money shall be divided equally between the state highway and the county highway funds, after deducting the stipulated expenses which will be incurred for administering the business.

One of the main objections to the sections governing the present auto license law is that it costs as much to register an auto December 1 as it does on January 1 of the same year—and all licenses expire December 31. Adopting the regulations of many other states, I am suggesting that all autos registered prior to August 1 of any year shall pay the full annual rate; after August 1 and till November 1, one-half the annual rate; after November 1, a rate equal to one-fourth the annual rate. This seems to me only fair and equitable. Then, too, about 85 or 90 per cent. of the new cars are registered before August 1.

It will not be possible to change the license registration fee schedule until January 1, 1920, as we will be collecting under the present rate for at least three months of 1919 before the legislature can well adopt the proposed new rate. But even so, if the growth of the auto license business continues at its past ratio—and there is every reason to believe that it will—the state and county highway funds will divide more than \$500,000 between them during 1919.

The want of space prevents me from going into the provisions in the proposed new law for the elimination of glaring lights and other phases designed to protect the highways, the auto owners and the public alike. I hope, however, to have a complete copy of the new enactment in the hands of all interested before the legislature meets.

National Transport Bureau Recommended

(Continued from page 12)

commercial purposes throughout the United States 365 days in the year would have upon the prosperity of the country and in turn its effect upon the export trade, thus linking up the question of highways, railways and waterways. And finally a close investigation into comparative operating costs on steam and electric railways, waterways and highways, with a view to distributing the volume of trade into its proper economic channels, so that there could not at any time be any competition between the four, but instead a co-operation which would be of benefit to all.

During his visit in Denver and just before his death in Chicago, Logan Waller Page, late director of the U. S. Bureau of Public Roads, inspected and approved the concrete road from Denver to Littleton, built by the State Highway Department in connection with the government

The Blue Lodge of Colorado Road Builders

By *Smith Riley, U. S. District Forester*

ROBERT E. PRATT was born January 5, 1885, at Parkville, Missouri, and received his early education in the public schools and high school and at Knox College, at Galesburg, Illinois.

He came to our western country in 1905 and did his first surveying for Mr. W. M. Clarke, who had contracts with the government for extensive surveying work. For him he worked two years as chainman and rodman and was highly regarded by Mr. Clarke.

In 1907 he began work on public lands and surveys, when that work was done under the old contract system. For five years he continued this work and for three years of this time was chief of party. During this time he passed the civil service examination and was classified transitman and later as U. S. surveyor. He was employed for some time in southern Colorado on the survey work (which work is very complicated) and it is interesting to note that his work at that time has been recently checked up and has received the approval of the land office and that one of its officials complimented Mr. Pratt on its accuracy.

He was transferred to the Forest Service in June, 1912, and his work with the service and his success in it are most interesting when considered in retrospect. He was possessed of the energy and adaptability, the resourcefulness and executive ability that guarantee success in a high degree.

His first work with the Forest Service was the surveying of June 11 claims, which was begun in June, 1912. Later he took up the work of organizing the section of topography. This includes all field surveys; reconnaissance, topographic and entry; the necessary mapping and drafting and the compilation of the Forest Atlas for the district. As may be easily seen, such varied work would require an unusual combination of qualifications and Mr. Pratt demonstrated his ability to handle all of this work efficiently. His Manual of Topographic Surveying is a standard work in the Forest Service and is consulted by other bureaus.

He introduced many new ideas, standardized the work, installed a system of filing and of cost keeping and in general inaugurated a smooth running policy for this department.

In the latter part of 1917 this work, as well as that

of hydro-electric engineering and road engineering, were consolidated and the office of engineering was created under the supervision of Mr. Pratt, confirmation of his appointment as district engineer being made on May 1, 1918. This was a well deserved appointment and a recognition of his six years of faithful, tireless and progressive service.

Mr. Pratt's policy of spending the Forest Service money which is allotted for roads was well defined and rigidly adhered to. Appeals for co-operation from the Forest Service in road building are numerous and obviously not all of them can be given assistance.

The merits of each proposed project were carefully examined and put to the test Mr. Pratt had outlined for himself. He asked "What was the need for the road? What communities or interests would be served by it? Could it be made to serve effectively the interests of the ranchers through whose district it would pass? And, finally, would it form, when built, an important link in the road system which it was his constant aim to expand and develop?"

Only such roads as passed this careful inquisition were approved, but when a project had earned his approval it also received his earnest

and unstinted effort to push it to completion.

He would visit the proposed location and examine feasible routes. He would confer with the county officials and determine the amount of co-operation that could be expected, the terms under which it could be gotten and arrangements for its distribution. When the moneys became available, he gave the work the benefit of his supervision and advice, all with the underlying plan of obtaining the maximum in results at the minimum of expense and all—as is apparent from his work—with a well defined and comprehensive system of roads in mind as a basis for all his actions.

Those who have read his many articles in the Colorado Highways Bulletin can appreciate the vision and grasp of the subject which he displayed, and those of us who worked with him knew well the constant effort he made to have his ideas put into actual working.

We feel keenly the loss of Mr. Pratt in both our personal and official relations and regret most deeply the passing of a brilliant fellow worker and loyal friend.



The late Robert E. Pratt.

Highway News and Notes on Work in Field

COMPILATION of the State Highway Commission budget this year brought out the fact that the road fund raised by the counties in Advisory District No. 1 amounts to more than the total amount available for expenditure by the State Highway Commission for the ensuing year. District 1 includes Denver.

For 1919 the State Highway fund proper amounts to \$1,043,000, while the amount raised by the counties for road work is \$1,054,000.

The State Highway Commission favors construction of roads, built in connection with the U. S. Forestry Service, by contract instead of by day labor. Its reasons for this attitude are given in the following resolution: "Be It Resolved, That this board authorize Commissioner Ehrhart to enter into a modified agreement, if possible, with the Bureau of Public Roads on a 50-50 basis with a request that the work be prosecuted on a more efficient, economical and expeditious plan, and that this department be furnished with monthly reports as to the cost and progress of the work, and recommend that all Forestry projects be done by contract."

A new and scenic route for motorists, leading from Lyons into the Rocky Mountain National Park by way of Allen's Park, will be opened to motorists when Boulder County completes reconstruction of the old St. Vrain road. A convict crew has started work on the project, which will require two seasons for completion.

County Commissioners of Jefferson County have asked that the road between Morrison and Golden on the west side of the hogback be declared a state road. The State Highway Commission has requested that a survey be made and submitted to it in connection with the matter.

Two new concrete bridges on the Denver-Colorado Springs road, one-half mile south of Castle Rock, were completed and put into use during December, 1918.

The big molybdenum deposits at Climax, in Lake County, have been opened by completion of the Leadville-Dillon road as far as Climax on the Leadville side. The Dillon side has not been put into shape yet.

Surfacing of the Golden approach to the Lookout Mountain Gateway in the Denver Mountain Parks has been completed, and the worst road feature in connection with the Mountain Park trip eliminated.

The Battle Mountain road above Red Cliff, in Eagle County, is to be improved during the coming season. This road has one of the most dangerous grades of any road in the state. The grades are to be standardized from Red Cliff to Minturn over Battle Mountain.

The rocky canon road above Glenwood, upon which a convict crew of twenty-five men has been working for three years, will probably be completed next season. Only four more miles of heavy construction remain to be finished.

The road from Pueblo to the Huerfano River, which crosses the Santa Fe Trail at the latter point, is to be completed next season. A convict crew is surfacing it with gravel.

Two miles of very bad road between Trinidad and Stonewall in Las Animas County has been surfaced and regraded at a cost of \$4,000. This completes an important connection between Trinidad and the San Luis Valley over La Veta Pass.

Federal Aid has been asked by the Archuleta County Commissioners for relocation and grading of the road from Pagosa Springs south to the New Mexico line, to connect with the road from Chama, New Mexico.

The Highway Commission expects work to start this spring on the forestry road over Monarch Pass in Chaffee and Gunnison Counties. The work has been held up by war conditions heretofore. The grade will be reduced considerably.

The State Highway Commission's repair and maintenance crew has been engaged on work on roads leading into Denver from all directions, keeping steadily in the field all winter. Work was done on roads running from Denver to the Army General Hospital, Brighton, Golden and Morrison, Broomfield and Bennett.

A modern steel and concrete bridge across the South Platte River at Merino will be constructed by the County Commissioners of Logan County during the coming summer. It will be 640 feet long and will replace an old wooden bridge at that point.

Demonstration Roads Endorsed

Lieutenant Governor George Stephan of Delta, who is an enthusiast on good roads and author of the highway commission bill, has written State Highway Commissioner T. J. Ehrhart a letter commending in warm terms the plan to build short sections of hard-surface roads near the principal cities and towns of the state, in order to demonstrate their value to the public. In the course of his letter the lieutenant governor says: "I am of the opinion that one-half mile of cement road approaching the large towns will do more to educate the farmers and citizens of outlying districts than the same amount of money expended for literature and lectures. I think a practical demonstration is what is necessary in order to awaken public interest. The people of Colorado could well afford to expend fifty million dollars in constructing a comprehensive system of highways and the only reason that the state is not investing that amount in highways is that a large percentage of people do not realize the benefits to be derived from good roads, and therefore are strongly in favor of actual demonstration of good roads by constructing small stretches near the various small centers of population."

Road Work and Road Builders the State Over

WL. PHILBIN and J. I. Glenn, county commissioners of Chaffee county, appeared before the State Highway Commission at its last meeting to advise the commissioners of the needs of their county. Chaffee county had to contend with several wash-outs last year, which carried out three bridges on state roads and four bridges on county rounds, hence needed a little additional assistance upon a new state bridge which they are putting in.

Similar misfortune occurred in Gunnison county, which lost thirteen bridges, according to Elmer Wiley of that county, who came to Denver in regard to the new road through Crested Buttes, which the county is desirous of completing. State Highway Commissioner T. J. Ehrhart suggested to the highway commission that the board authorize the county commissioners of Gunnison to have a survey and estimate made of the Wauneta Springs road, which he has already asked be declared a state road.

The county commissioners of Mesa county sent John Spratt to the meeting as their duly accredited representative, to ask for \$12,500, to be met dollar for dollar from county funds. The Midland Trail runs through their county and the construction of the High Line Canal has compelled the county to build a number of bridges at otherwise would not have been considered. Mr. Spratt also asked that road 31-S, which runs from White-water due west to Unaweep Canyon, be made a Federal aid project. Mr. Ehrhart suggested that the county commissioners put this request in writing so that it might be acted upon in connection with other projects of the same nature.

B. A. Banta, county commissioner from El Paso county reported a shortage of funds, due to certain building conditions last year. On account of this, he said, surfacing of the Pike's Peak ocean-to-ocean road and surfacing the Canon City road, had not been done.

F. L. Rouse, chairman of the Highways Transport Committee of Colorado Springs, was a visitor at the State Highway Commission's office last month, and reported that great stretch of country between Limon and Ordway, 70 miles from Colorado Springs, was being settled rapidly. A number of auto trucks are employed in this section to haul beans to the market.

Inauguration of the survey for relocating parts of a road up the Big Thompson Canon in Larimer county, as well as widening and regrading it in spots, took place a few days ago with a large party of road officials in attendance. In addition to State Highway Commissioner J. Ehrhart and Chief Engineer J. E. Maloney, of the

commission, those present were: Highway Commissioner E. E. Sommers, County Commissioner Graham, and County Engineer James Edwards of Larimer County, Assistant State Highway Engineer J. R. Cheney and J. M. Johnson, highway engineer of the U. S. Public Roads office. The commission appropriated \$90,000 for this work.

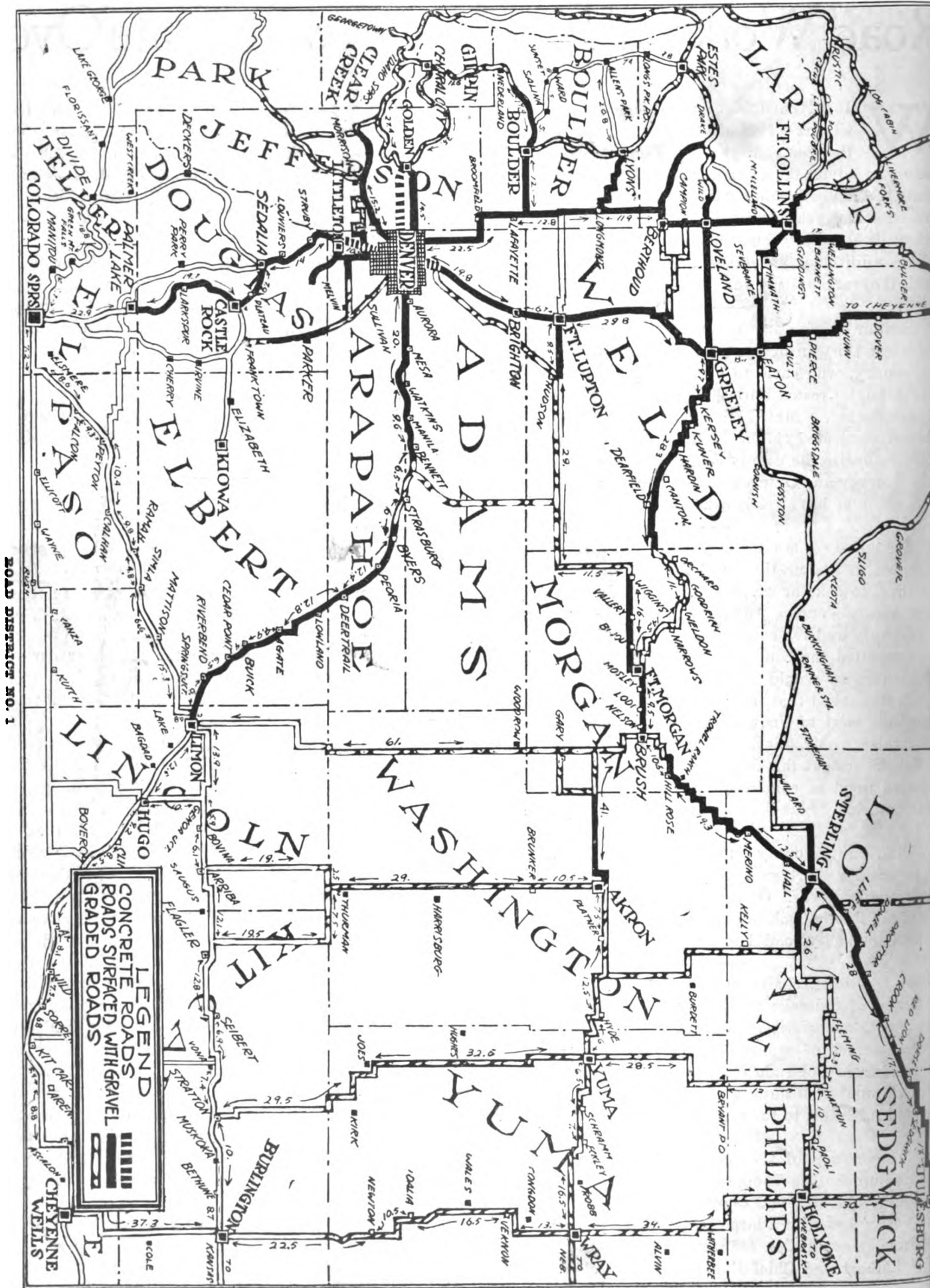
The following road officials were here during the first week in December to confer with the late Logan Waller Page of the U. S. Bureau of Public Roads: B. J. Finch, San Francisco, and L. E. Hewes, Portland, district engineers of the U. S. Bureau; T. W. Norcross, assistant chief of the U. S. Forest Service, Washington; L. F. Kneipp, district forester, and J. P. Martin, district engineer, U. S. Forest Service district No. 4 from Ogden; State Highway engineers, H. E. Severson, Wyoming, C. C. Cottrell, Nevada, and H. C. Allen, Idaho.

Passenger Car Traffic

(Extract from paper by E. J. Mehren, Editor of Engineering News-Record, at the convention of State Highway officials held at Chicago, December 11, 1918.)

"The spiritual justification that I claim for a national system of highways is based on the extent to which passenger car traffic has developed between the various states. There was a time when the passenger car was considered an agency for recreation only. We now see it in a different light and realize that it is an important instrument of business.

"Nevertheless, I am willing to claim justification for a very heavy expenditure by the Federal Government for highway construction solely on the basis of passenger car travel for recreational purposes. On Labor Day of this year I stood just below Colonel Cody's grave, in the Denver Rocky Mountain Park, and watched hundreds of cars pass by on the road beneath. The majority of them carried Colorado licenses, but a goodly number showed tags of Wyoming, Utah, Kansas, Nebraska, New Mexico and other trans-Mississippi states. I maintain that each of the cars that had come from another state into Colorado carried back men and women who were better citizens of our common Union, who had a better appreciation of the glory of our country and who were more firmly convinced than ever before that for the maintenance and defense of this nation, no sacrifice is too great. 'Not by bread alone does man live.' Spiritual forces are still the mainsprings of all great endeavor and hold this nation together no less certainly than they did in the Revolutionary War or in the great war. We have had a wonderful demonstration during this war of the unity of our people. That unity was fostered and secured by the various agencies of transportation and intelligence which have wiped out sectional lines and taught the east and west, the north and the south.



ROAD DISTRICT NO. 1

Colorado Highways

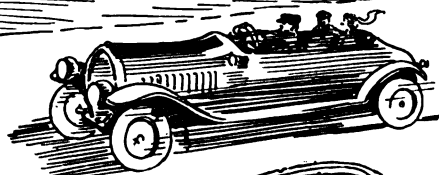
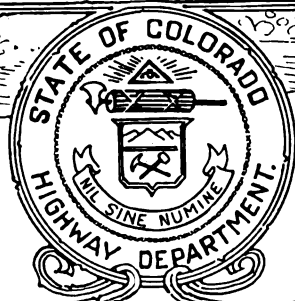
BULLETIN

Issued by the State Highway Department



Entrance to Turkey Creek Canyon in Jefferson County, looking out over the plains. A good idea is given here of the type of construction followed on precipitous mountain sides.

February, 1919



COLORADO HIGHWAY OFFICIALS

STATE HIGHWAY COMMISSION

L. BOYD WALDBRIDGE, Chairman, District No. 5, Meeker.
LEONARD E. CURTIS, Vice-Chairman, District No. 2, Colorado Springs.

FRED J. RADFORD, District No. 3, Trinidad.
FREDERICK GOBLE, District No. 4, Silverton.
ELMER E. SOMMERS, District No. 1, Denver.

T. J. EHRHART, Commissioner.

J. E. MALONEY, Chief Engineer.

COUNTY AND DENVER ROAD OFFICIALS

NOTE—In the appended list of county officials the first name in each county is that of the county clerk, the second name is that of the county surveyor, and the last three names are those of county commissioners.

ADAMS—Fred O. Pearce, Brighton; Peter O'Brian, Brighton; Peter Oleson, Westminster; H. G. Tiffany, Denver; Harry C. Flanders, Bennett.

ALAMOSA—Robert Ginn, Alamosa; Chas. M. Johnston, Alamosa; A. E. Headlee, Monte Vista; Cris Wallrich, Alamosa; D. W. Kirkpatrick, Alamosa.

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ARCHULETA—Eleanor H. Todd, Pagosa Springs; R. A. Howe, Pagosa Springs; Fred Catchpole, Pagosa Springs; David Hersch, Pagosa Springs; Grant Shahan, Chromo.

BACA—Chas. E. Howell, Springfield; J. H. D. Terral, Springfield; Geo. W. Elley, Stonington; Jas. A. Stinson, Springfield; Onda Young, Two Buttes.

BENT—J. W. Nelson, Las Animas; C. W. Beach, Las Animas; B. T. McClave, McClave; D. E. Helzer, Las Animas; Levi Dumbauld, Las Animas.

BOULDER—Francis Beckwith, Boulder; Arthur J. Boase, Boulder; S. A. Greenwood, Boulder; H. E. Miller, Longmont & Boulder; Guy Miller, Boulder & Nederland.

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CLEAR CREEK—Benj. A. Holley, Idaho Springs; C. D. McFadden, Georgetown; W. C. Ives, Idaho Springs; T. W. Cunningham, Georgetown; F. A. Miller, Idaho Springs.

CONEJOS—Bonifacio Gonzales, Magotte; Frank E. Thomas, Manassa; W. E. McClure, Antonito; Frank Russell, La Jara; J. C. Cantu, Manassa.

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EL PASO—E. A. Jackson, Colorado Springs; C. O. Ford, Colorado Springs; J. W. Potter, Fountain; Harry A. Scholton, Colorado Springs; J. B. Fowler, Colorado Springs.

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SUMMIT—Geo. F. Forman, Breckenridge; James D. Galloway, Breckenridge; A. Lindstrom, Dillon; W. H. Hampton, Frawley; Eli Fletcher, Breckenridge.

TELLER—J. H. White, Victor; E. P. Arthur, Jr., Cripple Creek; T. J. Wicks, Cripple Creek; Tom Foster, Woodland Park; I. N. Riley, Victor.

WASHINGTON—L. Roy Cummings, Akron; Elbert Lewis, Akron; Homer Evans, Akron; R. M. Buckmaster, Abbott; E. A. Lewis, Burdett.

WELD—as E. Littell, Greeley; L. L. Stimson, Greeley; A. F. Peters, Mead; T. Elmer Rowe, Greeley; J. W. Birkie, Platteville.

YUMA—John Adcock, Wray; A. C. Cary, Wray; Harry F. Straugways, Wray; H. W. Jackson, Yuma; Alex. Shaw, Wray.



Looking into the walls of Mt. Massive, Colorado's highest peak, from the summit of Tennessee Pass.

CONTENTS

	Page
Frontispiece	4
The Legislative Road Log	5
The Road That's a Friend to Man (Poem)	6
National Highways and the Missing Links. Roy D. Chapin..	7
Good Roads and County Commissioners. W. H. Emmons....	9
Wanted—Campsites for the Motor Gypsy	10
Grade Limits and Traffic Conditions. J. E. Maloney.....	12
Common Drainage Problems. John S. Whittaker.....	13
Editorial	14
Laying the Dust of the Bond Issue Bill. T. J. Ehrhart.....	15
Colorado's Road Management and Control—U. S. Public Roads	17
The Blue Lodge of Colorado Road Builders	19
Sign-Posts Along the National Highways	22
Road Work and Road Builders the State Over	23
Tennessee Roads	8
New Federal Bureau.....	8
License Fees Suggested.....	16
Farmers and Autos.....	16
Legislative Road Bills.....	19

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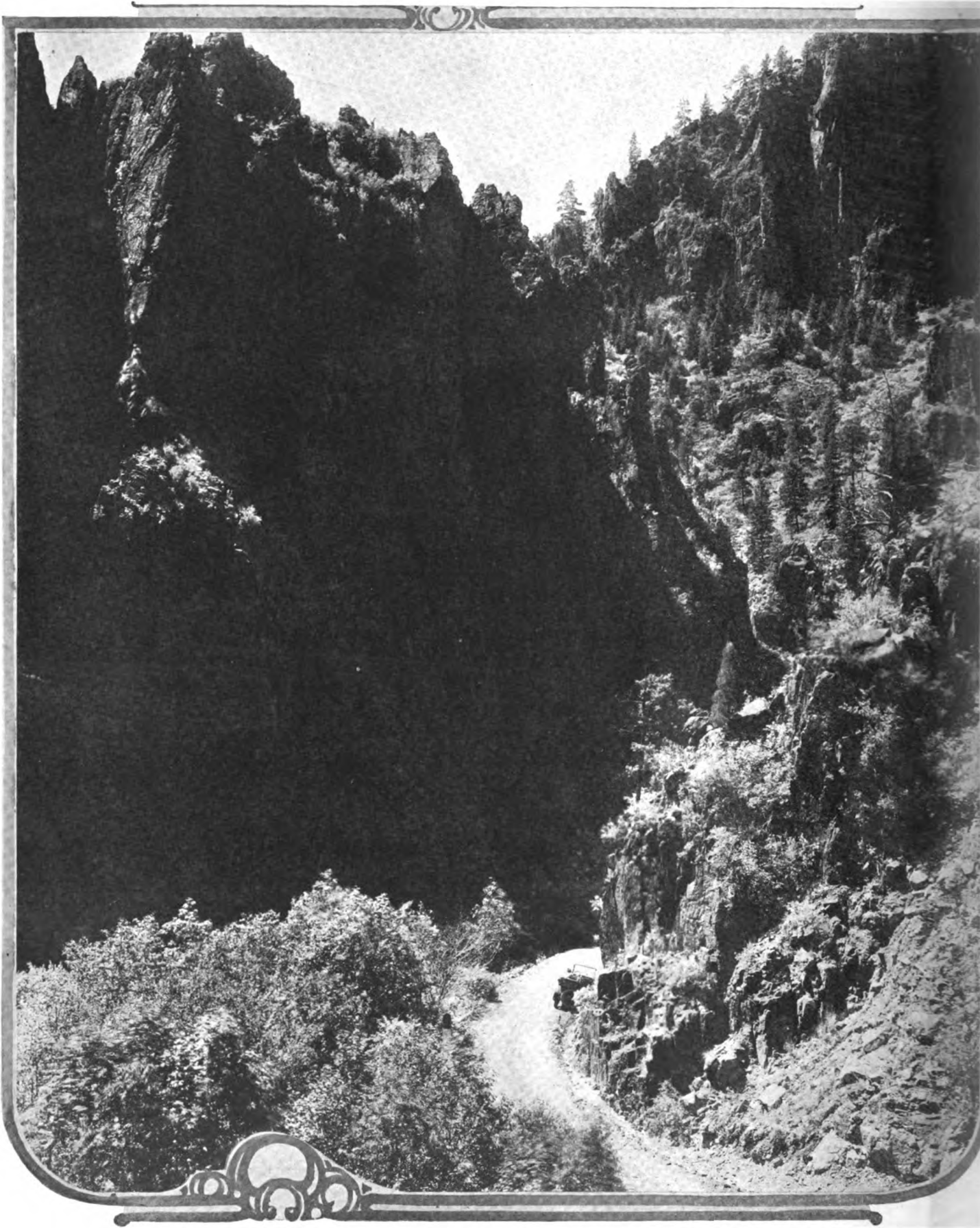
With the approval of the Colorado State Auditing Board.

Address all communications to Colorado Highway Department, attention Pyke Johnson, editor, Colorado Highways Bulletin.

Owing to the necessarily limited edition of this publication it will be impossible to distribute it free to any persons or institutions other than state and county officials actually engaged in the planning or construction of highways, instructors in highway engineering, newspapers and periodicals and civic associations. Others desiring to obtain Colorado Highways can do so by sending 10 cents for each number desired. Associations desiring to distribute the magazine can obtain it at cost in lots of from 500 copies up.

Subscription Price, \$1.00 per year.

Fleeting Vistas, Endless Curves, Vast Cliffs! It is the Phantom Route



The road up Phantom Canyon, Fremont County, that once was a railroad right-of-way.



COLORADO HIGHWAYS BULLETIN

Vol. II

FEBRUARY, 1919

No. 2

The Legislative Road Log

A discussion of the national highway bills and what Colorado must do to meet federal apportionments

NEVER in the history of the nation has there been such a universal interest in the good roads question as now, manifested by the unprecedented number of road bills before Congress and the state legislature, all looking toward the expenditure of millions for making a national highway system from the present disjointed patchwork of improved roads. In the Colorado legislature alone nineteen road bills and one joint resolution have been introduced, all touching upon the road question.

Just as this issue of the Bulletin is ready to go to press the State Highway Commission has received a wire from Washington containing the information that the Bankhead bill has been attached to the Postoffice appropriation bill as a rider, and in that form it is extremely probable that the measure will carry.

The Bankhead bill, introduced in the senate by Senator John H. Bankhead, chairman of the Committee on Post Offices and Post Roads, to which all highway legislation in the upper branch of Congress is referred, originally provided for an appropriation of \$50,000,000, to be immediately available; \$75,000,000, available July 1, 1919; \$75,000,000, available July 4, 1920, and \$100,000,000, annually to July 1, 1924. It also provided for a wider interpretation of the words "post road," to cover any road that might so be used. A bill by Senator Swanson, which is said to have been recommended by the United States Bureau of Public Roads, and Representative Browne in the House, are practically identical, according to information received, with a possible exception in the Swanson bill, highly important to Colorado and the western states. This will be discussed later.

The telegram received by the highway commission would seem to indicate that the Bankhead bill has been amended by the committee so as to cut off the appropriation after the third year, although further advices may be to the contrary.

Taking the telegram as a correct statement of the present reading of the bill, however, this would mean that there will be available for road building in Colorado from federal sources, as soon as this bill is passed and is signed by the President, the following sums in round figures: Immediately available for Colorado, \$880,000; available July 1, 1919, \$1,320,000; available July 4, 1920, \$1,760,000.

But these appropriations will not be awarded the state unless they are met by funds from state sources, and the present income of the Colorado Highway Commission is no more than sufficient to maintain the road system already improved. It is highly imperative, therefore, if the state is to receive the benefit of these funds, that the \$20,000,000 bond issue be voted. Even then some method will have to be devised to meet the appropriation for this year.

To refer back to the Swanson bill it may be stated that the late Logan Waller Page, who died in office as Director of the Bureau of Public Roads last December, had presented to him by Highway Commissioner T. J. Ehrhart when here recently, a plan for allotting federal aid funds to the various states upon a basis which the several states would be able to meet. This basis was figured upon five factors: Per cent. of assessed valuation to total for the United States; miles of road per square mile of area; rural population per square mile of land area; per cent. of total mile-

age in the United States and population per mile of road. The product of these figures resulted in the division of the states into four classes: those which should meet the federal apportionments on a 50-50 basis, or dollar for dollar; those to meet them on a two to one basis; those on a three to one basis, and those on a four to one basis. Colorado was ranked among thirteen western states in the latter class, *i. e.*, she would be called upon to put up one dollar of state funds for four dollars of government funds. Mr. Page approved this idea, but before he had returned to Washington his death occurred. His successor, acting director St. John Wilson, wrote Highway Commissioner Ehrhart within the last three weeks that the bureau had been advised of Mr. Page's approval before his death and made this recommendation to Congress. The idea also appears in the senate bill by Senator Reed Smoot of Utah. Upon request of the federal road officials and state road officials of Utah the state highway commission sent its recommendations and tabulations both to Washington and Salt Lake City. The Smoot bill, it is believed, represents the recommendations of the Utah Highway Commission, and consequently the Colorado plan appears in this bill. Senator Smoot's bill provides for the formation of a United States Highway Commission, to be composed of the chairman of the Senate Committee on Post Offices and Post Roads, the chairman of the House Committee on Roads and the Director of the Bureau of Public Roads. It proposes to issue bonds to the amount of \$1,000,000,000, the proceeds of which will be distributed to the states in proportion to the average percentage of their percentages of population, total assessed valuation, and total mileage of public highways. Highway Commissioner Ehrhart's recommendation, made last November, was that \$100,000,000 in bonds be issued, apportioned to be sold at par in the states and paid into the state treasuries to be used by the state highway commissioners in building roads.

The Smoot bill deviates from this plan further by providing that, when money is supplied to the states, they must

deposit state bonds, drawing interest at four per cent., to cover the amount advanced to them. The four per cent. interest shall pay the three per cent. rate on the United States Highway bond issues, and also establish a sinking fund to pay for these bonds. It is also provided further that the Federal Government shall pay yearly to the depositing states two per cent. of the amount deposited, to be expended in maintenance.

It is apparent, however, that the Senate Committee has taken a legislative short cut, and favors the bill presented by its chairman, as related before. The Congress of the United States, among all legislative bodies, exercises this peculiar prerogative of attaching riders to the appropriation bills, and the passage of the appropriation bill carries the rider with it, the rider often being attached by mutual agreement and thus avoiding a long drawn out fight over a legislative subject. Present advices do not state whether the Bankhead bill as amended by committee requires states to meet federal appropriations dollar for dollar, or according to their ability to pay.

The National Highways Transport Committee has requested all good roads bodies, influential citizens, clubs and other organizations to wire their senators and representatives to support this Bankhead rider, as this seems the best thing at this time to do. If passed it insures an expenditure of \$225,000,000 for good roads by the government as a federal aid to states, but it also is a warning in good time that the states themselves must prepare to meet the appropriation by local bond issues if they wish to remain in the forefront of progress. Naturally the states that

provide such funds will be those to receive the benefit of the appropriation. If Colorado is to receive its share this year provision must be made though the imposition of special taxes, such as transferral of inheritance tax, or a gasoline tax, to raise some \$800,000 for duplication of the federal apportionment prior to the bond issue. Competition between the states for these reconstruction funds will be fast and furious.

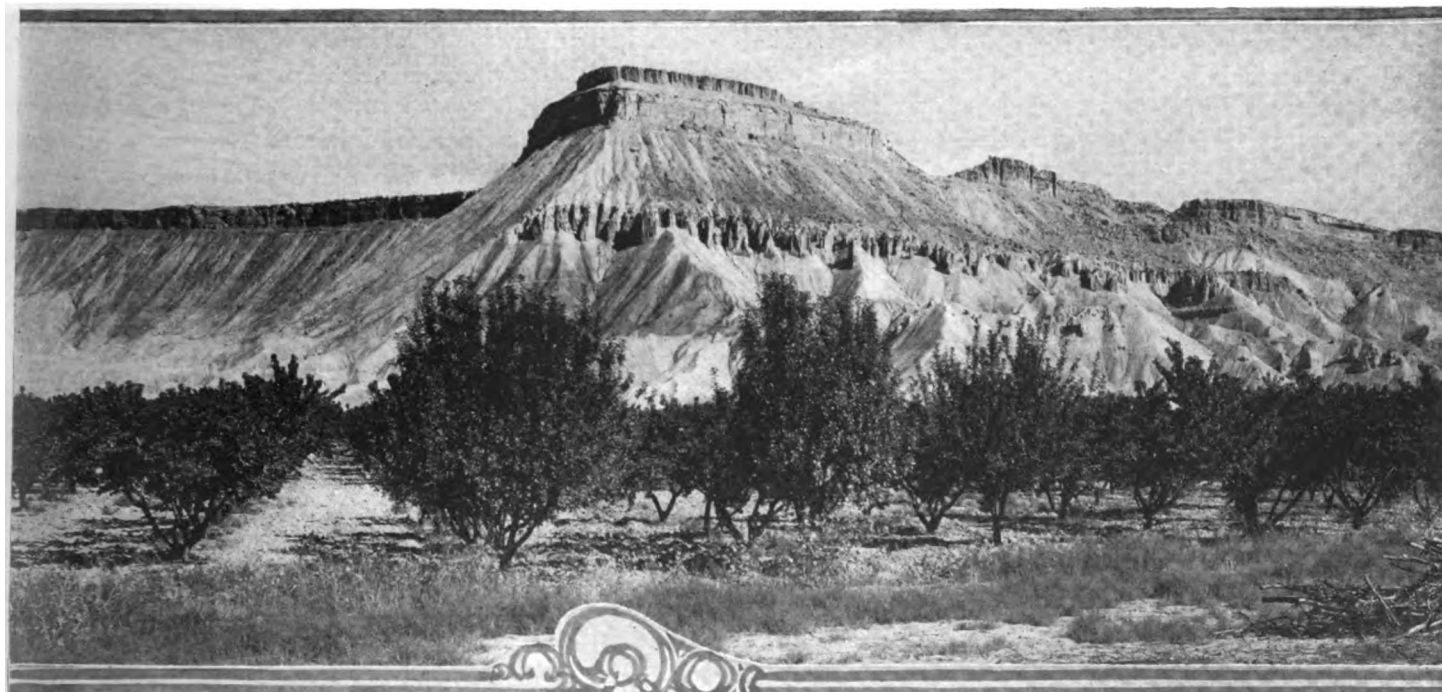
The Road That's a Friend To Man

From the Plateau (Colo.) Voice.

*Let me live in a house by the side of a road
Where the race of men go by—
But not such a road as I have now,
With its dust when the season's dry.
Roads are good, they are bad, they are weak, they
are strong,
Built on many a diverse plan.
But I'd like to live by the side of a road
That is always a friend to man.*

*Let me live in a house by the side of a road
Where flows, like the rich, red blood,
A current of life, cars, flivvers and trucks,
Not a highway composed of mud.
Who could dwell in content by a rut-slashed track,
Rock-strewn from Beersheba to Dan?
Let me live in a house by the side of a road
That is always a friend to man.*

*I can live only once, so why should I stay
Where daily offends my eye,
A crooked streak of mud or clay,
Scooped out by the passers-by?
I don't like to sit in the scorners' pew,
Nor "hurl the cynic's ban,"
But ye gods!—for a road that all the year through
Can be counted a friend to man!*



The Palisades on the Grand River in Mesa County, from which the prosperous fruit shipping town of Palisades takes its name, and a typical orchard of the section.

National Highways and the Missing Links

*Roy D. Chapin, Formerly Chairman, Highways Transport Committee,
Council of National Defense.*

WHEN the construction of roads was first undertaken on a large scale in the United States, it was a common belief that traffic was local. It was argued that as highway transportation could not hope to compete with railway carriage over any great distance, the problem of construction of roads was that of linking up communities without considering those communities either in their relation to the state or to the United States.

For the purposes of debate, the statement that highways transportation cannot compete with rail lines may be accepted without argument, since it is generally conceded that the low rates which prevail on long hauls on rail lines cannot now be met by even the most efficient form of highway transportation, which is the motor truck.

But to argue from that hypothesis that highway transportation is local in character is to fall into a common error which has resulted in the creation of many unconnected links of highways all over the country and which, because of their isolation, have had a tendency to increase costs of transportation and consequently the cost of commodities, since traffic either originates along or travels over the road at some stage in its progress from the producer to the consumer.

Take the case of Pennsylvania and Maryland as a concrete example in hand. The state highway departments of these states have recognized for a long time the desirability of connected gateways, yet today there are but three of the main highways leading out of Maryland into Pennsylvania

which are linked up with through highways in that state.

Analyze, if you will, the gateways between any other states in the Union, and you will find a similar condition prevailing, with the exception that the farther one travels from the congested traffic centers, the less likelihood there is of finding connected systems between the states.

The reason is not difficult to find. Since the day when road building first began in a modern sense in this country, the highway departments have always been handicapped by a scarcity of funds. As they have gradually pushed out their new, modern-type roads, the benefits derived therefrom have become so generally appreciated that there is a constant demand for more roads going up from every community in every state.

It frequently happens that a highway carrying heavy traffic may lead right to the boundaries of a state, there to link up with a district where traffic is not heavy or where the residents have not been so insistent, for one reason or another, for the improvement of the road. The result is that the state department has naturally considered first the demands of its own public and has expended its funds in other directions.

This in itself would not be so bad if we could arbitrarily arrange boundaries for traffic. But there is always inter-state traffic to be considered which may originate at or near the boundary of one state and have its terminal right within the boundary of another. This traffic is growing steadily in volume and it should be taken care of. But

it is closely limited today by the costs of transportation which increase in a startling ratio the moment the traffic passes from a good road to a poor one, and in consequence we have not the free interchange between states that we should have.

Further, it must be remembered that traffic of this nature is not always limited to flow between two states. Actual inter-state traffic passing across two or three or more states is going on today and one of the chief difficulties which the United States Government had to overcome in its care of military supplies passing from inland points to seaports for shipment to France, was this very need of through highways. Needless to say, this traffic which originated under the press of war conditions has not died, nor will it, since there are certain economic advantages to last through highways transportation of special types of express which are now generally recognized.

In a broad sense any provision for national highways means a linking up of the gateways between states. Back of that, of course, remains the pressing need for a study of the development of traffic, where it originates and how it increases, as in practice we will inevitably find that certain of these through links must be more heavily constructed than others, since they will prove to be the most economic routes of travel and hence the trunk lines from which "feeders" will radiate in all directions.

The states are limited in this linking up process, hence the development of a national system naturally falls upon the Federal Government with its unlimited funds and its ability to analyze these problems from a national standpoint, creating the trunk lines where they are most needed.

Today there is no department in the United States that has the authority to connect up these highways or to improve any one system, nor is there a body constituted to analyze the fundamental principles governing the flow of this traffic, but that is no reason why we should not have one. New conditions create new needs and of all of our new problems none is more vital than this one of an understood and directed transportation.

Yet, it cannot truthfully be said that the principle underlying this national system of highways is a new one. European countries have recognized the need of national highways for a long time and each of them has trunk lines spreading over it today, with a consequent lower cost of highway transportation per ton-mile than we have here.

More than that, the principle has been recognized in part right here in the United States by all of the state departments. Proof of this statement is self-evident on every hand in our county road systems.

For the information of those who do not know of the evolution of highway transportation, road building first started in highway districts. It was soon found that these districts must be linked up and counties took over the work. Then the state found that it had on its hands a number of disconnected roads which started nowhere and ended in the same general location, so state funds were set aside to link up county highways.

The result today is found in the beginning of a sys-

tem of state highways which serves to link up supply points everywhere and which makes it possible for the unit of transportation to travel from one end of the state to the other over a uniform highway where funds have been sufficient to bring about a practical realization of the goal. Where funds have been lacking, then an analysis of the plan of road building of any state should show that this interrelated system is the goal.

From district to county, from county to state, from state to national highways systems is a natural, logical growth and the day cannot be far away when, if we are to take care of our transportation needs, this national system will come.

And on the day, we will find that not only have we linked up our commercial arteries but at the same time we have created a uniform medium of communication which will permit through passenger traffic (something which must be taken into serious account), which in turn will permit a closer bondship between California and Maine, North Dakota and Texas.

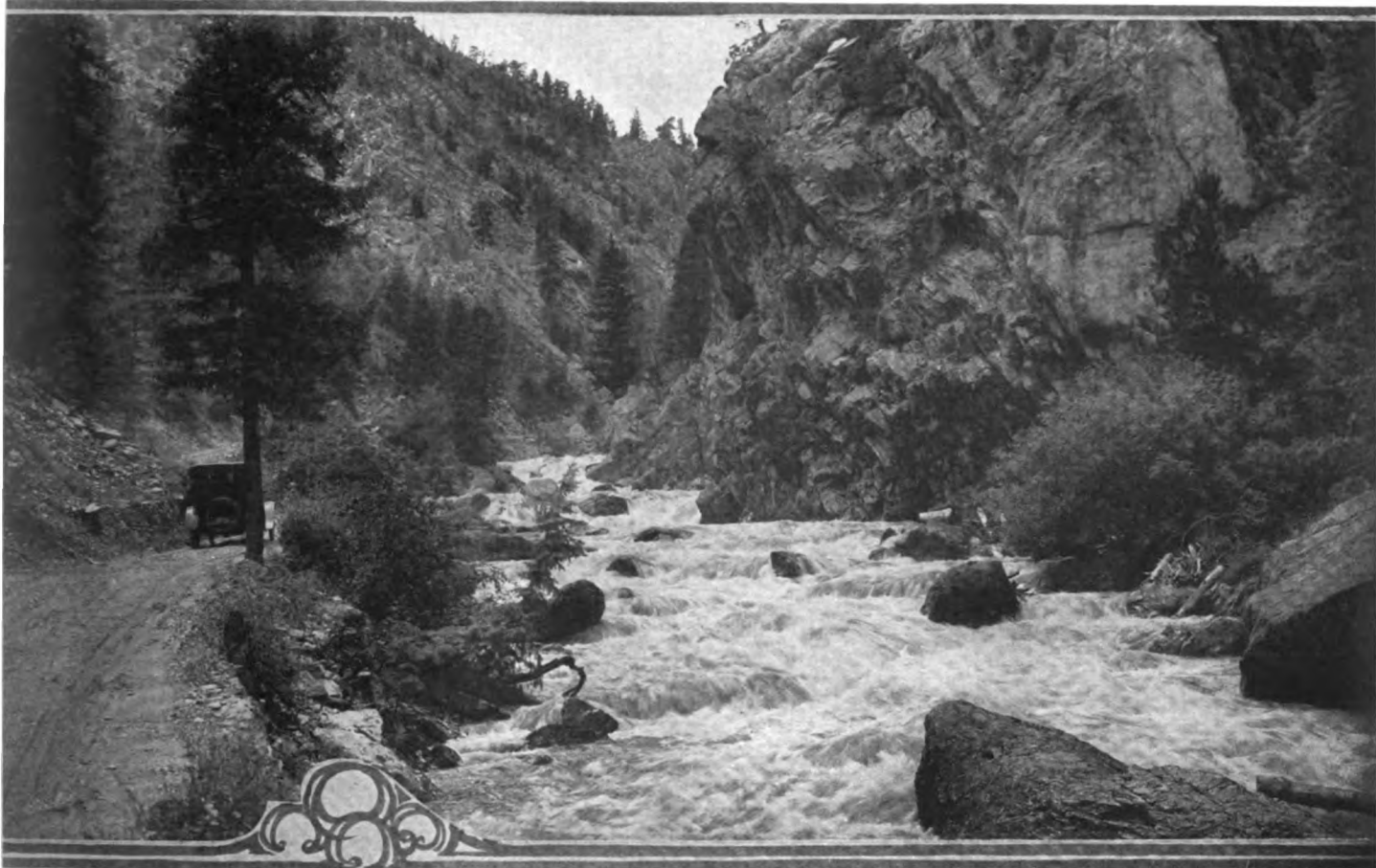
Realization of the ideal waits only upon an acceptance of the practical plan and its embodiment in legislation by Congress which will provide for more funds, a highway commission for the study of these problems, and a national highway system.

Tennessee Roads

Approximately \$250,000 is to be spent by the Highway Department of Tennessee on the Memphis-to-Bristol highway, part of the trunk line system of interstate roads leading from New York, Washington and Philadelphia to New Orleans. A large part of the road has been completed, the section on which bids are now being received at Nashville being 21.35 miles. A Waterbound macadam, 8½ inches thick, 16 feet wide on a 24-foot roadbed, with reinforced and plain concrete drainage structures, is to be used.

New Federal Bureau

The Division of Public Works and Construction Development, a section of the Information and Education service of the United States Department of Labor, is now being organized by F. T. Miller, publisher of construction periodicals. The particular objective of the Bureau's research will be to secure data for the use of construction industry, but the material to be collected will be so varied that the information will be of value to the industry generally. The facts made available will be of help to any community or investor in determining whether it is advisable to undertake public or private building at present. In a recent statement Mr. Miller said: "The country is probably a full year behind in its civil construction program, amounting to at least \$3,000,000. This amount must be caught up and normal building continued; a condition of permanently arrested development of the country is inconceivable."



The road up the Big Thompson, between Loveland and the Rocky Mountain National Park, which will be widened and improved this year to meet the growing demands of tourist travel.

Good Roads and County Commissioners

*Highway Recommendations of Two Important Conventions.
W. H. Emmons, Sec'y Colorado Good Roads Association.*

TWENTY MILLION DOLLARS FOR GOOD ROADS IN COLORADO!

This was the slogan of good road advocates from all over the State, who gathered in Denver during the week of the 20th of January to discuss the question of how best to secure better highways for the State.

Three good road measures, now pending before the General Assembly, were discussed by these good road advocates. These are the enabling act, providing for an issue of \$20,000,000 in bonds for the construction of roads; the bill to place a tax of one cent per gallon on all gasoline used by conveyances on the public roads, and third, the measure providing for an increase in the inheritance tax. These three bills have, since their inception, been the subject of various conferences held in Denver and attended by representatives from various parts of the State, and at the annual convention of the Colorado Good Roads Association resolutions were adopted endorsing all three of these measures and committees appointed to urge their passage in the Legislature. The State Association of County Commissioners has also appointed committees to work to secure the enactment of these same measures.

The enabling act for the bond issue, as now before the Legislature, provides that this question be submitted to the people at the general election to be held in November, 1920. The bonds are to be fifty-year bonds, bear 5 per cent interest and be issued in denominations of \$50.00 and over. It is hoped by this means to so popularize the bonds that they will become a ready source of investment by Colorado people, thus keeping the securities within the State. The measure also provides that the first of these bonds shall be issued June 1, 1921, in an amount of not to exceed \$2,000,000, and that they may be issued in amounts not exceeding \$3,000,000 in any one year, annually for the next years. These bonds shall not be issued at less than par and accrued interest.

The proceeds from these bonds would be used to construct good roads through the State, and a plan for the expenditure of this sum on a comprehensive system of State highways is now being worked out by the State Highway Commission. This survey is to be made by the State Highway Commission during the coming summer, and the plan for the expenditure of this money will, therefore, be placed

(Continued on page 20.)

Wanted---Camp Sites for the Motor Gypsy

A bill to provide free public grounds along state highways

IRATE Ranchman—What are you doing on my land? Didn't you read that sign? Are you blind? "No camping or fishing allowed." Now move on.

Kansas Tourist—But we couldn't find an unfenced place along the road, and we had to sleep. We've just started dinner.

Irate Ranchman—Can't help that. If I let one in fifty come, chop down my trees, fish out my stream, litter up my place.

Kansas Tourist—Well, what do you invite people to your state for? I suppose you want us to come, give you our money and hang on a Christmas tree.

Irate Ranchman—Now, see here, I said move on. I didn't invite you to camp here.

Kansas Tourist—All right—we'll go. But I'll be blanked if I ever come to this state again.

The above incident is not of any particular place or people or year. It is not of any particular state, but happens every year in every state through which the motor gypsy passes. Both the ranchman and tourist are right and wrong—the former because he has a right to the inviolability of his land, yet has done nothing to provide a place for the tourist to stop—the latter because he has no right on private property, but has a right to expect a few accommodations when he enters the state in answer to alluring invitations for enjoyment, the healthful air, and magnificent scenery of the Rockies, to which no man has a land office patent.

It is to obviate this difficulty and protect both the rancher and tourist that State Highway Commissioner T. J. Ehrhart drafted the public camp site bill, now before the state legislature. The idea is absolutely new. It is peculiarly fitting, but natural, that it should originate in Colorado, for Colorado invented the automobile camp.

As yet the camps have been located in or near cities, but the public camp site bill provides for the purchase of country camp sites along the state highways, where the tourist may find a pleasant, shady site, running water and a few simple accommodations; perhaps outdoor stone ovens, a convenient wood-pile and an open shelter house, such as may be found on the National Forest recreation grounds.

The bill was introduced in the House of Representatives by Rockwell and Lacey, and its text is given here:

"A bill for an act providing for the purchase of camping sites along State Routes and Highways of Colorado.

"Be it enacted by the General Assembly of the State of Colorado:

"Section 1. The boards of county commissioners of the several counties of Colorado are hereby empowered, with the approval of the State Highway Commission, to

Time: The close of a pleasant summer day.

Place: A grove of pines by a rushing mountain stream.

Principals: Kansas tourist, wife and two children; irate farmer; the filver.

purchase parcels of land to be used as free public camping grounds, not exceeding five acres in one tract, at a cost not to exceed \$100.00 per acre, along and contiguous to a state route or

highway, and pay for the same from the county road fund.

"Sec. 2. The boards of county commissioners before making any purchase of land under this act, shall visit the proposed site and, if a satisfactory agreement can be made with the owner as to the price and acreage, a survey and plat shall be made and abstract of title secured, which shall be submitted to the county attorney for his approval. A full statement concerning the proposed camp site purchased shall be forwarded to the state highway commission, and if the said commission shall approve the purchase, it may instruct the state highway commissioner to issue a voucher on the state road fund, payable to the county treasurer, reimbursing the county to the extent of fifty per cent. of the cost of such purchase. No camp site shall be purchased without first securing the approval of the state highway commission.

"Sec. 3. In the selection of camping sites, the topography of the land must be convenient for automobiles and other vehicles, with convenient water supply, and, where possible, shade trees. Rules and regulations governing the use by the public of such camping sites may be agreed upon between the boards of county commissioners and the state highway commission. A reasonable amount may be expended in fencing where necessary, and otherwise improving any camp sites.

"Sec. 4. It shall be a misdemeanor, subject to a fine not to exceed \$100 for any person to destroy any tree, deface any natural object, or befoul any source of water supply, located on or in any public camping site as defined in this act."

There is a sound reason for making it necessary for boards of county commissioners to secure the approval of the highway commission before a camp site is purchased. It will prevent any "friendship" sales of unsuitable sites, prevent the payment of extravagant prices for land, and, at the same time, permit the establishment of a connected system of sites, located on roads where travel is great, at convenient and reasonable points along the routes. Such camp sites, if established, will take the motor tourist into sections of the state which he now seldom visits, because of lack of accommodations for camping, and induce him to stay in the state for weeks at a time instead of for days. The practical benefit to rural communities, which now seldom see the tourist, is at once apparent, for the average-motor tourist lives well while on the long trail, and is motor-gypsying, not because he cannot afford trains and hotels, but because he wants to camp out and rejuvenate a tired body and brain.

In Spots Like These the State Should Establish Motor Gypsy Camps.



Top—In Denver's city motor camp. Below—Motor campers in the Denver Mountain Parks.

Grade Limits and Traffic Conditions

By J. E. Maloney, Chief Engineer, State Highway Commission

Explanation of Diagram of Cost of Operating Traffic.

Line 1 is based upon the gasoline used upon the different classes of road, as determined by Mr. A. N. Johnson, Consulting Engineer of the Portland Cement Association, in his experimental tests, and I have assigned the following values for the road resistances:

Concrete	28 lbs.
Macadam somewhat worn.....	70 lbs.
Gravel good	75 lbs.
Gravel fair	105 lbs.
Earth clay	210 lbs.

Lines 2 and 3 are also based upon the same experiments, with the cost of oil and of tires and repairs, respectively, added to show the increasing percentage of cost variation.

Line 4 shows the oil and gas, tires and repairs for Nos. 9 to 18 inclusive, given in the table of costs of operation in January, assigning the values of 135 to 140 lbs. and 235 lbs. to 240 lbs. as the road resistances.

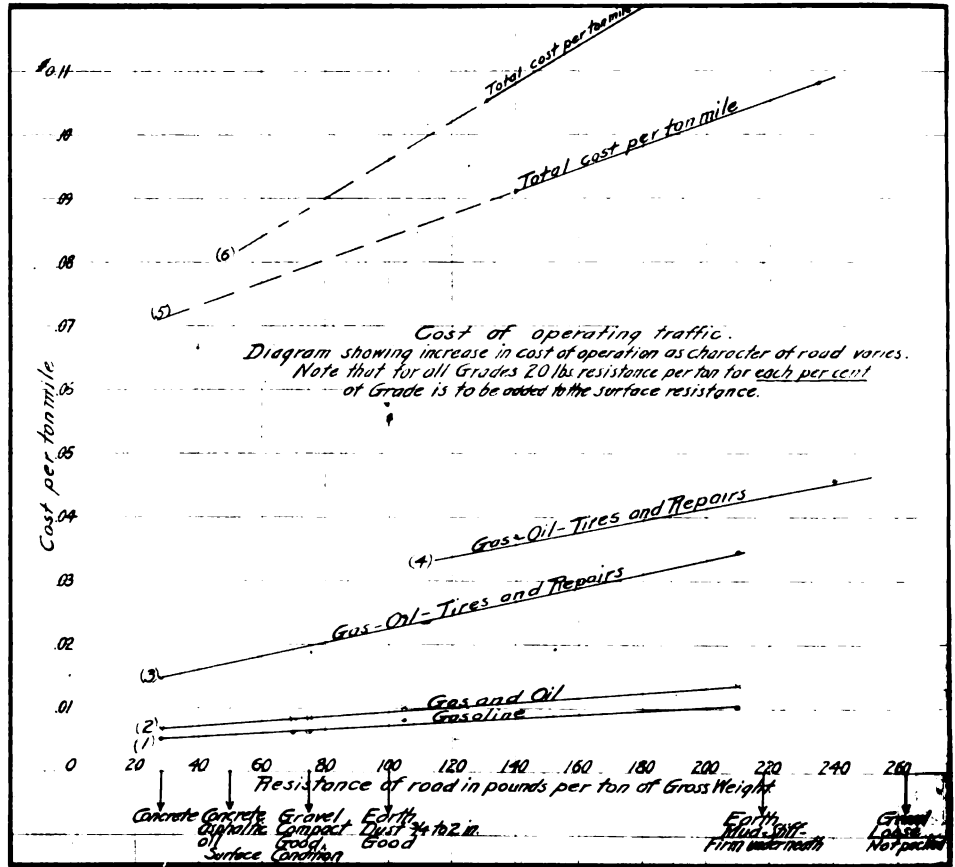
These two lines, Nos. 3 and 4 on the diagram, show the same general percentage of variation, but the recorded costs are higher than the costs based upon the experiments.

Lines 5 and 6 on the diagram show the variation using the total cost of operation as given in the tables published heretofore; line 5 being based upon the cost of operation of Nos. 17 and 18 in the table of operating costs published in January, and line 6 being based upon the cost of operation of Nos. 9 to 16 inclusive of the operating costs.

As line 5 shows the lower percentage of increase of cost it is used for the comparison of traffic costs on the different classes of road with the assurance that any future determination based upon more complete data will increase rather than decrease the rate of change, and will therefore be making a conservative estimate.

The designation of the character of road at the bottom of the diagram, and the resistance applied for each, is based upon the experiments of Prof. J. B. Davidson of the University of California, made for the Good Roads Bureau of the California State Automobile Association.

It is recognized that men's judgment will differ as to the values to be assigned to the road resistance for each particular case, and that the lines drawn on the diagram may be shifted one way or another as this resistance factor is changed. I believe, however, that any change which more complete data will show necessary, will be to replace the straight line with a curve flattened at the lower resist-



ance, say up to 40 lbs., and increasing the angle at the higher resistances.

In using the diagram to find the total cost per ton mile for a paved road, enter the diagram at the bottom at the point of the road resistance desired; for instance, take the point at 28 lbs., get the intersection of this vertical line with line five. This will give the horizontal line of cost, being 7.3 cents per ton mile. For gravel road compacted and in good condition, take the resistance at 75 lbs. per ton. The vertical line followed from this point to line 5 intersects at the horizontal of 8.5 cents per ton mile, showing a saving of 1.2 cents per ton mile for the paved road over the gravel.

Application of the operation costs to the traffic records on the roads of this State:

Taking the traffic for the 3827.6 miles, estimated in the tables published in December as 162,926,098 ton miles, and applying the average cost as given in the operating costs, of 10.8 cents per ton mile, will make \$17,595,917 dollars per year as the operating cost for the traffic alone.

A saving of but one cent per ton mile on this traffic would equal \$1,629,261 dollars annually, which sum capitalized at 5 per cent would warrant the expenditure of \$32,585,200 in the improvements necessary to effect this annual saving.

(Continued on page 21.)

Common Drainage Problems

*John S. Whittaker, District Engineer,
U. S. Bureau of Public Roads*



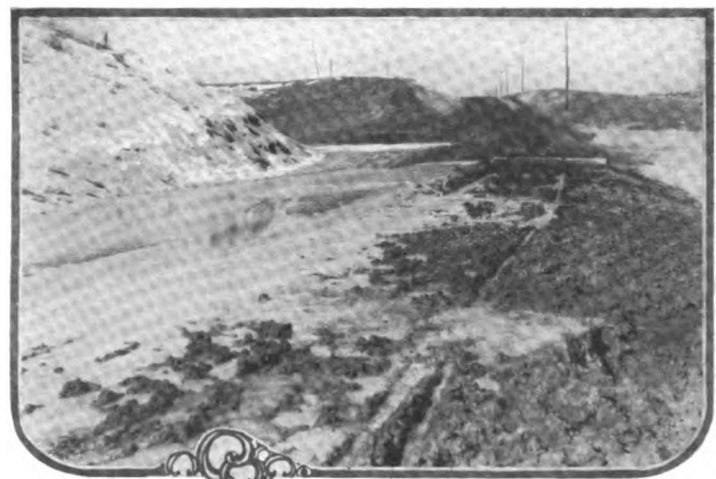
Lack of proper side-ditches is emphasized.

The drainage of earth roads in Colorado and other intermountain states presents special problems due to the range of climatic conditions and the wide variations in topography and subsoil. The arid, semi-arid or irrigated, and mountain sections each presents its special problem which becomes complicated with the variation in subsoil.

If the road surface is well above the abutting land on both sides there will probably be no trouble from lack of drainage unless the subsoil is unusually spongy. If on the other hand the abutting land is materially above the level of the roadway, the subsoil of the road is likely to intercept, not only surface drainage seeping under the road, but subdrainage from springs under the high ground at the sides. Consequently the experienced locator concerns himself not only with alignment and grade, but carefully observes the topography and examines the soils and strata formation. In his final location he avoids as much as possible soils which have a tendency to retain moisture; for it is acknowledged that practically any class of material, if kept dry, will provide a good foundation for the road structure.

In the arid or dry-farming sections soft road surfaces will seldom be experienced except during the winter snows

(Continued on page 20.)



Ice blocks solid the culvert's mouth.

ROAD drainage has been a complex problem for the engineer and the public since roads were first constructed and no doubt will continue until the end of time. It has been kept constantly before those who build roads or keep them in repair, and yet it remains one of the most neglected problems in construction and maintenance. Location, grade and drainage are said to be the only permanent features of a highway, and of these drainage appears to be the hardest problem for the locator to solve. Almost every engineer can relate from his experience incidents and problems requiring special methods to remedy and overcome. The fleets of army trucks traveling from the factory to the seaboard, and the short-haul motor truck lines in operation last winter and spring presented new problems for the road engineers of the more populous states to solve. Investigation in practically every case led to the decision that lack of drainage was the fundamental cause. No universal remedy was decided upon as a cure for all cases investigated.

The question of road drainage is so broad that the subject will be discussed only in a general way. The new factor of motor transport of short-haul freight requiring hard-surfaced highways with foundations and drainage problems special to each surfaced highway constructed, is just now appearing for all highway departments to solve. However, it is not this to which I call attention; rather it is to the every-day problems so common in the past, present and no doubt also in the future, so neglected in their entirety and yet in the end requiring and receiving special consideration and treatment.

Bridges and culverts generally are problems as to area of openings, strength, and materials of construction. The area of opening can be determined closely, by standardized mathematical formulae in which the drainage area, amount of rainfall and rapidity of run-off are the main factors. This result is checked whenever possible by the clear area of other structures if any on the same water-course and by records of maximum flow. The materials are largely determined according to their availability and cost, and the importance of the highway. However, in order that these may become permanent and capable of carrying the future traffic, uniform legislation defining the maximum load and maximum weight per linear inch of wheel tread, as well as the maximum rate of speed, must not only be enacted but must be enforced.

Whether cross-drainage structures are of wood, corrugated steel, vitrified clay, concrete or stone is largely a question of availability and cost. The size, location and proper installation are the determining factors which decide for success or failure. If proper outlets are not provided to quickly take care of the run-off, the result may be failure even if all other provisions made for cross-drainage are properly provided.



An Exploded Theory

In the discussion of road-building, as one of the great reconstruction measures desirable as a means of furnishing employment to the soldiers withdrawn from civil life by the war, we have heard the argument advanced that the soldier expects something better from his country than a job as a pick and shovel wielder.

On its face the argument is not a poor one, but it is based on false premises. The pick and shovel man is only one of the elements in the complex business of road construction. It is safe to say that the number to be employed in the various industries and professions involved in road-building will be fully equal to the army of day laborers.

What about the engineers, instrument men, rodmen and chainmen who must make surveys for every foot of road that is built, or the draftsmen and other office employes who must plat and advertise the road systems?

What about the contractors, their superintendents and timekeepers, or the road supervisors and inspectors who must patrol them?

What of the innumerable mechanics who must be engaged in the manufacture of automobiles, trucks, farm tractors and culverts, the drivers of the motor apparatus used in the construction work, or the commercial trucks that will use the roads in ever-increasing numbers as the mileage is extended?

What of the expert concrete men, handlers of high explosives, expert bridge builders and structural steel workers?

We might go on and list the scores of trades and industries that will be engaged, directly or indirectly, in pushing onward and extending that potent factor of civilization—the road—but we think that enough has been said on this point to convince the thoughtful man that the argument to which reference has been made is not well founded.

Good Business

After all, the question of good roads is eminently a practical one—a mere matter of dollars and cents. It matters not whether the road is a city street or a country highway, its improvements make the abutting property more valuable to the taxpayer. But in the latter case the improved road brings many more advantages. We have only to cite a simple illustration to drive this fact home, even to the most skeptical.

Every man, woman or child who rode a wheel when the bicycle was the rage, every farmer who has driven a

team, has experienced the drudgery of passing through a stretch of loose sand. In the case of the bicycle rider he has had to exert the utmost of foot pounds held in reserve within his body, while the farmer has seen his team strain every muscle to pull the load through the retarding element.

Then, when the vehicle reached an improved section of highway, or a hard-surfaced road, it has seemed to shoot forward of its own volition and with little apparent force from the motive power.

Now this strain on the vehicle, the wheel rider or the team meant in each instance a loss of time, wasted effort and an increased ratio of deterioration for the vehicle. A strain on a steel cable, if it lasts long enough, will snap that cable and cut short its life. In the case of an automobile it means that the engine will wear out earlier than if used on a road where the least possible resistance occurs. In other words, good roads are worth while because they save time, reduce depreciation to the minimum, lessen the percentage of breakage. One may leave out the question of pleasure and comfort entirely and still must arrive at the inevitable conclusion that good roads are worth while from the practical, cash standpoint. It is good business to have them.

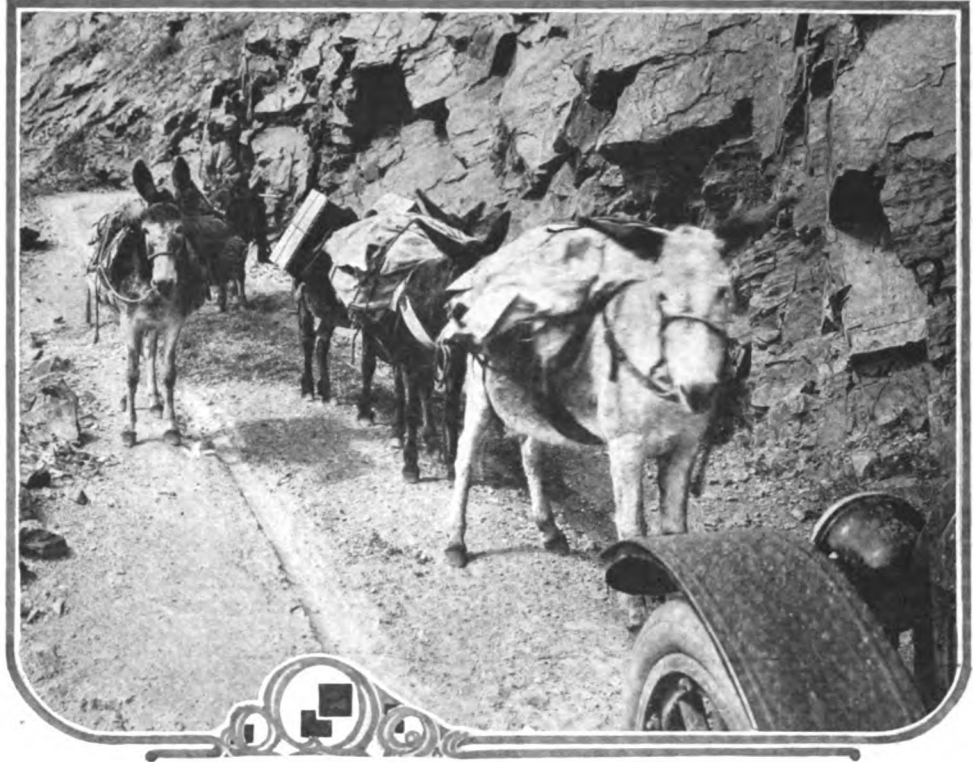
Interest and Sinking Fund

There has been some discussion as to the best manner of providing for the interest and sinking fund on the \$20,000,000 bond issue, provided the Legislature decides to submit this to the people for a vote. Several bills for raising additional road funds by fees or a gasoline tax have been introduced in the General Assembly, and the suggestion has been heard that this income should be set aside for the purposes mentioned. Bond dealers, however, who have been consulted upon the proposition, are of the opinion that the proper way to provide for interest and sinking fund is by a straight tax, as license bills or a tax on gasoline would be subject to alteration at any session of the Legislative, and offer no sound assurance to investors that the interest and sinking fund would be taken care of.

As the situation stands now the present income of the Highway Commission will not go much farther than maintenance, and if the State roads are to be increased and improved more funds will be necessary. There are 42,000 miles of roads in Colorado, of which 7,000 miles are State routes. This bond issue would be used on these 7,000 miles, not already improved, or those requiring a hard surface. Estimates made by the Commission engineers upon probable expenditure of the \$20,000,000 bond issue provide for improvements on 3,800 of the 7,000-mile road mileage.

Laying the Dust of the Bond Issue Bill

An analysis of the situation by State Highway Commissioner T. J. Ehrhart, and some predictions upon the benefits that may be expected if it is adopted. An address delivered before the county commissioners' association in Denver last month.



A disputed right-of-way on the Durango-Silverton Toll Road, to be completed by contract this summer. One of the federal aid projects.

IT has been my privilege to be associated with the Boards of County Commissioners for the past six years in a program for betterment of Colorado Roads. We started in 1913 on a "Shoe String," which we have, I think you will agree, used to good advantage. The Automobile Blue Book, the best authority in America, through its scouts and engineers places Colorado in the ninth rank as to roads in the list of states in America.

But at this time we have almost reached the limit of further constructive advancement, as the county and state funds now available are needed for maintaining the system of roads we have already improved. It seems imperative that we have additional funds to go on in a progressive way with the work so well begun.

The sentiment of the people is, without doubt, for better roads. Various plans for increasing the State Road Fund have been presented to the present Legislature, looking toward immediate relief. An increased automobile and truck license fee, and the transfer of the Inheritance Tax to the State Road Fund, are two. I do not know of a better use for these funds, or one that will do the whole people so much good, than to use them for road construction.

Some relief of this character is needed at once so that the funds, coming from the government to the State under the Federal Aid Road Act, which requires one dollar of state funds for every dollar of Government Aid, may be utilized. The State Highway Commission is compelled to set aside from the State Road Fund a sufficient amount to meet the yearly allotments due the State from this source, during the federal fiscal year, which begins July 1, 1919.

There will be due Colorado more than \$350,000, which must be met by a like amount. The following year approximately \$450,000 will be due. This will require almost half the available State Road Fund. It seems imperative to me, therefore, that the Legislature make some provision to increase the State Road Fund sufficiently to meet the Federal Road Aid, so that our ordinary fund may be applied to general county State road improvement.

There is a bill now being considered by Congress which

has the endorsement of the administration at Washington. It proposes an appropriation of \$600,000,000 to be expended on general road construction in the several states during the coming six years. Under the method of distribution incorporated in the bill Colorado would be entitled to \$1,590,000 for each year, but in order to receive this fund, will be required to provide a like amount. This would be impossible with the limited fund we now have, and would require some legislative provision to enable the State to avail itself of the funds allotted.

The Legislature will more than likely take the necessary steps to submit to the voters at the regular election, to be held in 1920, the proposition of a \$20,000,000 issue of road bonds.

If the people of Colorado can, as a whole, arrive at a full appreciation of the investment value to them of twenty million dollars in good road construction within the next seven years, there will be no dissenting opposition to an immediate campaign for that amount and provisions for more to follow.

Our state is destined to be the mecca for tourist travel in America. I predict that within ten years we will have 250,000 tourist automobiles visiting us each year, carrying a million passengers, who will travel to every corner of Colorado.

From personal observation and systematic inquiries covering three years, I am convinced that our visitors will stay in the state an average of thirty days, and that they will expend an average of not less than \$100.00 each. This

means an annual business of one hundred million dollars. The net returns to the business of the state would be \$15,000,000, estimating 15% profit—surely enough to justify us in mortgaging the future to the extent of a few millions each year to improve our road system to facilitate travel and transportation.

Possibly the foregoing statement may seem like an air castle to some of you, but we have the following eight states directly tributary: Iowa, Texas, Kansas, Nebraska, Missouri, Oklahoma, Arkansas and Illinois, representing twenty per cent. of the population, twenty per cent. of the area, twenty-five per cent. of the taxable valuation and twenty-five per cent. of the number of automobiles (1,580,994) in the United States. All are within an average distance from Colorado of 450 miles, or, over the present roads, an easy three-days' trip.

In addition to this vast tributary region and population we have already coming to us thousands of cars from other states. In the next ten years the population will largely increase and the number of local automobiles may be doubled. With improved roads, which will shorten the time and lessen the difficulties, we may, in my opinion, expect a larger percentage of tourist automobile visitors. Therefore, my guess as to the number of visiting cars is not at all improbable.

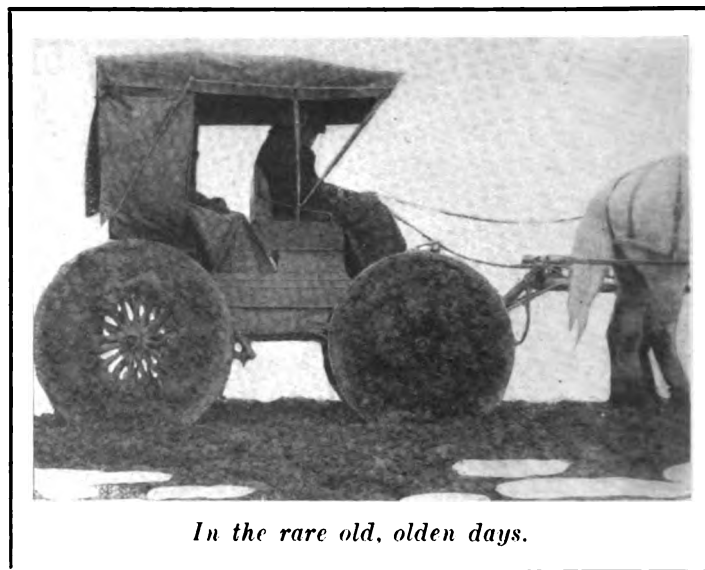
If we accept this as near the truth, it behooves Colorado to "get busy" in preparation for their entertainment. We must have more and better roads, increased and varied hotel facilities. I predict that the tourist business will, within ten years, develop into the most profitable single asset of the state, will bring a growing increase in the permanent population, and will add more to the value of our lands than the entire amount that may be expended upon our whole road system.

Good roads will be the greatest factor in land settlement and the establishment of summer homes throughout the mountain section. This will increase taxable valuations.

Colorado has everything to gain and no possibility of loss by investing millions in road building. There is little loss to the state in the expenditure of money in road construction, because it is paid out to a large extent for labor and is at once returned to the various business channels, finding its way back to the pockets of those who contributed it through taxation.

Public camping grounds should be set aside and maintained in the vicinity of every town and through the entire mountain district. A law should be enacted giving County Commissioners authority to purchase sites for this purpose along our public highways. Thousands of our visitors come to camp in the open and our own people like to do it. The necessary cost would not be great and these free public camping places would form a novel and attractive feature fully appreciated by every visitor.

I believe we can show by actual figures that, with the expenditure of the \$20,000,000 proposed on the general State Highway System, we can save ten per cent. of our gasoline consumption, ten per cent. in time and add twenty per cent. to our load on the roads improved.



In the rare old, olden days.

The expenditure of the funds derived from the bond issue in construction on the main highways would relieve in large part the expense on these roads to counties, and permit the rapid extension and improvement of local county roads with county road funds.

There is some criticism concerning the construction of scenic mountain roads. I do not know of any section of road in the State Highway System that will not be used for commercial purposes. Hundreds of tons of Colorado produce and goods are transported each year into Estes Park, the Cripple Creek district and the San Juan country over state roads that are scenic beyond comparison. What our state needs is a network of good roads throughout both the farming districts and mountain sections. More funds are a necessity. With this need supplied there will be no question of ultimate satisfactory results.

License Fees Suggested

In answer to the request upon the State Highway Department for suggestions as to the proper amount of automobile and truck license fees to be established by legislative enactment Highway Commissioner T. J. Ehrhart and Chief Engineer J. E. Maloney have submitted the following:

Passenger cars—Up to 2,000 pounds, at 25 cents per 100 pounds; from 2,100 to 3,000 pounds, inclusive, 40 cents per 100 pounds; 3,100 pounds or over, 50 cents per 100 pounds.

Trucks—\$5.00 per ton or fraction thereof up to and inclusive of five tons; \$20.00 for each additional ton.

Farmers and Autos

The extent to which farmers are buying automobiles is indicated by an investigation made through dealers by the Haynes Automobile Company of Kokomo, Indiana. The results of the query as to sales during the past year showed that of 1,643 Haynes owners, information as to whose occupations was received, 331, or approximately 20 per cent, were agriculturists. The dealers said that this was the largest number of cars bought by any one class.

Colorado's Road Management and Control

An Analysis by M. O. Eldridge, Assistant in Road Economics, G. G. Clark and A. L. Luedke, Engineer Economist of the U. S. Bureau of Public Roads

STATE participation in road improvement in Colorado is of state-wide scope and consists of money aid, technical advice and supervision, and was first evidenced in 1918 by the employment of state convicts on the improvement of certain roads designated by the legislature.

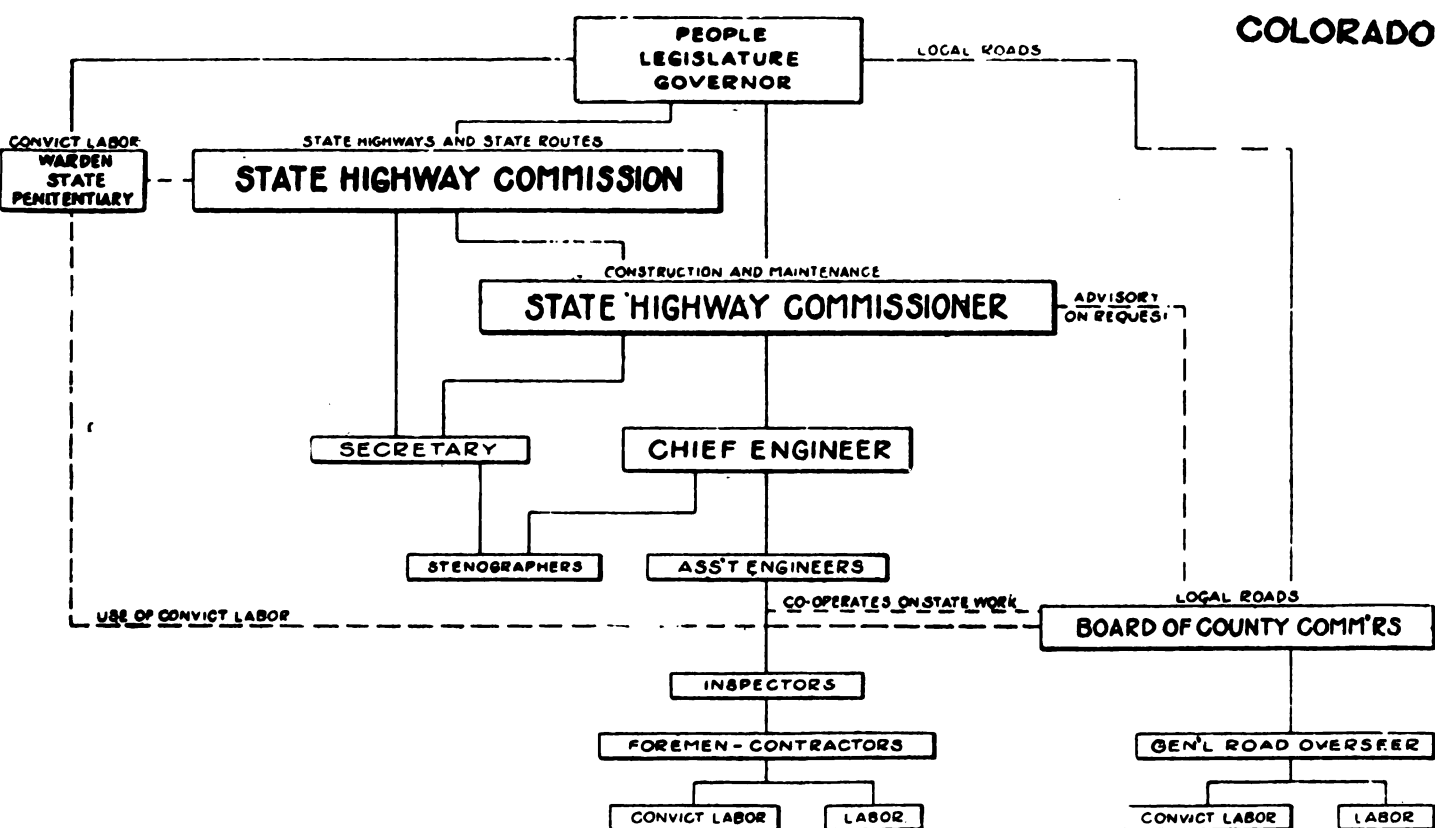
A highway commission was created in 1909 with advisory powers over all roads of the state and had at its disposal a fund for state aid to the various counties.

The laws relating to state aid and state highway officials have been modified and strengthened from time to time until at present the highway department of Colorado is well organized, has funds at its disposal for state participation in road work throughout the state, and exercises to

special appropriations for the construction of bridges in various counties of the state.

At the close of 1916, about 1,800 miles, or 4½ per cent. of the total mileage of public roads, had been improved by hard surfacing. In 1916, \$607,728 of state funds and \$662,829 of local funds were expended by or under the supervision of the state highway department. The total expenditures by state and local forces reached \$2,313,208 in the same year. In 1917 they totaled \$2,570,000.

State participation in road work was delayed by lack of funds during the period of 1911 to 1913, due to the fact that the law providing state funds for construction purposes was declared unconstitutional.



a limited extent supervisory and advisory powers over local work executed by county officials.

A system of state roads comprising about 18 per cent. of the total road mileage of the state, composed of roads chosen by the various county boards, with the approval of the state highway department, has been designated as state routes from which a system of state highways will be selected for improvement with state and local funds by the state highway department.

The state legislature from time to time has provided

ORGANIZATION

The organization of the road forces of the state and the relation existing between them is shown by the accompanying chart.

STATE—The state highway department, composed of the state highway commission, state highway commissioner, his assistants and employes, is in charge of all road improvements for which the state provides funds wholly or in part.

The commission is composed of five members appointed

by the governor for terms of five years, one being appointed each year from one of the five districts into which the state is divided by law. The commission has general charge over the establishment, revision, construction and maintenance of the proposed state highway system; the financial affairs of the state highway department, and the preparation of a yearly budget of proposed operations of the department. The affirmative vote of all members is required for any action proposed. In case they fail to agree, decision is made by the governor.

The state highway commissioner may be removed from office by the vote of all members of the commission. If they fail to agree, the governor, acting with the majority of the commission, decided the matter. In case of removal the successor to the commissioner is appointed by the commission to serve the remainder of the term for which the removed official was appointed. The state highway commissioner is appointed by the governor for a term of four years and is required to designate an employe of the department to act as deputy in case of absence or incapacity of the commissioner.

The commissioner is the executive official of the department and, subject to the orders of the commission, is in charge of all matters pertaining to road improvement financed wholly or in part by state funds. He appoints from lists of eligibles furnished by the commission such assistant employes as may be needed. The state civil service regulations do not extend to these employes. All payments made out of funds at the disposal of the department must bear the approval of the commissioner.

COUNTY—County supervision over road affairs is vested in a board of commissioners, consisting of three members elected for a term of four years. The county clerk and county treasurer, elective officials, are clerk and fiscal agent, respectively, of the board. In all counties of the state, except Denver and those counties in which the road funds are less than \$12,000 annually, the county board may elect a county road supervisor who is skilled in road building and who acts as the executive official of the board in all matters pertaining to roads and bridges under their control, and who has power to form road districts for the purpose of road dragging and other minor repairs. The board may divide the county into districts and appoint a general road overseer who, with the consent of the board, appoints deputy overseers for each district. The board has the power to levy and raise taxes and to enter into contracts for road and bridge improvement.

CLASSIFICATION, CONTROL AND PROCEDURE

STATE HIGHWAYS—These comprise the roads chosen by the state highway commission from the system of 7,083 miles of state routes. These are improved under the immediate control of the state highway commissioner with state and local funds and maintained by state forces at the joint expense of the state and county.

The state route system comprises all roads designated prior to 1917 as state highways and such other roads as in the opinion of the commission should be added thereto. It is the intent of the state law that the state highways

shall not be set apart from the state route system unless they have been improved and maintained as state routes by means of a joint fund supplied by the state and county in such proportion as may be mutually agreed to by the state and local officials. Federal funds, with the approval of the Secretary of Agriculture, may be used either for the construction of state highways or state routes. Construction of either the state highways or state routes is done under the supervision of the state highway commissioner either by force account, convict labor, with the approval of the warden of the state penitentiary, or may be let by contract. When executed by contract, let by the state or by the state and county, payments are made on order of the state highway commissioner.

COUNTY HIGHWAYS—These comprise all public roads of the state not specifically designated by the state highway commission as state highways or state routes. They are constructed and maintained by county forces with county funds. Convicts from the state penitentiary, on application of the county board and with the approval of the warden of the state penitentiary, may be employed on county roads. All excess expense in connection with such employment is borne by the county. State routes are included in this system until withdrawn by the action of the state highway commission.

REVENUES

The state highway fund for the year ending November 30, 1917, was composed of receipts obtained from the following sources:

1. From the proceeds of one-half mile state-wide tax levied on all taxable property in the state, \$592,615.
2. By appropriation by the state legislature.
3. Receipts of the internal-improvement permanent fund and the internal-improvement income fund, \$153,110.
4. From 50 per cent. of the fees levied on motor vehicles and chauffeurs for license purposes and from 50 per cent. of the fines and penalties accruing from motor vehicle laws, \$141,966.
5. From all public contributions, including those made by the United States Government or a department thereof. Such funds are to be expended in strict accordance with the terms of the contributions.

LOCAL—From 50 per cent. of the fees levied on motor vehicles and chauffeurs as license fees, and from 50 per cent. of the fines and penalties accruing from the violation of the motor-vehicle laws. This fund is added to the proceeds of a tax levied by the county board at a rate which may not exceed \$1 on each \$100 of valuation. The combined fund is known as the county road and bridge fund.

BONDS—Bonds may be issued for road and bridge purposes by the county boards when authorized by a majority vote of the tax-paying, qualified electors of a county. Bond issues are limited as follows: Counties having a valuation between one and five millions may issue bonds to the amount of \$12 for each \$1,000 of valuation. When the valuation of a county exceeds \$5,000,000, the limit is \$6 for each \$1,000 of valuation.

The Blue Lodge of Colorado Road Builders

By Smith Riley, U. S. District Forester

IT is an indisputable fact that those who crossed the plains behind ox-teams were pioneers. But there have been other pioneers and under this proud classification comes the man who drove a snorting, bucking, old-fashioned automobile down Sixteenth Street in Denver the first time the horseless buggy made its appearance in the "wild and wooly" West.

The ox-train pioneer was a brave man without doubt, for he faced the shafts of the redskins without fear, but it is doubtful if the Indian arrows were any sharper or more dangerous than the shafts of ridicule and amazed disdain which were faced by S. E. Norton, when he essayed his record-breaking trip.

Perhaps it was the courage of a pioneer father that led him to make the venture, for Mr. Norton is a native son of Denver and Colorado, and first saw the light of day thirty-five years ago somewhere on upper Curtis Street. The car that he piloted on his memorable trip was a steamer of antique design that would be highly valued by the State Museum if it had survived the attacks of time.

But Mr. Norton did not confine his pioneer explorations to Denver. He also took the first automobile to Leadville from the metropolis, and the first car from Denver to Cheyenne. That was a trip that required nerves of steel, much patience and a plentiful supply of provisions, for the run that may now be made in a couple of hours took four and one-half days then. It was not so much the inferiority of the car as it was the lack of roads, and, dating from this experience, Mr. Norton became one of the most

insistent and persistent boosters of good roads in Colorado. When Colorado began organizing for the war Governor Gunter selected Mr. Norton for the chairmanship of the Highway Transport Committee of the State Council of Defense. He took charge for the government of motor truck food delivery, and rendered such good service that Governor Shoup asked him to continue in his position.



S. E. Norton.

When it was decided to hold a motor transport parade in Denver, Mr. Norton was placed in charge of the arrangements, and the memorable representation he secured will long remain fresh in the memory of those who witnessed the event.

With the end of the war and the rise of the reconstruction plans it was Mr. Norton again who was selected as chairman of the Good Roads meeting, held by various motor, good roads and commercial organizations to discuss the proposed bond issue. It was at this meeting that the legislative committee was selected, which took charge of the \$20,000,000 bond issue bill and saw that it was introduced in the Legislature. This committee will remain on duty during the present session of the General Assembly, and urge the adoption of an adequate road program for the State.

Mr. Norton is one of the pioneer automobile dealers of the State, having been in the business continuously for twenty years. He is the president of the Norton-Buick Automobile Company, one of the largest firms of its kind in Denver.

Legislative Road Bills

Nineteen bills and one joint resolution, the latter providing for submission to the voters of the \$20,000,000 bond issue, have been presented in the Colorado Legislature. These are as follows:

House Bills.

110—Hosman and Raye—Autos crossing main lines of railroad tracks are required to come to a full stop within 50 feet of the crossing.

112—Rhodes and Jenkins—Providing for the registration and licensing of motor vehicles.

406—Rotruck, Bond and Tedmon—Providing for a gasoline tax of one cent per gallon.

471—Rhodes and Jenkins—Providing for the licensing of motor vehicles.

473—Cole—Providing for the compilation of road statistics, distribution of funds, etc.

476—Bond—To double the inheritance tax and give 50 per cent to the State Highway Commission for building roads.

481—Rockwell and Lacy—To provide for the purchase of free camp sites for motor tourists.

(Continued on page 21.)

Good Roads and County Commissioners

(Continued from Page 9.)

before the people almost a year before they are asked to vote on the bond issue.

The bill providing for the tax of one cent per gallon on the gasoline used in public conveyances is designed to raise a fund which will at once provide revenue which will enable the road work to be continued this year without interruption, and at the same time offer a possible means of paying for the entire \$20,000,000 bond issue together with the interest on the same. It is estimated that from this one source alone there will be available for good roads construction in this State in the neighborhood of about \$300,000 or more, and that this sum will increase annually.

During the coming year Colorado must take advantage of the Federal Road Law, which gives government aid in the building of postroads. It is this sort of aid which made possible the construction of the Littleton road, leading from Denver to Littleton. The Federal government at present requires that the states availing themselves of this aid put up dollar for dollar with the government. There is, however, at this time an amendment to the Federal law proposed, which would allow the government to aid the states on the basis of the states putting up one dollar to every two, three or five that the government would contribute. This is in line with the provisions of the present highway law in this State, and would allow those states which have not as large a road fund as some other older and wealthier states to receive proportionate aid in road construction.

Should the proposition for the bond issue be favorably voted upon by the people, and this sum become available at once for road work throughout the State, it is proposed that at that time (after 1910) the revenues from the gasoline tax be used to pay for the interest and sinking fund for the bond issue, thus avoiding the necessity of a direct tax for these bonds, and at the same time make the cost of the improvement of the highways fall upon those who are constantly using the roads. This is in line with the action in Illinois where \$60,000,000 have been voted for good roads, and the bond issue will be met from the taxes derived from the auto licenses. The plan of campaign adopted by the Illinois Highway Improvement Association, and which has resulted so successfully, is in line with that which has been mapped out for the Colorado campaign. The Illinois Highway Commission prepared a statement showing where the moneys would be expended under this bond bill, and that is what is being done now by the Colorado State Highway Commission.

Recognizing the fact that the people should be fully acquainted with any plans proposed, under which funds to be derived from the bond issue would be expended, the Colorado Good Roads Association has requested that a survey be made during the coming summer of all the State highways, and that then a comprehensive plan be prepared for the improvement of these highways. This plan will be announced within the year, and the people will then have at least eight months or more before election in which to consider the methods proposed.

In the construction of these highways special attention will be given to the needs of the farmers, the ranchers and the merchants who are today the chief users of the highways by reason of the increased use of the motor trucks. Experiences of the last few years, especially the lessons learned during the war, have proven that good roads are necessary to the upbuilding of any community and particularly in reference to the transporting of the products of the farms, ranches and mines to the city and vice versa.

With this idea in view, Colorado is now preparing a program of road construction such as has never been attempted before. If the roads are made fit for motor transport service, they will be fit for the tourist travel and this will come wherever the good roads are built. Colorado, therefore, stands to profit well by the construction of better highways, and the movement now inaugurated seems fair to gain such momentum in the next two years that the people will without doubt vote at the election in 1920 \$20,000,000 for better highways in the State.

Common Drainage Problems

(Continued from Page 13.)

and rains. Roads constructed in these sections should wherever possible be raised above the land on either side. If this can not readily be done, adequate ditches between the road and the higher ground, if constructed on proper grades and provided with free outlets, will generally suffice. For drainage across the road adequate culverts must be provided. Earth or gravel surfaced roads in this class can be kept crowned by regular and systematic dragging, and at a reasonable expense per mile, so that all water will quickly leave the road surface.

For the roads through irrigated sections similar construction methods should be followed. Here, however, the water problem is quite generally continuous throughout the summer, and the lack of proper side ditches is forcibly impressed upon the mind of the traveler when he is obliged to proceed through the water, sometimes quite deep, or when driving an automobile into an apparently small amount of water the wheels sink into the soft surface and the machine is stalled. The energy used in moving one machine from such places, if properly applied, might remedy the defect. If this experience could only occur often enough to the authorities in charge of each particular road where such conditions exist, no doubt in time many such spots would be repaired.

Possibly the worst troubles in irrigated sections are encountered where the ditch or irrigated land lies above, and the impervious earth strata slopes toward the road. In a few such cases the water-soaked earth above may be at such a degree of slope as to start a sliding action in the surface. In such cases if the cause cannot be eliminated it generally proves cheaper in the end to immediately secure a new location for the road. If this cannot be arranged then side drains, drained foundations, and other special remedies must be resorted to. The conditions are so varying that each case will require special treatment.

In the mountainous section the problem is generally

one of deep and heavy snowfall in winter, and frequent light, with occasional very heavy, rainfall in summer. Also cloudbursts occur, but these are rather exceptional in a particular locality and very in such a degree of magnitude that drainage structures ample for the extreme cases can hardly be expected. Due consideration of such occurrences should, however, enter into the design and water area of all large culverts and bridges, and these should, if possible, be adequate for any occurrences of this nature.

For earth ditches or gutters on grades from four to seven per cent. and draining fourteen feet of roadway, erosion commonly begins at 400 to 600 feet and sometimes occurs at 100 feet from the beginning of the flow of water. This distance varies with different types of soils. Swamps at high altitudes present interesting problems, involving the decision between draining the swamp, going around it, crossing it on a special foundation, or a combination of these methods. At high altitudes and in the northern latitudes alternate thawing and freezing often results in blocking solid the mouth of the culvert and overflowing the road grade. Where this occurs the road embankment in the spring is generally full of moisture and without stability or bearing power for long periods. Also it has been washed away to an extent varying with the quantity and degree of water run-off.

The important features then for earth road drainage are clean, free-flowing gutters or side ditches, adequate culverts in sufficient numbers, and unobstructed free-flowing outlets. To these must be added constant maintenance beginning early in the spring, and in the mountainous region, continuing and following up the melting snow until after its disappearance in the early summer.

Attention is directed to Bulletin No. 724, recently issued by the U. S. Department of Agriculture, entitled "Drainage Methods and Foundations for County Roads," which explains in detail drainage problems, the different types of structures, and methods of construction.

Grade Limits and Traffic Conditions

(Continued from Page 12.)

That this saving in annual cost of operation can be made is, to my mind, clearly shown by the increase of cost of operation for the unimproved road over the improved road, as indicated on the diagram.

This saving per ton mile of one cent is, in my judgment, a conservative estimate.

Considering the question as to what character of improvement over existing conditions would be warranted by the possible saving on the operation of the traffic:

For every 20 lbs. reduction in resistance of road surface there is an indicated saving of approximately 4/10 of cent per ton mile in the cost of operation of the traffic.

Assuming an average cost	
per mile for an 18-ft. paved road.....	21,000.00
per mile for a 9-ft. paved road.....	15,000.00
per mile for an 18-ft. gravel road.....	8,000.00
per mile for a 9-ft. gravel road.....	4,000.00

From a gravel to a paved road there would be an average saving of 1 1/10 cents per ton mile, so that an annual traffic of 95,000 or more ton miles per mile of road would justify an expenditure of \$21,000.00 per mile for the improvement.

Similarly an annual traffic of 68,800 or more ton miles per mile would justify an expenditure of \$15,000.00 per mile, and an annual traffic of 36,000 or more ton miles per mile would justify an expenditure of \$8,000.00 per mile for the improvements.

This can be worked out in a similar manner for any traffic, and any existing condition and proposed improvement.

It will be noted that this applies to improvement of existing road conditions, and is to be considered in the reduction of grades as well as in the improvement of the surface conditions.

Some Exceptional Conditions.

In the roads to be improved there will be stretches of road which may not in themselves seem worthy of very extensive improvement, but which as necessary connecting links, will be found desirable to be fully improved in order that the road between the main points shall be complete.

Also in the opening of roads to afford an outlet for any particular portion of the State the improvement will be in the nature of development work, essential to the State and communities served, even though apparently not warranted by the probable traffic.

Legislative Road Bills

(Continued from page 19.)

484—Rockwell—Making an appropriation to build a road between Delta and Nucla.

502—Bond—Providing for the expenditure of the \$20,000,000 bond issue.

519—Colgate—Providing for the diversion of the inheritance tax to be used for highway construction.

568—Rotruck—To levy a tax for building good roads.

Senate Bills.

65—Warren—Providing that cities and towns may use county funds for roads.

281—Tobin and Lines—Providing for the expenditure of the \$20,000,000 bond issue.

349—Hattenbach—To create a State Highway Department and make the districts conform to the 13 judicial districts.

372—McWilliams and Booth—Providing for a tax on motor vehicles.

388—Hattenbach—Providing for the expenditure of the bond issue.

425—Fincher—To create a State Highway Department.

431—DeBusk, McWilliams and Staley—To create a State Highway Department.

432—DeBusk, McWilliams and Staley—To create a State Highway Department.

Sign Posts Along the National Highways

Six bills dealing with highway construction were introduced in Congress during December. One of these was the bill introduced by Senator Smoot of Utah, providing for a complete reorganization of highway administration by the federal government, for the issuance of bonds to the amount of \$1,000,000,000, which is discussed elsewhere in this issue. Other bills either are amendments to the present federal aid highway law, or utilize the organizations of the war and post office departments. A joint resolution has been introduced, which provides for handing over to the Secretary of Agriculture by the Secretary of War of such war material as may be used in highway construction work. Of the four bills providing for the utilization of the present federal highway administration, those by Senator Bankhead and Senator Swanson in the senate, and by Representative Browne in the house, are in the form of amendments to the present federal aid highway act, and consist of a change in wording to permit a wider interpretation of the words "post road," to cover any road that might so be used. They also provide for the appropriation of \$50,000,000, to be immediately available; \$75,000,000 available July 1, 1919; \$75,000,000 available July 4, 1920; and \$100,000,000 annually to July 1, 1924. Another bill, introduced by Representative Shackelford, provides for a similar change in wording and for an appropriation not to exceed \$150,000,000 a year. The other bill was introduced by Senator Swanson, and provides for the setting aside of 50 per cent of the net proceeds derived from the operation of motor trucks engaged in carrying parcel post, to be expended in the survey, construction, reconstruction, improvement, repair, maintenance and administration of such highways as might be selected by the Postmaster General for the transportation of mail.

Governor Robertson of Oklahoma hopes to induce the legislature to adopt a \$40,000,000 bond issue for the purpose of supplying the Indian state with a connected road system. It is his idea that interest and sinking fund can be met chiefly through the production tax from oil and the registration tax from automobiles.

Governor Davis of Virginia has put forward the proposition in the Old Dominion of raising \$25,000,000 for building 1,200 miles of state highway.

The Division of Public Works and Construction Development, which has just been organized in Washington by the Department of Labor, has obtained from the Bureau of Public Roads and Rural Engineering of the Department of Agriculture a compilation of estimates of the amount of road work to be undertaken in several states during 1919. These indicate an expenditure of about \$300,000,000. Cash expenditures on highways in 1916 from all sources were, according to the Department of Commerce, \$272,634,424.

There exist in the United States approximately 2,750,000 miles of roads, of which not over 300,000 miles have been improved. To improve the remaining two and one-half million miles would require, at the rate we have been going, something like 166½ years.

In a speech delivered before the Highways Transport Committee, Herbert C. Hoover was quoted by the press on the following statement: "If we are to do our duty to the world and

ourselves, we must utilize every means to increase production and distribute food efficiently. The development of the rural expresses, using the highways of the country, commands every moral support of which we are capable. The direct results, which appeal to me strongly at this time, are the labor saved and the productive area extended by the employment of more efficient mechanical means.

"Another of the results of a perfected highway's use would be to cut down the waste of perishable foods. Fifty per cent of our perishables never reach the consumer. We lose from forty to sixty per cent of our potatoes yearly. Besides stopping this terrific waste, a highly-developed rural express would work to establish lower prices."

In his annual report Postmaster General Burleson printed the following: "At the close of the fiscal year 6,041,404 families, comprising 27,790,459 persons, were being served by rural carriers throughout the country; and 43,451 routes, serving 1,127,110 miles daily, were in operation; of these 823, covering 44,570 miles daily, were operated by motor vehicles."

The state senate of Michigan has passed a joint resolution providing for a constitutional amendment to permit a bond issue of \$50,000,000 for good roads. The house is said to be overwhelmingly in favor of the resolution, which provides for the submission of the proposition at the April election.

Officials of the Lincoln Highway association estimate that \$20,000,000 will be required to bring that national artery to its proper standard. Approximately \$4,000,000 have been expended on it, and its condition in the various states is as follows: New Jersey and Pennsylvania, practically 100 per cent macadam; only a few miles of natural dirt roads, most of the remainder being brick; Indiana is rapidly concreting the road; macadam interspersed with gravel and natural-dirt road, make up the Illinois stretch; Iowa, without laws to enable issuance of bonds, has so graded and dragged the route that in dry weather it is a perfect dirt boulevard; Nebraska, work accomplished is negligible; from Salt Lake City west the roadbeds are of hard-packed salt; California, well maintained boulevard most of the way.

The bill introduced by Senator Swanson in the United States senate to amend the present provisions of the federal aid road act, called the Page bill because of the work done by the late Logan Waller Page in drafting it, is the bill endorsed by the American Association of State Highway Officials at the Chicago meeting on December 10, 1918.

One of the first new developments to follow the concreting of the Detroit-Monroe, Mich., and Toledo, Ohio, road, until then a notoriously bad piece of road, was the establishment of an interurban motor truck refrigerator service between Detroit and Toledo. Two trips a week are made and the saving on transportation charges is 60 cents a hundred.

Governor Pleasant of Louisiana has approved the plan suggested by the American Forestry association for planting trees along Jefferson Highway to commemorate the part her sons played in the war. Oaks will be used for the most part, and the trees will stand about 40 feet apart. Altogether 440 miles of "victory oaks" will be planted.

Road Work and Road Builders the State Over

Should the \$20,000,000 bond issue for Colorado good roads carry the taxpayer would be called upon to pay one dollar a year on every \$1,000 valuation. If the farmer owns a \$5,000 ranch he would pay five dollars a year to secure a real road by his place that would save him many times this amount annually in vehicle upkeep and time.

Toney Monell, county clerk of Montrose, secretary of the state association of county commissioners, member of the legislative committees of that body and the Colorado Good Roads association, will be in Denver while the legislature is in session, and will doubtless find something else to do during his spare time.

The five convict crews in Weld, Pueblo, Larimer, Boulder and Garfield counties are emulating the allied forces at Archangel in staying on the job all winter long. Snow and cold weather may delay, but cannot stop them in building roads.

County Commissioners Thomas A. Forkner, R. S. Hamilton and R. B. Overholt of Moffat county, took occasion while in Denver to attend the county commissioners' meeting, to call at the state highway commission offices and talk over ways and means for starting the new bridge over the Bear river below Craig, early this season. The old bridge went out in a washout.

It is expected that the survey for widening and improving the road from the mouth of the Big Thompson to Estes Park will be completed early this month. Twenty miles will be created at a cost of \$90,000. The work was inaugurated last month by Highway Commissioner T. J. Ehrhart, Chief Engineer E. E. Maloney of the highway commission, Engineer June Johnson of the U. S. Bureau of Public Roads, County Commissioner James Graham of Larimer county, and County Engineer James Edwards of the same county.

Costilla county is ready to co-operate with the government and state this spring in improving the 17-mile stretch from Ft. Garland to San Luis. County Road Superintendent Parrish and County Commissioner W. R. Morris brought this news to the highway commission last month.

The 17 miles on the Durango-Silverton road uncompleted last season because of labor difficulties, will be let by contract this year, four contracts covering the work. This decision was reached after a conference between the highway commission of the state, Assistant District Forester Stahl, District Forestry Engineer Bonar, Acting District Engineer Loder of the U. S. Bureau of Public Roads and Engineer Palen of the same service. The road is a federal aid project.

St. John Wilson, acting director of the U. S. Bureau of Public Roads, has notified Highway Commissioner Ehrhart that he has recommended amendments to the federal road bond issue, approved by the late Logan Waller Page just before his death. This means that western states will not have to meet the government expenditures dollar-for-dollar, but in some instances will have to pay only one dollar to four of government expenditures—provided, of course, that the amendments are adopted by Congress.

The survey for improvement of the road from Trinidad to point on the Santa Fe Trail route, a distance of six miles, is now practically finished.

County Commissioners Simon Olson and J. B. Stevens of Grand county, discussed estimates for improvement of the Midland Trail near Granby, and requested a survey for the road up the Blue River between Kremmling and Dillon, at the last meeting of the state highway commission.

Necessary data for advertising various highway projects and federal aid projects is being prepared by the office force of the state highway commission. This work will be completed speedily so that advertisements may be printed and work started in the early spring.

County Commissioners G. L. Garren, Charles Engel and R. Bradfield of Dolores county, urged the highway commissioner to push work on the bridge over the Dolores river between Rico and Dolores, and speed up work north of Rico to Lizzard's head this summer so that the Dolores section may secure its long-needed outlet toward Montrose, during a recent visit at the commission's offices.

Surveying parties from the state highway commission are making the survey for the two miles more of hard-surfaced road north of Denver. Some of the Brighton folks would like to see the hard-surface laid from Brighton south to Denver and have so notified the commission.

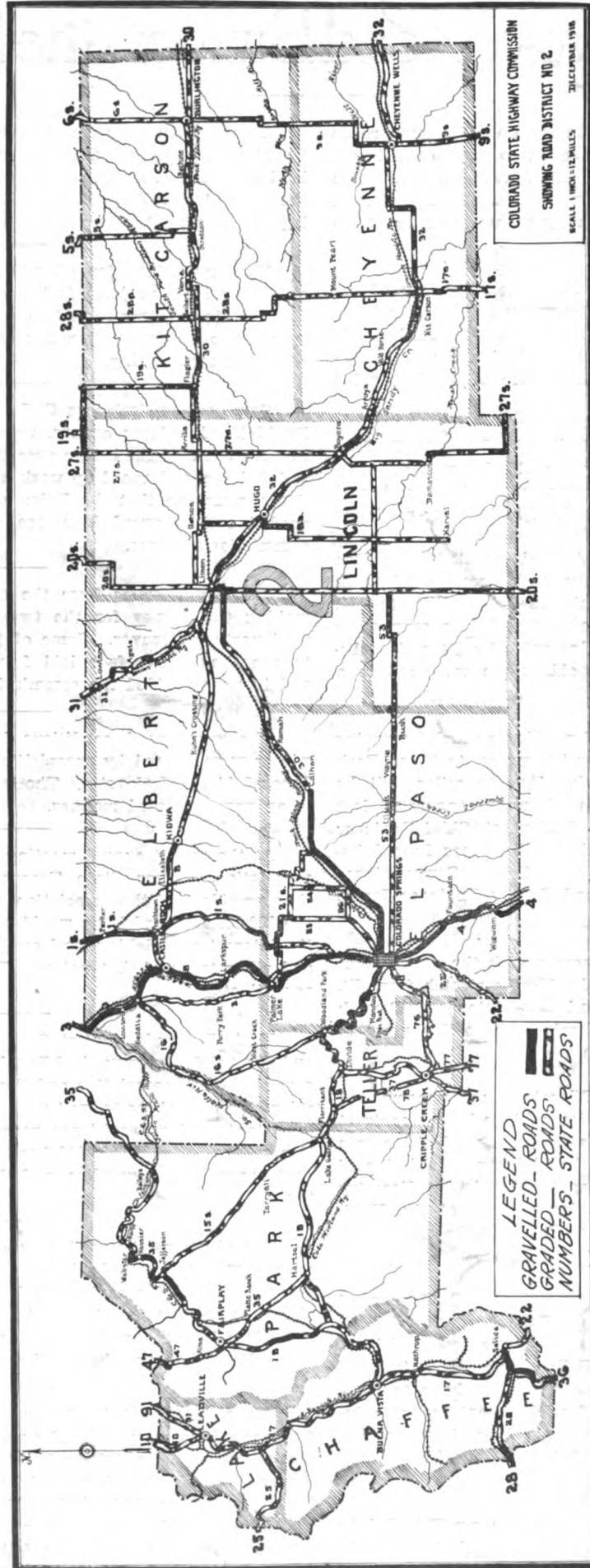
The worst road conditions in northeastern Colorado this winter were caused by snowdrifts on tops of the hills between Broomfield and Lafayette. The last snow stayed on the ground in an unprecedented manner.

At the recent annual meeting of the county commissioners' association, former State Treasurer Robert H. Higgins, one time president of the association, suggested that the passage of the \$20,000,000 bond issue would not mean a direct tax, but that the interest and sinking fund could be met from the inheritance and other taxes of that nature. This plan has been adopted in several states.

H. A. Edmonds of Fort Collins, H. G. Tiffany of Brighton, and Samuel A. Greenwood of Boulder, were named by the county commissioners' association and the Colorado Good Roads Association as a committee to wait upon the legislature and urge three important road propositions: passage of the concurrent resolution calling for a \$20,000,000 bond issue, a road tax levy of one cent per gallon for gasoline, and the doubling of the inheritance tax.

The nineteen-mile road from Rifle to Meeker in Rio Blanco county will be rushed through in short order next spring. Edward O'Neill, the contractor, is hauling shale to depot points along the road so that it may be spread with as little delay as possible when the weather opens in the spring. Grading is proceeding whenever the weather permits operations.

If the \$20,000,000 bond issue is adopted by the people no funds will become available for road work until 1921. The bond proposition would not be submitted until the fall of 1920 and the bonds would then have to be printed and floated. The first funds available would be \$2,000,000 in 1921. After that \$3,000,000 would be available each year for a period of six years. It would take a full year to complete a full fledged organization and get outfits on the roads and in working order.



Map of Road District No. 2, Showing Gravelled and Graded Roads.

GIFT
MAR 19 1919

March 1919



COLORADO HIGHWAYS BULLETIN

Practical Reasons for the Bond Issue.

An All-Mountain Trip From Long's
Peak to Pike's Peak by Auto.

Provisions of the Bankhead Federal
Aid Act.

Tree Planting Along Concrete High-
ways.

Issued by the
State Highway Department

COLORADO HIGHWAY OFFICIALS

STATE HIGHWAY COMMISSION

L. BOYD WALDBRIDGE, Chairman, District No. 5, Meeker.
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The meeting point of two centuries, found by the auto in Turkey Creek, Jefferson County.

CONTENTS

	Page
Berthoud Pass and the Royal Gorge—Cover Design.....	1
Practical Reasons for the Bond Issue.. J. E. Maloney.....	5
Progress on Federal Aid Projects by States.....	7
Half-billion Dollars in Sight for Better Roads.....	9
Long's Peak to Pike's Peak by Auto. H. G. Hedden.....	10
Some Highway Bill Recommendations. T. J. Ehrhart.....	11
Hints for the Road Overseer.....	12
Victory Loan Campaign	12
A National Highway System.....	12
State Pledged to Meet Federal Aid Fund. Robert H. Higgins. 13	13
Editorial	14
Tree Planting Along Concrete Highways. S. R. De Boer.....	15
Provisions of the Bankhead Federal Aid Act.....	17
Regulation of the Speed, Weight, Width and Height of Motor Trucks. George M. Graham.....	18
D. C. D. Route Honored.....	20
The Blue Lodge of Colorado Road Builders.....	21
Sign Posts Along the National Highway.....	22
Road Work and Road Builders the State Over.....	23

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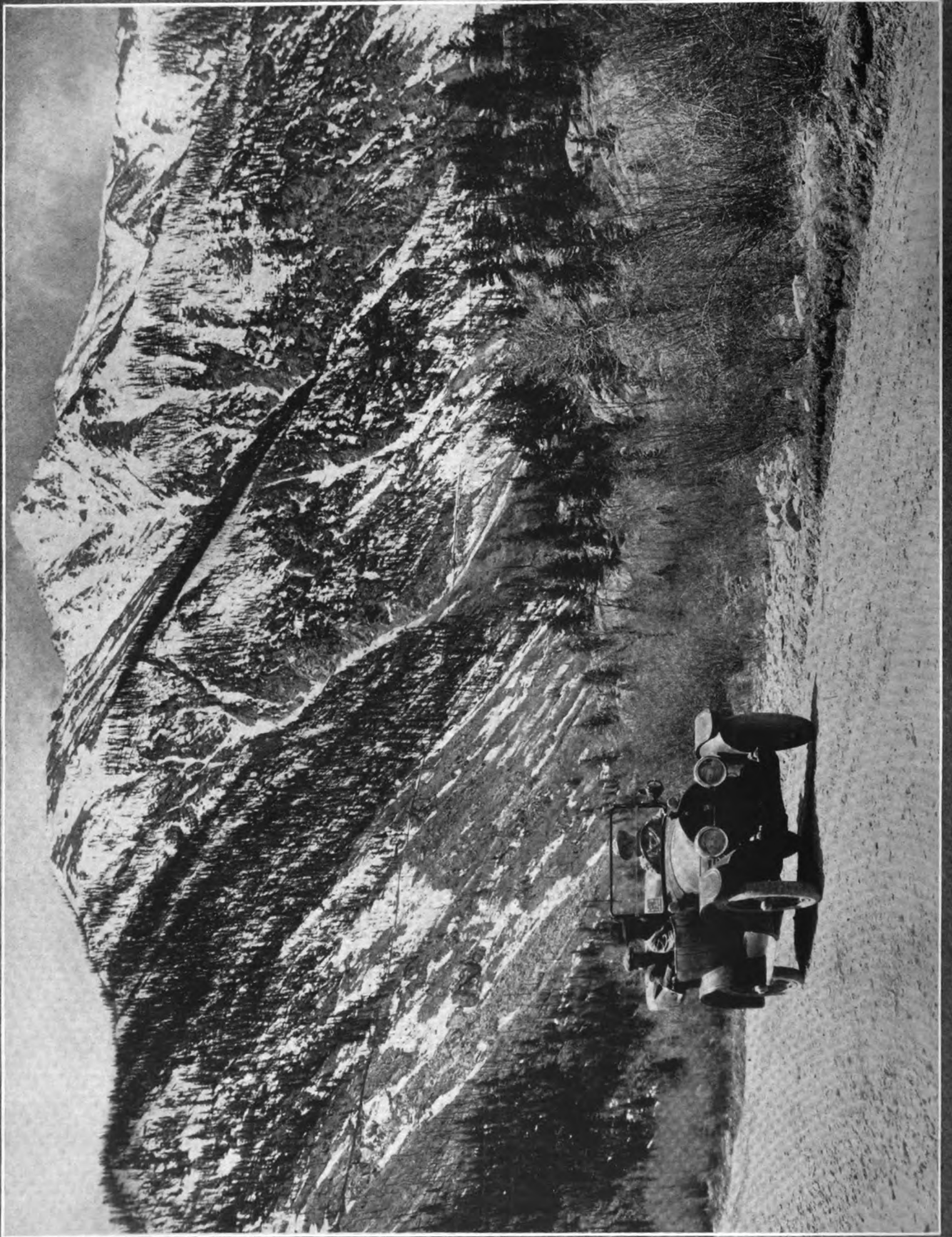
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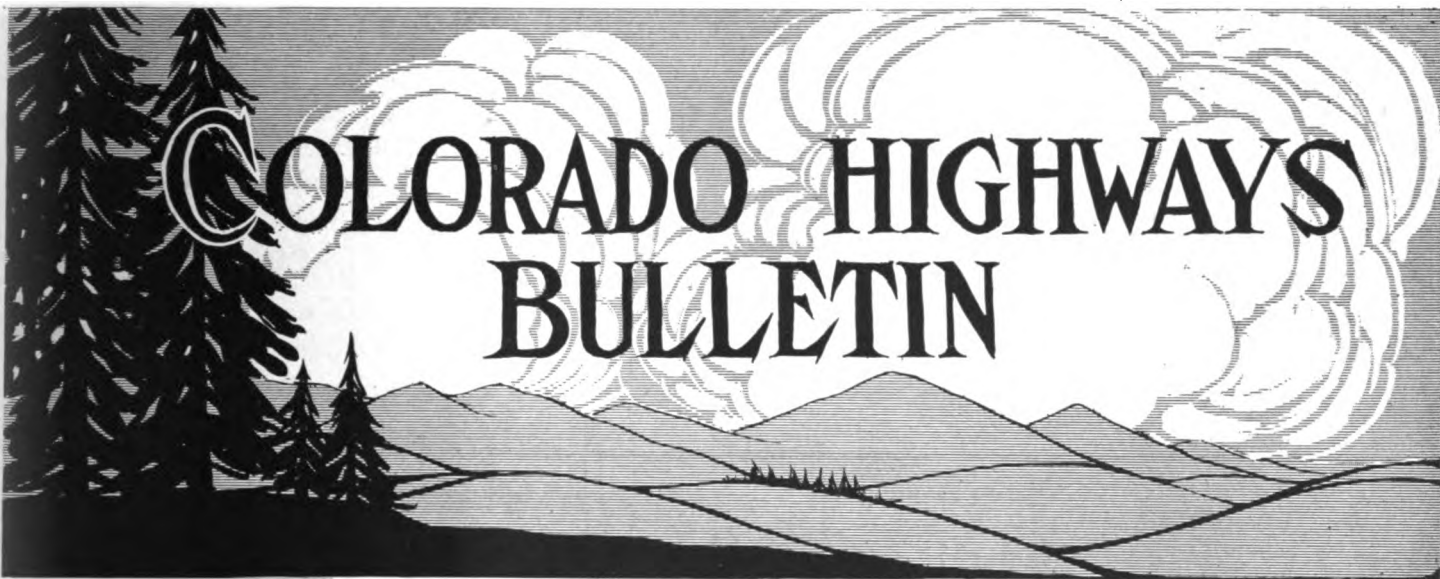
Address all communications to Colorado Highway Department, attention Pyke Johnson, editor, Colorado Highways Bulletin.

Owing to the necessarily limited edition of this publication it will be impossible to distribute it free to any persons or institutions other than state and county officials actually engaged in the planning or construction of highways, instructors in highway engineering, newspapers and periodicals and civic associations. Others desiring to obtain Colorado Highways can do so by sending 10 cents for each number desired. Associations desiring to distribute the magazine can obtain it at cost in lots of from 500 copies up.

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The rugged majesty of the Rockies in the high altitudes of Colorado. Mt. Hope, one of the points of interest along the new Independence Pass Road, Chaffee County.



Practical Reasons for the Bond Issue

*Colorado Highway Engineer tells where the \$20,000,000 could be applied.
By J. E. Maloney, Chief Engineer, State Highway Department*

WHY is it needed? Because the present state road fund is absolutely insufficient to more than maintain the present road system. The state and county road funds are derived from the following sources; county road funds to be used on county roads and also in meeting state aid:

1. By direct tax levy on all assessed property in the county.
2. Fifty per cent of all automobile license fees collected in the county.
3. Forest Reserve funds distributed to counties having Forest Reserves within their boundaries.

The levies vary considerably in the counties of the state, and run from eight-tenths of a mill to seven mills. The total amount raised in 1918 was about \$2,500,000 for the sixty-two counties. This fund must take care of some 42,000 miles of roads, with their many thousand bridges and culverts. The fund averages sixty dollars per mile, so if the county expends twelve hundred dollars for the repairs or construction of a bridge, or culverts, some twenty miles of road are without funds for the season.

The state road fund at present is made up of the following receipts from the different sources, taking the probable receipts for the year 1919:

1. Direct levy of one-half mill on all property in the state	\$ 700,685.00
2. Fifty per cent of all automobile license fees collected in the state	205,000.00
3. From the Internal Improvement Permanent and Income fund	125,000.00
4. Miscellaneous items of interest, etc...	12,500.00
Total receipts	\$1,043,185.00

The counties set aside varying amounts to meet the state aid on the state routes in the counties. This will amount to about \$250,000 for 1919 for all the counties.

These amounts must provide for all the state work on 7,800 miles of state routes. This fund averages \$165 a mile of state road. When the commission gravels a mile of state road at a cost of \$3,000, twenty miles go without any maintenance for the year. If a bridge costing \$15,000 (and we have many of them) is built, then ninety-five miles of road somewhere in the state go without maintenance for the year. It has been found impossible to use the fund for construction, and also have it for maintenance and repair.

In opening roads over the mountains the very expensive construction involved means that, for every mile built, some forty miles in another section of the state is neglected.

The state road fund is sufficient for the maintenance of the present state road system, but improvements, surfacing, grading, bridges and all new construction must be provided for by some other means.

Why not buy a twenty-year loan at four and one-half or five per cent interest? A six-year construction program can be laid out to use:

- \$1,000,000 the first year.
- \$2,000,000 the second year.
- \$3,000,000 the third year.
- \$4,000,000 the fourth year.
- \$5,000,000 the fifth year.
- \$5,000,000 the sixth year.

So that at the end of the sixth year improvements will have been completed to the full extent of the fund. To do this from the present state road fund would take forty years.

What roads would be improved? What should be the character of the improvement? Would it be all expended on hard-surfaced pavements in the vicinity of the larger centers?

These questions bring up the further question of service to the larger part of the population, also the use made of the various roads, and the character of the traffic. There are certain fundamental points that should not be lost sight of in this connection.

First: The location must be made where the road is to stay for the future. This will involve re-location of many sections of our main system, and this must be done regardless of the character of the surfacing.

Second: The road must be graded, drainage and bridges of a permanent character must be provided; and this work must be just as thoroughly done for a gravel surface as for any kind of hard surfacing.

These two points include the really permanent parts of the highway; the location, the roadbed and drainage structure. And then the surfacing is to be placed on the prepared roadbed.

Many lessons have been taught by our war experience, and among them is the fact that water-bound gravel or crushed stone on some of the so-called hard-surfaced roads will not stand up under the truck traffic which has been so largely developed in the past two years, and which will keep increasing in the future.

Choice of the character of the base and surfacing to be used on any particular stretch of road must be governed by the kind and amount of the traffic using the road. An inspection of the articles published on traffic conditions in preceding issues of Colorado Highways will show that only a heavy traffic would warrant the investment necessary to use the higher types of surfacing; and it will also show the economy of the better class of surfacing. From the ordinary dirt road to a well-built gravel; from the gravel to the better class of macadam; from the macadam to the hard surface, there is in each case a definite, tangible, absolute saving which represents just as good dollars as anybody ever puts in his pockets.

The improved system would extend to each county in the state, connecting the county seats, one with the other, and would give a complete connected system throughout the state. A tentative idea may be given by the statement that about 4,000 miles would be included in such a plan.

All the connections over the mountain passes would be included, as also the Eastern, Northern, Western and Southern inlets.

The East, North and South highway branching to Greeley, Fort Collins and Boulder, and running through Colorado Springs and Pueblo to Trinidad; the Santa Fe Trail from Pueblo to Lamar; the Platte River Road to Fort Morgan, Sterling and Julesburg, with some branches of the Western, Northern and Southern highways, form the group of heavy traffic roads of the state which will justify the cost of hard-surfacing.

In my judgment the possible saving in the cost of operation of the present traffic amply justifies the expenditure of the \$20,000,000. In addition the increased value of the land, the increased school and social benefits, and these are no small items, make the expenditure desirable.

Attention is called to the fact that the federal government has just passed a Federal Aid bill which makes available for Colorado the additional sums of:

\$ 880,000 in 1919,
\$1,320,000 in 1920,
\$1,320,000 in 1921.

All these must be met by the state with a like amount, but the state will be unable to meet and accept the appropriations unless some new provision for increasing the road fund is adopted.

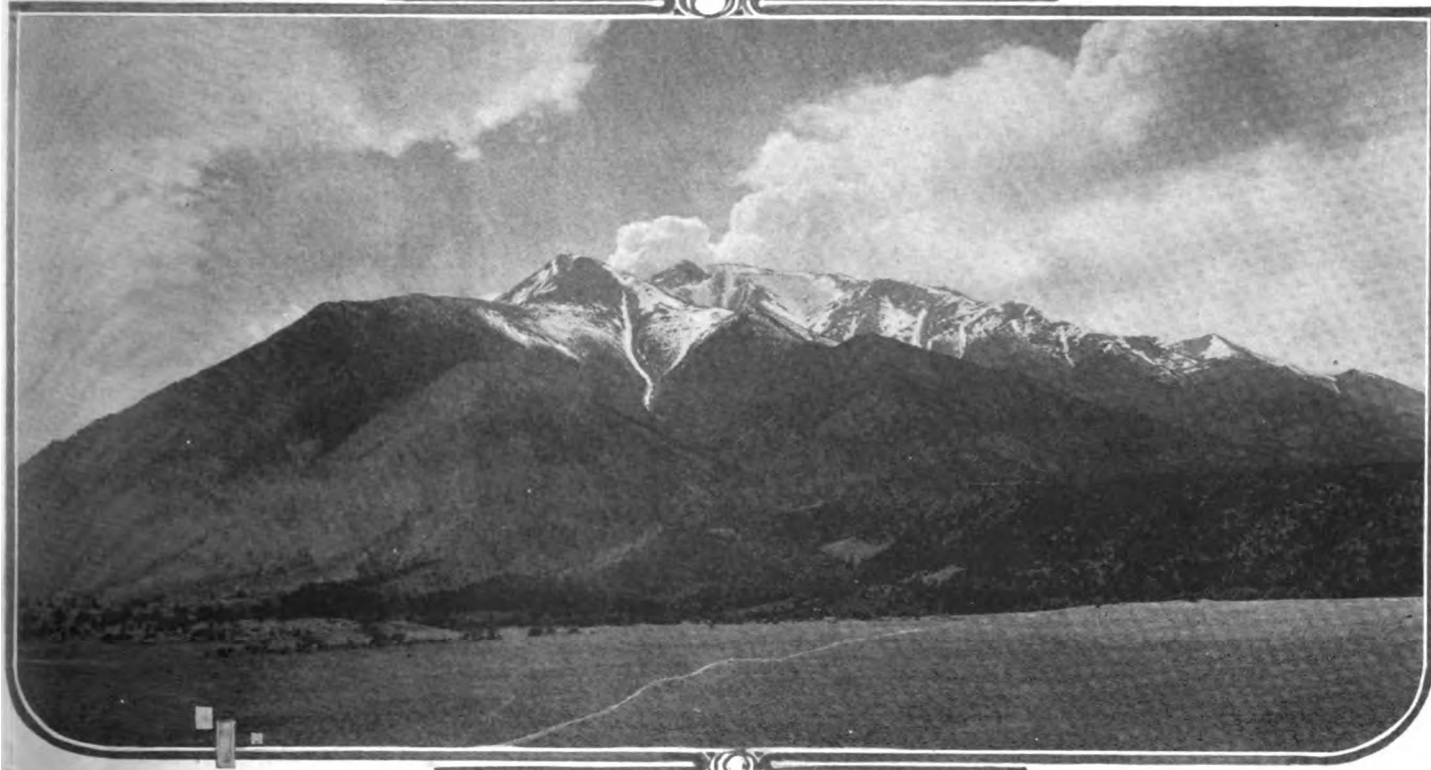


Tell-tale marks of an avalanche, the white terror of the Mountains, Independence Pass, after repairs were made.

These amounts are not to be used for maintenance, so it means that if the present state fund should be used as far as it will go, to match the Federal Aid funds, then the 7,800 miles of state roads must go with little or no maintenance for three years. As this would result in an intolerable condition, the other alternative of refusing the Federal Aid would have to be accepted in the event no extra funds are provided.

COUNTIES MAY MEET FEDERAL AID.

Already some of the wealthier counties, fearful lest Colorado will not meet the Bankhead provisions, have taken up the question of voting county bond issues in order to secure the federal appropriations for roads within their boundaries. It is a practical idea that merits favorable consideration, for the county voting bonds could not lose.



Mt. Princeton, Chaffee County, as seen from the crest of Chalk Canon. This is a bulwark of the Collegiate Range, ranked as one of the most beautiful mountain groups in Colorado.

Progress on Federal Aid Projects by States

Less than 45 miles of roads are reported completed by states availing of Federal Aid. Appropriations made by Congress to pay the Federal Government's proportion of the cost of state road building projects now total \$48,500,000. This soon will be increased materially. An addition of \$200,000,000 probably will be available during the next three years.

With these millions available and with the approval of the Federal Government on 760 road-building projects, involving 7,869.61 miles of roads, less than 45 miles—44.969 to be exact—of roads have been constructed under the Federal Aid plan.

The Information and Education Service of the U. S. Department of Labor, co-operating with such national organizations as the American Automobile Association, the Automobile Chamber of Commerce, and the National Highway Industries Association, is calling to the attention of state officials the desirability of at once getting under way such state road construction as has been approved by the Federal Government and for which the latter has set aside funds.

In addition to obvious benefits derived from improved highways, the Department of Labor urges a new argument, especially important at this time when labor conditions are arousing anxiety and business is endeavoring to find an unembarrassed way back to peace conditions. For the states at once to go in for road building is, according to the Department of Labor, a direct way to stimulate business

and absorb labor. To all that has been said heretofore on the value of good roads, now may be added road building's potentialities as an efficacious tonic for the industrial organization of the country.

The Department of Labor does not deny that road materials and labor costs are high. Rather, the Information and Education Service asserts, indications are that prices will remain high for some time to come and, in view of the forecasts for market conditions, it is imprudent to longer hold up state construction anticipating lower construction costs. Secretary of Labor Wilson, both in a recent address in New York City and in an article in *Collier's Weekly*, expressed the conviction that an era of unprecedented activities is ahead of American industry. He asserted his confidence in the ability of American industry to absorb, eventually, the labor released from the army and from war industries. He did not hesitate, however, to emphasize the fact that during the months of transition from war to peace conditions, the labor situation is fraught with disquieting possibilities if it is altogether neglected.

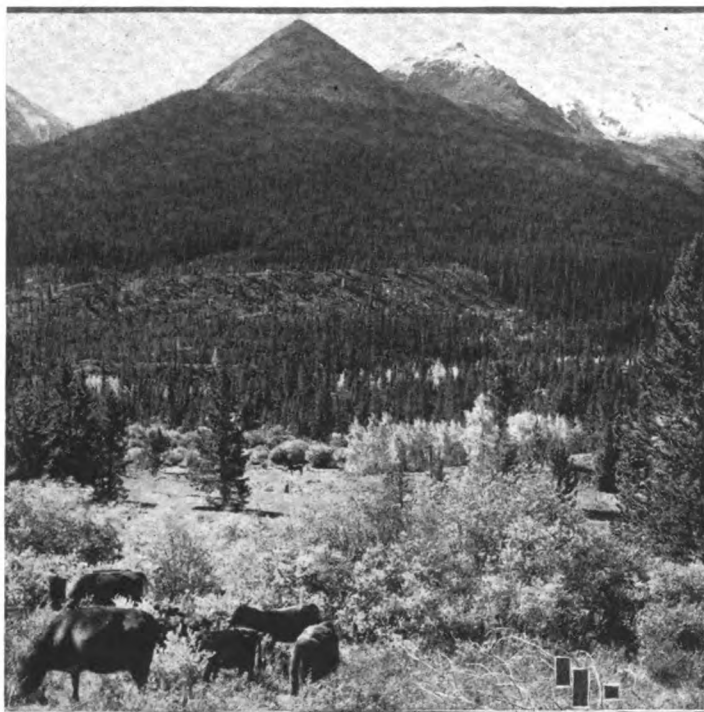
Road building will provide buffer employment for thousands of men until they can be absorbed by industries as the latter gradually reach their peace-stride production. Road building immediately pays dividends in increased land values. Roads are an asset to every state and to their permanent value as public improvements is now added their temporary value, of incalculable importance,

of stimulating business and protecting states against the possibilities of a period of general unemployment.

If the various states would get under way such road-building projects as have been approved by the Federal Government, \$56,171,846.72 would be spent for better roads and, if the construction costs are higher than in pre-war times, the actual financial outlay for the states need not be higher, since approximately half of the bill would be paid by the Federal Government.

There have been set aside to cover the Federal Government's portion of the costs on the 760 road projects approved in various states, more than \$21,000,000. This now is available for states which will go to work on their road construction on plans approved by the Federal Government.

Although federal aid for state roads has been avail-



The Three Sisters, Lake County, one of the many interesting sights along the Independence Pass Route.

able since 1917, but eight states report road projects, involving federal aid, completed. Arkansas has completed one project involving 5.540 miles, California has completed two projects of 6.785 miles, Louisiana has completed one project of four miles, Massachusetts has completed two projects of 13.802 miles; North Carolina, one project of 8.01 miles; Vermont, one project of .793 mile; Washington, one project of 3.5 miles; and West Virginia, one project of 2.53 miles. In all, ten projects have been completed of a total mileage of less than 45 miles.

In so far as getting under way road-building projects involving federal aid goes, Arizona, Connecticut, Delaware, Maine, New Jersey, Oklahoma, Rhode Island and Tennessee have five or less projects which now are approved by the Federal Government. Five projects in Illinois involve 178.75 miles of road and the estimated cost is \$2,946,311.92.

Texas, with 70 projects, leads in the number submitted

and approved by the Government. These involve 992.53 miles of roads, the estimated cost being \$3,968,494.43.

In estimated cost of road projects approved by the Government, Pennsylvania leads with a total of \$4,792,875.65, and Ohio is second with a total estimated cost of \$4,777,207.05. Pennsylvania's program calls for the building of 146.88 miles, while in Ohio 148.4 miles are involved.

The Information and Education Service, through the Division of Public Works and Construction Developments of the U. S. Department of Labor, emphasizes the fact that with more than \$45,000,000 now appropriated by Congress for federal aid in road building, less than 45 miles of roads have been completed under the Federal Aid plan. Such states as have been allotted Federal Aid on approved projects, the Department submits, are in position to give general business a great stimulus and to effectively combat the ills incident to general unemployment, by immediately getting the road building work under way.

To Push War Savings Stamps

At the recent conference of Liberty Loan and War Savings leaders of the Tenth Federal Reserve District at Kansas City, L. B. Franklin, Director War Loan Organization, outlined the Government plans for War Savings.

If it were only a question of raising a certain amount of money, say two billion dollars, the Treasury Department recognizes that this could be done, at a much less cost to the Government, through an active, intensive campaign for the sale of Liberty Bonds. However, they feel justified in taking the more expensive and difficult way, by continuing to instill the spirit of thrift and saving in the minds of the people.

It was impressed upon us all that every member of the school organization must support the scheme; that War Savings Societies should be organized by every teacher, in his or her class room, or in every school in the more rural districts. We were impressed also with the fact that the "wholesale selling idea" must be used, viz., that of selling the idea to the management of large stores and other similar employers of labor, such manager or head to group his employees into a War Savings Society and sell the idea to them, thus bringing about willing, automatic purchasers.

No quotas have been assigned to the various counties in Colorado but, as a state, we will be expected to sell approximately the amount sold last year.

From now until after the Fifth Liberty Loan we are to do three things: Get every school or class room organized with a War Savings Society; form societies in every natural group of citizens, such as business houses, lodges, churches, school districts, etc.; sell all the stamps we can but, primarily, build a sound and permanent organization.

It is expected that, in the promotion of sales, every postman will be instructed, through the postal organization, to do his best to sell War Savings Stamps. The banks of the state have been enlisted, and are practically 100% behind this movement. The 3,000 selling agents, throughout the State of Colorado, have been requested to continue their efforts, and all of the postoffices have a supply of stamps.



The Twin Lakes, Chaffee County, from Holy Cross Way, with Mt. Ebert in the background. Ebert and Mt. Massive are tied for the honor of being the highest mountain in the state, elevation 14,402 feet.

MORE than half-a-billion dollars for road construction in the United States either has been made available by Congressional enactment or authorization of special bond issues by states, or made probable within the next few months by legislative enactment submitting enormous bond issue propositions. At no previous time in the history of the nation has there been such a pronounced trend toward highway development as is evidenced by these measures.

Half Billion Dollars in Sight for Better Roads



Early estimates placed the total probable expenditure on roads by the states and the national government in 1919 at \$300,000. Since that time Congress has acted favorably upon the Bankhead rider attached to the post office appropriation bill, and the President has made the act operative by his signature. This Federal Aid bill provides that \$50,000,000 is made available immediately, another \$75,000,000 is added for the fiscal year beginning July 1, 1926, and the last \$75,000,000 is set aside for 1921.

North Carolina already has provided for an increased revenue of \$1,250,000, derived from automobile revenues, to meet the increased Federal Aid, and this is to be supplemented by an annual bond issue of \$1,000,000.

Illinois has voted \$60,000,000 and Pennsylvania \$50,000,000 for road improvements.

The Minnesota legislature has submitted the proposition for a \$100,000,000 bond issue for the construction of a definite state highway system, while the Michigan legislature has submitted a \$50,000,000 road bond issue for the specific purpose of building 5,000 miles of road. This is to be voted upon at a special election this spring.

The sister state of Wyoming, through its legislature, will vote at a special election, to be called immediately, upon a \$2,800,000 road bond issue, one feature of which will be the construction of a great highway from

Cheyenne to Yellowstone.

Even counties have entered the competition and news has just come that the County of Salt Lake has voted \$1,500,000 in bonds for construction of county roads.

The Georgia legislature soon will have before it a bond issue proposition providing for a \$40,000,000 bond issue, coupled with an additional \$20,000,000 tax. This latter item is as much itself as the proposed \$20,000,000 bond issue project now under consideration by the state legislature of Colorado.

Oklahoma elected a governor pledged to the specific platform of a state highway system, and a bond issue of \$40,000,000 is up for legislative consideration there. Virginia proposes an outlay of \$40,000,000, West Virginia has a campaign on for an increase, a \$10,000,000 road bond issue is being agitated in Alabama and a \$3,000,000 bond issue is being considered in Utah.

Oregon has already spent more than \$2,000,000 of a \$6,000,000 bond issue voted by the people of that state.

Not all of the sums could be made available for expenditure this year, and could not be spent if available, but the larger bond issues were voted or are proposed with the view of continuing road construction for many years to come. Every state where bond issues have been proposed is planning for a comprehensive highway system to take care of needs for years to come.

Long's Peak to Pike's Peak by Auto

A 135-Mile All-Mountain Highway.

By H. G. Hedden

A SCENIC trip of constantly changing splendor, without once leaving the mountains, can be made by motor from Long's Peak to Pike's Peak, two of Colorado's famous landmarks and tourist attractions. The distance by the most direct route is about one hundred and thirty-five miles, and every mile abounds in glories of Nature to please the eye and make the heart glad and grateful. Besides traversing immense playgrounds all the way, this trip furnishes rare sources of inspiration and study for artists, vast storehouses of knowledge for naturalists and mighty monuments to thrill the imagination with the romance and tragedy of human struggle and achievements, rugged pioneer history and charming Indian legend.

From Long's Peak, whose snow-clad summit stands 14,255 feet high and beckons travelers across the distant plains to that cloudland recreation region embracing Estes Park and the Rocky Mountain National Park, you drive southward to Allen's Park, Ward, Nederland, Rollinsville, Central City, Idaho Springs, Bergen Park, Evergreen, Conifer, Shaffer's Crossing, Pine Grove, Buffalo Park, Wellington Lake, Cheesman Lake, Woodland Park and Manitou, nestling at the foot of Pike's Peak, another giant sentinel of the Rockies towering above 14,000 feet, and crowned with ever-present snow.

The Arapahoe group of snowy summits, Mount McClellan, Gray's and Torrey's Peaks, Mount Evans and other lofty peaks are in close and gorgeous view at points along the trip, while lakes, rivers, creeks, waterfalls, reservoirs, timbered canyons, strange rock formations, gold, silver, lead and tungsten mines, rugged trails used years ago, factories, power plants, farms, ranches, hot springs, fishing hunting and rest resorts form a continuous treasureland for picture-taking and other enjoyment, and at the same time present a panoramic story of Colorado's industrial development dating back to the gold-rush days of '59.

The halfway point of this banquet of motor travel is practically reached at Bergen Park, in the Denver Mountain Park system. Here, if desired, a circle of Denver's Municipal Parks—Fillius, Genessee, Lookout, Starbuck, Little and Corwina—can be made by adding about forty-five miles and still staying within the mountains. This can be done by swinging over to Lookout Mountain, winding down its picturesque slope to the "hogback" road that connects Golden and Morrison and following this foothill drive to Bear Creek Canyon and thence up the canyon to Evergreen.

Lovers of history will want to pause in Lookout Mountain Park long enough to visit the grave of the late "Buffalo Bill" (Colonel William F. Cody), and also to sit a moment in the huge stone council seat at Colorow

Point, a mile and a half above sea-level, and the highest point on Lookout, where fifty years ago old Chief Colorow used to come from deep in the mountain fastnesses once a year with his Ute braves, hold council in the natural amphitheater sloping to the stone seat, and then come on down to Golden or Denver with a few of his most favored followers, carrying furs and articles of Indian handiwork to trade for the white man's wares.

The course of this trip can also be varied at other points, if the traveler so wishes. One main change of this kind—still keeping the auto on mountain roads—is to go from Allen's Park to Lyons and Boulder and thence to Nederland and Rollinsville. Another is to swing off the Rollinsville-Central City route and run into Golden over the Golden Gate Gulch road, and then climb Lookout Mountain and go on to Evergreen by way of Genessee and Bergen Parks.

When the Fall River road is completed from Estes Park through the Rocky Mountain National Park to Grand Lake, then the Long's Peak to Pike's Peak all-mountain drive can be varied further by following this new road to beautiful Grand Lake and coming into Idaho Springs and Evergreen via Granby, Fraser, Berthoud Pass (over 11,000 feet high) and Empire.

Although the direct route outlined now has many steep and rather difficult pieces of road, it is by no means a problem for experienced mountain motorists. Besides, the roads will be improved extensively in the next year or two, and diligent workers for the advancement of Colorado's touring attractiveness predict that this trip between these two giant peaks of extraordinary scenic and historic worth will be made by thousands of Colorado's appreciative citizens and by visitors from all parts of America and other lands, who will go forth to tell the world about this playground for the whole world.

A suitable highway of easy grades and other advantages all the way from Long's Peak to Pike's Peak will be a fitting memorial to the sturdy pioneering of Colonel S. H. Long, commander of an exploring party sent to Northern Colorado in 1820 by President Madison; and to Lieutenant Zebulon Pike, who discovered the peak of his name in 1806, at which time he also gained a distant view of Long's Peak. And such a highway will also do much to spread the fame of Denver as the gateway to twelve national parks and thirty-two national monuments—America's natural tourist center.

Approximately six million motor vehicles were in use in the United States by the first of the year. The production of new cars for 1918 should have been 2,000,000 to keep pace with the demand, but, owing to the war, only 1,100,000 were produced. Manufacturers have figured that it will require 1,000,000 new cars annually to keep up replacements.

Some Highway Bill Recommendations

An Abstract of a Statement made before the Senate and House Finance Committees by Highway Commissioner T. J. Ehrhart.

ROADS are the biggest business in Colorado and of personal importance to more people than any other public or private matter in the state, yet they have and are receiving less serious consideration from a business point of view than matters of trivial import to the people.

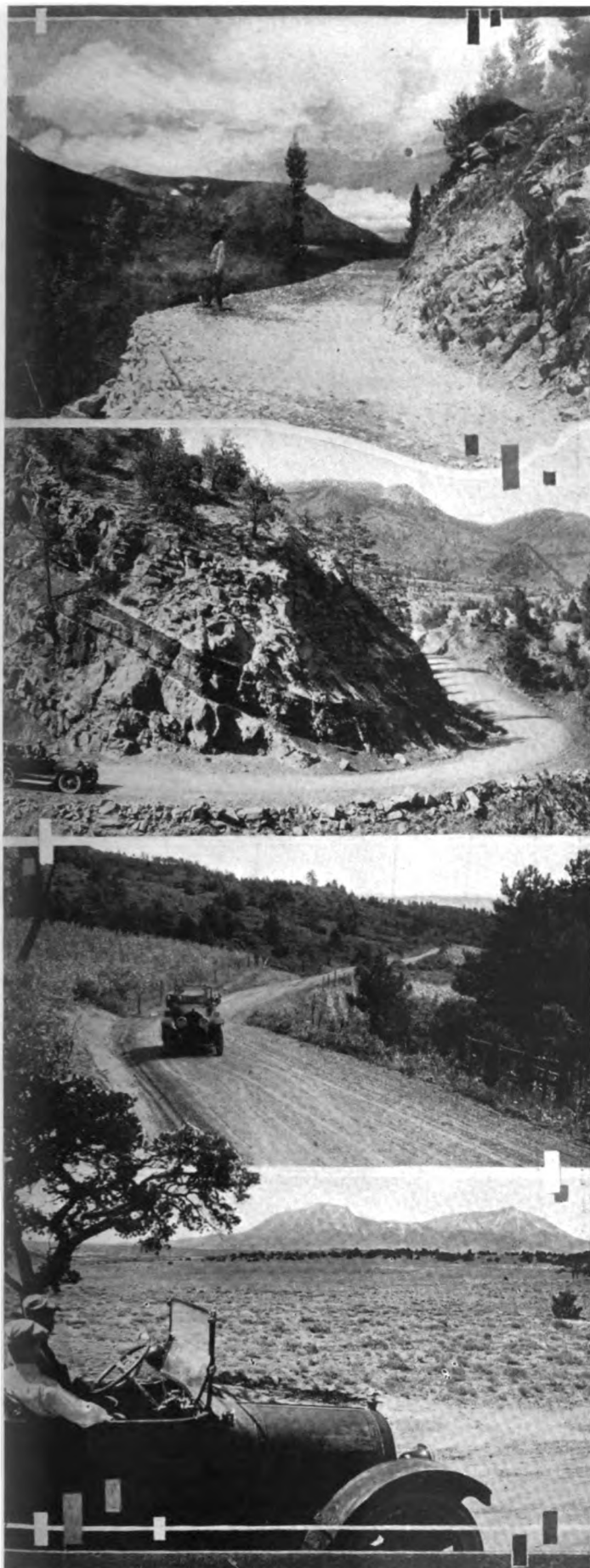
The county commissioners of the state are, without hesitation, meeting the emergency of higher costs and needed road improvement by increasing local road fund levies—in fact, these levies have increased the county road funds forty-five per cent., or more than \$800,000 in the past two years, making the county road funds this year approximately \$2,600,000.

Under the terms of the Bankhead bill Colorado's proportion, immediately available, according to the U. S. Bureau of Roads, is \$1,375,920.29; in 1920, \$1,648,384.71; in 1921, \$1,735,141.80, but in order to secure these funds the state must provide an equal amount each year. This includes Federal aid allotments under the former act. It is clearly evident that this cannot be done with the resources at hand. It seems to me that, if the state is offered this money for the improvement of its roads, every possible thing should be done to avail ourselves of the assistance from the government, if for no other reason than to provide labor employment and add to our business activities. We will, in addition, be getting many more miles of better roads, which will be a permanent asset to the whole state.

The legislature has before it for consideration several bills, that, if passed, will help materially in the acceptance of the Federal Aid appropriations. I refer to the transference of the Inheritance Tax fund, which now goes into the general fund, and I cannot conceive a better use for this tax than road building. Then there is the proposed increase in automobile and truck license fees. Our present fees are among the very lowest in the United States. I think that this fee should at least be doubled by placing it on a weight basis on automobiles: 25 cents per hundred weight up to 2,000 pounds; 40 cents on cars weighing from 2,100 pounds to 3,000 pounds; 50 cents on all cars weighing over 3,000 pounds; \$10 per ton capacity on trucks up to five tons and \$20 for each additional ton.

There is also the proposed gasoline tax of one cent per gallon, to be collected on gasoline used for propelling vehicles over our roads and streets. Other states are now considering such a tax. Under this tax our automobile tourists would contribute about \$50,000 to our road fund

(Continued on page 20.)



Top to bottom: Fall River road, Grand County; Dead Man's Canon, El Paso County; U. S. Forestry road, Jarr Canon, above Sedalia; Spanish Peaks, Huerfano County.

Hints for the Road Overseer

The modern road overseer, or patrolman, must be more than a good road builder; he must be a good judge of human nature, a diplomat, a patriot and have hard, common sense. A good road overseer is a mighty valuable man to his county and the state, and few people who meet him along the roadway realize that he is the hard-working faithful employe who does much to make their trip a pleasure.

The good road overseer will answer any and all questions courteously, no matter how foolish they are.

He will assist the traveling public, when in trouble, without charge. Most of those so helped appreciate the favor and may some day repay it with interest.

The good road overseer will see many people lose their tempers, but he will keep his under control. The man who keeps his temper is the man who comes out on top.

Machinery, tools or loads of material, not in actual use, will never be found on the right-of-way on this overseer's district. The gravel or stone used for maintenance will be found piled neatly at convenient places outside the ditch line. There will be no ridge of earth, sod or loose stone in the center of the road after he has dragged it.

The traveler will not see the road drag working on a hard, dry surface nor the planer or clay soil when the surface is wet and sticky in his district.

This overseer will drag the road just before the winter season, and again as the frost is leaving the ground in the spring. His last work in the fall and first in the spring will be that of cleaning inlets and outlets of all culverts and drains.

The good overseer will know the automobile laws and rules of the road. He will report violations to the proper officials, and report owners of cars carrying wrong number plates to the Secretary of State in Denver.

Attention to these and other apparently small details is what makes the difference between an excellent road and an ordinary road; between a valuable, efficient road overseer and an indifferent one. The good man takes a lively interest in the roads of his district; he is proud of them and their appearance.

Victory Loan Campaign

The State Council of Defense has sent the following rally call to all Liberty Loan workers to prepare for the Victory Loan:

To All County Chairmen and the Entire Organization of the Council of Defense:

Greetings:

During December and January just past, the United States Government spent \$2,000,000,000 a month.

We have probably passed the peak load in our national expenditures, as would seem to be indicated by returns available at the present writing.

The Congress now convening has appropriated more money, and the Government has contracted for expendi-

tures, exceeding the total expenses of the Government since President Washington took the oath of office.

This statement would almost stagger the imagination and may seem extravagant on the part of some persons not familiar with the subject.

Yet the war could have been won in no other way: and during the trying months of the past year, when President Wilson said, "Let's Go" and "Stint Until It Hurts," we applauded him and were carried by enthusiasm to points of sacrifice probably never experienced before by most of us.

All this inspiration is now gone, but the Government must still pay for the munitions, supplies and other equipment which was necessary in connection with our soldiery.

No one can estimate the number of lives and the amount of money saved by the quick termination of the war, brought about chiefly by the intelligent and decisive action of the U. S. Government on a large scale.

We have won the fight, now let's pay for it. Every member of the County and Community Organization is therefore urgently requested to get solidly behind the Liberty Loan organization for the purpose of securing our quota to this—the VICTORY LOAN—beginning about April the sixth.

The Four-Minute Men in Colorado will be thoroughly organized for this campaign. Get in touch with them immediately in your Community.

Yours very truly,

EXECUTIVE COMMITTEE,
STATE COUNCIL OF DEFENSE,

A. U. MAYFIELD, *Secretary*.

C. A. KENDRICK, *Chairman*.

A National Highway System

The information has reached this office that Senator Charles E. Townsend, of Michigan, announced his intention to introduce a new road bill, setting forth his ideas and outlining a comprehensive plan to place federal highway activities on a basis that will call for an interstate system, and definite direction of it through federal co-operation with the state highway departments. It was not expected that the bill will be taken up for serious consideration this session but, in view of the fact that Senator Townsend will probably be the next chairman of the senate committee on Post Offices and Post Roads, the announcement is significant. When this bill becomes available for discussion Colorado Highways readers will be given its contents.

"I believe that we ought to have a nationalized system of highways," said Senator Townsend. "I hope that before Congress expires we shall have before us a general scheme for building roads. But this appropriation (the Bankhead rider) is as wise an investment as we can make now. I hope the various state highway commissions will see to it that it is so expended that it will contribute to a national system. Let the states build the laterals, but let us have a system of highways extending through every state, east and west, north and south."

State Pledged to Meet Federal Aid Funds

*Extract from a Letter, on the \$20,000,000 Road Bond
By Robert H. Higgins, to Legislative Committees
on Constitutional Amendments Issue.*

AT that time and during the years 1913 and 1914 the commission only had at its disposal one-half of the funds of the automobile licenses and the revenues from the Internal Improvement funds—all told, from all sources, the sum of between \$300,000 and \$400,000 per annum. This was ample, I considered, for the beginning. However, after one and one-half years' work of the commission, the people voted in 1914 election a direct tax of one-half mill for road purposes. The then Highway Commission agreed with several counties that they would return, through appropriations, an amount at least equal to the said counties, one-half mill tax. This agreement was faithfully kept throughout the years 1915-1916 and 1917, and, in my opinion, would have been continued until this very moment if it had not been that the Congress of 1916 made an appropriation for the improvement of Post Roads throughout the various states, and the Forestry Service of the federal government, the same year, appropriated an amount for road work in and through the Forest Reserves. Both of these appropriations were to be apportioned to the various states on the basis of the state meeting or matching the Federal Aid money dollar for dollar.

The people in those sections of the state where this federal money would help, asked and insisted that it be accepted by the Highway Commission.

I refer you to Session Laws of 1917, chapter 116, page 433, wherein the legislature pledged the faith of the state to provide funds to meet the Federal Aid Act of July 11, 1916.

The Commission, in accepting this Federal Aid money, added another obligation and use for the state road fund, and without any additional revenue accruing in 1918, they were unable in all cases to appropriate sufficient to all counties to cover their one-half mill levy as paid by the county. This caused some little dissatisfaction, and justly so, from a county standpoint. The year 1919 will be equally as bad in this respect and the years 1920 and 1921 will be worse if some of the legislation now pending is not passed and the revenue increased, as the Federal Aid money under the Post Road and Forest Reserve Acts increases each year and reaches the maximum of \$480 450 in 1921.

This Bankhead rider provides \$200,000,000 for road purposes. The money has to be accepted by the states within a limited time after notice has been received that it is available, and the proportion awarded a state and
(Continued on page 20.)



Indian Head, Wolf Creek Pass, Mineral County, from the entrance to the Pass. Thousands of these rugged headlands, scattered through Colorado.



The Federal Aid Problem

The enactment of the Bankhead road bill, as a rider to the post office appropriation bill, is a victory for the cause of better roads far more important than the tangible results in road building that will follow the application of the money. It means that Congress at last has become interested in a good roads program, and the expenditure of this money will create a momentum that is bound to result in further and greater appropriations by Congress, as well as to encourage the state governments to vote bond issues. It means that a national highways system, linking the states, is about to commence, for good roads enthusiasts have been preparing for just such action, and an organization to promote a comprehensive national system has already been formed.

A national highways system will give direction to the better roads movement. It will permit the states to develop their cross-roads and laterals in conformity to a general scheme. It will bring to remote sections that great civilizer—the road. It will furnish labor to the unemployed. Road expenditures mean greater prosperity, for not only do they develop the country, and result in the economical handling of traffic, but the money is turned over and over, passing through many hands and keeping continually on the go. Unlike money tied up in the banks and working for a few, the dollar spent on better roads works for the entire community.

The appropriation of \$200,000,000 made by the Bankhead bill has certain limitation that might well be removed in the passage of further road appropriations by Congress, but it is a starter.

For instance, it says that the money must be expended on established post routes, and does not limit the expenditure to main routes, or through routes. It is not improbable that a good share will be spent on isolated routes. Very often a post road takes in a long detour through a sparsely settled district, and that only three or four miles of the route will follow a heavy traffic road. As a result the road used most heavily will benefit from the Bankhead bill funds only in spots, while a comparatively unimportant road may be developed far beyond its value economically. It seems to many better roads enthusiasts that greater value could have been secured for the money by permitting its use to connect stretches of heavy traffic roads lying between post roads, instead of leaving the total expense of eliminating these links to the states and counties.

Then, too, the Bankhead bill provides for a dollar-for-dollar expenditure by the states which benefit from the

Federal Aid. This is a very live question in the West where there is neither the population per square mile, the property value, nor the ability to pay on a 50-50 basis. The Colorado Highways Commission long ago suggested that these factors should be taken into consideration by the government in the distribution of Federal Aid moneys, and that states such as Colorado, New Mexico, Idaho, Utah, etc., should be allowed to put up only one dollar to the government's four dollars or five dollars. It is unjust to the sparsely settled and younger states to have to compete with rich and heavily settled districts such as those of New York and Pennsylvania, and to compete on the same basis.

However, unless an amendment can be put through at the next session of Congress the western states will have to accept conditions as they are, and hope for better terms.

The problem of meeting the Federal Aid appropriations is a serious one and makes it imperative that the legislature provide adequate funds for this purpose if the state is to benefit from Federal Aid,

Plain Arithmetic

There are 42,000 miles of public roads in Colorado: 35,000 miles of which are county and 7,000 miles state roads, representing a value of of \$42,000,000. The rights-of-way of these roads amount to 315,000 acres, and are worth, at a low valuation, \$10 per acre, or \$3,150,000. This brings the total value for road property to \$45,150,000. There are 85,000 autos and trucks in operation over these highways which, added to other vehicles, will represent, conservatively, a value of \$85,000,000, the operation of which cost \$40,000,000.

For the care and development of this magnificent property, owned by the people, over which they operate \$85,000,000 worth of equipment, we have available from all sources, county and state, about \$90 per mile to maintain the whole system and do all construction work, or a total of \$3,750,000, while \$40,000,000 are being spent annually in gasoline, oil, tire repairs, etc.

If a corporation owned an estate of 315,000 acres of land with \$42,000,000 invested in improvements, over which \$85,000,000 worth of vehicles were operating at a cost of \$40,000,000 per annum, and the traffic could be increased twenty per cent., with a reduced operating cost of ten per cent., would the directors hesitate to issue \$20,000,000 bonds and make ample provision from the millions of profits involved for maintenance and improvement?

Tree Planting Along Concrete Highways

By S. R. DeBoer, Landscape Architect for the City of Denver

Tree planting is a matter of foresight; it is constructive work of which the next generation will probably derive greater benefits than those doing it. We have all met the man who did not want to plant trees because he would be dead before the trees would mature and get commercial value. That same man all wrapped up in his financial calculations failed to see what his ranch or his town or even his county would be if his father and other fathers had taken the same point of view. It is said that

the old Friesian people, an old tribe of farming people living in the low lands around the North Sea and the Zuidersee, in the middle ages used to build their houses and barns mainly of oak wood. They calculated that these buildings should last a hundred years, and they planted groves of young oaks to take the place of the trees which had been cut, the wood of which was to be used for repairing and rebuilding the buildings a hundred years hence. Even at the present time many farms over there are said to have groves of oak trees planted for that purpose.

We are not using as much consideration for future generations as all that any more. We are living so fast and so much in the present that we nearly never stop to think whether our children might possibly pass judgment on us for having failed to provide in some matters of this kind. For much as we hate to think of it there will be generations after us and others after them again, and so on forever.

But even if tree planting is largely a matter of foresight this does not necessarily mean that we are too old and worn to enjoy a great deal of the benefits ourselves. For tree growth is not so slow but what in ten or a dozen years trees of considerable size can be grown, specially in the faster-growing varieties. And in a score of years one can realize what an avenue of trees may develop into.

As long as our state was still in the period of dirt roads, there seemed little advantage of tree planting along them, for the shade of the trees would keep the road wet and soft and often impassable. On these roads tree planting could only be done to advantage on the North and West sides of the roads. But we are gradually outgrowing the dirt roads and hard surface roads are already built in some places and in sight for a great many others.

And it seems that more than at any time during the development of our state, this is the right time to follow up the building of a permanent and hard roadbed by the

planting of permanent rows of shade trees. And specially along the gray lines of concrete highways where the sun rays reflect their heat stronger than on any other road surface, no time should be lost in planting the young trees necessary for this purpose.

The general county road is 60 feet wide between property lines and the concrete roadways now being built are 18 to 20 feet in width. Taking the latter width as a maximum and allowing for a 10-foot macadam road on either side of it to take care of horse drawn traffic and heavy trucks which may be too heavy for the concrete surface, we would get a roadway of 40 feet width in all. Trees should not be closer to this roadway than 3 feet. According to this the minimum distance of the tree line from the center of the road should be 23 feet. This a minimum. Trees can be planted closer to the property lines without any disadvantage should conditions make this advisable.

No problem in regard to tree planting of this kind seems as serious as the one of irrigating the trees planted.



Tree borders, correctly planted, add immeasurably to the attraction of hard-surfaced roads. On the concrete road to Golden.

But if we think of the hundreds of miles of canals and ditches we have already built in this state, of the change which has been wrought in the land which once was part of the great American desert, the problem of irrigating a few lines of trees need not worry us.

Tree planting should begin in the sections where the

farm lands along the road are irrigated. In most of these sections it is possible to divert water from farm ditches to the trees along the road. The trees would mean a great deal to the people living along the road and in many cases they would take enough pride in them to take care of the irrigation of the trees.

On places where the road runs over narrow fills or through deep cuts, it should become the duty of the Highway engineer to make the roadbed wide enough to include room for the trees. For long dry hills water can be pumped from the creeks or from wells in the valleys and piped to the top of the hill. As a rule a galvanized iron pipe of 1½-in. diameter will be ample to irrigate the trees. Intake places on the creeks or at wells can be built with either stationary or portable engines and pumps. Where long distances are planted in trees and the hills to which water has to be pumped are numerous it might prove possible to have a good powerful pumping outfit move from one place to the other.

Until the time that tree planting along our roads is recognized as a necessity this latter method of irrigation may be found rather expensive. There is, however, no reason why such hills should not be left unplanted temporarily if not permanently. The charm of a road is often in the change of light and shade. After following a shady line of trees for several miles a sunny hill would become a pleasant change.

The kind of trees to be used for this planting on a large scale, should be a matter of careful study. Soil and drainage as well as irrigation conditions should be considered in this. The distance apart will depend on the variety again. As a general rule distances should be rather more than absolutely necessary. The cottonwoods on Grandview avenue in Arvada are from 45 to 50 feet apart and the West does not have a more attractive street than this one. Of course part of the attraction of this street is the view of the range.

And this takes us to the tree I should like to put at the head of my list of available tree varieties.

The native cottonwood. Sturdy as an oak, free from disease and insect pests, the pioneer of our trees. And we can plant the staminate tree to escape the cotton. But cotton and all, it is the best tree Colorado has grown thus far.

The American elm. No tree will stand more abuse than this variety. However, it is becoming subject to insect pests. English, Scotch and Cork elms are also valuable for highway planting.

Honey locust. This tree is well adapted to dry situations with a sandy soil. The tree is free from insect pests in Denver, where it is considered one of the best trees.

Hackberry. The Western hackberry is hardy here, but care must be used that Northern, or still better, home-grown stock is used. Dishonest tree agents will also bring the Mississippi hackberry into our state. This tree grows in Texas and at first sight looks like a valuable tree, but it is not hardy here, winterkilling every winter.

Green ash. Where the borers are not working in this



This magnificent line of cottonwoods has been planted along a dirt road, too close to the roadway, two bad points.

tree it is a useful variety. It should, however, not be planted in orchard sections where the oyster shell scale is found.

Oaks. Red, pin, and bur oak are very valuable for highway planting. Though the hardest one to transplant the Bur oak is the hardiest one of the three. Home-grown stock is preferable for all trees, but specially for oaks and other hardwood trees. There is no reason whatever that Colorado has to depend on other states for its trees and then get second grade, unacclimated stock. Colorado should have more tree nurseries and grow its own stock.

Maples. Soft maple can be used where scale insects do not bother it. Sugar maple and Norway maple should be used in sheltered locations only.

Poplars. Silver poplar is of great value for this work. Carolina poplar is no good. Lombard, black and Canadian poplar can be used occasionally.

Sycamores. In low ground locations this tree might prove successful.

This is by no means a full list of all the shade trees that can be grown in our state; Colorado does not lack in tree varieties even if our list is not as long as those of other states.

In hilly sections, like near Palmer Lake on the Colorado Springs road, it is quite well possible to use evergreen trees, pine and spruce. In such locations line planting will become difficult, but trees can be grouped, planting groups of from six to twelve in a group in places where conditions are favorable.

General maintenance of these trees should be taken care of from the public funds, be they government, state,

(Continued on page 20.)

Provisions of the Bankhead Federal Aid Act

How the \$209,000,000 Road Appropriation Will be Handled

FOR the information of readers of Colorado Highways the full text of the Bankhead bill, passed as a rider to the post office appropriation bill, is given below. It will be observed that the bill carrying an appropriation of \$9,000,000 is made for the construction of roads and trails in the national forests, under direction of the Secretary of Agriculture. Of this \$3,000,000 is available immediately, \$3,000,000 becomes available in 1920 and \$3,000,000 becomes available in 1921. This appropriation is in addition to the \$200,000 appropriation for federal aid on post routes.

The sections bearing upon the road appropriations are as follows:

“Sec. 5. That the act entitled ‘An Act to provide that the United States shall aid the states in the construction of rural post roads, and for other purposes,’ approved July 11, 1916, is hereby amended to provide that the term ‘rural post roads’ as used in section 2 of said act, shall be construed to mean any public road a major portion of which is now used or can be used, or forms a connecting link not to exceed 10 miles in length of any road or roads now or hereafter used for the transportation of the United States mails, excluding every street and road in a place having a population, as shown by the latest available Federal census, of 2,500 or more, except that portion of any such street or road along which the houses average more than 200 feet apart: PROVIDED, That Section 6 of said act be further amended so that the limitation of payments not to exceed \$10,000 per mile, exclusive of the cost of bridges of more than 20 feet clear span, which the Secretary of Agriculture may make, be, and the same is, increased to \$20,000 per mile.

“Sec. 6. That for the purpose of carrying out the provisions of said act, as herein amended, there is hereby appropriated, out of any money in the Treasury not otherwise appropriated, the following additional sums: The sum of \$50,000,000 for the fiscal year ending June 30, 1919, and available immediately; the sum of \$75,000,000 for the fiscal year ending June 30, 1920; and the sum of \$75,000,000 for the fiscal year ending June 30, 1921: said additional sums to be expended in accordance with the provisions of said act; PROVIDED, That where the constitution of any state prohibits the same from engaging upon internal improvements, or from contracting public debts for extraordinary purposes in an amount sufficient to meet the monetary requirements of the Act of July 11, 1916, or any act amendatory thereof, or restricts annual tax levies for the purpose of constructing and improving roads and bridges, and where a constitutional alteration or amendment to overcome either or all of such prohibitions must be submitted to a referendum at a general election, the sum to which such state is entitled under

the method of apportionment provided in the act of July 11, 1916, or any act amendatory thereof, shall be withdrawn by the Secretary of the Treasury from the principal fund appropriated by the act of July 11, 1916, or any act amendatory thereof, upon receipt of the certification of the governor of such state to the existence of either or all of said prohibitions, and such sum shall be carried by the Secretary of the Treasury as a separate fund for future disbursement as hereinafter provided; PROVIDED FURTHER, That when, by referendum, the constitutional alterations or amendments necessary to the enjoyment of the sum so withdrawn have been approved and ratified by any state, the Secretary of the Treasury, upon receipt of certification from the governor of such state to such effect, shall immediately make available to such state, for the purposes set forth in the act of July 11, 1916, or any act amendatory thereof, the sum withdrawn as hereinbefore provided; PROVIDED FURTHER, That nothing herein shall be deemed to prevent any state from receiving such portion of said principal sum as is available under its existing constitution and laws; PROVIDED FURTHER, That in the expenditure of this fund for labor preference shall be given, other conditions being equal, to honorably discharged soldiers, sailors and marines, but any other preference or discrimination among citizens of the United States in connection with the expenditure of this appropriation is hereby declared to be unlawful.

“Sec. 7. That the Secretary of War be, and he is hereby authorized in his discretion to transfer to the Secretary of Agriculture all available war material, equipment, and supplies not needed for the purposes of the War Department, but suitable for use in the improvement of highways, and that the same be distributed among the highway departments of the several states to be used on roads constructed in whole or in part by Federal Aid, such distribution to be made upon a value basis of distribution the same as provided by the Federal Aid road act, approved July 11, 1916; PROVIDED, That the Secretary of Agriculture, at his discretion, may reserve from such distribution not to exceed 10 per cent of such material, equipment, and supplies for use in the construction of national forest roads or other roads constructed under his direct supervision.

“Sec. 8. That there is hereby appropriated, out of any money in the Treasury not otherwise appropriated, for the fiscal year ending June 30, 1919, the sum of \$3,000,000, for the fiscal year ending June 30, 1920 the sum of \$3,000,000, and for the fiscal year ending June 30, 1921, the sum of \$3,000,000, available until expended by the Secretary of Agriculture in co-operation with the

(Continued on page 20.)

Regulation of the Speed, Weight, Width and Height of Motor Trucks

By *George M. Graham, Chairman, Motor Truck Committee,
National Automobile Chamber of Commerce.**

I ask your consideration for my client, the motor truck. He is charged with wreaking untold damage upon the highways. He has cracked open the surface; he has made deep ruts; he has made holes into which the rains have beaten—and collapse has followed. This is the bad side.

But there are extenuating circumstances. It is admitted that he has done notable things for the country, performing almost incredible service in speeding up our war program. He has brought the manufacturer nearer his market, the farmer nearer the consumer, the finished war product nearer the shipping point. He has facilitated the rapid filling of orders, brought in raw materials, supplied the equivalent of man power, rendered less serious the shortage of horses and filled gaps occasioned by the deficiency in labor, material and transportation. The motor truck has been doing railroad work on short hauls, and public utilities companies would operate under a serious handicap but for his assistance. This is what my client has done on the good side.

But there are those who would banish him because he has damaged roads that were never suited to his use. He has not offended maliciously; his misdeeds have proceeded from the fact that he has height, width, weight and speed—particularly weight and speed. We admit that he has these attributes; he could not very well get along without them. But in spite of the trouble in which they have involved him, we believe that this is an ideal time to define his place and to ask justice in his behalf.

We believe that the truck has been as much sinned against as sinning, for out of 2,500,000 miles of highways in the country, not over 10% are improved and many of these are of the most mediocre quality. The unfitness of the road has not only resulted in damage to the highways, but has also militated against the efficiency of the truck.

Tests made by the California State Automobile Association show that it takes a pull of 218 lbs. to draw a 1-ton load on an earth road, and that this pull becomes less on better surfaces until it is reduced to 27.6 lbs. on the surface offering the least resistance. A Detroit manufacturer found that a 2-ton truck could make 16.4 miles per hour on improved roads, 9.5 miles on roads of medium type and 4.6 miles on dirt roads. In other words, the truck made 257% better time on highly improved roads than on dirt roads.

There are three main parties in the controversy with respect to motor trucks and their relation to highways. First, there are extremists who argue that all the truck has achieved does not compensate for the damage it has done to the highways. They would legislate it from the roads and ignore the blessings of a new transportation system that has taken its place with railroads and steamships. The second party comprises those who defend the motor truck, who are willing that it should bear a proper financial penalty for the damage it does and who are willing to compromise on the question of weight and speed. Between these is a third class which stands for compromise. These concede the place of the truck and believe

that adequate roads should be built for it, but they insist that until better roads are obtained the present highways must be protected even if it necessitates imposing restrictions on trucks.

My presentation will be directed to drawing into the closest possible accord these three viewpoints. As a basic proposition we beg to submit that the highway should be the servant of transportation, not its master. The truck has proved its adaptability to modern transportation problems, and civilization will lose unless means be found for its expanding application. If the roads are not adequate to heavy truck traffic they must be made so, for the truck has too great possibilities to be sidetracked for temporary considerations. Those who admit no place for the truck stand opposed to the spirit of the times.

Those legislators who vote against trucks, feeling that they are serving the interest of the farmer, should be reminded that actually they are working against the farmer's pocketbook, for it is a fact that the haulage of farm products by motor truck is cheaper than by team. This statement is supported by authoritative figures from the Department of Agriculture, showing that in 1918 the estimated costs of shipping wheat, corn and cotton from the farms to the shipping points were respectively 30 ct. by team and 15 ct. by truck, 33 ct. by team and 15 ct. by truck, and 48 ct. by team and 18 ct. by truck. Motor truck costs are now lower than were wagon costs in 1906.

For those who ask that trucks be not permitted to ruin the present roads before money, labor and material can be obtained for the building of new ones, we have only the highest respect. We feel sure that they will be our allies against unfair legislation, and we meet them in a spirit of co-operation. As manufacturers we know that we must build trucks that will do the least harm to the present roads.

The foremost men of the industry have given close thought to the matter of dimensions. Compromises and adjustments have been made and we are in agreement on a bill which we would like to see enacted by all of the legislatures. We wish to propose a combination of necessary fundamentals, equitable legislation, efficient administration and proper construction, and it is necessary to give the subject consideration at once. Despite poor roads and discouragement by state authorities, long distance motor haulage has been established all over the country. It is entirely possible that after the war the short-line railroad will be a thing of the past, not only because the truck can take care of short-haul business in less time and at a reduced rate, but because it saves labor and time by delivering goods at the consignee's door.

I should like to raise the question of how far trucks are responsible for the present damaged condition of the roads. Are they justly accused in this respect?

It is conceded that the roads were never in worse shape, but is this up to the trucks? Is it not rather the penalty for the lack of repairs? A leading road expert has said that during the past two years the roads have not suffered more damage than heretofore, but because of labor shortages and embargoes on material it has been impossible to make repairs. In our investigation we have found the opinion almost general that most of the damage is done in the spring. The condition of the road at that time is such that the impact of a vehicle results in more damage than could be inflicted in all of the other months put

*Abstract of a paper presented at a joint session at the fourth annual meeting of the American Association of State Highway Officials, and the annual meeting of the Highway Industries Association, Chicago, Ill., Dec. 2-6, 1918.

together. In our bill we have proposed a remedy for this in the shape of an embargo by which the local highway authorities can close any road, for not over 45 days in any one year, to a vehicle weighing more than 10,000 lbs.

Height and width are not the major problems with which we must deal; they can be speedily eliminated. The prevention of projecting loads does not concern the manufacturer, but is a matter for local regulation. We have fixed 12 ft. 6 in. as the greatest distance between the road and the top of the body, and 96 in. as the greatest width of body.

Weight and speed are the most difficult to contend with. The truck constantly grows in weight and if unrestrained will grow faster. We do not deny that the heavy truck running on solid tires at a high rate of speed does damage to the road, but it should not be forgotten that both its weight and speed serve a highly practical purpose. The cost of carrying the load decreases in proportion to the number of tons carried.

As a general rule the cost of operation in relation to carrying capacity decreases as the size of the truck increases. There are four reasons for this, as follows: (1) The cost of manufacture of a truck does not increase in proportion to the carrying capacity; (2) the so-called fixed charge, or overhead of operation, does not increase in proportion to the carrying capacity; (3) the actual operation cost does not increase in proportion to the carrying capacity, and (4) the weight of the truck itself does not increase in proportion to the carrying capacity.

From an economic standpoint this is a most important consideration, for truck owners have the right to operate their trucks to the maximum of economy and efficiency. They should be permitted to operate the heaviest possible trucks necessitated by their haulage problems, and roads should be made equal to the burden as speedily as possible. To take any other position is to work against an increasing army of motor truck users. Our plan for uniform truck laws calls for permission to operate a vehicle whose gross load is 28,000 lbs., but it provides that a highway commissioner may reduce this limit to 24,000 lbs. when it can be shown that a road will not stand a greater weight. It is also provided that the limit can be raised where highly improved roads make it possible. The plan also provides for license fees, maximum speeds in different sections, maximum weights and a fixed load per inch width of tire.

The load per inch width of tire has been fixed at 800 lbs. for all vehicles, whether equipped with steel or pneumatic tires. For vehicles weighing less than 6,000 lbs. gross, including vehicle and load—in other words passenger cars or light commercial cars—the maximum speed in open country is fixed at 30 miles per hour, with the proviso that this limit may be exceeded for ¼ mile in order to permit one vehicle to pass another. The maximum speed in suburban sections, villages and towns is fixed at 20 miles per hour, and in closely built parts of cities and towns at 15 miles per hour. The speed limit for pneumatic tired vehicles of from 6,000 to 28,000 lbs. gross weight, is fixed at 25 miles per hour in open country, 20 miles in suburban sections and 15 miles in congested sections.

Trucks equipped with solid tires and having a gross weight of from 4,000 to 28,000 lbs. are limited to 12 miles an hour in congested sections and in suburban sections to 15 miles per hour, except the 8,000-lb. vehicle for which the maximum is fixed at 18 miles and the 4,000-lb. vehicle for which the limit is placed at 20 miles. In the open country the following limits are fixed; 4,000-lb. vehicles, 25 miles; 8,000-lb., 20 miles; 12,000-lb., 18 miles; 16,000-lb., 16 miles; over 16,000-lb., 15 miles.

Motor vehicles used for carrying passengers for hire are divided into three classes—those of less than 6,000 lbs., 6,000 to 7,000 lbs., and 7,000 to 8,000 lbs. The first are limited to speeds of 30, 20 and 15 miles per hour according to section; the second to 30, 20 and 12 miles, and the third to 25, 20 and 12 miles.

In the case of trailers with solid rubber or pneumatic tires the speed permitted is the same as that fixed for the propelling vehicle.



Mary has a little lamb, with fleece as black as ink, The roads were good and that is why she has him—so I think. Miss Marietta Fry at the Denver Stock Show.

The motor truck is highly economical in its consumption of steel as compared to its carrying capacity. The steel required for the average railroad freight car is 25 tons, while a 2-ton motor truck requires 1½ tons. The ton-mileage of a freight car per day is 800, 40 tons being the average load and 20 miles being the average mileage. An easy average for the 2-ton truck is 200 ton-miles, based on a 2-ton load and 100 miles per day. Therefore, four 2-ton trucks can do more work per day than one freight car. Building 50,000 steel freight cars and 1,250 locomotives to draw them requires 1,437,000 tons of steel. Only 300,000 tons of steel are necessary to build 200,000 2-ton trucks capable of doing the same amount of work as the freight cars and locomotives. This is a saving of 1,137,000 tons of steel. From the standpoint of national wealth and prosperity, does not this saving, plus the saving of time 'n favor of the motor truck, make insignificant the cost of repairing the damage to the roads?

As a temporary measure the ideal plan would seem to be the building of improved roads on the shortest routes between important centers and then the protection of these roads from washouts, cave-ins and the obstructions caused by snow and ice. Traffic should be temporarily centralized on such designated routes, so far as possible, thereby eliminating the necessity of sending trucks over side roads before they have been properly rebuilt.

There are three principal methods of financing by which may be obtained roads that will afford the truck its full opportunity of service. The first is direct taxation by the state. The second is enlarged federal aid based on the probability that the end of the war will see the Government owning a large number of trucks that will be applied to peace uses. Finally, there never was so great a warrant for bond issues as now.

Some Highway Bill Recommendations

(Continued from page 11.)

this year. The needs of the state road fund are so great that I believe that this bill should be passed as an emergency measure.

As State Highway Commissioner (and my term will have expired before any bonds can be sold) and as a citizen taxpayer of Colorado, I am heartily in favor of a \$20,000,000 bond issue. I believe the people will be amply justified in voting this issue from a strictly business point of view, and as a gilt-edged investment, which will yield them greater profits than the steel or packing industries have paid.

State Pledged to Meet Federal Aid Funds

(Continued from page 13.)

not accepted within the limit, is divided up among the states that accept their original allotment. The Highway Commission has made their appropriations to the various counties and accepted the Federal Aid money on Post Roads and Forest Reserves for the year 1919, and has less than \$10,000 on hand in the contingent or emergency fund. If we are to progress in our road building some more revenue must be provided.

Tree Planting Along Concrete Highways

(Continued from page 16.)

county or city. But, as already pointed out, many citizens along the road will take a pride in taking care of the trees in front of their property, specially in irrigating them. This will save considerable expense, but should not lead to the state or county releasing all responsibility for such trees. The whole tree line should be under continual supervision, specially in the summer, by one responsible man. Pruning will occasionally be necessary, but after the young trees are started one pruning every three years should be sufficient.

There is no more fitting memorial to our dead boys in France than two living lines of green foliage. Trees planted along the Denver-Golden road, to name only one example, in memory of those who left the two counties through which the road runs, never to return, would still be the talk of the country in long years hence, maybe in years when people speak about wars as things of the past.

Probably the West had no greater tree lover than former Mayor Speer. Miles and miles of boulevard trees stand there as silent witnesses of the vision of Denver's great mayor. Once he dreamt of a great highway planted with trees, to connect Denver with the Platte Canon, and he proposed to name it after one of the state's wealthiest men, if the latter would donate the forty thousand dollars necessary to plant the trees. The proposal was refused. The man has been dead for several years already,

lawyers and courts have wrangled over his estate. There probably is somewhere a sumptuous piece of granite in a cemetery to which no man cares to lift his eyes. Think of the chance this man missed, think of the blessings that would have gone up daily, had he put a measly few dollars, for to him the sum was small, into a line of living foliage tying Denver with the Platte Canon mountains.

Provisions of the Bankhead Federal Aid Act

(Continued from page 17.)

proper officials of the state, territory, insular possession, or county, in the survey, construction and maintenance of roads and trails within or partly within the national forests, when necessary for the use and development of resources of the same or desirable for the proper administration, protection and improvement of any such forest. Out of the sums so appropriated the Secretary of Agriculture may, without the co-operation of such officials, survey, construct, and maintain any road or trail within a national forest which he finds necessary for the proper administration, protection and improvement of such forest, or which in his opinion is of national importance. In the expenditure of this fund for labor preference shall be given, other conditions being equal, to honorably discharged soldiers, sailors and marines."

D. C. D. Route Honored

Representatives from forty-five states, representing the transeontinental highways associations of the nation, met in Kansas City on January 21, and organized the Associated Highways of America. This is the national organization that was discussed at the Chicago meeting in December. The main purpose of the Associated Highways of America will be to urge upon Congress the wisdom of the establishment of national highways, of their construction and maintenance by the Federal Government.

D. J. Young, president of the D. C. D. highway, in which Colorado is vitally interested, and W. A. Palmer, secretary and general manager, attended the Kansas City meeting and both were made members of the board of directors of the national association. President Young was named as one of the four additional members of the executive committee which, together with the president, secretary and treasurer will form the general executive committee.

The recognition given to the D. C. D. route at this meeting was very gratifying to the people all along the route, as it gives this route rank as one of the great highways of the nation.

As soon as the weather permits Ed O'Neill, contractor who has worked on the Rifle to Meeker road, will put on a full force and rush the road through to completion this season. The force on the road worked throughout most of the winter season.

The Blue Lodge of Colorado Road Builders

The Story of a Retiring State Highway Commissioner

THE past month saw the retirement from the Colorado State Highway Commission of Mr. Leonard E. Curtis of Colorado Springs, representing Road District No. 2 on the commission. This district includes the counties of Lake, Chaffee, Park, Teller, Elbert, El Paso, Lincoln, Kit Carson, Cheyenne and part of Douglas county. Governor Shoup appointed in his place Mr. E. E. of experience with commercial and good roads associations in connection with the subject of better roads.

Mr. Curtis was brought up on an Illinois farm, near Galesburg, so that the importance of good roads was early impressed upon him, and he never forgot to urge them on every occasion. He was graduated from Yale Academy in 1872, and from the law school two years afterward.

Most of the subject's Nichols of Manitou, one of the prominent citizens of El Paso county and a good roads advocate, who, as a hotel man, has made himself thoroughly familiar with their value to the state.

Mr. Curtis, during his term, endeared himself to the other members of the commission by his qualities of fairness, courtesy and foresight, as well as bringing to his work many years legal practice took place in New York City where he practiced law from 1874 until 1896. He rose to the top of his profession and, among other important cases with which he was connected, had charge of the Westinghouse side of the great patent dispute between that company and the General Electric Company that lasted sixteen years.

In 1896 Mr. Curtis' health failed and he came to Colorado to recuperate. He went to Colorado Springs and has resided there continuously since that time. At first he took up his profession in the Springs, but soon saw the opportunity in the young state for electrical development. The firm of Curtis and Hine was formed and reorganized the electric light and gas company at Colorado Springs and rebuilt the plant.

With the backing of banking interests friendly to the company Mr. Curtis financed and built the water power plant on the Animas river for Silverton and Durango, as well as a large Mexican power plant and the Central Colorado Power Plant. The latter involved an investment of approximately \$10,000,000.

Mr. Curtis became interested in the good roads movement actively more than fifteen years ago. He was president of the State Good Roads association the year the State Highway Commission was organized, was president of the Colorado Springs Automobile club for seven years and chairman of the committee on streets and highways of the Colorado Springs Chamber of Commerce, which did much toward promoting the good roads movement in the state.

Mr. Curtis did a great amount of work on the present state highway law. Although a Republican he was appointed a member of the commission by Governor E. M. Ammons, a Democrat, and was reappointed by another Democrat, Governor J. C. Gunter.

Mr. Curtis has always favored more liberal expenditures for roads and has written and done considerable public speaking in

advocacy of this policy. He believes that the present time is the psychological time for making this policy effective and is a supporter of the proposed bond issue plan for constructing a greater and better system of roads in Colorado.



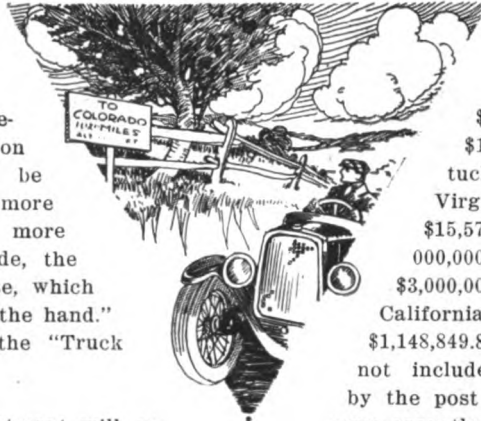
Mr. Leonard E. Curtis of Colorado Springs, retiring member of the State Highway Commission from District No. 2.

Testimonial to Charles R. McLean

A recent issue of the Daily Record of Canon City contained a very unique testimonial to Charles R. McLain, whose years of unremitting service in the interest of good roads were recognized by the chamber of commerce of Canon City. A set of engrossed resolutions was presented to Mr. McLain by the chamber, in which appreciation of his work was expressed. It was a most unusual recognition of public work.

Sign Posts Along The National Highway

THE movement in several states to restrict motor trucks is by no means original with this age. Two hundred years ago the town authorities of Boston were compelled to adopt an order to restrict the "cussedness" of the famous Boston teamsters as follows: "Trucks shall not be more than 18 feet long, may employ not more than two horses in one team, carry no more than one ton, have tires four inches wide, the driver to go at the head of the thill horse, which he must govern by a halter to be held in the hand." The law was efficacious, and this was the "Truck Law of 1720"



"Definite estimates" announced by the Department of Agriculture for road building this season are given in detail as follows: Maine, \$1,500,000; Rhode Island, \$90,000; Connecticut, \$4,000,000; New York, \$12,000,000; New Hampshire, \$175,000; Kentucky, \$1,500,000; Alabama, \$1,000,000; West Virginia, \$16,000,000; Illinois, \$9,000,000; Iowa, \$15,574,000; Louisiana, \$4,674,000; Texas, \$20,000,000; Nebraska, \$1,657,089.07; North Dakota, \$3,000,000; Wyoming, \$653,000; Colorado, \$3,900,000; California, \$20,000,000; Arizona, \$900,000; Nevada, \$1,148,849.80; Idaho, \$1,000,000. The estimates do not include the \$200,000,000 expenditure authorized by the post office appropriation bill by action of Congress recently.

The Connecticut State Highway Department will expend approximately \$4,000,000 during 1919, according to State Highway Commissioner C. J. Bennett. This will be an approximate increase of 20 per cent over the ordinary expenditure of the department.

There is now available for road construction in Mississippi approximately \$3,000,000, according to State Highway Engineer Xavier A. Kramer. About half of this fund was held over from last year because of scarcity of labor and high prices. It is expected that the entire fund will be spent this year.

County appropriations in Oklahoma for 1919 will amount to about \$3,000,000 to \$4,000,000, according to State Engineer Max L. Cunningham, while the amount to be handled by the state will depend upon the action of the legislature.

Pennsylvania now has sixty-nine projects for road improvement under contract located in thirty-three counties, the amount of money covering the contracts totaling \$5,407,678.77, with a mileage total of 150.52. Federal aid amounts to \$567,360, but this will be applied toward the contracts. Local appropriations plus federal aid total \$2,356,929.01, making the net cost to the state for road improvement \$3,050,749.76. This illustrates the value of meeting federal aid and county appropriations. Types of construction are reinforced and plain concrete, brick water-bound macadam, bituminous concrete, asphaltic block, bituminous macadam.

South Carolina road enthusiasts are to be congratulated for their foresightedness. Although a bond issue cannot be voted in that state until 1920 the legislature has been asked to authorize additional license fees on automobiles, based on a horse power rating. These funds are to be used in preliminary work of plans, surveys and other preparation. Altogether it is planned to build 1,060 miles of hard surface roads and 500 miles of sand and clay roads to connect with every county seat not on main lines.

A recent issue of the American Motorist, published in Washington, D. C., contains a glowing description of the Phantom Canon highway, once the roadbed of the old Florence and Cripple Creek Shortline. Not only is it praised for its magnificent scenic qualities but because of its relation to industrial districts and the historical associations with Cripple Creek, the world's greatest mining camp.

The State of California, which has voted \$33,000,000 for the construction of a highway system totaling approximately 3,000 miles, needs another bond issue of \$10,000,000 to complete the system and build subsidiary roads that the various counties demand. The new bond issue question is now being agitated, although the state highway commission has spent \$23,000,000 from the bonds sold and still has some \$7,000,000 worth of bonds unsold. The first California bond issue was in 1909-1910 for \$18,000,000; the second issue was in 1915-1916 and provided for \$12,000,000 for continuation of work on the system and \$3,000,000 to be spent on a state-counties co-operative basis for important routes.

The Arizona Highway commission, which met recently in Phoenix, passed a resolution calling upon the legislature to submit a bond issue for \$30,000,000 to build a comprehensive system of roads for commercial and other demands, the election to be called especially for this purpose.

The Oregon legislature is humming with road bills this session, chief among the measures up for consideration being a proposition for the submission of a \$10,000,000 bond issue. As the bond limit of the state is \$18,000,000, and there are some \$7,500,000 bonds outstanding, this would be the maximum issue possible to secure.

Among the most important plans suggested are: completion of the Pacific Highway and the Columbia River Highway; a loop around Tillamook; a road from Roseburg to Coos Bay; one from Eugene part way to the Coast; construction of part of the John Day Highway, and opening of the North and South route through central Oregon. A complete readjustment of license fees, imposition of a gasoline tax, a classification of roads to carry heavy traffic, under five-ton trucks, water board macadam and common dirt or gravel roads are suggested. One bill makes it a penitentiary offense to lay a patented road in Oregon.

The State Road Commission of Utah has let the contract for the Ogden-Hooper road to the Strange-McGuire Paving Company of Salt Lake on a bid of \$65,191.70.

County commissioners of Jefferson county, Idaho, held a special election on March 1 to vote on a \$200,000 bond issue for construction of roads and bridges. The election at Genesee, Idaho, for the creation of the Genesee Highway District resulted affirmatively and means the construction of 27 miles of hard surfaced roads this spring.

Road Work and Road Builders the State Over

Bids on the road between Georgetown and Silver Plume were opened on February 24. The work to be done includes reduction of the grade widening of the road.

County Commissioner Fred Catchpole of Pagosa Springs called upon Commissioner T. J. Ehrhart recently to urge the completion of the road from Pagosa to Hama, New Mexico, to give La Plata County an outlet to the south; also improvement of the Wolf Creek Pass road.



Silverton be completed this summer.

County commissioners from all parts of the state are visiting or writing the Highway Commissioner to urge that work on projects or improvements in their counties be started early this spring and pushed through this season. One of these visitors, not a county commissioner, however, was John A. Clay, of the Animas Forks Power company, who urged that the road from Durango to

County commissioners of Park county, Montana, have decided to call a special election immediately to vote on the issuance of \$200,000 worth of bonds for construction of roads and bridges.

Plans for a bridge over the Rio Grande River at Wassons, Mineral County, on the Creede-Wagon Wheel Gap road, has been approved by the highway commission of the state.

E. E. Nichols of Manitou was appointed by Governor Oliver H. Shoup to succeed Leonard E. Curtis as the representative of the Second Road District of Colorado on the State Highway Commission.

Chris Wallrich, county commissioner of Alamosa county, was a visitor at the State Highway Commission offices recently in the interest of protecting the state road from the overflow of the Rio Grande river at Alamosa by construction of a new bridge.

The Highway Commission is pushing ahead rapidly on the surveys for the demonstration hard-surfaced roads authorized in this year's budget, running for distances varying from half-mile to two miles out from the principal centers of population. Surveys for these hard-surfaced roads have been completed at Greeley, Brighton, Fort Morgan and Pueblo. Engineers are now working on the survey at Boulder and work has just been commenced on the bridge over the Platte river at Merino, to give better connection between Wray and Idalia in the northeastern corner of the state.

Tony Monell, county commissioner of Montrose, dropped into the Highway Commission offices last week to urge improvement of the North and South highways from Montrose.

Another visitor was Alexander McCallum of Lincoln county, who asked that the roads North and South through Lincoln county, and that the road through Arriba and South from Limon be improved.

Robert Young, of Walsenburg, former county commissioner of Huerfano, stopped at the Highway offices when in Denver last month, to discuss the road project No. 2, providing for surfacing of the road from the Pueblo County line south to Trinidad.

Montezuma county commissioners have advertised the projects for two bridges in their county, one over the canal east of Dolores and the other in the McElmo canon, west of Cortez. The first is to be a 35-foot span and the latter a 70-foot span.

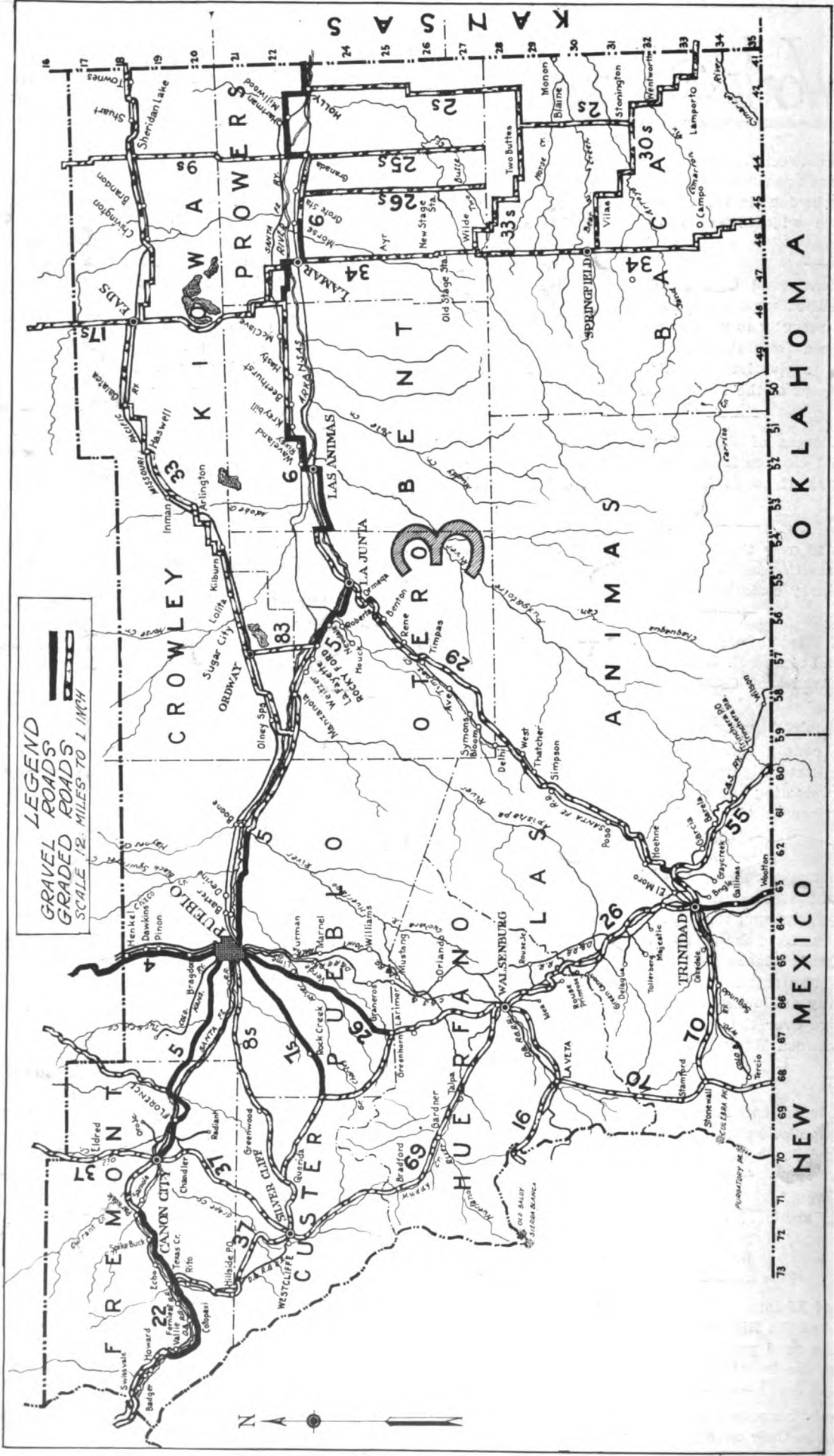
Logan County has been impressed with the needs of reconstruction and has made a road levy this year of 4.21 mills, which will raise \$110,000. Up until four years ago the county road tax had never exceeded one-half of a mill. Arthur W. Hand, county commissioner, was a visitor at the State Highway Commission offices last month and announced that \$50,000 would be expended in the construction of a bridge over the South Platte River at Merino.

State Highway Commissioner T. J. Ehrhart and Chief Engineer J. E. Maloney of the commission inspected two Federal Aid road projects in El Paso county last month, in company with County Commissioners Harry Scholten, Joseph B. Fowler and J. W. Potter; William Bartel, road supervisor, and Clarence O. Ford, county surveyor, with the result that the state officials approved the projects and work will start this spring.

Project No. 1, pertaining to a road from the Allen Road to Husted, and from Monument to Palmer Lake, is virtually approved and only awaits a survey by the county. It will eliminate bad turns, grades and grade crossings. The state highway commission appropriated \$15,750 for this work, and the Federal government a like amount.

The other project was that for the highway over Ute Pass from Cascade through to Green Mountain Falls. This survey will place the road on the east side of the railroad from Cascade to the county line and will eliminate four bridges, and four grade crossings. El Paso will receive \$31,500 from the state and Federal Aid this year, for construction, aside from \$10,000 state funds for repair and construction of county roads, not Federal Aid projects.

"I was present at the preliminary meetings held some years ago to find some beginning of funds for our state highways," says W. A. Insinger, former member of the executive committee of the Colorado Good Roads association, in a recent issue of the Greeley Tribune-Republican. "At that time already the boosters were strongly arguing that this state should borrow, like other progressive states, millions of dollars for highways. Naturally the contractors were talking the loudest. It was the State Highway Commissioner who strenuously opposed the plan, for the time being, on the ground that it would be wiser to start slower and gain more time by study and profit from experience with the already large bond issues, with which other states had already started. His opinion prevailed, the half-mill levy was proposed and was soon ratified by the voters. Colorado went slower and more conservatively than many states; but now the time has come when it can no longer lag behind. No other state, excepting perhaps California (which has already borrowed millions), has so much to gain by developing its resources as a state, on top of the well-known economy of better transportation."



Map showing the gravelled and graded roads in Road District No. 3.

GTET
APR 21 1919



April 1919



COLORADO HIGHWAYS BULLETIN

Colorado to Vote on \$5,000,000
Bond Issue.

Highway Commission Organized
for Year's Work.

State Forests Get \$800,000 This Year.

Digest of Townsend Road Bill.

Issued by the
State Highway Department

COLORADO HIGHWAY OFFICIALS

STATE HIGHWAY COMMISSION

ELMER E. SUMMERS, Chairman, District No. 1, Denver.

FRED J. RADFORD, District No. 3, Trinidad.

FREDERICK GOBLE, Vice-Chairman, District No. 4, Silverton.

E. E. NICHOLS, District No. 2, Manitou.

ROBERT E. NORVELL, District No. 5, Hayden.

T. J. EHRHART, Commissioner.

J. E. MALONEY, Chief Engineer.

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BENT—J. W. Nelson, Las Animas; C. W. Beach, Las Animas; B. T. McClave, McClave; D. E. Heizer, Las Animas; Levi Dumbauld, Las Animas.

BOULDER—Francis Beckwith, Boulder; Arthur J. Boase, Boulder; S. A. Greenwood, Boulder; H. E. Miller, Longmont & Boulder; Guy Miller, Boulder & Nederland.

CHAFFEE—F. A. Bromley, Buena Vista; Howard Sneddon, Salida; O. S. Mason, Buena Vista; J. I. Glenn, Salida; W. L. Philborn, Salida.

CHEYENNE—E. H. Akerly, Cheyenne Wells; D. H. Zuck, Cheyenne Wells; Walter Ramsey, Kit Carson; Anton I. Johnson, Wild Horse; J. W. Shy, Cheyenne Wells.

CLEAR CREEK—Benj. A. Holley, Idaho Springs; C. D. McFadden, Georgetown; W. C. Ives, Idaho Springs; T. W. Cunningham, Georgetown; F. A. Miller, Idaho Springs.

CONEJOS—Bonifacio Gonzales, Magote; Frank E. Thomas, Manassa; W. F. McClure, Antonito; Frank Russell, La Jara; J. C. Cantu, Manassa.

COSTILLA—Amos P. Rodriguez, San Luis; A. H. Martin, San Luis; S. N. Smith, San Luis; T. Mancho, Garcia; W. R. Morris, Ft. Garland.

CROWLEY—J. E. Downey, Ordway; L. W. Walter, Ordway; Wm. Broadbent, Ordway; Frank McNary, Sugar City; J. H. Cowden, Olney Springs.

CUSTER—L. H. Schofield, Westcliffe; August Koppe, Silver Cliff; Harry Kettle, Westcliffe; Chas. A. Barton, Wetmore; F. S. Canda, Westcliffe.

DELTA—H. K. Gibbs, Delta; Oliver B. Cook, Delta; J. E. Beckley, Delta; Thomas J. Harshman, Cory; Charles T. Rule, Paonia.

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DOLORES—Thos. C. Young, Rico; A. E. Arms, Rico; G. L. Garren, Rico; Chas. Engel, Rico; R. Bradfield, Lewis.

DOUGLAS—Harry Jones, Castle Rock; D. N. Stewart, Castle Rock; S. H. Stream, Sedalia; Ed. G. Seldensticker, Castle Rock; Jas. P. McInroy, Larkspur.

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ELBERT—Frank D. Hart, Kiowa; C. A. Mathews, Elbert; C. A. Huff, Simla; Fred L. Albin, Kiowa; Wm. J. Park, Kutch.

EL PASO—E. A. Jackson, Colorado Springs; C. O. Ford, Colorado Springs; J. W. Potter, Fountain; Harry A. Scholton, Colorado Springs; J. B. Fowler, Colorado Springs.

FREMONT—Jonathan Seaman, Canon City; James Buntin, Canon City; J. V. McCandless, Florence; G. V. Hodgkin, Canon City; Jas. Belknap, Hillside.

NOTE—In the appended list of county officials the first name in each county is that of the county clerk, the second name is that of the county surveyor, and the last three names are those of county commissioners.

GARFIELD—Carleton L. Hubbard, Glenwood Springs; P. C. Thurmond, Glenwood Springs; L. F. Grace, Glenwood Springs; R. P. Coulter, New Castle; Geo. Newton, De Beque.

GILPIN—Frank G. Moody, Central City; S. A. Rank, Central City; Joseph Borzago, Black Hawk; Neil McKay, Central City; R. I. Hughes, Russell Gulch.

GRAND—H. J. Harrison, Hot Sulphur Springs; F. I. Huntington, Hot Sulphur Springs; Simon Olson, Parshall; J. H. Cather, Kremmling; J. B. Stevens, Fraser.

GUNNISON—C. C. McWilliams, Gunnison; J. H. Robinson, Gunnison; W. H. Whalen, Crested Butte; Geo. L. Miller, Gunnison; C. L. McDonald, Gunnison.

HINSDALE—L. E. Shull, Lake City; E. L. Defenbaugh, Lake City; Jno. C. Gavin, Lake City; E. W. Wiley, Lake City; E. W. Soderholm, Lake City.

HUERFANO—J. G. Archuleta, Red Wing; J. O. Francisco, La Veta; Walter Hamilton, La Veta; J. T. Trujillo, Red Wing; Chas. E. Furphy, Walsenburg.

JACKSON—E. N. Butler, Walden; M. C. Ward, Walden; A. J. Monroe, Walden; W. G. Mellen, Coalmont; Chas. L. P. Winscom, Walden.

JEFFERSON—Frank N. Felch, Golden; Chester A. Lytle, Critchell; J. R. Cruse, Mt. Morrison; Gus A. Johnson, Golden; R. L. Downes, Evergreen.

KIOWA—Ed. M. Low, Eads; C. E. Bell, Eads; C. C. Wolever, Eads; Wurt Bailey, Towner; Ed. Houston, Arlington.

KIT CARSON—Miss Chlo S. Judy, Burlington; D. D. Buck, Flagler; I. D. Messinger, Stratton; A. L. Anderson, Burlington; J. O. Hendricks, Selbert.

LAKE—John Gregory, Leadville; Fred J. McNair, Leadville; B. H. Martin, Leadville; Dan Colahan, Leadville; Geo. Bennett, Leadville.

LA PLATA—Helen Galloway, Durango; W. H. Wigglesworth, Durango; Ole M. Lee, Durango; Geo. Olbert, Oxford; Jacob Fritz, Durango.

LARIMER—G. R. Cushing, Ft. Collins; James G. Edwards, Ft. Collins; J. M. Graham, Loveland; Harris Akin, Ft. Collins; C. M. Garrett, Laporte.

LAS ANIMAS—Juan B. Romero, Trinidad; Hal Barnes, Trinidad; A. G. Prosser, Trinidad; J. J. Cordova, Aguilar; Robert C. Scott, Trinidad.

LINCOLN—Henry A. Johnson, Genoa; J. W. Pershing, Limon; Alex McCallum, Arriba; W. M. Smith, Rush; Ed. Riekenberg, Hugo.

LOGAN—Mabel E. Whiteley, Sterling; John W. Black, Sterling; Arthur W. Hand, Sterling; C. M. Morris, Fleming; W. E. Henning, Peetz.

MESA—Chas. S. Jones, Grand Junction; Frank R. Hall, Grand Junction; Gus J. Johnson, Grand Junction; Geo. M. Masters, Mesa; D. Gover Rice, Grand Junction.

MINERAL—Wm. G. Messinger, Creede; S. B. Collins, Creede; Chas. H. Lees, Creede; James Seward, Creede; A. M. Collins, Creede.

MOFFAT—Mrs. L. O. Haughey, Craig; W. P. Finley, Craig; Thomas A. Forkner, Craig; R. S. Hamilton, Hamilton; R. B. Overholt, Maybell.

MONTEZUMA—Samuel M. Burke, Cortez; Geo. Mills, Mancos; R. B. Dunham, Dolores; Chas. B. Kelly, Mancos; W. L. Myler, Dolores.

MONTROSE—T. W. Monell, Montrose; W. H. Fleming, Montrose; John W. Lamb, Montrose; Howard P. Steele, Montrose; Cory S. Heath, Montrose.

MORGAN—A. H. Asmus, Ft. Morgan; J. A. Gilbertson, Brush; Jas. Hurley, Ft. Morgan; J. K. Samples, Brush; J. H. Osborn, Wiggins.

OTERO—Oran Walker, La Junta; Mark Denson, Rocky Ford; W. F. Green, Rocky Ford; J. N. Johnston, Manzanola; Geo. Barr, La Junta.

OURAY—R. Whinnerah, Ouray; J. H. Doran, Ouray; W. S. Rose, Ridgway; Geo. B. Croft, Ouray.

PARK—Harry L. Moyer, Fairplay; W. H. Powless, Alma; G. S. Singleton, Shawnee; J. F. Rhodes, Fairplay; J. Tol. Witcher, Howbert.

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PUEBLO—Wm. Barber, Pueblo; C. A. Reese, Pueblo; Geo. Herrington, Pueblo; J. M. Sare, Pueblo; J. C. Harbour, Pueblo.

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RIO GRANDE—H. G. Trapp, Del Norte; W. W. Reilly, Monte Vista; August Weiss, Del Norte; W. W. Wright, Monte Vista; M. S. Woods, Monte Vista.

ROUTT—J. D. Crawford, Steamboat Springs; C. W. Harkness, Hayden; Claude J. Smith, Clark; Wm. Scheer, Oak Creek; Henry J. Summer, Hayden.

SAGUACHE—Birt Clare, Saguache; A. H. Smith, Saguache; Geo. Woodard, Saguache; A. V. Shippey, Villa Grove; Adam Deitrich, Center.

SAN JUAN—C. E. Dresback, Silverton; A. W. Harrison, Silverton; Gail Munyon, Silverton; J. Ernest Shaw, Silverton; Edward Meyer, Silverton.

SAN MIGUEL—Lillian C. Kenyon, Telluride; Ben W. Purdy, Telluride; T. B. McMahon, Telluride; A. T. Woods, Placerville; J. R. Galloway, Norwood.

SEDGWICK—Nellie E. Nichols, Sedgwick; E. C. Hamilton, Sedgwick; H. H. Hodges, Julesburg; Frank Nagel, Julesburg; J. G. Mowbray, Sedgwick.

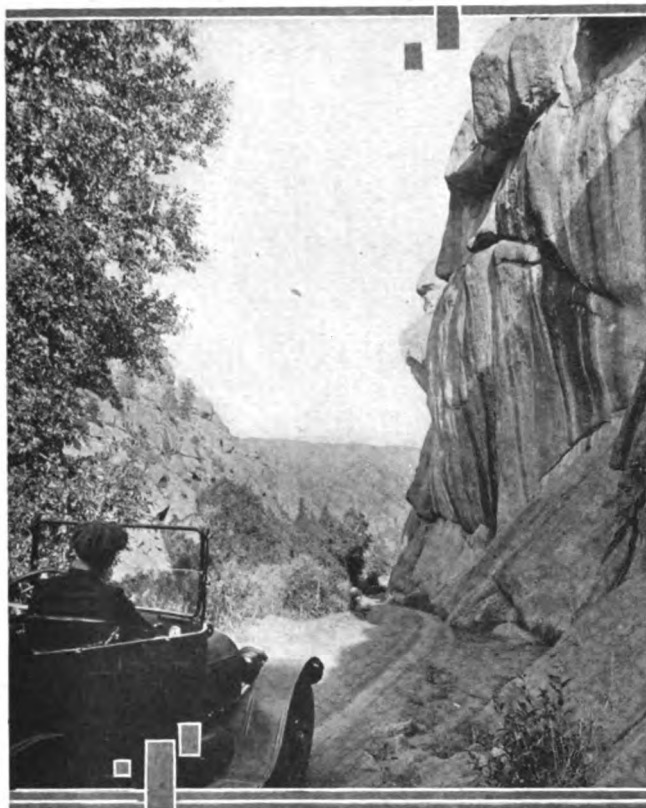
SUMMIT—Geo. F. Forman, Breckenridge; James D. Galloway, Breckenridge; A. Lindstrom, Dillon; W. H. Hampton, Frawley; Ell Fletcher, Breckenridge.

TELLER—J. H. White, Victor; E. P. Arthur, Jr., Cripple Creek; T. J. Wicks, Cripple Creek; Tom Foster, Woodland Park; I. N. Riley, Victor.

WASHINGTON—L. Roy Cummings, Akron; Elbert Lewis, Akron; Homer Evans, Akron; R. M. Buckmaster, Abbott; E. A. Lewis, Burdett.

WELD—Chas. E. Littell, Greeley; L. L. Stimson, Greeley; A. F. Peters, Mead; T. Elmer Rowe, Greeley; J. W. Birkle, Platteville.

YUMA—John Adcock, Wray; A. C. Cary, Wray; Harry F. Strangways, Wray; H. W. Jackson, Yuma; Alex. Shaw, Wray.



Moslem Gate, entrance to the South St. Vrain, an exceptional fishing stream in Larimer County.

CONTENTS

	Page
Legislature Passes \$5,000,000 Bond Bill.....	5
Highway Commission is Reorganized.....	6
Ocean-to-Ocean Cement Highways Urged.....	7
Million and Quarter for Colorado-Wyoming National Forest Roads This Year.....	8
Over the Hills to Health in Colorado.....	9
Digest of the Townsend Federal Highway Bill.....	10
Editorial	12
County Levies	12
Motor Transportation Spreads Over Nation.....	13
Typical Sections of Surfaced Roads—J. E. Maloney.....	14
How Much Do You Spend for Gasoline in Your County?.....	15
New Commissioner Good Road Advocate—J. G. Hilliard.....	17
Road Work and Road Builders the State Over.....	18
Sign Posts Along the National Highway.....	19

COLORADO HIGHWAYS BULLETIN

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by the



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Department

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With the approval of the Colorado State Auditing Board.

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Owing to the necessarily limited edition of this publication it will be impossible to distribute it free to any persons or institutions other than state and county officials actually engaged in the planning or construction of highways, instructors in highway engineering, newspapers and periodicals and civic associations. Others desiring to obtain Colorado Highways can do so by sending 10 cents for each number desired. Associations desiring to distribute the magazine can obtain it at cost in lots of from 500 copies up.

Subscription Price, \$1.00 per year.



On the edge of the abyss. On the Blue Mesa in Gunnison County, one thousand feet above the magnificent Blue River



COLORADO HIGHWAYS BULLETIN

VOL. II

APRIL, 1919

NO. 4

Legislature Passes \$5,000,000 Bond Bill

Half Mill Levy, Gasoline and Motor License Laws Adopted

A bond issue proposition for the issuance of \$5,000,000 in bonds, an additional one-half mill levy for road purposes, an automobile license bill, a gasoline tax and segregation of a portion of the inheritance tax for road purposes, were the results of the legislative session in the interest of better roads this year in Colorado.

The proposition for a \$20,000,000 bond issue failed of passage, much to the regret of the better roads advocates, who firmly believe that Colorado is far behind many other states in her appreciation of the road situation, and also has failed to take proper action to meet the requirements of the federal aid program. For illustration, the state's apportionment of Federal Aid funds for 1919 is in round figures, \$867,000. Probably half-a-million dollars, or more, will be available for the newly created sources of revenue to meet this appropriation. During 1920 there will be available for Colorado from the federal government \$1,600,000; and during 1921 an additional \$1,700,000. The bond issue cannot be made available until 1921, as the people will not vote upon the proposition until the fall of 1920.

To meet these funds satisfactorily the additional one-half mill levy, the gasoline tax, inheritance tax and automobile license bills will have to yield more than the state highway commission can conservatively figure upon. However, the commission, by adopting a federal aid program each year for the next year or two, will be able to keep the government appropriations alive, so that the money will not lapse back into a common fund. In this way Colorado will not lose the money and probably will be able to fulfill all the conditions imposed upon the state by the Federal Aid act. The highway commission will meet again on April 14, and this subject will then come before that body for action. In the meantime the highway commissioner and chief engineer of the commission are busily at work laying

out a program for federal aid projects, which will be submitted to the commission for its approval or refection.

A complete digest of the laws passed by the legislature will be printed in the succeeding issue of the Colorado Highways Bulletin, but a brief summary of their provisions may be given at this time.

In passing the legislature certain restrictions were imposed upon the highway commission in the matter of the bond bill and the gasoline tax. The bill for submission of the bond issue provides that one-half of the issues shall be reserved to meet federal aid appropriations and one-half or \$2,500,000, shall be distributed by the commission among the various counties of the state, according to the road mileage in each county. If passed by the people, the money would not be available until 1921, but the highway commission may, if it so desires, adopt a plan of expenditure so that the people may know for what they are voting at the next general election in 1920.

The commission already had a one-mill levy for road purposes, but this is regarded as no more than sufficient to meet the maintenance and repair cost of the existing system of state roads, some 7,000 miles in all.

The second half-mill levy has no restrictions upon it, and may be applied at the discretion of the commission. The amount raised by a half-mill levy in Colorado is approximately \$700,000.

The gasoline tax bill provides that a tax of one cent per gallon shall be paid on all gasoline used by motor vehicles operating upon the roads of the state. This excludes motor tractors and other motorized apparatus used on the farm for strictly agricultural purposes.

The bill provides that one-half of the fund so raised shall be distributed among the counties of the state on a mileage basis.

According to the legislative committee appointed by the Good Roads association to further road measures, the gasoline tax will raise approximately \$625,000 per year, but it is not expected that more than \$300,000 will be raised from this source during the remainder of 1919.

The motor license law provides for a license fee on touring cars of one-half per cent of the cost of any vehicle weighing more than 1,000 pounds, and for automobiles weighing less than this amount the tax is a flat \$5 per year.

Trucks are handled upon a different system. A one-ton truck is required to pay a license of \$10 a year; two-ton truck, \$17.50 a year; three-ton truck, \$25 a year; four-ton truck, \$37.50 per year; five-ton truck, \$50 per year. An additional charge of \$25 per year is made for each additional ton, but no trucks with a carrying capacity of

more than ten tons will be allowed on the roads at all.

The inheritance tax bill provides that all money raised by the state inheritance tax, after \$200,000 has been set aside for general revenue, and after the expenses of administration have been paid, shall go to the highway commission, one-half to be expended at the pleasure of the commission and one-half to be distributed among the counties on the basis already mentioned.

The highway commission, however, will be reimbursed this year to the amount of \$200,000 for a loan made from its funds to the state capitol building fund, so that it will be seen that the estimate of one-half million, available to meet the \$867,000 Federal Aid allotments for this year, is a conservative one and possibly the commission will be able to meet the entire amount.

Highway Commission Is Reorganized

E. E. Sommers, District No. 1, Named Chairman

The State Highway Commission, which met on April 1, inaugurated a new custom that is expected to keep the commissioners of the various districts in more direct and frequent touch with their constituents. Instead of meeting quarterly as heretofore the commissioners will meet on the second Monday of each month because of the increased business of the commission. All petitions, remonstrances and agreements are to be presented at these meetings through the members of the commission, and all petitions presented through the several boards of county commissioners, or commissioner, or through a member of the State Highway Commission or the highway commissioner.

Two new members were present, Mr. E. E. Nichols of Manitou and Mr. Robert E. Norvell of Hayden. The commission reorganized, Mr. E. E. Sommers of Denver, representing the first road district, being chosen chairman, and Mr. Frederick Goble of Trinidad, being elected vice chairman. N. A. Ballou was appointed secretary of the commission.

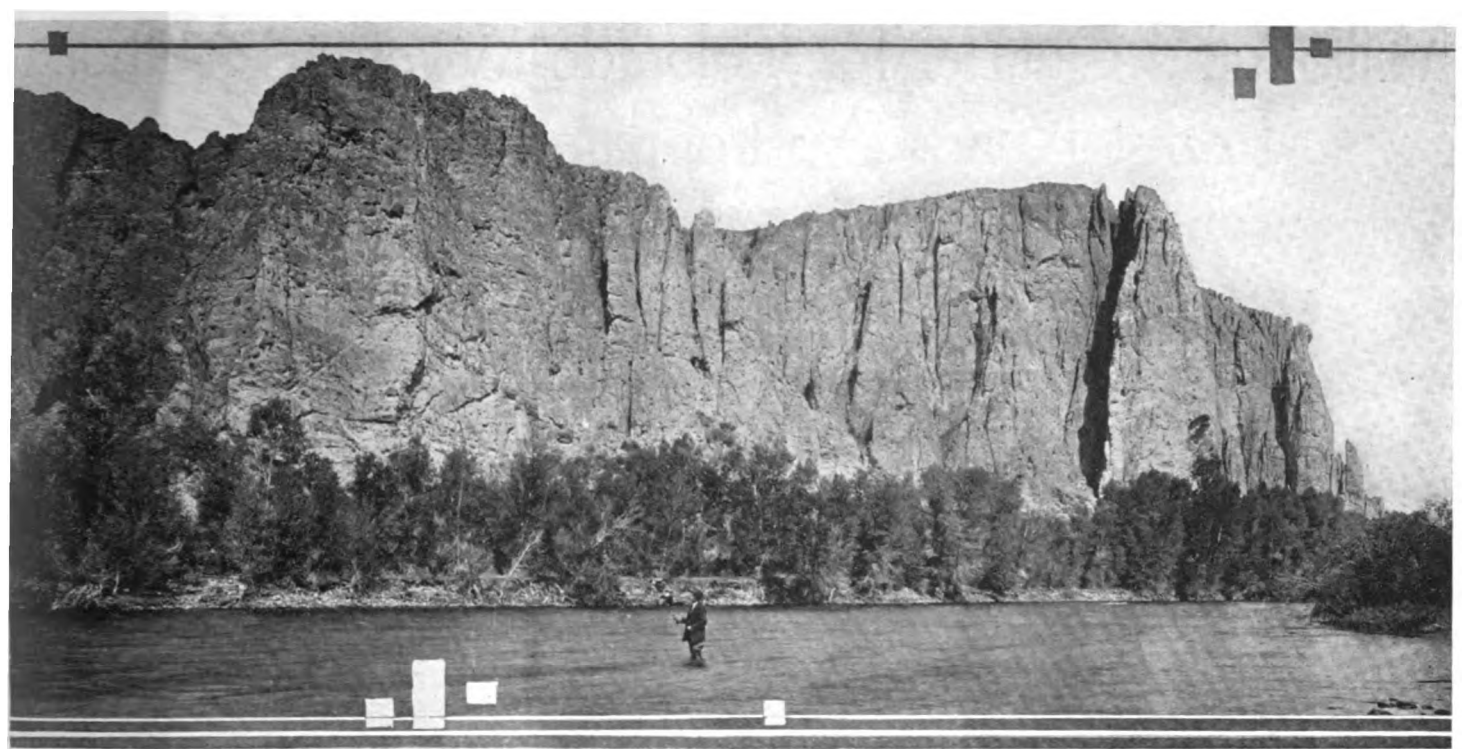
Representatives of the United States Forestry Service appeared before the commission to notify it that the forestry service projects for the Rabbit Ears Pass road, the Sedalia road, the Decker Springs road, the Silverton-Durango road and the Monarch Pass road were ready for the letting of contracts. The commission voted the following sums for work on forestry projects, as follows: Bardine-Redstone road, \$2,250; Red Mountain road, \$1,050; Hard scabble project, \$1,250. Twenty-two counties have failed to send in their recommendations for their state apportionments and the secretary was directed to notify the county commissioners of these districts to send in these recommendations so that the commission may take action at the next meeting, April 14.

New Roads Official Named

Thomas H. MacDonald, Chief Engineer of the Iowa State Highway Commission, has been appointed by the Secretary of Agriculture as Engineer in immediate charge of the work under the Federal Aid Road Act, which provides for co-operation between the states and the federal government in the construction and improvement of roads. Mr. MacDonald will assume his new duties as soon as he can close up his work in Iowa. In the meantime he will continue to keep in close touch with the Federal Aid Road work of the department, as he has done during the past two or three months. Steps already have been taken to expedite the resumption and extension of highway construction under the terms of the federal law, as amended by the Post Office Appropriation Act, and nothing will be omitted to facilitate the vigorous prosecution of the work. The regulations have been carefully revised in the light of past experience and of suggestions offered by the State Highway Departments, the standards of plans, specifications and estimates have been modified to meet special conditions existing in some of the states, and other changes in practices and procedure have been made, all with the definite object of speeding up the work.

National Highway System for Japan

Mr. Makino and Mr. Zhalakeyama, engineers, sent over to this country by the Japanese Government to make a study of road administration and construction, were in consultation with the Highway Industries Association on March 15th, seeking information as to the establishment of a national highway system and the methods of construction and maintenance of roads. Traffic has become very much congested in Japan, the railroads being unable to handle the large volume of products necessary to be moved.



Under the imposing Palisades of the Gunnison River, Gunnison County. A fishing scene on the greatest of all Colorado trout streams, which draws sportsmen from all parts of the country.

A NUMBER of practical suggestions, intended to solve the reconstruction problems now before the country, were made at the governors' and mayors' conference, held in the White House on March 3 and 4, at the invitation of President Wilson, although, generally speaking, the conference was without definite, concrete results. Among the resolutions made and referred to a committee for further consideration, however, was one by Lieutenant-Governor George Stephan of Colorado, who proposed that the federal government immediately should begin construction of two ocean-to-ocean cement highways, as the most practicable way in which to furnish labor to all industries. In this the government would have the co-operation of the states, which would all improve the lateral roads radiating from this system. The suggestion is of so much interest to the nation's road builders that Governor Stephan's speech is reprinted in full in the Bulletin. The speech is as follows:

"As the Government has to some extent outlined a policy, it seems to me the most important matters to be considered are:

"First, are the various states and municipalities co-operating with the Federal Government in carrying out its policies? And second, has the Federal Government anticipated the requirements of the various states and municipalities?

Ocean-to-Ocean Cement Highways Are Urged

the conditions and be prepared to render the necessary assistance.

"So far as the State of Colorado is concerned, the question of unemployed labor is not a serious one, as we have been able to furnish employment to the returning soldiers. I feel, however, that we are confronted by a much more serious problem, being that of the spirit of unrest caused by the Bolshevik propaganda and tendencies, and, as a matter of fact, I consider this the greatest menace to civilization and one which must be confronted and overcome during our period of reconstruction.

"Colorado is furnishing employment to men by resuming work on all public improvements, such as public buildings of every nature, streets, sewers, roads, etc., and if the constitution of the State of Colorado permitted us to aid railroads, we would undoubtedly assist some of our struggling roads by giving them financial assistance to enable them in the construction of needed extensions, etc.

"Our Legislature is in session and there are bills now pending, providing for money to be used in the further construction of roads. Among these measures is one providing for a tax of one cent per gallon on gasoline; one

(Continued on page 16.)

Million-and-Quarter for Colorado-Wyoming National Forest Roads Appropriated This Year

SECRETARY Houston's approval of the National Forest road building program for Colorado, Wyoming and South Dakota, involving the expenditure of a million and a quarter dollars this season, is announced by the Denver office of the U. S. Forest Service. Of this total, which includes co-operative funds subscribed by states and counties, \$800,000 will be spent in the National Forests of Colorado; \$320,000 in Wyoming, and \$93,000 in the Black Hills of South Dakota.

This fund is the largest ever appropriated for road work in the National Forests of the Rocky Mountain district, and will do much toward opening up inaccessible localities, and it makes it easier to protect the forests from fire. Recreation uses of the National Forest playgrounds will also be stimulated.

The principal road projects to be constructed this season, together with the funds allotted, are as follows:

COLORADO: Durango-Silverton, \$350,500; Rabbit Ears Pass, \$16,800; Monarch Pass, \$173,000; Sedalia-Deckers Cut-off, 39,500; Nederland-Ward, \$45,700.

WYOMING: Wind River, \$154,000; Buffalo-Tensleep, \$105,000.

BLACK HILLS, SOUTH DAKOTA: Deadwood-Hot Springs, \$72,500.

Over \$125,000 will also be spent by the Forest Service on minor road and trail projects in the various states.

Road work on all projects, which will be in charge of the Bureau of Public Roads, will start as soon as weather conditions permit. Honorably discharged soldiers, sailors and marines will be given preference in securing the required labor.

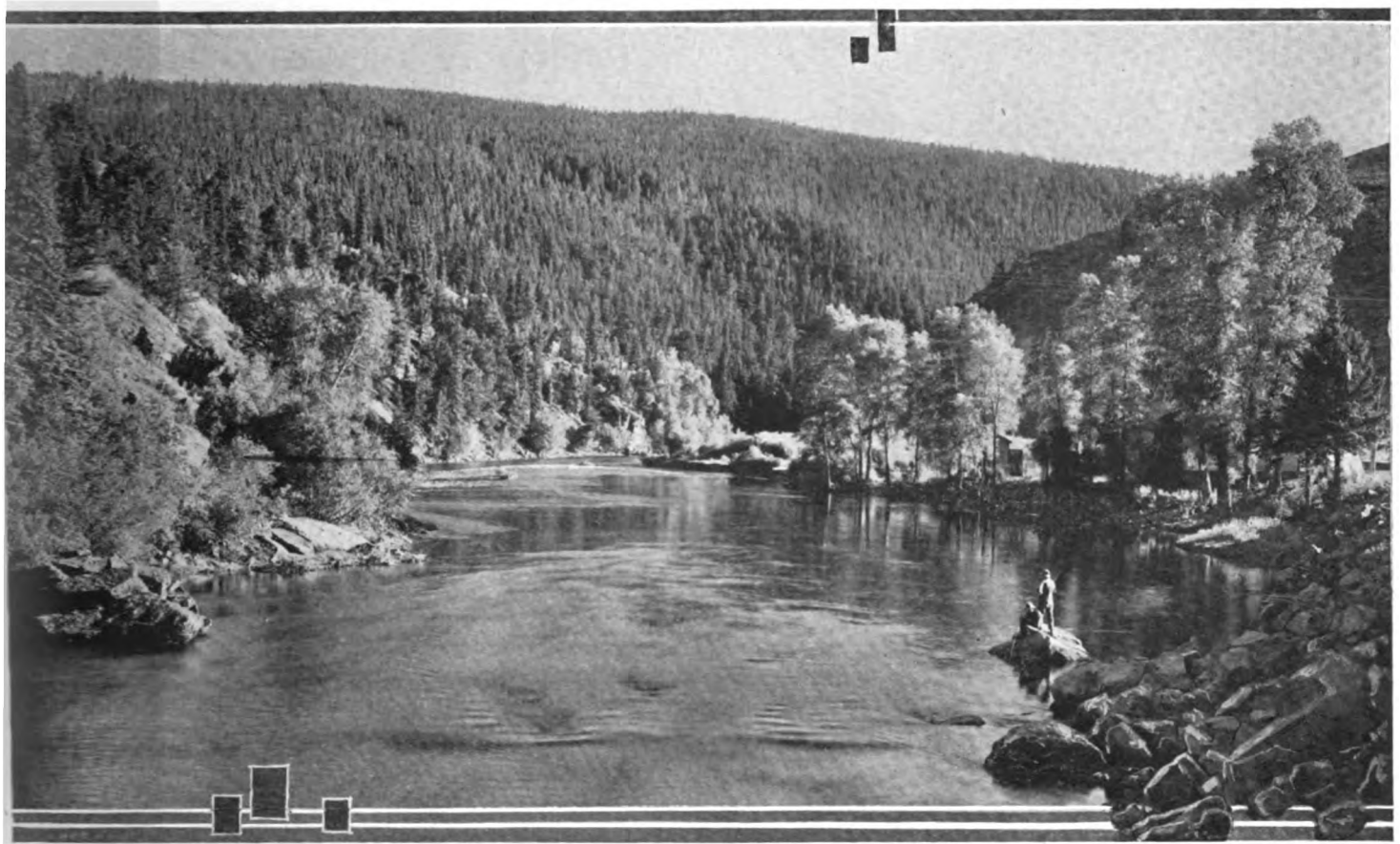
FOREST SERVICE ROAD PROGRAM (Season of 1919)

Project	Amount to be Expended COLORADO			Remarks
	Forest Service	Co-operators	Total	
Durango-Silverton Durango National Forest	\$242,700	\$107,800 (State)	\$350,000	Const. 46 mi. 4 mi. built by Forest Service in 1918.
Rabbit Ears Pass Routt National Forest	\$ 13,500	\$ 3,300 (State)	\$ 16,800	Improvement on 6 mi. from Benton Saddle to Divide. 3 mi. built by Forest Service in 1918.
Sedalia-Deckers Cut-off Pike National Forest	\$ 39,500	\$	\$ 39,500	Project to be completed. 7½ mi. to be constructed on Sugar Creek and Jarr Canyon section to be improved.
Monarch Pass Cochetopa National Forest	\$134,000	\$ 39,000 (State)	\$173,000	Construction of 27¾ mi. from Sargents to Maysville.
Nederland-Ward Colorado National Forest	\$ 36,700	\$ 9,000 (Boulder County)	\$ 45,700	Construction 11 miles, Lakewood to Ward.
Mt. Evans Pike National Forest				It is proposed to co-operate with the City of Denver in constructing a portion of the Mt. Evans road.

In addition to the above projects, \$70,000 will be spent on Minor Road and Trail Projects.

Location Surveys will be made on the following projects during the 1919 season: Bardine-Redstone, 30 mi.; Red Mountain 9½ mi., Hardscrabble, 18 mi.

The total road program for Colorado calls for the expenditure of \$800,000 this year, of which amount \$180,000 will be co-operative funds furnished by State and County officials.



No state in the union can equal Colorado in the variety of its trout streams. Whipping the Grand River, near Hot Sulphur Springs, for speckled beauties.

Over the Hills to Health in Colorado

“Say, Nett, I’m all in!”

“I know, John, you have overworked on your increased war acreage and no help. I, too, am at the end of my physical endurance.”

“Yes, Nett, if you had not made a man of yourself, besides the cook, it would have been impossible to have saved that wheat.”

This story opens on a farm near Lincoln, Nebraska, one evening about the 15th of July, 1918.

The Harveys had done their bit to increase production and felt tired and worn out after the extra effort to save the wheat crop.

“Did we get any mail today, Nett?”

“Yes, a letter from Brother Jim. He says it has been awful hot in Oklahoma for the past week and that Mary and he are going somewhere soon to get away from the worry of it all for a month. Mary isn’t any too well and Bobby has been sick all summer. Here’s something from Alice Ward, Boulder, Colorado. You know, John, she is out there for her health—The Colorado Highways Bulletin. Oh, my, look at that cover picture—such an immense mountain with evergreen timber half way up, and the snow on top. Doesn’t it look cool and inviting? Then a mountain river, and a road leading right up that

canon into the spruce and pine. Say, wouldn’t you like to be there right now? I’ll bet there’s fish in that creek.”

“Here’s a story about a trip in an automobile and a whole bunch of scenery and road pictures. Do you suppose there’s that many out there? I guess they like to brag on themselves.”

“By George, Nett, if it wasn’t so blamed far—how far is it, anyhow? Why here’s a table giving distances from Tulsa to Pueblo, Kansas City to Colorado Springs, from Omaha to Denver—and it’s 120 miles from Omaha to Lincoln, that is 410 miles to Denver, how long would it take to drive old ‘Betsy’ over there? Why, say, Nett, we can drive twenty miles an hour if the roads are good, say eighteen miles for an average eight hours a day, for we’d want to take it easy—that would be 144 miles a day. By Jove, we could be there in three days. I wonder how much further it is to that mountain. Why, here it is, right here—157 miles from Denver. That would be another day—only four days to that snow and those pines.”

“Let’s go, John.”

“I don’t see how we can, Nett.”

“Oh, yes we can. You can have everything taken care of, except the beets and corn, in ten days, and we can get ready and leave home the first of August. If Mutt

(Continued on page 16.)



A view of the historical mining town of Silverton, San Juan County, nestling at the foot of Sultan mountain.

Digest of the Townsend Federal Highway Bill

THE most important good roads legislation that will come before the next Congress of the United States is the Townsend bill for the creation of a Federal Highway Commission. This bill, which was introduced during the closing days of the Sixty-fifth Congress, embodies the suggestions of the Chicago Road Congress held last year and will have the support of the leading road and automobile associations of the United States at the next session. Senator Townsend will be the chairman of the Senate Committee on Postoffice and Post Roads at that time, and the bill stands every chance of becoming a law.

The purpose of the bill is stated in Section 1 as follows: "To provide a connected system of main highways adequate to sustain the demands of interstate commerce, to provide adequate roads for the transportation of United States mails and parcel post and to provide for the common defense and promote the general welfare of the people of the United States."

The bill provides for a Federal Highway Commission, to be appointed by the President, by and with the advice and consent of the Senate, each to receive a salary of \$10,000 per year, and serve, after the initial term, for seven years. Commissioners are to be chosen from

the different geographical sections of the United States, and shall choose their own chairman from their membership.

The Commission is given power to employ a chief engineer, engineers, special experts, and such clerks as it may find necessary. The Commission also is given authority to select the highways to be comprised in the national highway system, and to determine the order in which such highways shall be constructed, reconstructed and improved. It shall request state highway departments to recommend routes to be followed in their respective states.

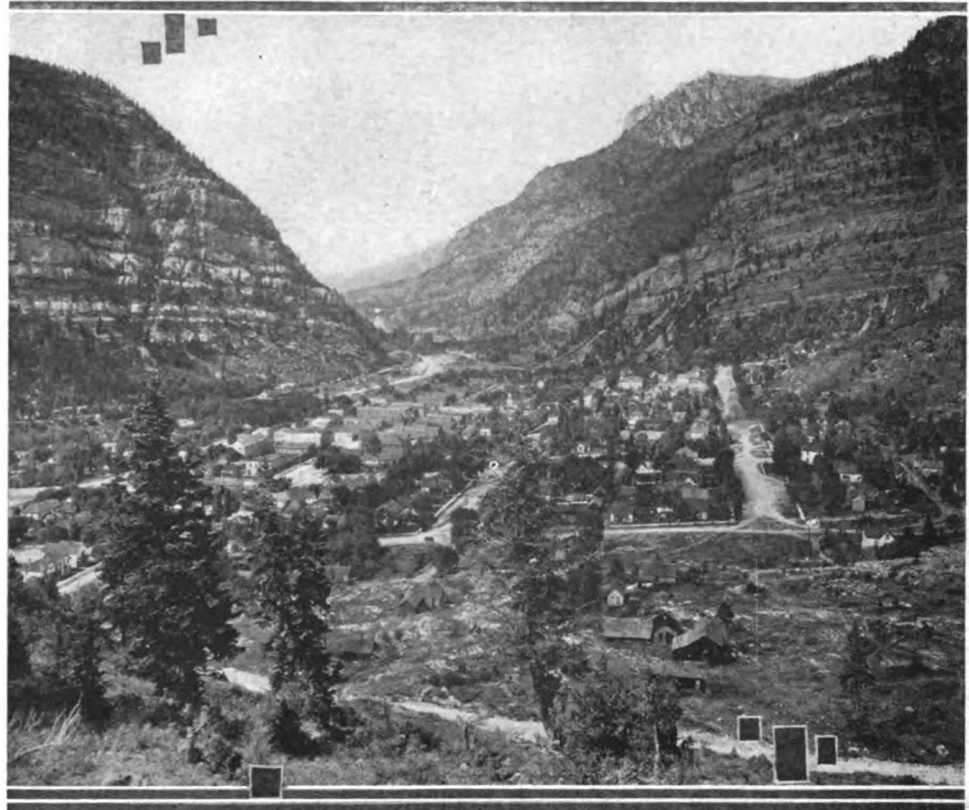
The national highway system shall not include any highway in a place having a population, as shown by the latest available Federal census, of five thousand or more, except that portion of any such highway along which the houses average more than two hundred feet apart. The Commission is also given full power to determine the types of construction, and to control the making of surveys and preparation of plans. Only such durable types and adequate widths of surface shall be adopted for any highway as will effectively meet the traffic conditions thereon, and the probable future traffic needs. The Secretary of War may turn over to the commission, at his discretion, any equipment suitable for its needs.

No money may be expended in any state under the federal act until its legislature shall have assented to the



Human ant hills, left by the seekers for gold at Victor, Teller County.

provisions of the act, or until the governor, during an interim, shall have given his assent. The states also are requested as a condition present to the construction of any such highways to furnish to the United States without any expense to it the right of way therefor, not less than sixty feet in width. The bill provides for the improvement, maintenance and administration of the national highway system at the expense of the United States, except as to state police powers, and the commission is authorized to prescribe regulations governing the use of the highways. Violation of these regulations may be punished by a fine not more than \$1,000 nor imprisonment for more than one year, or both. The act is not to effect jurisdiction of the state, either civil or criminal, over persons and property upon such highways, except so far as the regulations of their use is concerned.



Ringed by the giants of the range, the little mining town of Ouray, as seen from the Silverton road.

The duty is imposed upon the Commission to ascertain by experiment and collection of data on new developments in highway transportation, construction and maintenance, and to publish the same for the benefit of the people at large. It shall be the further duty of the Commission to take over and perform all duties, powers, functions and other obligations of all federal agencies having jurisdiction and control of highway and experimental road work, and of federal agencies of educational and investigative character relating to highway

transportation, except those used solely for military or naval purposes.

The bill makes an appropriation of \$50,000,000, available July 1, 1919; \$75,000,000 beginning July 1, 1920, and \$100,000,000 for each of the three succeeding fiscal years; in all \$425,000,000, which shall be available until expended. These amounts also may be used for the erection and maintaining of buildings, operation of housing and subsistence facilities. The commission is authorized to purchase, lease, rent, operate and maintain all modern and transportation facilities necessary.

Further power is given the Commission to issue permits, licenses and franchises, for the use of any portion of the right of way, and it may regulate payment from the beneficiaries thereof.

Distribution of the federal appropriation is authorized by the bill on the following basis: One-third in the ratio which the area of each state bears to the area of all the states; one-third in the ratio to the population each state bears to the total population of all the states as shown by the latest federal census; one-third in the ratio which the highway mileage of each state bears to the total mileage of all the states as shown by the official bulletin issued by the Secretary of Agriculture for 1914; provided, that if any state desires immediately to improve any section of the national highway within the state, designated by the commission, the commission may enter into an agreement with the state highway department of such state to finance the construction or reconstruction of said highway or section thereof; provided, however, that the amount so advanced

(Continued on page 16.)



A view of the greatest mining camp in the world, Cripple Creek, Teller County,



A Step Forward

Although Colorado better roads advocates were disappointed in the failure of the state legislature to submit the \$20,000,000 bond issue proposition to a vote of the people they are finding considerable consolation in a comparison of the probable results to be obtained during the next three years, with those obtained in the state during the last fifteen years.

Including federal aid money, more funds will be spent on Colorado roads during the three years now opening than has been spent by the state highway commission and all counties together since 1906. This is encouraging, for it will send motor visitors to sections of Colorado heretofore untouched by them. Tourist travel from the East has flowed westward to the Rocky Mountains and there expended its force. The Rocky Mountain National Park, the regions around Denver and Colorado Springs have received the greatest benefits from this great industry, and perhaps, for that reason, members of the legislature from outlying districts believed that a \$5,000,000 bond issue would be sufficient. The expenditure of this money and additional funds awarded the state highway commission, however, will serve to lead the visitors into all sections of the state and convince all sections of the value of better roads.

More than any other state in the union Colorado needs a thorough, modern road system. The more roads that are built the more visitors will come, for, from a tourist standpoint, Colorado has the greatest tributary territory of any state in the country. No other state is located so conveniently to the center of population. Some persons regard the tourist as a transitory visitor of little real value to a state, but this is an entirely erroneous attitude. Not only does the tourist benefit the cities where he may stop, but he creates a better market for the farmer, by increasing the demand for food products. Furthermore, of the millions who come to the state to enjoy its climate and scenery, hundreds and thousands will become so charmed with it that they will locate here permanently.

State Engineer Max L. Cunningham advises that Oklahoma is planning at present the issue of \$50,000,000 for building hard surfaced roads. A law calling for this has passed each House, but they are different in form and it will be necessary for the two houses to get together before a definite statement can be given.

COUNTY VALUATION AND ROAD LEVY.

County	Assessed Valuation	County Road Levy (Mills)	County Road Fund
Adams	\$ 28,473,925.00	2.0	\$ 56,940.00
Alamosa	8,544,005.00	1.75	14,952.00
Arapahoe	19,420,432.00	1.4	27,188.60
Archuleta	5,276,227.00	2.5	13,190.56
Baca	7,512,356.00	1.0	7,512.36
Bent	12,127,275.00	2.5	30,318.19
Boulder	44,153,000.00	2.4	106,570.34
Chaffee	11,088,055.00	1.75	19,474.10
Cheyenne	11,614,995.00	1.45	16,945.74
Clear Creek	5,561,650.00	5.5	30,627.98
Conejos	9,741,958.00	3.0	29,225.87
Costilla	5,700,687.00	3.5	19,952.40
Crowley	9,532,360.00	1.1	10,485.60
Custer	2,552,531.00	2.5	6,381.33
Delta	16,535,150.00	2.4	39,684.36
Denver	348,055,410.00 (To State)	5.5	174,027.71
Dolores	1,774,125.00	2.0	3,548.00
Douglas	11,486,720.00	2.6	29,865.47
Eagle	7,610,319.00	4.01	31,278.41
Elbert	15,246,642.00	3.5	53,441.31
El Paso	67,066,460.00	1.5	100,614.69
Fremont	20,001,690.00	2.5	50,005.23
Garfield	19,341,985.00	5.0	96,709.92
Gilpin	3,103,275.00	3.5	11,110.69
Grand	5,035,455.00	2.4	12,085.09
Gunnison	16,082,935.00	2.2	35,382.46
Hinsdale	1,010,545.00	4.0	4,014.18
Huerfano	13,792,111.00	2.5	34,480.28
Jackson	5,645,665.00	3.0	16,936.99
Jefferson	23,348,880.00	2.49	58,138.71
Kiowa	10,866,530.00	1.0	10,866.53
Kit Carson	21,182,783.00	2.0	42,365.56
Lake	10,857,295.00	0.8	8,705.00
La Plata	15,877,705.00	2.25	35,724.86
Larimer	43,181,550.00	2.52	108,817.50
Las Animas	39,701,754.00	1.25	49,639.69
Lincoln	19,147,025.00	2.5	47,867.81
Logan	37,746,887.00	5.21	195,681.27
Mesa	28,897,603.00	2.786	80,508.75
Mineral	1,531,625.00	5.0	7,658.12
Moffat	6,714,199.00	6.0	40,285.19
Montezuma	6,463,107.00	7.0	45,241.82
Montrose	16,839,360.00	2.9	48,834.14
Morgan	25,825,480.00	2.2	56,817.16
Otero	28,863,930.00	2.0	57,727.86
Ouray	5,493,696.00	5.0	27,468.48
Park	9,041,250.00	4.0	36,565.00
Phillips	15,840,788.00	1.25	19,802.23
Pitkin	5,750,370.00	2.5	14,378.42
Prowers	20,104,700.00	2.0	40,209.40
Pueblo	70,178,990.00	1.3	91,232.69
Rio Blanco	6,198,010.00	3.88	21,408.28
Rio Grande	11,072,250.00	2.0	22,144.50
Routt	15,766,550.00	3.23	50,925.96
Saguache	12,518,707.00	3.0	37,556.12
San Juan	4,578,081.00	3.0	13,734.24
Sedgwick	10,783,172.00	1.391	14,999.40
Summit	6,499,040.00	3.0	19,497.12
Teller	13,876,890.00	2.5	34,692.22
Washington	20,208,310.00	3.0	60,624.93
Weld	96,306,880.00	2.52	260,028.56
Yuma	18,610,210.00	2.42	45,036.71
Grand Total	\$.1,422,113,275.00	2.747	\$2,625,834.00
		Average	
		Co. Levy	



The Sunnyside concentrating plant at Eureka, one of the most modern plants of its kind in the world.

Motor Transportation Spreads Over Nation

Rural motor express, that method of transportation over the highways by motor trucks, linking rural America with the rest of the world, and operating from fifteen to one hundred miles each, is gradually forming a transportation system which eventually will spread over the entire United States. During the war such a system was created in Chicago in connection with Interurban Street Car lines, and resulted in delivery of material as speedily as it could be shipped by express, and at a cost little higher than the ordinary freight rate.

A highways motor transport company of Cleveland, Ohio, also has been operating rural motor express lines out of that city to Sandusky on the west, and Ashtabula on the east, taking in all railway stations. When fruits and vegetables began to come in, these trucks transported twenty thousand crates of berries and twenty thousand bushels of tomatoes from the farming districts to the Cleveland markets. These shipments were followed by

twenty thousand bushels of apples, peaches and beans. During the grape season this company hauled eighty-four thousand baskets of grapes, part going to the wine presses and part to the markets. Seven hundred baskets were carried to the load, which made one hundred and twenty truck loads of grapes alone. The average hauling distance was 37½ miles and the charge was approximately \$7.00 per ton. The trucks hauled approximately seven loads each. Empty baskets were carried on the return trip.

Out of the thousands of baskets of fruits and vegetables hauled by this line not a basket was damaged or broken open. The farmers, used to rail haulage, which usually results in considerable loss, were amazed at the record made, and will patronize the service to a greater extent next summer.

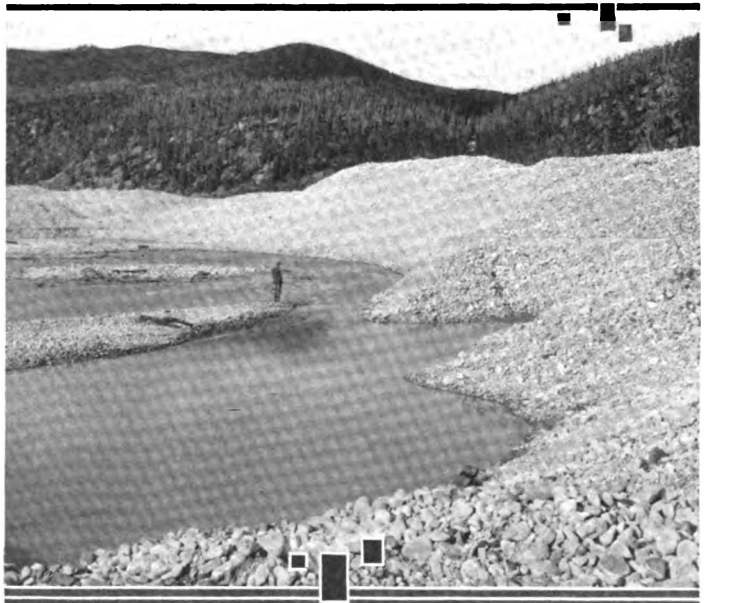
This winter mangoes, onions, apples, cabbage, etc., will be hauled. These vegetables should not stand in freezing cars or on freight platforms, but should be hauled to destination as rapidly as possible. The trucks will, if necessary, be heated.

At Johnstown, Pennsylvania, another motor truck line is hauling potatoes thirty-five miles over mountain roads. These trucks carry one hundred and fifteen bushels to the load, in a little over three hours. It formerly took a two-horse team over a day to haul that number of bushels over the same road.

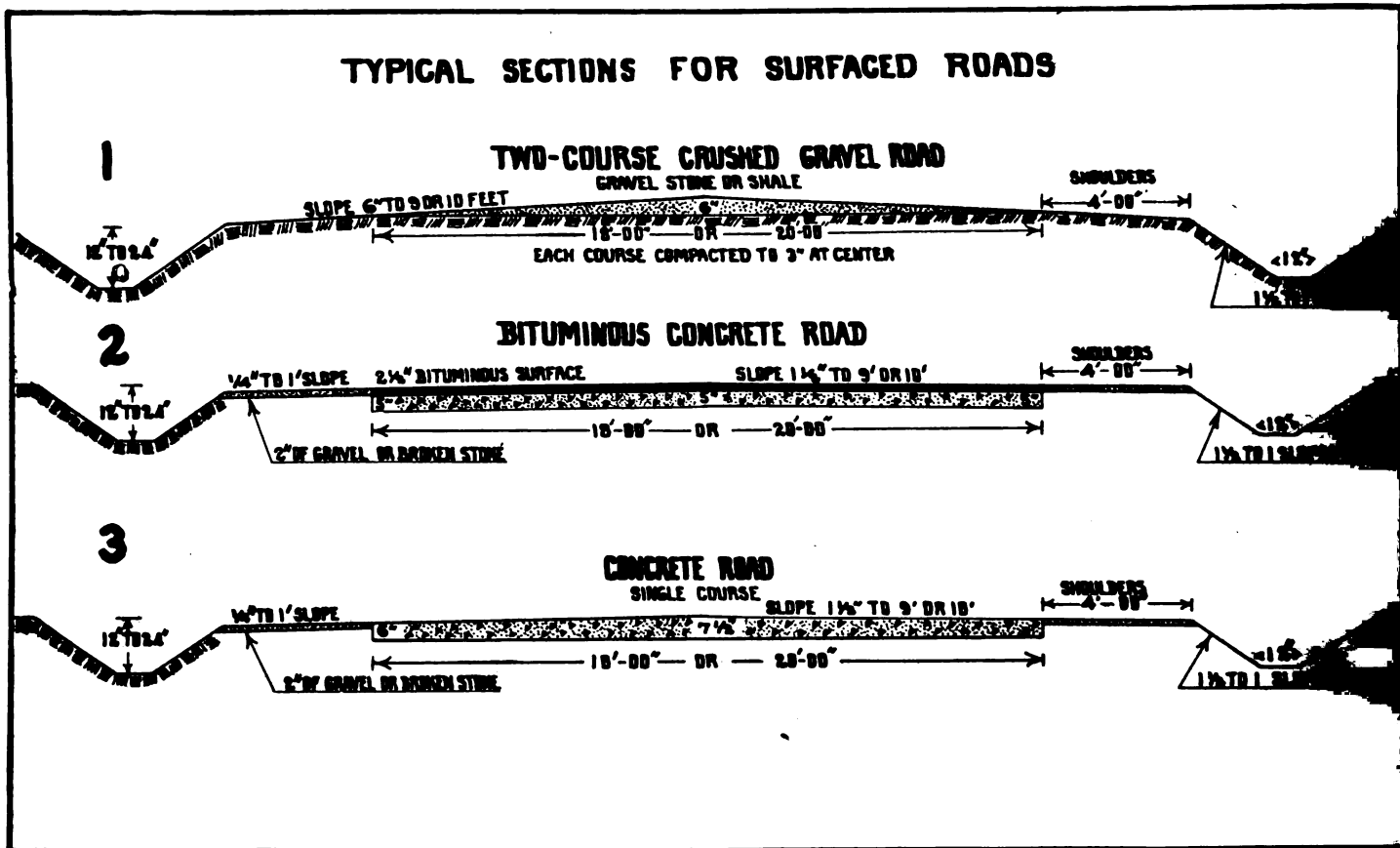
A Canadian motor express line, running out of Toronto to surrounding towns, operates twenty-five motor trucks.

An organization of business men in Spokane, Washington, operates sixteen large trucks on runs varying from 18 to 91 miles. This company handles a minimum of 68,000 tons per year.

A majority of these lines are not in competition with the railroads, but serve sections that have never been served except by horse and wagon.



One of the immense fields of boulders left by the dredging scows at Breckenridge, Summit County.



Typical Sections of Surfaced Roads

By J. E. Maloney, Chief Engineer, Colorado Highway Department

The graveled road (of screened or crushed gravel, stone or shale) now constitutes the major part of our surfaced roads. This will continue to be the case, as even when the ultimate development of our system is attained, it is likely that 80 per cent of the surfaced mileage will be of the so-called graveled type, with the other 20 per cent of the hard surface type.

The importance of this type of surfacing is therefore apparent.

The plate shows the general features covering the placing of this character of road surfacing.

One general requirement for all roads is that they shall be properly located and that the county shall have a good title to the right-of-way. It happens at this time that many counties have no record or apparent title to their roads, even to some main state highways. It will be seen that the proposed improvements will be delayed unless the title to the right-of-way is cleared up. It is poor business to go on spending money for the improvement of roads to which the county has either no title at all, or at best a very questionable one. On all types of roads the grading should be thoroughly done in every case and ample drainage structures provided of good construction.

The bridges should be of a permanent type.

The graveled surfaced type shown is to be constructed in two courses of three inches each at the center, running to a feather edge at the sides. This three inches is the compacted thickness, each course being rolled with a road roller weighing not less than 300 pounds to the lineal inch of roller.

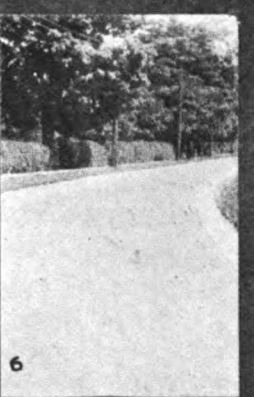
The bottom, or base course, to be stone ranging from screenings to 2 1/2 inches.

The top course to be of stone ranging from screenings to 1 1/2 inches.

This surfacing will require approximately 1,200 cu. yds. of material measured in the wagon box per mile of road for the 18-foot width.

The ordinary gravel or sanded road is built by dumping and spreading the material upon the road, relying upon the traffic to compact it. This may work out all right if the material is put on in not over a 3-inch layer and is gone over with a drag often enough to keep the ruts filled up, so that the surfacing will "iron out" evenly.

When work is done under the Standard Specifications, however, it must be spread and rolled. The cost of this type of road will vary greatly and may run from \$2,500.00 to \$12,000.00 per mile, depending upon the grading and structures necessary, and upon the location of the surfacing material.



1—Earth road, 5.78 mi. per gallon. 2—Fair gravel road, 7.19 mi. per gallon. 3—Good gravel road, 9.39 mi. per gallon. 4—Bituminous macadam, 9.48 mi. per gallon. 5—Fair brick road, 9.88 per gallon. 6—Good brick road, 11.44 per gallon. 7—Concrete road, 11.78 per gallon.



How Much Do You Spend for Gasoline in Your County?

Tests recently made at Cleveland, Ohio, to determine the gasoline consumption of two-ton motor trucks over various types of roads resulted in some interesting conclusions. The pictures at the top of this page show the types of roads upon which the tests were made.

On road No. 1 the truck made 5.78 miles per gallon. The number of miles made per gallon on each road is indicated in the captions. The following table shows the number of gallons of gasoline needed for 100-mile run by a two-ton truck and the cost of the run figured at 25 cents per gallon of gasoline:

Road	Gallons Used	Cost
No. 1	17.30	\$4.33
No. 2	13.90	3.48
No. 3	10.63	2.66
No. 4	10.54	2.64
No. 5	10.12	2.53
No. 6	8.75	2.19
No. 7	8.49	2.12

The saving that may be made on a concrete road in comparison to an ordinary dirt road for the same load is shown by this table to be more than 50 per cent, an unanswerable argument for the hard-surfaced road.

In the second type of pavement shown, a bituminous surface is placed upon a concrete base. The sub-grade is shaped and compacted, and upon this is placed the concrete for a foundation course. The material for this concrete base is to be of screened material of a mixture of cement 1, sand 3, gravel or crushed stone 6.

The cement to be of Portland, meeting the standard tests. The sand or fine aggregate to be clean and meet the requirements for size of the Standard Specifications. The coarse aggregate to be graded from 2½ inches to ¼ inch. On the base of concrete is placed the bituminous surface 2½ inches in thickness; this may be of any of the following types:

- Amiesite in two courses,
- Topeka Mixture,
- Bituminous macadam.
- Warrenite Mixture.

This type of base and surface will run from \$1.75 to \$2.50 per sq. yd., and for an 18-foot roadway the paving

will cost from \$18,500.00 to \$26,400.00 per mile for the pavement. Including the grading and structures, the cost will be approximately \$21,000.00 to \$30,000.00 per mile.

Section 3 shows a section of the single course concrete pavement of a mixture of cement 1, sand 2, coarse aggregate 3. To be of Portland cement, clean sand, and the coarse aggregate either gravel or crushed stone, all of these to meet the requirements of the Standard Specifications.

The single course concrete will run from \$1.50 to \$2.00 per sq. yd. of pavement, or \$16,000.00 to \$21,120.00 per mile for an 18-ft. roadway. Including the grading and structures, the cost will be approximately from \$19,500 to \$25,000 per mile.

In both types, 2 and 3, a four-foot gravel shoulder is provided so that the full width of the roadway is 26 feet.

These sections are not absolute, rigid standards, but are subject to such modifications as may be found necessary for each particular case.

Digest of Townsend Highway Bill

(Continued from page 11.)

shall not exceed the amount appropriated to said state for construction of reconstruction.

For the purpose of carrying out the provisions of the act there is appropriated in addition to amount already set aside for it \$25,000,000, which shall become available for expenditure July 1, 1919, and \$25,000,000, which shall become available for expenditure July 1, 1920, these amounts to be expended along with and in the same manner and under the same provisions as directed by the federal road act.

Ocean-to-Ocean Cement Highway

(Continued from page 7.)

for an increased automobile license tax; one for doubling the present inheritance tax, the additional income from which will be placed in the road fund. In addition to which, a bill is pending by which the people will be asked to vote a twenty million dollar bond issue for road purposes.

"These are all in addition to a half-mill levy, which levy brings an income of \$700,000.00 or \$800,000.00 per annum. In addition to these provisions made by the state, the counties, cities and towns have almost without exception been increasing their levy for road purposes.

"We feel, therefore, that the State of Colorado, as well as the various municipalities, is doing all in its power to co-operate with the Federal Government in giving employment to men and a market for raw materials as well as manufactured products.

"While the various departments of the Federal Government deserve great credit for what they have already done, there are some matters which they seem to have overlooked, or have not yet reached. The greatest periods of development in the United States were brought about at a time when the Federal Government gave very material assistance to the railroads and to railroad construction. No new country can be developed except through the developing of its transportation facilities. Transportation at the present time is not limited to railroads, but must of necessity include hard-surface highways. We believe that the Federal Government should give greater assistance to some of the struggling railroads. Unfortunately, Colorado has one railroad that has been ordered junked; the failure of this road and its present condition being due largely to war conditions, and indirectly to Government control of competing railroads operated by the Government, and naturally entitled to all the through business from such Government controlled roads.

"Another road is in very bad financial condition, being unable to extend a complete system as originally planned and without which extension the limited business makes the road unprofitable.

"The question of highways, in my mind, is even more important than that of the railroads, and I believe the Government should at once proceed to the construction of

not less than two ocean-to-ocean cement highways, of a width of not less than 25 ft. and of sufficient thickness to permit of heavy traffic.

"If I did not misunderstand a statement made here yesterday by the head of one of the departments, the Government has let contracts for manufacturing torpedoes in order that factories may be kept running and men given employment, in addition to which, there seem to be thousands of chair-warmers in Washington and elsewhere, drawing salaries from the Government.

"I therefore believe that by commencing the construction of these ocean-to-ocean highways, we will be offering employment to men throughout the land; will be making a market for some of the raw materials, as well as all classes of goods and merchandise ordinarily required by a prosperous people with an opportunity for work. And for that reason, Mr. Chairman, I now move you that the Chair appoint a committee of five to take up with the proper departments of Government the question of building such ocean-to-ocean highways, and that if possible, the Committee report to this convention before final adjournment."

Editor's Note: To this motion an amendment was offered by Governor Walter E. Edge that the matter be referred to the Committee to be appointed later to consider the entire subject of questions and recommendations. Motion as amended was agreed to.

Over the Hills to Health in Colorado

(Continued from page 9.)

Gray is willing to just take it easy and look after things we needn't come back until September."

"All right, Nett, we'll talk it over in the morning. I'll bet I dream of falling off that peak kerplunk into that water."

The next morning at breakfast the trip did not seem so impossible, if it did not cost too much.

"Nett, hand me a pencil. Suppose we figure on the whole month of August, or thirty days. Now, it would be about 500 miles to Denver or Colorado Springs and 500 miles back. That's 1,000 miles, and suppose we drive another 1,000 miles in Colorado—that's 2,000 for the thirty days, which will give plenty of loafing time. 'Betsy' will average fifteen miles to the gallon of gasoline—say 135 gallons at 28c—that's \$37.80. Six gallons of oil at \$1.00—that's \$6.00; one extra tire, \$25.00; one extra tube, \$5.00, and \$10.00 for repairs, etc.—that's \$83.80. I believe that will do it. Now what will it cost you and I? We are going to camp part of the time, you know, so that I believe \$5.00 per day, even with the costs, will pay our expenses, or \$150.00—a total of \$233.80. I think we have both earned a good time and 120 bushels of that wheat will pay it all. We ought to have a small tent, folding bed, oil stove and two pairs of cover-alls. If we stayed at home it would cost us at least \$60.00, so, you see, we will only spend \$173.80, I am sure, for thirty days of pleasure and recreation. What do you think of it, Nett?"

"Oh, let's go!"

"All right, I'll see Mutt this evening,

New Commissioner Good Road Advocate

By J. G. Hilliard, Editor Rocky Mountain Hotel Bulletin

THE recent appointment by Governor Oliver H. Shoup of E. E. Nichols of Manitou as Highway Commissioner for Colorado District No. 2 is intensely pleasing to hotel operators of the Centennial State, as well as to that portion of the general public which is best acquainted with the new official.

Highway Commissioner Nichols has been identified with the development of Colorado in one of its most important particulars, good roads, practically all his life. It has always been one of his principal aims to make accessible to the tourist visitor as well as to the resident the matchless scenic beauty of the nearby Rockies. Situated as he is, at Manitou, with the seven wonders of the Western world almost within a stone's throw of his hotel, it is small wonder that he has been an ardent supporter of every worthy good roads movement.

When E. E. Nichols, Sr., father of the present Highway Commissioner, migrated to Colorado in 1874, he selected Manitou as his place of residence, foreseeing the great tourist possibilities of the wonderful place. He built the original Cliff House, the first hotel there, the following year, when E. E., Jr., was still a very small child. The young man eventually replaced his father as proprietor and the hotel has expanded until today it is one of the foremost resort hotels in the United States and one of the largest hotels, resort or commercial, in Colorado.

There is no class more intimately concerned with the rapid development of good roads than the hotel keepers, and this is true especially in Colorado. Hotel managers know that with the increasing accessibility of Colorado's scenery will come the motorist in annually increasing numbers. He can now reach the summit of Pike's Peak by a splendid road, with the conception and realization of which Mr. Nichols had a great deal to do. This road project is in Mr. Nichols' immediate vicinity, but he is determined that both commercial and tourist roads in his district shall get all that is coming to them during his term of office. He also is broad enough to realize and declare that Colorado is a unit in so far as the necessity for good roads exists and that what benefits the state will advance the interests of any part of the Commonwealth.

Mr. Nichols' standing in his own specialized line of activity, the hotel industry, the fourth in volume and im-

portance in the Nation, is very high. When the Rocky Mountain Hotel Association was organized, 18 years ago, he was its first president, and is again its chief executive, having been elected its 1918 president, and again appointed by its board of governors for the present year. The organization includes the states of Colorado, Wyoming, Utah and New Mexico, and is grateful to Governor Shoup, not only for reaching into its ranks for a representative in a department of government which is of necessity one of the most important of all to the state, but for making such a wise selection in the man.

The new Highway Commissioner is an ardent motorist himself. He is familiar with every road—mountain and plain—in the diversified Pike's Peak country, and can drive the tortuous canyons in his big touring car as well as can the best experienced mountain chauffeur. He knows what the roads need, and he is going to try to see that they get it. He is a man of liberal education and splendid business ability, and will prove a credit to the administration of Governor Shoup and the essential department of it which he represents.

Mr. Nichols believes that it will be necessary to utilize for construction of roads all the money which it will be possible to obtain by state bond issue, and that maintenance is something to be provided for when needed. He realizes that the tourist industry is bound to be Colorado's greatest asset and that good roads will so pay for themselves that the people will be more than able and willing to keep up the highways when they once get them.



E. E. Nichols of Manitou, Colorado, State Highway Commissioner for district No. 2.

ASK LOWER RATES ON SAND AND GRAVEL.

The state highway department has made a formal request upon the Director General of Railroads at Washington for a reduction of freight rates on road building material, especially sand and gravel. This is in conformity with the action taken by road builders of the United States, in general, in an endeavor to meet the wishes of President Wilson in regard to the country's reconstruction program. Unless a reduction in rates is granted, however the road builders of the nation will be seriously handicapped in their effort to co-operate with the national government in furnishing work to the unemployed.

Road Work and Road Builders the State Over

The maintenance force of the State Highway Department has been at work for a week graveling the two and one-half mile stretch on Federal Boulevard beyond the Tarvia pavement. When this work has been completed the road will then be surfaced all the way from Denver to Broomfield.



Advertisement has been made and bids asked for the five-mile stretch of road between Walsenburg and Trinidad, known as Federal Aid Project No. 2. Bids will be received at the State Highway Commission on April 7. Completion of this work will give a hard-surface road from Pueblo to the New Mexico State line.

The Weld County Commissioners have about completed the work of graveling the two-mile stretch on the Denver-Greeley road near Evans.

County Commissioners from Lake County met at the State Highway Office last month, and took up the question of beginning work on the roads from Leadville to Climax and also over Tennessee Pass.

The State Highway Department has bought a new six and one-half ton Packard truck, which will be used for dragging and hauling in connection with maintenance work. The maintenance crew is now using three trucks and a stone crusher.

Boulder County Commissioners have notified the State Highway Commission that the county is willing to assist the state to meet the Federal Aid appropriation in the construction of a bridge necessary on the hard-surface stretch near Longmont. Boulder County officers are much interested in the proposed road to Ward. They expect to receive assistance from the Forest Service. While in Denver the officials of the State Highway Department, and County Commissioners Francis Beckwith and Arthur J. Boase, called upon S. A. Greenwood, chairman of the Boulder County Commissioners, who has been ill in St. Luke's Hospital. Mr. Greenwood has left the hospital by this time, and is well on the road to recovery.

Contractors are ready to start work on the completion of the concrete bridge between Greeley and Kersey over Platte river. The County Commissioners of Weld County and officers of the State Highway Department are conducting an investigation to determine the character of the concrete used in the piers of this bridge. They have heard rumors that poor material has been used in the construction.

Grading work has been finished on the road from Petersburg to Loretto Heights, an extension of Federal Boulevard. Graveling is now being done on this stretch.

Road Surveyor Harlan of Lake County is getting his plans and equipment ready to start work on the Denver-Twin Lakes road to Independence Pass. He expects to start work in a week. This is known as Federal Aid Project No. 3.

Engineer Roy Randall of the State Highway Commission is now in charge of the surveying work on the road from Wray to Idalia. This will include grading and surfacing and graveling on a stretch of fifteen miles.

The Montezuma County Commissioners have let two contracts for construction of a bridge to the Denver Steel and Iron Works Company. One of the bridges will span McElmo Creek, while the other will be thrown across an irrigating canal near Dolores. The entire cost of the two bridges will be approximately \$8,000.

For Better Roads

Surfacing has been completed and plans made for the two-mile stretch of concrete road running east from Pueblo, and for the one-half mile concrete stretch, including a bridge, that is to run south from the Town of Longmont. Surveys have been made for the one-half mile hard stretches of road at La Junta, Rocky Ford, Boulder, and Fort Morgan, as well as a one-mile stretch near Greeley.

The Colorado Highways Bulletin is published by the State Highway Commission of Colorado in the interest of better roads. There is no profit derived from its publication, as the State pays the cost of publication and advertisements are not taken. The subscription price is \$1.00 a year. Will you not subscribe and help give the road situation the publicity that it needs so badly?

Fill out the blanks and send this coupon to the Editor, Colorado Highways Bulletin, State Museum Building, Denver, Colorado.

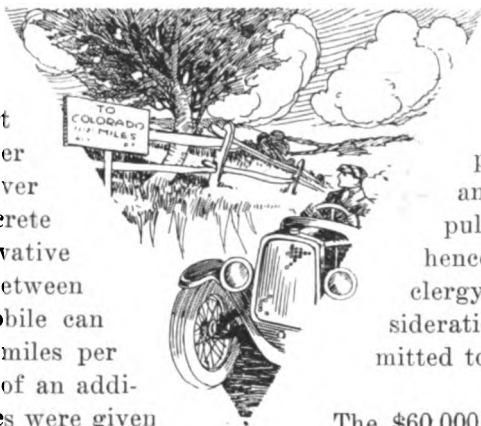
Enclosed find \$1.00 in payment for one year's subscription for the Colorado Highways Bulletin. Mail to

Preliminary statements have been approved for the two-mile concrete stretch on the Brighton road, an extension of the present hard-surface road.

.....Name.
.....Address

Sign Posts Along The National Highway

ONE can travel over a hard-surfaced highway with an automobile for three cents per mile less than he can travel on dirt highways. With the same horse power required to travel ten miles per hour over a dirt highway, he can travel on concrete forty miles per hour. To be conservative one cent per mile can be saved as between dirt roads and concrete. An automobile can travel an average of three thousand miles per year, making a saving on automobiles of an additional ten million dollars. These figures were given by the highway transport committee of the state council of defense at Des Moines, Iowa.



addressed an open letter to the ministers of the state, containing these words: "I have a deep seated conviction that every additional mile of improved highway serves to strengthen and increase the splendid influence of the pulpit and broaden the sphere of education, hence, I am moved to suggest that the clergymen of Michigan give thoughtful consideration to the road issue which will be submitted to the people at the polls on April 7."

The \$60,000,000 road bond issue voted by Illinois is the subject of a friendly test suit to determine the constitutionality of the issue. The Sangamon circuit court has dismissed the injunction proceedings. The matter will now go to the Supreme court and it is expected that the matter will be decided at the June term.

Another way of figuring the cost of motor operation is given by Charles M. Babcock, Minnesota state commissioner of highways, as follows: "On an average mileage of five thousand miles a car each season, the total mileage of automobiles is one billion miles. Figuring the cost of operation at ten cents per mile, the cost of operating cars in the state of Minnesota totals one hundred million dollars a year. A saving of 10 per cent easily can be made by operating over well improved roads. This would mean a saving of ten million dollars a year."

New York State has appropriated \$5,000,000 for the maintenance and repair of state and county highways, with an additional \$5,000,000 that may be drawn upon to meet any emergency. Between \$18,000,000 and \$23,000,000 will be available for road work in New York State during 1919.

Road projects in Virginia, either already under contract or ready to be let, will cost more than \$3,100,000 for 1919. This does not include expenditures that may be made by counties on roads not included either in the state or county systems. The total is more than double any previous annual road budget of the state.

New oil fields of singularly regular formation have been discovered at Hurgada, Egypt, which are now yielding, according to consular reports, more than 15,000 tons of crude oil a month.

Over \$300,000 will be expended on road work in Jefferson county, Georgia, this year. Lawrence county, Pennsylvania, may issue road bonds amounting to \$500,000. The New Florence special road district has voted \$275,000 in bonds for road work. The road committee of the board of free holders, Essex county, N. J., has recommended a bond issue of \$605,000 for road work in that county. That county commissioners of Dallas county, Texas, have ordered an election on the question of issuing \$1,400,000 in road bonds to be held on April 1st.

According to American engineers, who have been serving in France, it would be a backward step for this country to adopt the type of water-bound macadam roads now used in France, for the reason that the damp climate there more successfully keeps the roads in shape than would be possible in this country.

In addition to the \$2,800,000 bond issue to be submitted at a special election the legislature of Wyoming has passed a bill that carries a road appropriation of \$300,000 annually for 1919 and 1920.

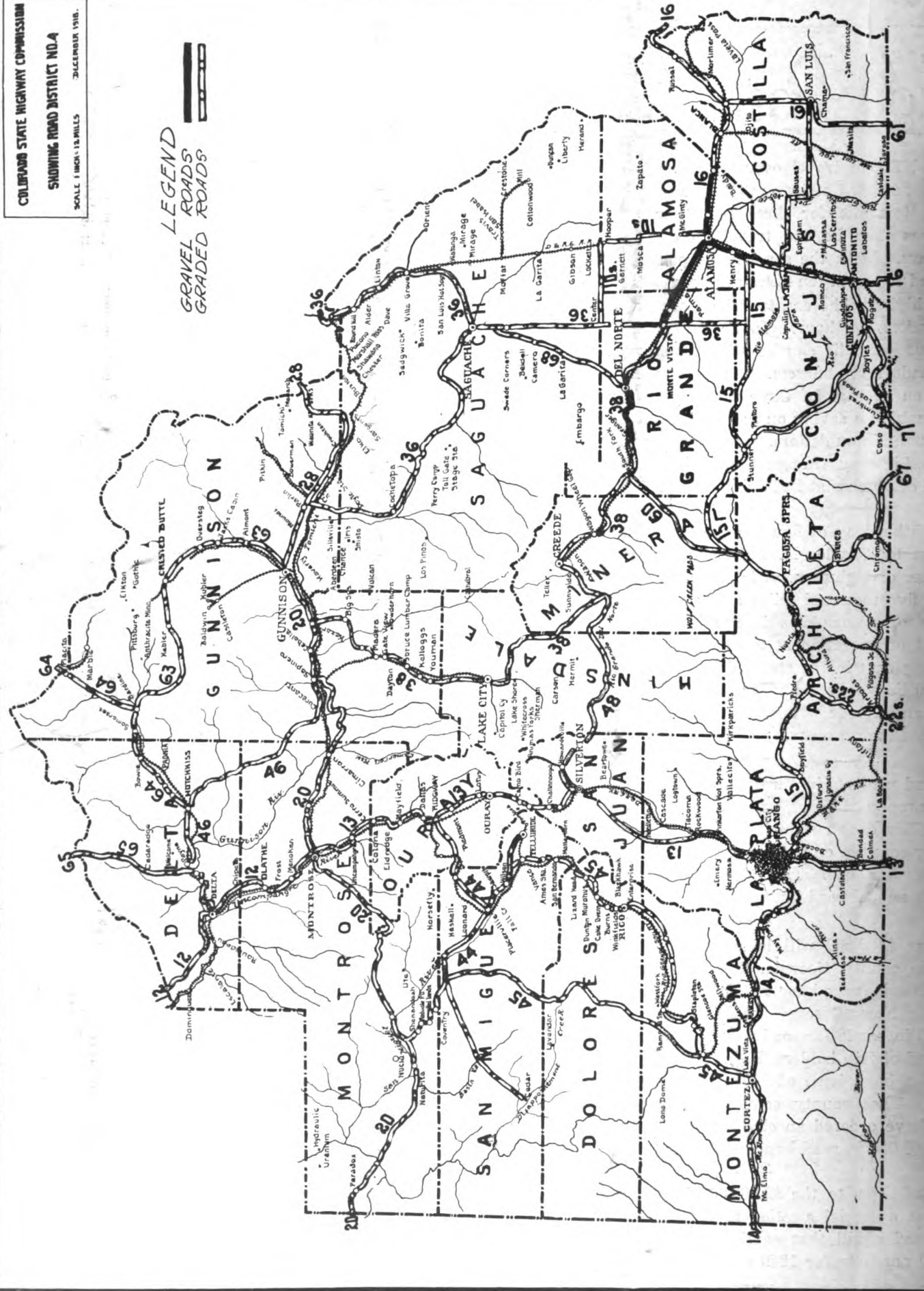
The State Highway commission of Pennsylvania has announced that no permanent pavement will be laid in the boroughs of that state until every pipe or sewer connection has been made on a thoroughfare to be improved, and that, after any pavement has been laid, local authorities will not be allowed to cut the pavement except in a case of extraordinary emergency.

Governor Albert L. Sleeper of Michigan is the first to appreciate the spiritual value of good roads. In urging the adoption of the \$50,000,000 bond issue, he has

Assistant State Highway Engineer L. J. Charles advises us that New Mexico has issued no road bonds since the \$500,000 issue of 1913. Efforts are being made at this session of the Legislature to authorize the issue of \$5,500,000 to be refunded from Auto revenues. A constitutional limitation restricts indebtedness of State to 1 per cent of assessed valuation which is \$380,000,000 this year.

COLORADO STATE HIGHWAY COMMISSION
 SHOWING ROAD DISTRICT NO. 4
 SCALE 1 INCH = 12 MILES
 DECEMBER 1918.

LEGEND
 GRAVEL ROADS
 GRADED ROADS



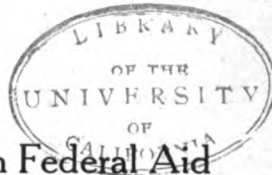
Map of road district No. 4, showing the graded and gravel roads in this district.

GIFT
MAY 10 1919



COLORADO HIGHWAYS BULLETIN ~

May, 1919



Counties Must Help Match Federal Aid

How Far Western States Met An
Emergency

Colorado-to-Coast Motor Short Line

Road Bills Enacted by the 22nd
Assembly

Issued by the
State Highway Department

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STATE HIGHWAY COMMISSION

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FRED J. RADFORD, District No. 3, Trinidad.

FREDERICK GOBLE, Vice-Chairman, District No. 4, Silverton.

E. E. NICHOLS, District No. 2, Manitou.

ROBERT E. NORVELL, District No. 5, Hayden.

T. J. EHRHART, Commissioner.

J. E. MALONEY, Chief Engineer.

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FREMONT—Jonathan Seaman, Canon City; James Burten, Canon City; J. V. McCandless, Florence; G. V. Hodgkin, Canon City; Jas. Belknap, Hillside.

NOTE—In the appended list of county officials the first name in each county is that of the county clerk, the second name is that of the county surveyor, and the last three names are those of county commissioners.

GARFIELD—Carleton L. Hubbard, Glenwood Springs; P. C. Thurmond, Glenwood Springs; L. F. Grace, Glenwood Springs; R. P. Coulter, New Castle; Geo. Newton, De Beque.

GILPIN—Frank G. Moody, Central City; S. A. Rank, Central City; Joseph Borzago, Black Hawk; Neil McKay, Central City; R. I. Hughes, Russell Gulch.

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KIOWA—Ed. M. Low, Eads; C. E. Bell, Eads; C. C. Wolever, Eads; Wurt Bailey, Towner; Ed. Houston, Arlington.

KIT CARSON—Miss Clio S. Judy, Burlington; D. D. Buck, Flagler; I. D. Messinger, Stratton; A. L. Anderson, Burlington; J. O. Hendricks, Selbert.

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LARIMER—G. R. Cushing, Ft. Collins; James G. Edwards, Ft. Collins; J. M. Graham, Loveland; Harris Akin, Ft. Collins; C. M. Garrett, Laporte.

LAS ANIMAS—Juan B. Romero, Trinidad; Hal Barnes, Trinidad; A. G. Prosser, Trinidad; J. J. Cordova, Aguilar; Robert C. Scott, Trinidad.

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RIO GRANDE—H. G. Trapp, Del Norte; W. W. Reilly, Monte Vista; August J. Weiss, Del Norte; W. W. Wright, Monte Vista; M. S. Woods, Monte Vista.

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SAN MIGUEL—Lillian C. Kenyon, Telluride; Ben W. Purdy, Telluride; T. B. McMahon, Telluride; A. T. Woods, Placerville; J. R. Galloway, Norwood.

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TELLER—J. H. White, Victor; E. P. Arthur, Jr., Cripple Creek; T. J. Wicks, Cripple Creek; Tom Foster, Woodland Park; I. N. Riley, Victor.

WASHINGTON—L. Roy Cummings, Akron; Elbert Lewis, Akron; Homer Evans, Akron; R. M. Buckmaster, Abbott; E. A. Lewis, Burdett.

WELD—As E. Littell, Greeley; L. L. Stimson, Greeley; A. F. Peters, Mead; T. Elmer Rowe, Greeley; J. W. Birkle, Platteville.

YUMA—John Adcock, Wray; A. C. Cary, Wray; Harry F. Strangways, Wray; H. W. Jackson, Yuma; Alex. Shaw, Wray.



Picturesque Entrance of the Hardscrabble Canyon Rout, above Florence, Custer County.

CONTENTS

Counties Must Help Match Federal Aid.....	5
How Far Western States Met an Emergency.....	7
Colorado-to-Coast Motor Short Line.....	10
Reorganize Highways Transport Bureau.....	11
Colorado Highway Commission's Meeting.....	12
How to Comply with Bankhead Provisions. J. E. Maloney	15
Road Drag Rules Applicable to Colorado.....	17
Commissioner Changed in District 5.....	18
Progress on the D. C. D. Highway.....	19
Road Bills Enacted by the 22nd Assembly.....	21
Bond Issue Resolution. Refund from Capitol Building Fund.	
One-half Mill Levy. Motor Vehicle Law. (Digest.)	
Gasoline Tax.	

COLORADO HIGHWAYS BULLETIN

Published Monthly
by the



Colorado Highway
Department

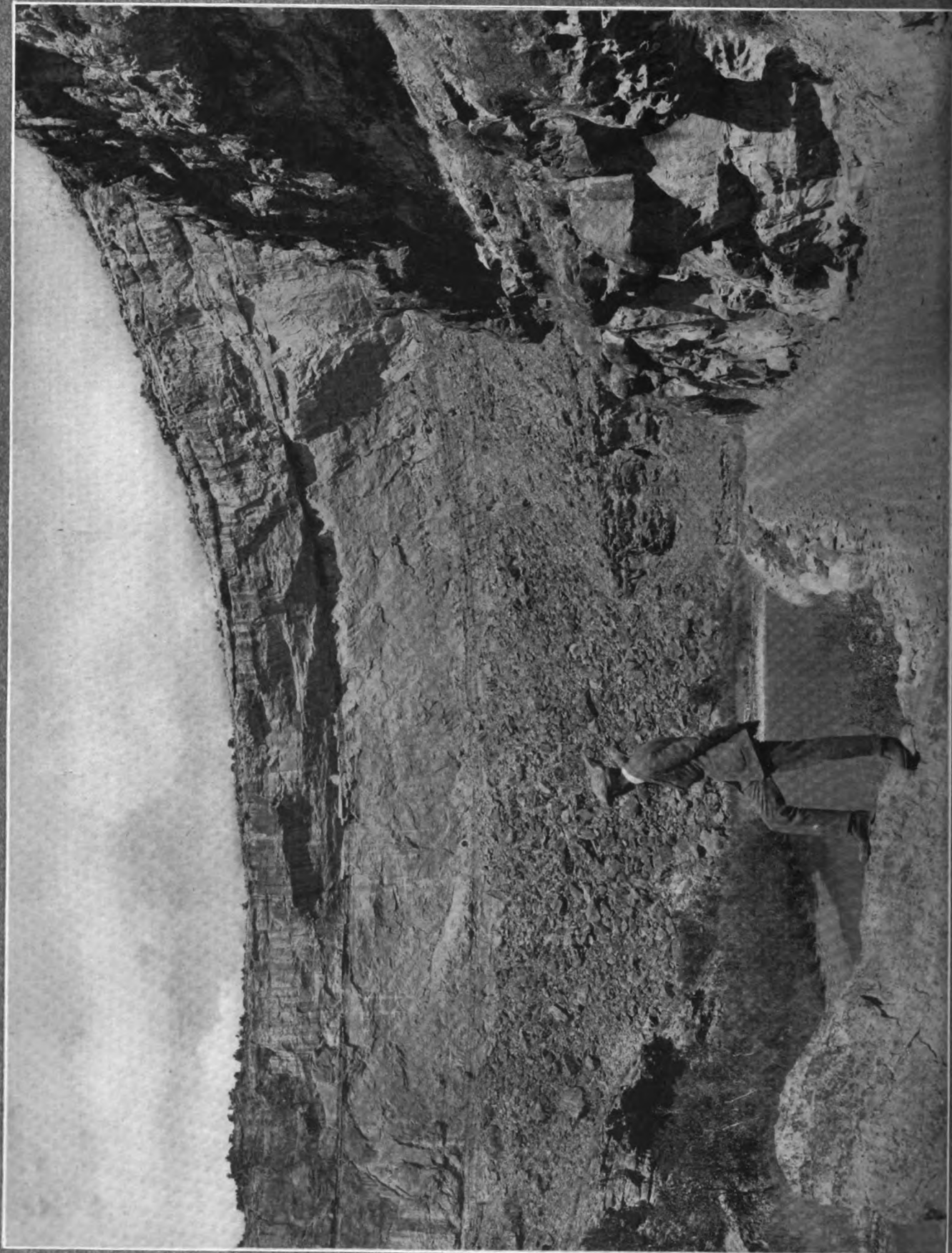
Denver, Colorado.

With the approval of the Colorado State Auditing Board.

Address all communications to Colorado Highway Department, attention Pyke Johnson, editor, Colorado Highways Bulletin.

Owing to the necessarily limited edition of this publication it will be impossible to distribute it free to any persons or institutions other than state and county officials actually engaged in the planning or construction of highways, instructors in highway engineering, newspapers and periodicals and civic associations. Others desiring to obtain Colorado Highways can do so by sending 10 cents for each number desired. Associations desiring to distribute the magazine can obtain it at cost in lots of from 500 copies up.

Subscription Price, \$1.00 per year.



The Amphitheater of the Titans in the Canyon of the Grand above Grand Junction. In the foreground is the shelf road with the placid water of the river below



COLORADO HIGHWAYS BULLETIN

VOL. II

MAY, 1919

NO. 5

Counties Must Help Match Federal Aid

Colorado Highway Commission Adopts \$2,300,000 Budget for Federal Aid Projects So That National Allotment Due Now and on January 1st Will Not Lapse—Many Counties Agree to Make Up Funds Which the State Cannot Provide

NOW that the state legislature has folded its tents like the Arabs the Colorado Highway Commission is in a position to take definite action in relation to the immense federal aid funds made available by the Bankhead rider to the postoffice appropriation bill. During the legislative session the commission could do nothing toward taking advantage of the new federal aid funds, for its hands were tied until such time as it might know authoritatively what additional funds might be expected for road work. The commission's activities were limited to an effort to impress upon members of the legislature the critical nature of the situation faced by Colorado in relation to federal aid.

It may be stated fairly that good roads enthusiasts were disappointed in the action of the assembly. Twenty million dollars in bonds were asked, yet the legislature put a limitation of \$5,000,000 upon the amount which will be submitted to the voters of the state in 1920, and put restrictions upon the expenditure of this amount should it be voted. The bill providing for the submission of the bond issue provides that \$2,500,000 of the amount may be spent solely to meet federal aid appropriations, while the remaining \$2,500,000 must be divided among the various counties of the state for road work. To the good roads worker of the day, educated to look at this problem from a broad standpoint, such restrictions seem a reversion to old methods of distributing road funds. There was talk for a time of eliminating the bond issue proposition altogether, but when the good roads organizations of the state

let it be known that a bill would be initiated to submit a \$20,000,000 proposition the \$5,000,000 proposition was passed by the legislature. However, the same division of funds, noted in regard to the bond issue, was made in relation to the gasoline tax bill and the automobile license bill.

Since the bond issue proposition cannot be submitted for another year and the additional one-half mill levy for good roads, passed by the assembly, will not bring in revenue until the levy is made for next year, the Highway Commission can only count upon about \$600,000 additional revenue for this year to meet federal aid appropriations.

Chairman E. E. Sommers, who is thoroughly familiar with this phase of the situation, says that there will be no opposition to the tax of one-half of one per cent on all gasoline not used for farm purposes alone. He estimates that approximately \$400,000 may be expected by the commission from this source. Consumption of gasoline has been running far ahead of consumption last year during corresponding months, and dealers predict the amount consumed during the year will show an increase of fifty per cent over 1918. They also make the prediction that \$400,000 will be realized from this source for use on road work. In addition the commission will receive \$200,000 refund from the Capitol Building fund, this fund having been loaned from road income a number of years ago. These two sources will make up the \$600,000. Some additional revenue may be received from other sources, but will be needed for the contingent fund.

The Colorado Highway Commission at its last meeting on the second Monday in April, adopted a plan to meet \$2,380,000 of federal aid funds this year, including the \$867,000 now available and \$1,300,000 to become available on July 1, 1919. Highway Commissioner T. J. Ehrhart and Chief Engineer J. E. Maloney made up a tentative budget and, in the main, this was accepted. In arriving at a just distribution of the funds the budget took into consideration the valuation, road mileage and area of the five road districts, which gave to each district the following percentages: District No. 1, 50 per cent; District No. 2, 10 per cent; District No. 3, 17 per cent; District No. 4, 15 per cent; District No. 5, 8 per cent. A further adjustment was made by taking 10 per cent from District No. 1 and distributing it between Districts No. 2 and 5. This gives District 2 about 15 per cent and District No. 5 about 10 per cent.

The adoption of this budget does not mean that the entire \$2,380,000 federal aid and a corresponding amount of state funds will be spent this year as that would be almost an impossibility with the scarcity of contractors. It was necessary to adopt a budget, however, and designate the federal aid projects to be undertaken in order that the government appropriations might not lapse and be lost to Colorado. A great part of the year will be spent in making the necessary surveys, and estimates and gathering data upon the projects for submission to the federal government.

The actual division of federal aid funds made in the budget is as follows:

District No. 1	\$ 952,000.00
District No. 2	357,000.00
District No. 3	404,600.00
District No. 4	357,000.00
District No. 5	309,400.00
<hr/>	
Total	\$2,380,000.00

The Highway Commission has tentatively allotted funds for each project to be undertaken, of which there are sixty. This working plan will not be published in the Bulletin, however, until the commissioners have each given it further consideration in relation to the needs of their respective districts, as some changes may be found advantageous and desirable. To publish the adoption of a project until it has been decided upon definitely would manifestly be unfair to the communities involved.

The foregoing summarization must have made it plain to the reader that the Colorado Highways Commission cannot hope to have sufficient funds at its disposal to take care of the program outlined. This brings up the question: "How are the additional funds to be raised so that full advantage may be taken of the federal aid appropriations?"

The only solution of the problem and one that is now being worked out in one or more western states is for the counties affected to raise additional road funds by levy, bond issue or some other source.

In New Mexico such a movement is already well under way, and since the adjournment of the Colorado Highway Commission a similar movement has been started in Colorado with gratifying results. At this time a number of counties have signified their willingness to raise such funds and Commissioner Ehrhart estimates that each county to which a federal aid projects are awarded will have to raise approximately 15 per cent of the amount of these appropriations aside from road funds already raised. Pueblo, El Paso, Prowers and Bent county commissioners already have assured the state highway department that they will guarantee that their counties will meet their share of the additional expense. Other counties that have promised to do so in a more or less positive manner are: Saguache, Eagle, Jackson, Moffat, Mesa, Grand, Logan, Adams, Boulder, Las Animas. The town of Del Norte has likewise agreed to raise a fund by public subscription.

The outlook, therefore, is highly optimistic. Not only does it augur well for the adoption of the \$5,000,000 bond issue, but it indicates that the members of the legislature underestimated the sentiment for the larger bond issue which it refused to sanction. With the aid of the counties the Highway Commission will be able to meet the allotments of the federal government for the ensuing year at least.

Michigan Votes Bonds

Michigan gave a majority of 225,000 votes for the \$50,000,000 bond issue for good roads at the election held on April 7. This is one of the largest road programs in the country, and it is worth noting that Michigan claims a great number of tourists and travelers during the summer months.

The plan of expenditure will probably provide for an issue of \$5,000,000 for the next two years which, added to \$8,000,000 Federal Aid money available during the next three years, and \$12,000,000 from county bonding propositions and highway income, will give the contractors in Michigan all the work they can handle for some years to come. The \$50,000,000 is available as needed.

The Dominion of Canada may have federal aid for good roads if a resolution introduced in the House of the Dominion Parliament, is passed. This provides for an appropriation of \$20,000,000 for highway work during the next five years. Each province is to receive \$80,000 annually, and an additional payment based upon population. The appropriation will constitute 40 per cent of the cost of each project, and all work must be in accordance with regulations and specifications approved by the governor in council.

The United States has a total of 2,500,000 miles of road of which twelve per cent are classed as improved, and only one-quarter of one per cent as capable of sustaining the modern heavy duty traffic. The rest are dirt highways, used simply as elementary means of communication between points.



Scene on the Southern Slope of Red Mountain Pass, where the United States Forest Service and the State Highway Department plan the location of nine and one-half miles this season.

How Far Western States Met An Emergency

Summary of Legislative Action on Post Roads Appropriations

THE unanimity with which the western states have attacked the problem of how best to meet the federal aid appropriations of the United States government indicates that, at last, they have realized that a better roads program is the key to progress. The West needs better roads far more than any section of the country, for it has neither the great manufacturing interests of the Atlantic Coast, nor the intensive agricultural development of the Mississippi Basin. Until it has the best roads in the country it cannot hope to compete industrially with the older sections of the Union, because it has greater distances to overcome in sending its goods to market.

The adjournment of the various legislatures of the western states makes it possible to sum up the results of the greatest good roads campaign that the west has ever witnessed.

Most of the western states will vote on bond issue propositions sometime within the next two years, few legislatures having failed to provide for the submission of such propositions. Regardless of the state boundary lines the road problem of the West is one, wholly so from a tourist standpoint and largely so from an industrial one.

CALIFORNIA—

A review of the good road situation in California demands precedence because of the fact that the California legislature provided for submission of the largest bond issue in the West. Just before the legislature of California adjourned it voted to submit a \$40,000,000 bond issue. Coming on top of the several heavy bond issues for good roads in this state the action speaks wonders for the progressive spirit of the Native Son state, and there is little room for doubt that her people will pass the measure. There are, of course, other projects for which money will be raised, chief among which may be mentioned a drive by the Automobile Club of Southern California, which will open a campaign on May 22 to raise \$1,000,000, which will be added to the \$700,000 available from state and federal funds, to build an all-year 70-mile concrete road from Merced to Yosemite Valley.

COLORADO—

Colorado, to which the road question is more important than any other issue before the state, has just adopted a \$2,380,000 federal aid program, in addition to the

appropriation of \$1,054,000 at the beginning of the year from established sources of income. The passage of the bill to submit a \$5,000,000 bond issue, the passage of the gasoline tax bill, the automobile license law and the additional one-half mill levy, which alone will raise about \$700,000, insures a fund for next year with which real constructive work can be done. The bond issue, if adopted by the people of the state, will not become available until 1921.

IDAHO—

Idaho came forward with the passage of a bond issue proposition for raising \$2,000,000. Including federal aid the state highway commission of Idaho expects that \$3,000,000 will be spent in that state during 1919, although the bond issue, if adopted by the people, will not be available until 1921.

Aside from some minor bills, and the bond issue bill, the principal bill signed by Governor D. W. Davis, after the adjournment of the legislature was that for a levy of two mills for road purposes, available 1919-1920. This levy will raise approximately \$1,850,000.

WYOMING—

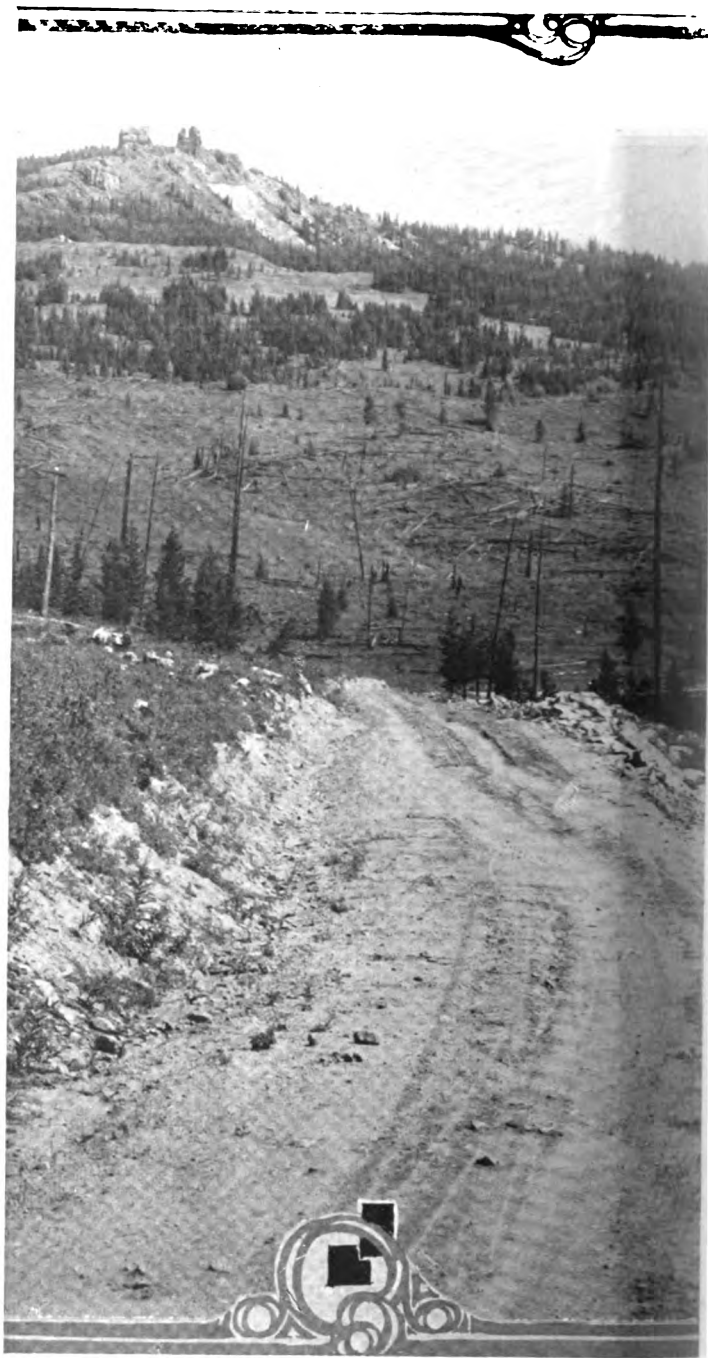
Colorado's sister State of Wyoming, although lacking the wealth of some of her neighbors, acted promptly in putting through a bond issue. The legislature of Wyoming authorized the submission of a \$2,800,000 bond issue and called a special election for the purpose of voting upon this proposition. The election was held on April 22, and the people overwhelmingly voted the issue. Wyoming, therefore, will have a full year's start over other western states, that will submit their bond issue proposals at the next general election, in the matter of beginning her great road building program. The legislature added from other sources \$300,000 a year for road building. The construction of a highway from Cheyenne to the Yellowstone is one of Wyoming's pet projects, and one that is vitally important from the tourist standpoint. It will find a very important link in the Park-to-Park highway that has been the dream of the National Park service for many years.

WASHINGTON—

The legislature of Washington, before its adjournment, voted the largest budget ever provided for road building in that state. From all sources, including \$3,500,000 available from federal aid in 1919 and 1920, Washington has approximately \$17,000,000 to spend on good roads during the next two years. Of this, some \$6,000,000 will come from the counties which must bear the preliminary costs of engineering, estimates, plans and specifications. State Highway Commissioner James Allen advertized for bids when the legislative budget was made up, and opened them within three days after the adjournment of the session. Actual work will start in considerable force there this spring.

UTAH—

Utah's legislature provided for a \$4,000,000 bond issue for roads, the bill providing that \$50,000 shall be



Near the Summit of Rabbit Ears Pass, Routt County, showing the famous landmark. Another Forestry Project to be pushed this year. Last year three miles were built. This year six more will be added.

allotted each county for hard-surface roads. The state road commission decided, so furious was the struggle for road funds, to increase the proportion of costs of state roads in any county, to be paid by that county, from 10 to 25 per cent, and this fund must be secured from funds other than those ordinarily available for road building. Three contracts for hard surfaced roads already have been let, amounting to \$241,809, for concrete road work between Salt Lake City and Ogden.

NEVADA—

In Nevada the legislature authorized the issuance of bonds to the limit of the state's legal indebtedness, \$1,000,000. There also has been an issuance of \$1,420,000



A rugged point on the Durango-Silverton Road. Construction of 46 miles at an estimated cost of \$350,000 is on the program for joint action by the Highway Department and Forestry Service this season.

commissioners provided for in it, he vetoed the bill providing \$1,500,000 for two years to meet federal aid allotments. However, the state engineer will have available on July 1st, \$900,000 from tax levy; \$160,000 from automobile licenses; \$60,000 from the prison labor fund; \$200,000 from an emergency appropriation to meet federal aid allotments; \$100,000 from the Miami-Superior appropriation; \$25,000 from the Williams-Clarkdale appropriation; \$50,000 from the Arrowhead Trail appropriation and \$115,000 for bridges and approaches. The state has available now \$1,000,000 in federal aid and will have \$1,300,000 more on July 1.

NEW MEXICO—

The New Mexico legislature voted to submit a constitutional amendment for a bond issue of \$2,000,000 for better roads. In addition New Mexico has provided for a very heavy mill levy for the same purpose, one bill providing that county commissioners shall make a special levy of three mills on the dollar upon all taxable property in June, 1919, 1920, and 1921. This levy is intended to meet a federal aid allotment of \$4,389,000. Another bill provides for a tax of 1½ mills on all taxable property in the state for the same purpose, and also transfers all automobile tax to the state highway fund, beginning March 17th, last. Still another bill provides for collection of a two-cent per gallon tax on gasoline, the proceeds to go to the state road fund.

OREGON—

Oregon has added \$10,000,000 in bonds to its road fund, there remaining \$3,560,000 from the six million bond issue made several years ago. The state highway commissioner estimates that during 1919, 1920 and 1921, there will be available, including federal and county aid, more than \$25,000,000. Several counties have bond issue propositions before them totalling \$2,640,000. Contracts already let and under way in Oregon total \$2,359,068.17.

MONTANA—

Governor Stewart of Montana vetoed the bill to create a new highway commission and abolish the present non-partisan commission, on the grounds that an adequate road system cannot be worked out if the commission is to be changed constantly. Two years ago, according to the governor, the commission was displaced because it did not do enough work, and the attempt to abolish the present commission was based on the claim that it did too much work. The bill, according to Governor Stewart, also gave the proposed new commission too much discretionary power in regard to accepting or rejecting federal aid allotments. Contracts for four new federal aid projects in Montana have recently been let at an estimated cost of \$73,000, of which the counties will bear fifty per cent of the cost, the federal government fifty per cent, and the state highway the engineering work. Forestry service plans for Montana provide for an expenditure of \$718,688 by the government and \$248,334 by the counties.

bonds by various counties. Nevada already has a 10-cent state tax on each \$100 property valuation for construction and maintenance of roads, which raises \$200,000 yearly. This sum is duplicated by an additional 10-cent county-state tax. The amount of unused federal aid money available before the passage of the Bankhead bill was \$800,000.

ARIZONA—

The Arizona legislature failed to pass the \$30,000,000 bond issue, even when it had been pared down to \$10,000,000. Furthermore, when Governor Campbell found that S. B. 185 deprived him of the right to appoint highway



A notable switchback leading to the top of the Divide, Fall River Pass. The Highway Department plans to push this road through during the present season, connecting Rocky Mountain National Park with Grand Lake.

Colorado-to-Coast Motor Short Line

CONFERENCES between good roads enthusiasts and highway officials of Colorado, Utah, Nevada and California within the past month have assured the construction of an automobile short line highway from Denver to San Francisco. Heretofore the main auto traffic to the Coast has been over the southern route, passing through New Mexico and Arizona to Southern California, and there has been no practical northern route. The conferences in question were begun with the intention of creating such a route and putting central Colorado, Utah and Nevada on such a transcontinental route.

Last month a meeting was held at the Denver Athletic Club which was attended by W. D. Rishel, secretary and director of the Utah State Automobile association; George Watkins, manager and secretary of the San Francisco Motor Club; Rodney J. Bardwell, representing the Denver Civic and Commercial association and the Denver Motor Club; Ex-Governor George A. Carlson, of Colorado; S. E. Norton, president of the Auto Trades association; Robert H. Higgins, president of the Colorado Good Roads

association; State Highway Commissioner T. J. Ehrhart and Charles McLain, representing the Colorado Good Roads association.

The project, insofar as Colorado is concerned, calls for connection of the state highway system with a through road being built to the state line through Vernal, Utah, by the Utah Highway Commission. The States of Utah, California and Nevada, together with the General Motors company, have agreed to take care of the road through Nevada.

The route to be followed would start from Denver, pass through Turkey Creek to Fairplay, thence to Buena Vista, then over Tennessee Pass, to Rifle and Meeker, and thence down the White River to the Utah State line. This route is passable now, but those at the meeting believed that it could be much improved by work on the last sixty miles in Colorado. Utah has agreed to build a thirty mile stretch between Vernal and the Colorado line, while on the other side of Vernal it is now con-

(Continued on page 20.)



The incomparable ruggedness of the natural bowl that encloses Ouray, Colorado, is shown in the above photograph. In the foreground appears a switchback in the highway which climbs its sides at one point.

Reorganize Highways Transport Bureau

GROSVENOR B. Clarkson, Director of the U. S. Council of National Defense, announces a reorganization of the Council's Highways Transport Committee.

In harmony with the Council's reorganization to a peace-time basis, the work of the Highways Transport Committee has been broadened to include direct representation from the Office of Public Roads and Rural Engineering of the Department of Agriculture; the Bureau of Markets of the same department; the Post Office Department, and the Department of Commerce.

With this reorganization close co-operation with the executive departments most vitally interested in matters of highways transportation will be brought about in such a way that the committee will be a clearing house of action for all federal interests concerned.

The committee as reorganized consists of the following:

John S. Cravens, of the Council of National Defense, Chairman.

James I. Blakslee, Fourth Assistant Postmaster General.

J. M. Goodell, Consulting Engineer, Office of Public Roads and Rural Engineering.

James H. Collins, Investigator in Market Survey, Bureau of Markets.

R. S. MacElwee, second assistant chief, Bureau Foreign & Domestic Commerce.

Charles W. Reid, executive secretary.

Grosvenor B. Clarkson, Director of the Council, ex-officio.

The committee will be assisted by the Highways Transport Committee Advisory Board, consisting of:

William Phelps Eno, of Washington, D. C.

Prof. Arthur H. Blanchard, of New York.

C. A. Musselman, of Philadelphia.

Raymond Beck, of Akron, Ohio.

John T. Stockton, of Chicago.

The Council in addressing itself particularly to the

(Continued on page 20.)

Colorado Highway Commission's Meeting

The regular meeting of the Colorado Highway Commission held in the state museum building on April 14, 15, 16, resulted in creation of several new state roads. A digest of the minutes is herewith given for the benefit of those sections of the state affected.



Jefferson county's appropriation of \$3,900 was allotted on the basis of \$2,100 raised by the county.

Saguache County petition that the road location of Hogan hill be changed was granted on the condition that the county secure the right-of-way. Committees from Rio Grande and Saguache counties reported a five to seven thousand dollar flood damage on the Gun Barrel road, and the commission agreed to assist the counties in repairing it. Three thousand dollars was appropriated on condition that the county put up \$1,500.

The Mt. Vernon canyon road, opening a new route into the Denver Mountain Parks, was declared a state highway. Surveys are to be submitted by Jefferson county. This will greatly relieve congested traffic conditions on the Lookout and Bear Creek canyon roads.

Two thousand dollars was appropriated to Douglas County for maintenance on roads three and eight on condition that the county contribute \$1,000.

The application of Larimer and Jackson county commissioners for assistance on state highway from Ft. Collins to Walden was laid over to the next meeting. A committee from Brighton, Adams county, asked assistance to lay concrete paving within the town limits and also south of the town for five miles, but this petition was deferred until more information can be obtained as to the amount of funds that will be available this year.

The commission authorized an inspection of a proposed road from Ft. Morgan to the Nebraska state line, requested by Weld county commissioners. The Highway Commission appropriated \$995 for this project.

Notification was received that the San Juan commissioners have appropriated \$15,000 as the county share of the Durango-Silverton forestry project.

Bids opened on April 7, for the construction of the sixty-mile road from Trinidad south to the New Mexico state line, were rejected because excessive. This road, known as Federal Aid Project No. 2, will be constructed by the state highway commissioner.

Petition of Park County commissioners in reference to bridges across the Platte near Hartsell and Fairplay was deferred until the next meeting.

Petitions were read asking that certain streets in the following towns be declared state highways: Olathe, Montrose county; Silverton, San Juan county; Meeker,

Rio Blanco county; South Canon, Fremont county; Empire, Lyons, Boulder county; Manitou, El Paso county; Idaho Springs, Clear Creek county. The petitions were allowed in cases of Meeker, Empire and Idaho Springs. The Manitou petition was laid on the table. The other petitions were referred to the commissioners of the respective districts.

Petitions from Weld County requesting that the roads thru Grover and Hereford to the Wyoming state line, and also from Cornish thru Barnsville and Greeley to Windsor be declared state highways were referred to chairman Sommers for investigation.

An appropriation of \$3,246.13 was made to Alamosa county to pay for additional piling driven to protect a bridge on state highway No. 16.

The road from Akron north to Atwood in Washington county was declared state highway 19S.

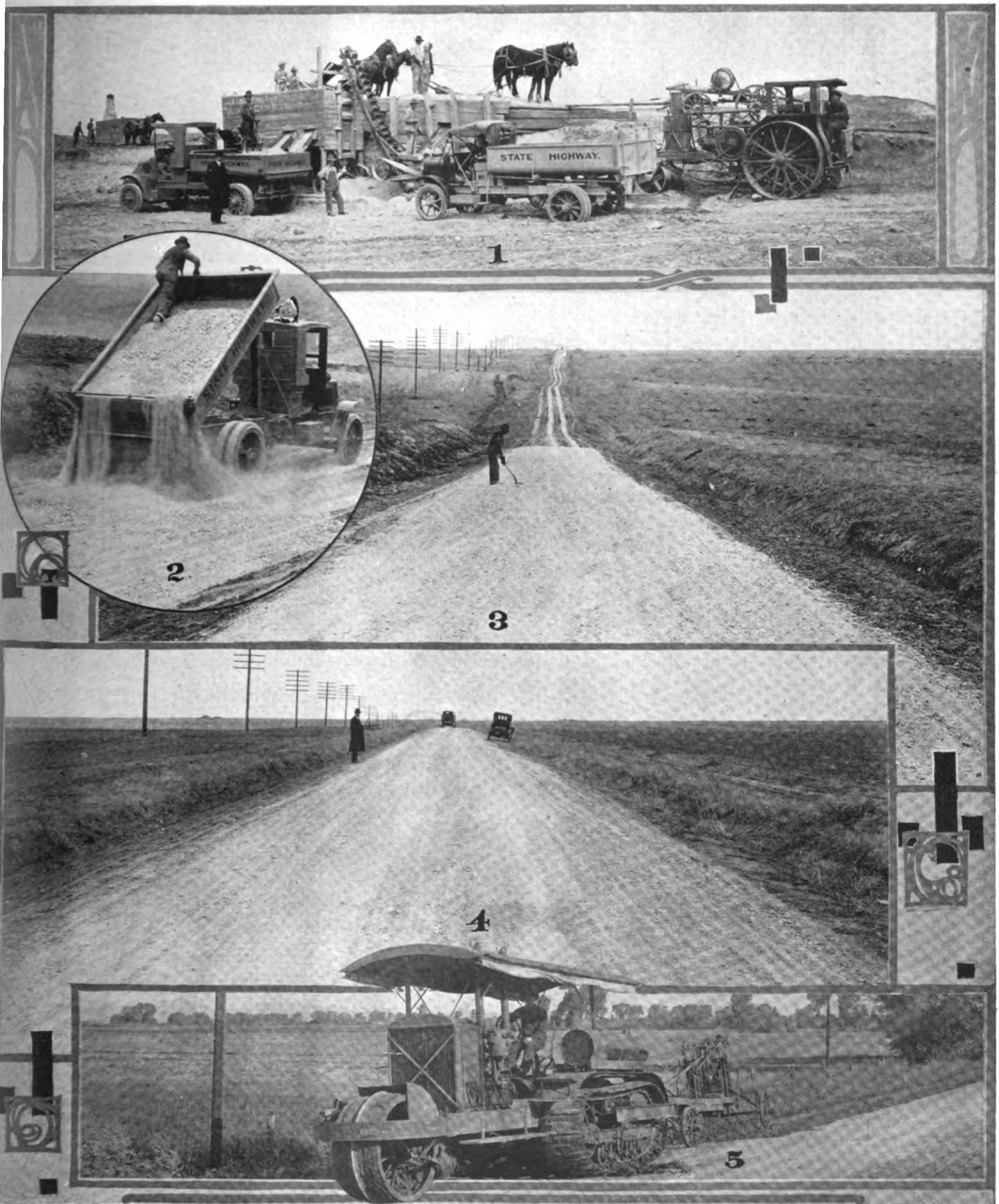
Weld county petition for allotment of state fund on two to one basis was rejected. The allotment in this county is one to one basis.

The commission appropriated \$1,500 for repair of the Lyons-Estes Park road, by the state highway commissioner; \$2,000 was appropriated to Grand County on road 51 north of Grand Lake, the same to be met by \$1,000 from the county. The commission appropriated \$6,000 for construction by the state highway commissioner of two concrete bridges on the road between Denver and Broomfield.

The commission also ordered that the following roads be declared state highways: Sheridan Boulevard, one mile south of Ft. Logan to the intersection of Arvada road No. 72; also the road starting on Waisworth Ave., Arvada, north to Broomfield. The road on the boundary line between the counties of Arapahoe and Jefferson counties also was declared a state highway.

The New Mexico state highway commission has let contracts for four Federal Aid road projects covering the construction of about forty-five miles of road work in the counties of Chavis, Colfax and Santa Fe. It is expected that nearly \$400,000 will be spent on this work. The Santa Fe County road project extends from the city of Santa Fe south to Pankey's Gate. The Colfax County project extends from Raton north to the Colorado state line. The Chavis County project extends from the Mescalero Sands and from Roswell to Comanche Springs.

Governor Sproul of Pennsylvania has signed bills appropriating more than \$14,000,000 for carrying out the highway program of that state. Of this nearly \$11,000,000 has been set aside for construction, maintenance and repair.



Conveyor and motor machinery owned by the State Highway Department and used for maintenance in District No. 1. 2. Motor truck spreading gravel on Boulevard F, beyond the north limits of Denver. 3. Before and after travelling. 4. If the emigrants had found roads like this? 5. Highway Department Caterpillar tractor on the Morrison Road.



County Responsibility

The failure of the state legislature to make adequate provision for funds with which to meet federal aid appropriations now available, or to become available on July 1, 1919, places upon the counties the burden of making up such delinquency as may exist in the state highway funds.

If Colorado is to avail herself of the opportunity offered through federal aid the counties of the state in which federal aid projects are located must raise from funds other than regular road funds approximately 15 per cent of the amount of the allotments. There is hardly much choice about the matter, for it would be almost criminal to allow these funds to lapse back to the federal road revenue when other states are struggling to get their hands upon this money.

Inquiries instituted by officials of the State Highway Department indicate that few counties will fail to raise the extra funds. A number already have signified their intention to do so. This is true also in Colorado's sister states of the mountain region. Montana counties are raising fifty per cent of the total, matching federal aid allotments dollar for dollar. In Utah the counties are expected to raise from 10 to 25 per cent more than was originally contemplated before the passage of the post office appropriation bill with its \$200,000,000 appropriation for post roads. In several states the counties are voting bonds to meet the emergency. The proceeds from the \$5,000,000 bond issue, if authorized by vote of the people of Colorado in the fall of 1920, will not be available until the spring of 1921. The State Highway Commission estimates that the various counties will have to produce something like \$300,000 to enable the commission to take care of federal aid allotments now due or to be available on July 1st.

The Proper Spirit

The manner in which dealers in gasoline have accepted the gasoline tax bill, passed at the last session of the Colorado legislature, not only is highly creditable to them, but an indication of the helpful spirit toward a great road building program manifested by all lines of the automobile industry.

It is to the interest of gasoline dealers, as well as automobile manufacturers, that better roads and more roads should be built, and the automobile trades generally have recognized this. Nevertheless dealers too often consider the immediate effect of a new law upon their business, and are not guided by ultimate results. The car

owner may be expected to complain about the increase in prices, until he becomes thoroughly familiar with the cause and effect, for he must eventually pay the bill, but the gasoline dealers have to argue the matter out with him and it is not always a pleasant task to explain increased costs in these days.

State Construction

Secretary of Agriculture Huston, in a recent message, made the statement that under the federal aid law state highway departments have been developed and strengthened "in a way that could not be equalled under any other type of national road legislation that could be suggested." This is taken by road enthusiasts to mean that direct control of construction under the last federal aid bill, the post office appropriation bill, is to be in the hands of state highway departments and engineers. These are so thoroughly familiar with local conditions that such a course is one greatly to be desired both from a local and national standpoint, the government, of course, retaining a supervisory control.

Visualizing Road Work

Road construction and development is a subject that may more easily be comprehended by the layman through visual demonstration than by reading matter and, acting upon this truth, the Visual Instruction Section of the Department of the Interior, is preparing to book motion pictures of road construction throughout the country. Slides are also to be sent out illustrating the subject. Already twenty-five states have applied, through various agencies, for the service. In addition to the ordinary road pictures there will be listed for circulation among the public some 1,000,000 feet of film negative held by the War Department, which presents every phase of America's participation in the war. These films include road building in the war zone.

One hundred and five federal aid projects, covering 1,148.93 miles of road, and involving a total expenditure of \$14,525,667.38, were approved by the Secretary of Agriculture during March, 1919. This is the greatest amount of federal aid requested for projects in any one month since the passage of the Federal Aid Road Act of 1916. Agreements were executed with state highway departments during the month covering 41 projects with an aggregate total mileage of 290.34.

How to Comply With Bankhead Provisions

By J. E. Maloney, Chief Engineer, State Highway Commission

In order that the Boards of County Commissioners and the public generally may be informed as to the requirements of the Federal Aid Road Act effective March 8th, 1919, the following extracts and notes are given:

FROM BUREAU OF PUBLIC ROADS, ENGINEERING MEMORANDUM No. 5 REVISED.

1. Engineering Memorandum No. 5, effective September 11, 1917, is hereby amended, effective March 8, 1919, as follows:

2. Under the Federal Aid Road Act as amended, any public road that comes within any of the following classes is eligible for Federal Aid:

1. Any public road a major portion of which is used for the transportation of the United States mails at the time the application for Federal Aid is made (the major portion may consist of a single stretch of road or several parts); or

2. Any public road which can, by reasonable construction or improvement in co-operation with the state authorities, be put into such condition as to permit the use thereof for transporting the United States mails; or

3. Any public road no part of which is used for the transportation of the United States mails at the time the application for Federal Aid is made, provided it is not more than ten miles in length and forms a connecting link (cross link) between two roads used for transporting the United States mails at the time such application is made; or

4. Any public road no part of which is used for transporting the United States mails at the time the application for Federal Aid is made, provided it does not exceed ten miles in length and connects the end of a road with the beginning of another road over both of which the United States mails are being transported at the time of such application.

NOTE: These provisions are all subject to the opinion of the solicitor of the Department of Agriculture as to the status of any particular project which may be submitted.

From Rules and Regulations of the Secretary of Agriculture for carrying out the Federal Aid Road Act, revised March 5, 1919.

NOTE: The following are applicable to all Post Road projects:

Regulation 4. Project Statements.

Section 1. A project statement shall contain all information necessary to enable the Secretary to ascertain: (a) whether the project conforms to the requirements of the Act; (b) whether adequate funds, or their equivalent, are or will be available by or on behalf of the state for construction; (c) what purpose the project will serve and how it correlates with the other highway work of the state; (d) the administrative control of, and responsibility for, the project; (e) the adequacy of the plans and pro-

visions for proper maintenance of roads; and (f) the approximate amount of Federal Aid desired.

Sec. 4. Each project statement shall be accompanied by a sketch map, showing the location of the proposed project and all main contiguous transportation features.

Sec. 5. Where any part of the cost of a project is to be furnished by a county or other local subdivision or subdivisions of a state, the project statement shall be accompanied by certified copy of each resolution or order, if any, of the appropriate local officials respecting the funds which are or will be made available, or respecting the supervision of the construction of the road and of the expenditure of the money provided or to be provided for paying such cost.

Regulation 5. Surveys, Plans, Specifications and Estimates.

Section 1. Surveys and plans shall show in convenient form and sufficient detail, according to accepted engineering practice, necessary data, in connection with the specifications and estimates, to enable the Secretary to ascertain and pass upon location, grades, drainage, bridges, other structures, special and unusual features, the work to be performed, and the probable cost thereof, all in conformity with the standards governing form and arrangement prescribed by the Secretary, except that state standard specifications submitted and approved prior to July 1, 1919, need not conform to the standards prescribed by the Secretary; and such approved state standard specifications may continue in force after July 1, 1919, so long as they remain unchanged.

Sec. 2. Specifications shall set forth the proposed method of construction, type of construction, materials to be used, and other essentials, in such detail as to afford complete knowledge of all steps to be taken in the construction of the project.

Sec. 3. The estimate for the proposed type, or types, of construction for each project shall show the estimated quantity and cost of each item of construction in detail and, separately, the ten per cent fund, and shall not include any expense of advertising.

Sec. 4. Unless state standard contract and bond forms have been approved, there shall be submitted, with each set of specifications, for the approval of the Secretary copies of the form of contract, together with all documents referred to therein or made part thereof, and of the contractor's bond which it is proposed to use on the project. No alteration of such form shall be made until it is approved by the Secretary.

Sec. 5. Rights-of-way necessary for any project shall be provided, and any incidental damages to adjoining property due to construction work paid, by or on behalf of the state, and the expense thereof shall not be

included in the estimate or paid in any part, directly or indirectly, by the Federal Government.

Sec. 6. Grade crossings shall be avoided where practicable. The estimated cost of eliminating a grade crossing shall not include any amount the state, county or other civil subdivision has received, is to receive, or is entitled to receive, directly or indirectly, as reimbursement or payment from the owner of a public utility, for or on account of such elimination.

Sec. 7. No part of the expense of making surveys, plans, specifications or estimates, by or on behalf of the state prior to the beginning of construction work, shall be included in the estimate or paid by the Federal Government.

Sec. 8. When plans, specifications and estimates have been approved by the Secretary, no alteration thereof shall be made without his approval, except that minor alterations which will not involve an increase in the cost of the project to the Federal Government may be made with the approval of the Director of the Bureau of Public Roads, or of his authorized representative.

Regulation 6. Project Agreements.

Section 1. A project agreement between the State Highway Department and the Secretary shall be executed in triplicate on a form furnished by the Secretary. No payment shall be made by the United States unless or until such agreement has been executed, nor on account of work done prior to the recommendation by the District Engineer of the Bureau of Public Roads that the project plans, specifications and estimates be approved.

Regulation 7. Contracts.

Section 1. No part of the Federal money set aside on account of any project shall be paid until it has been shown to the satisfaction of the Secretary that adequate means, either by advertising or by other devices appropriate for the purpose, were employed, prior to the beginning of construction, to insure the economical and practical expenditure of such money.

Sec. 2. Immediately on publication of advertisements, copies thereof shall be furnished to the Bureau of Public Roads.

Sec. 3. Bids shall conform to the standard proposal form and the items shall be the same as those contained in the estimate provided for in Reg. 5, Sec. 3.

Sec. 4. Copy of the tabulated bid prices, showing the unit prices and the totals of each bid for every project, shall be furnished promptly to the Bureau of Public Roads.

Sec. 5. In advance of the acceptance of any bid, sufficient notice of the time and place the contract is to be awarded shall be given to the Bureau of Public Roads to enable it, if it so desire, to have a representative present. When a bid has been accepted, prompt notice thereof shall be given to the Bureau of Public Roads.

Sec. 6. If the contract be awarded to any other than the lowest responsible bidder, the Federal Government shall not pay more than its pro rata share of the lowest

responsible bid, unless it be satisfactorily shown that it was advantageous to the work to accept the higher bid.

Sec. 7. A copy of each contract as executed shall be immediately certified by the State Highway Department and furnished to the Bureau of Public Roads.

Sec. 8. The specifications and plans shall be made a part of the contract.

Sec. 9. No alteration in such contract shall be made without the approval of the Secretary.

Regulation 8. Construction Work and Labor.

Sec. 3. Unless otherwise specifically stipulated in the project agreement, bridges, viaducts and underpasses shall have clear width of roadway of not less than 16 feet, and clear head room of not less than 14 feet for a width of 8 feet at the center.

Sec. 4. No part of the money apportioned under the Act shall be used, directly or indirectly, to pay, or to reimburse a state, county or local subdivision for the payment of, any premium or royalty on any patented or proprietary material, specification, process, or type of construction, unless purchased or obtained on open actual competitive bidding at the same or a less cost than unpatented articles or methods equally suitable for the same purpose.

Sec. 5. The supervision of each project by the State Highway Department shall include adequate engineering and inspection throughout the course of construction.

Sec. 8. Force account work, or other labor, teams, material and equipment furnished by or on behalf of the State Highway Department on construction work shall be used only on such terms and conditions as are set forth in the project agreement.

Regulation 9. Records and Cost Keeping.

Section 1. Such records of the cost of the work, and of inspection and tests by or on behalf of the state, shall be kept by or under the direction of the State Highway Department, as will enable the Secretary, or his authorized representative, at any time to determine the condition of the construction and maintenance of, and the cost to the state and the Federal Government of the construction work and labor done on any project.

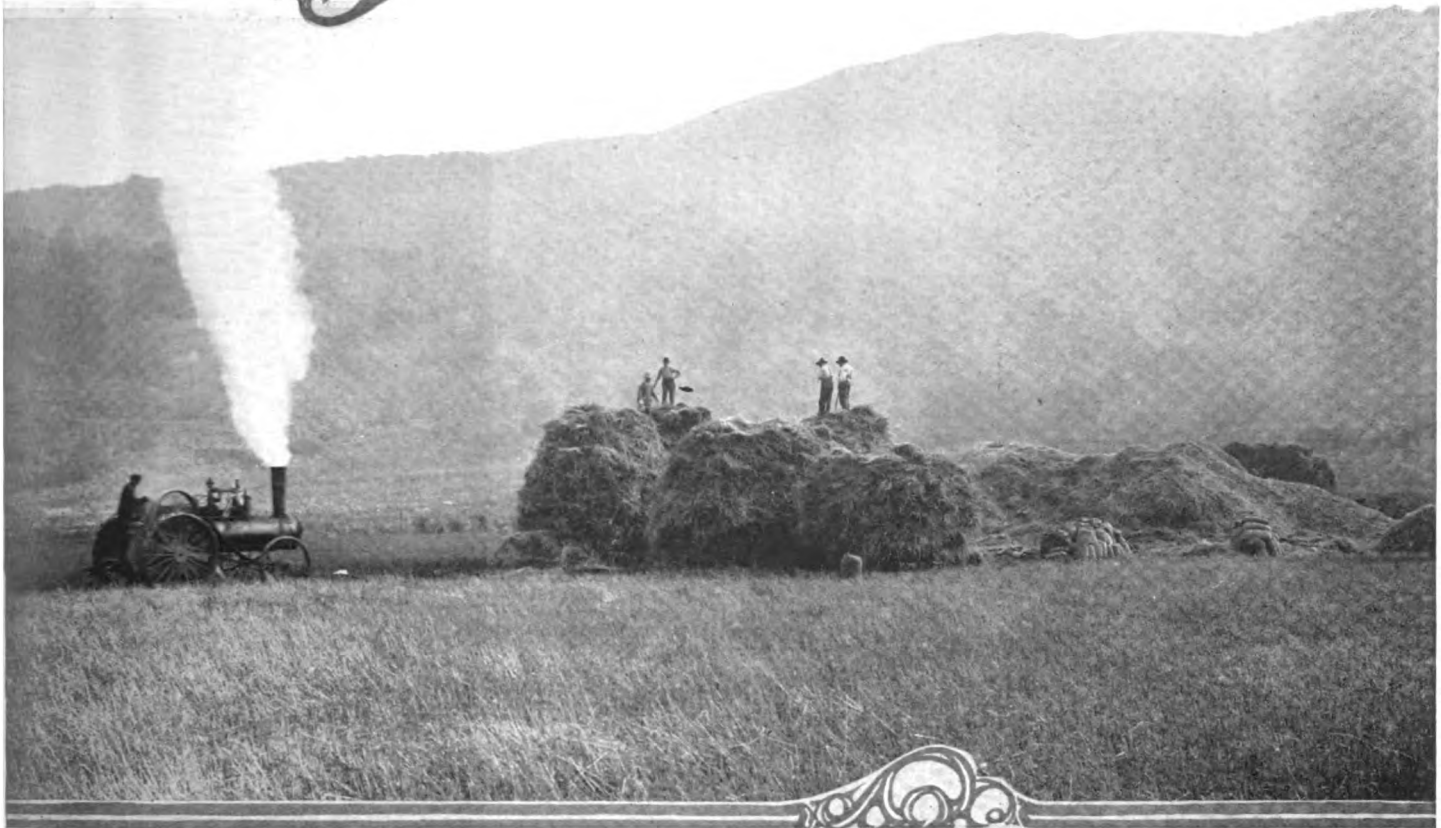
Sec. 2. The accounts and records, together with all supporting documents, shall be open, at all times, to the inspection of the Secretary, or his authorized representative, and copies thereof shall be furnished when requested.

Sec. 3. Certified copies of payrolls on force account work and of all vouchers for other expenditures shall be furnished, whenever requested by the Secretary or his authorized representative.

Sec. 4. Whenever requested by the Secretary or his authorized representative, unit costs on any project shall be kept, on forms furnished by the Bureau of Public Roads.

NOTE: The method of procedure is: A piece of road is selected for improvement which is a state road and which also is within the classification of The Federal Aid Road Act. An engineer for the state is sent to make a preliminary investigation to base an approximate estimate of the proposed work

(Continued on page 20.)



A modern farm in the Far West. Haying and threshing scene on the road to Aspen, Garfield County.

Road Drag Rules Applicable to Colorado

COUNTY Commissioners and road overseers in Colorado will find much of benefit in a set of rules designed to govern road dragging, in use in Saskatchewan, Canada, because these rules fit Colorado conditions in an ideal manner. They are reprinted in the Bulletin for that reason.

1. Drag at the right time. The right time to drag a road is as soon as possible after every rain when the soil is mellow and pulverizes readily. Do not drag when the soil sticks to the drag, or do not wait until the soil is too dry before you drag.
2. Drag early in the spring as soon as the frost is out of the ground. Dragging a muddy stretch of road will aid in drying it out, since the wind and sun will have free access to the thin layer of saturated soil which the drag spreads over the surface of the road.
3. Drag before it freezes. A road dragged before it freezes in the fall will freeze smooth, and usually remain in this condition for some time. The general condition of the road in the spring, after winter dragging, will be remarkably good.
4. Drag a gravel road when wet. A gravel road should be dragged, as a rule, soon after a rain when the soil is wet but not too saturated. It will be found that the gravel can be worked better when in a wet condition.
5. Drag between the shoulders. When a road is bad-

ly cut up over the entire surface, two complete round trips should be made with the drag. The first trip should be made along the edge of the shoulder. The second trip should be made inside and slightly overlapping the first. This will take up any excess material left by the first round, and will aid in building up the crown.

6. Ride the drag. Under ordinary conditions the driver should ride his drag. He will soon be able to adjust his position so as to produce the desired effect. By standing on the forward edge, the drag may be made to cut deeper and vice versa. A long hitch causes a downward pull and thus increases the depth of the cut, while a short hitch tends to lift up on the front blade and decreases the depth of the cut.
7. Carry pick and shovel. The driver should always carry a pick and shovel on his drag. He will find them very useful in opening water courses, filling mud holes and chuck holes, repairing washed places and digging up rocks.
8. Drag often. Drag as often as ruts appear in the road. Do not try to build a road with the drag. Its use is to maintain the surface of the road which already constructed, in a smooth condition. The best results are obtained by repeated dragging.
9. Successful road dragging requires experience. Dragging a road is a business that is but learned in the

(Continued on page 20.)

Commissioner Changed in District Five



Robert E. Norvell.

State Road District No. 5, embracing the great empire of northwestern Colorado, is now represented on the Colorado Highway Commission by Robert E. Norvell of Hayden, who was appointed by Governor Oliver H. Shoup upon expiration of the term of L. Boyd Walbridge of Meeker.

Mr. Norvell has lived in Colorado for twenty-eight years and has been identified with the upbuilding of the northwestern section of the state since he first entered that land of promise. He was born in Tennessee.

Northwestern Colorado has a great future before it, as it has become what it is in spite of the fact that it has never been on a through railroad and was not served by any railroad until the Denver & Salt Lake was pushed to Steamboat Springs. Business men and cattlemen of Routt and Moffat counties still have long trips to market, but the automobile is rapidly advancing the interests of these counties.

Mr. Norvell is peculiarly fitted to serve on the highway commission as representative of the northwest, not

alone because of his familiarity with the region, but because as a farmer and a distributor of automobiles he is intimately in touch with the great industry of the region, and the means of bringing it in closer touch with the world.

The new highway commissioner has always taken an active interest in a public way in every question involving the interests of his section in particular and the interests of the state in general. He was a member of the Nineteenth and Twentieth General Assemblies, was active in the promotion of good roads legislation during this official period, and has done much to advance the road situation in his own section.

L. Boyd Walbridge

L. Boyd Walbridge, who completed a six year term as highway commissioner for District No. 5, on April 1st of this year, has for more than twenty years played an active part in the development of northwestern Colorado.

Mr. Walbridge, although a pioneer in the northwest, is not a native Coloradoan. He was born September 17, 1859, in Wellesboro, Tioga County, Pennsylvania, moved to Muncy, Penn., when three years of age and was educated in the public schools and the Lycoming County, Pennsylvania Normal school. He started as school teacher and taught in country schools for two terms. Later he worked for a number of years as head clerk and bookkeeper in a Pennsylvania general merchandise store. Mr. Walbridge went to Hayden, Routt County in the fall of 1886 and spent that winter with his father, Joshua Walbridge, who for a number of years was county judge of Routt.

Mr. Walbridge went to Meeker in 1887 and secured employment in the general merchandise store of Thomas Watson. He then worked for J. W. Hugus & Co., pioneer merchants and bankers, part of the time in the store and part of the time as

cashier of their bank. He was elected county clerk of Rio Blanco County, served three terms, and in 1895 branched out in business for himself with an old land company in the general merchandise business. He was one of the founders and for many years has been cashier and director of the First National Bank of Meeker. He always found time however, to give his services to help build northwest Colorado. He represented Routt and Rio Blanco in the Seventeenth and Eighteenth Assemblies.

During Mr. Walbridge's term on the State Highway Commission some very important road projects were inaugurated, all of great importance to his section of the country. These included the opening of some notable passes in District No. 5, including Rabbit Ear, Independence and Tennessee passes, construction of the Pike's Peak ocean-to-ocean highway and Midland trail through to the Utah state line, opening of the canyon of the Grand above Glenwood Springs, elimination of Battle Mountain, and the opening of the north and south highway from Grand Junction to Rifle, thence north to Craig



L. Boyd Walbridge.



View of the Automotive Show, held in the Stockyards Pavilion, Denver, April 1 to 5, one of the finest exhibits in recent years given in the West. The accessories display was especially good, while every exhibit was of the latest on the market. The Highway Commission road construction display made a hit with the spectators.

Progress on the D-C-D Highway

W. A. Palmer, secretary and general manager of the Dallas-Canadian-Denver Highway Association, has recently completed a trip from Canadian to Dallas and intermediate points in the interest of the highway. He held meetings in all the towns between Canadian and Dallas, and he reports that the people are very active in the matter of improvement of the highway, and, without exception, every town is loyal and doing everything possible in the interest of the D-C-D. He reports that Denton county, Texas, has recently voted one and one-half million road bonds, and every mile of the D-C-D in that county will be hard surfaced. From Dallas to Lewisville, in Denton county, the D-C-D highway goes over a splendid graveled pike. Cook county, just north of Denton, will vote on April 12th one and one-half million good road bonds, and, likewise, every mile of the D-C-D highway in that county will be hard surfaced. A magnificent steel and concrete bridge has recently been opened for traffic across Red river between Texas and Oklahoma, and the cities of Gainesville, Marietta, and Ardmore have raised

a fund of six thousand dollars to grade and clay the stretch of deep sand north of Red river in Love county, Oklahoma. Love county will soon hold an election to vote one hundred and fifty thousand for good road bonds. Carter county's portion of the D-C-D highway is about completed, and this includes twenty miles of road west from Ardmore having a crushed rock base with graveled surface. Every town on the line has promised to make immediate improvement in their respective sections by re-grading, filling in bog holes and dragging. Splendid concrete bridges and culverts are being placed on many sections of the road and there is general activity. Practically every town between Canadian and Dallas has paid its quota in full for the expenses of the association.

Mr. Palmer spent considerable time in Ardmore in conference with the Chamber of Commerce perfecting plans for the annual convention in Ardmore on June 10-11. He also reports that every town on the line will send a large number of cars to the convention, and up to date at least five hundred cars have promised to attend.

Colorado-to-Coast Motor Highway

(Continued from page 10.)

structing a 75 mile concrete road. The greatest difficulty is expected in Nevada, as this State has heavy work before it, aside from this through route. The General Motors company, however, has agreed to give \$250,000 for road construction along this section of the route.

Commissioner Ehrhart informed the meeting in Denver that the highway commission has laid out for this year expenditures along the route mentioned totaling \$250,000 for this year. The key to the situation is Tennessee Pass. No other pass in the Rocky Mountains remains open so well during the winter, and it would be possible to maintain practically unbroken traffic during the year over Tennessee Pass. During five or six months of the year, or while the tourist season was on, Berthoud Pass could be used and the journey materially shortened.

The California and Utah representatives are exceedingly enthusiastic about the route and promised quick action from their states. A second meeting is to be held in the near future in Salt Lake City, which will be attended by California and Nevada road enthusiasts, and an active campaign will then be launched to interest road organizations, chambers of commerce and other business associations along the route so that the route may be opened this summer.

Colorado representatives have promised the fullest co-operation as soon as the general program has been adopted in all states, and the matter will then be taken up by the Civic and Commercial Association, the Denver Motor Club and other Colorado cities along the route. It is possible to secure a number of highly scenic variations of the route in Colorado with very little deviation from the short line. Colorado Springs, Salida, or the Middle Park towns could very easily be taken in on detour trips. A road leads down the Bear River from Steamboat Springs, which is almost as short as the one first outlined. Such a route will serve to divert thousands of cars thru Colorado that now go by the southern route.

Reorganize Highways Transport Bureau

(Continued from page 11.)

problems growing out of the entrance of the motor truck into the commercial transportation field, will seek to determine just how the motor truck can best be fitted into the nation's existing transportation agencies.

It is the policy of the Council through its committee to co-operate with all transportation agencies with the view of determining for the people how their transportation needs can be served most efficiently, speedily and economically, and to aid in the promotion of motor express lines through rural communities which now do not have adequate transportation.

The Council will co-operate with the United States Railroad Administration in the study of the short haul problem, and will also give specialized attention to the relation of the Rural Motor express to interurban electric

lines and waterways traffic, in the interest of all elements concerned.

The Highway Industries Association announces from its headquarters in Washington, D. C., that seven hundred and twenty organizations have endorsed the Chicago highway resolution, which calls for the national highway plan as set forth in the Townsend bill, a digest of which was published in April Colorado Highways. Every state in the Union is represented. The organizations include: three hundred and ninety-three commercial clubs, twenty-seven national trade organizations, thirty-one state trade organizations, seventy-two rotary clubs, sixty-two travelers protective associations, seventy-six United Commercial Travelers associations, twelve Kiwanis clubs, ten transcontinental highway associations, thirty-seven state and county good roads organizations. Out of this number two hundred and thirty-eight already have appointed good roads committee to co-operate directly with the highways associations.

How to Comply With Bankhead Provisions

(Continued from page 16.)

upon. A project statement and estimate is made out and submitted to the Bureau of Public Roads for approval. An engineer of the U. S. Dept. inspects the location as to the proposed work and also as to the status of the road as a postal route. Upon approval by the United States of the Project Statement, final surveys, cross sections and plans for the proposed work are made and an estimate of the cost. These are submitted to the U. S. Department and, upon approval, a project agreement or contract is signed by the Secretary of Agriculture for the United States and by the State Highway Commissioner for the state. The work is then advertised and contract let. By the co-operation of the U. S. District Engineer's office time has been saved by having the preliminary investigation made by the State and Federal Engineer together.

Attention may be called to the following points:

The improvement must be of a substantial character.

The maintenance must be kept up by the state and county to the satisfaction of the United States on all Federal Aid roads.

The engineering information must be accurate and complete and cover all details.

When a county sets aside a certain amount of county funds to assist the state in meeting the Federal Aid funds, a certified copy of the resolution of appropriation in duplicate must be sent in to the State Highway Commission to be filed with the project statement.

Road Drag Rules Applicable to Colorado

(Continued from page 17.)

school of practical experience. Every man engaged in dragging must become an enthusiastic and observant student of the road to be dragged if he desires to produce results.

Avoid dragging when the mud sticks to the drag, except when water is standing on the road; then the drag can be used to bale out the water. It is best to drag just following a rain. Drag from the side to the center, driving on one side, returning on the other. It is usually a waste of time to drag a dry road. Drag when possible at all times of the year.

Road Bills Enacted by the 22nd Assembly

*Five Million Dollar Bond Issue
One-half Mill Levy for Roads
One Cent Per Gallon Gasoline Tax
Reimbursement Highway Fund
Motor Vehicle Law*

THE five road measures passed by the Twenty-second General Assembly of Colorado are printed below for the information of those Bulletin readers who desire accurate information as to the contents of the bills. Four measures were enacted into law and signed by Governor Shoup. The resolution providing for submission of the \$5,000,000 bond issue calls for a vote upon this measure at the next state election, which does not occur until November, 1920.

All of the measures mentioned are printed in full with the exception of the Motor Truck Bill, so-called because of the important changes made in relation to motor truck licenses. Because of its length a digest was made of this law.

The only measures from which the State Highway Commission can expect any material benefit during 1919 are the gasoline tax and the reimbursement of highways funds from the Capitol building fund. However, this will be sufficient to give the commission a start toward construction of federal aid projects, provided that estimates and data, collected by the highway department upon the proposed projects, meet the approval of government officials before the end of the year.

The amount of work to be done in preparing estimates for federal aid adopted in the budget of the highway commission, in preparing maps, specifications and plans, is enormous and will necessitate the expansion of the present engineering force until well into next fall. When this is done these plans must go to the Secretary of Agriculture for approval, and the agreement must then be signed with the state highway department.

Bond Issue

HOUSE CONCURRENT RESOLUTION No. 5. By Mr. Bond

Section 1. Whereas the prosperity and comfort of the citizens of the State of Colorado, as the State develops, are becoming more and more dependent upon the condition of the public highways of the State, and under existing law is it impracticable and often impossible to construct and maintain highways throughout the State so that the same shall be permanent and capable of the highest and best utility and service;

Sec. 2. Now, therefore, be it resolved by the House of Representatives of the Twenty-second General Assembly, the Senate concurring:

That there shall be submitted to the qualified electors of the State of Colorado, at the next general election of members of the general assembly, for their approval or rejection, the following amendment to the Constitution of the State of Colorado, which, when ratified by the majority of those voting thereon, shall be valid as a part of the said Constitution, to-wit:

Section Three (3) of Article Eleven (XI) of the Constitution of the State of Colorado shall be amended so as to read as follows: (The old part of the Section omitted because of lack of space. The proposed amendment follows):

"And provided further, that, in addition to the amount of debt that may be incurred as above, the State may contract a debt by loan for the purpose of creating a fund to be expended as provided by law, by the State Highway Commission for the construction and improvement of public highways in the State of Colorado, said debt to be evidenced by registered coupon interest bearing bonds to an amount not to exceed \$5,000,000.00.

"The said bonds, to an extent not exceeding \$2,000,000, shall be dated June 1st, 1921; not exceeding \$3,000,000, dated June 1st, 1922; and said bonds shall be payable at the option of the State of Colorado at any time after ten (10) years from their respective dates, and shall be of the denomination of fifty (\$50) dollars each or any multiple thereof. The interest on said bonds shall be payable semi-annually at the rate of five (5%) per cent per annum, at the office of the State Treasurer or at some place in the State of New York, U. S. A., and the principal of said bonds shall be payable at the office of the State Treasurer.

"No such bonds shall be issued except at par and accrued interest.

"Fifty per centum (50%) of the proceedings from the sales of said bonds shall be divided among the various counties of the state according to the mileage of State Roads and State Highways within said counties, and the remaining fifty per centum (50%) of the proceeds from the sale of said bonds shall be used by the State Highway Commission only to meet and accept the Federal Aid awarded to the State of Colorado by United States Congressional Act.

"The General Assembly shall, as by law provided, enact all such laws, as may be necessary with reference to said bonds and with reference to carrying out the projects and purposes herein specified."

Half-Mill Levy

HOUSE BILL No. 570.

By Mr. Best

Levying a tax for the building of Highways in the State of Colorado and providing for the expenditure thereof.

Be it enacted by the General Assembly of the State of Colorado:

Section 1. There shall be levied annually, beginning with the year 1919, for the purpose of building Highways within the State of Colorado, one-half of one mill on each and every dollar of assessed valuation of all taxable property in the state of Colorado, said tax to be assessed and collected in the same manner and at the same time as is now or may hereafter be provided by law for the assessment and collection of State tax.

Sec. 2. The State Treasurer shall credit the State Highway Fund with all funds received by him under the provisions of this act, and shall furnish the State Highway Commission with a statement of such account not later than the 25th day of each calendar month showing all monies received and credited to the said account during the previous calendar month in which said monies are so received by him.

Sec. 3. The General Assembly hereby declares this law is necessary for the immediate preservation of the Public peace, health and safety.

Sec. 4. In the opinion of the General Assembly, an emergency exists, therefore this act is to take effect and be in force on and after its passage.

One Cent Per Gallon Gasoline Tax

HOUSE BILL No. 406.

By Messrs. Rotruck, Bond, Tedman,
Wilkins, Kelley, Godsman, and
Sutton.

Providing a tax on Petroleum products used in propelling motor vehicles

Be it enacted by the General Assembly of the State of Colorado:

Section 1. A tax of one cent (1c) is hereby levied and shall be collected upon each gallon of kerosene, gasoline and any fluid or substance which is a product of Petroleum, whether manufactured in this State or not, offered for sale or used for consumption for power purposes in propelling motor vehicles. Provided that this tax shall not be fixed and charged upon distillate, crude petroleum, residuum, gas oil or smudge oil.

Sec. 2. It shall be the duty of the State Oil Inspector, his assistant and deputies, to collect the tax provided for in this act, at the same time and under the same rules, regulations and provisions under which he makes the collection of the 1-10c inspection fee provided for in Chapter 126 of the Session Laws of Colorado of 1915.

Sec. 3. The State Treasurer is hereby authorized and directed to pay warrants, to persons found to be entitled thereto, out of the special road fund herein created, to repay any tax erroneously collected under this act upon vouchers drawn by the State Auditor with the approval of the State Auditing Board.

Sec. 4. It shall be the duty of the State Oil Inspector to transfer daily the collections obtained from the one cent tax, provided for in this act, to the State Treasurer, to be placed by the said State Treasurer in the special road fund. One-half of the said special road fund shall be apportioned by the State Highway Commission among the several counties of the State according to the mileage of the State roads and State Highways, as established by the State Highway Commission, in said counties, on the first day of January of each year, provided: that nothing in this section shall prevent the State Highway Commission from applying the money in this special road fund, or so much as may be necessary, during the year 1919, to meet the money appropriated by the United States government on the dollar-for-dollar basis, for road construction in Colorado.

Sec. 5. The General Assembly hereby determines and declares that this act and each and every sentence, phrase, clause, section and subsection thereof is necessary for the immediate preservation of the Public peace, health and safety.

Sec. 6. In the opinion of the General Assembly an emergency exists; therefore, this act shall take effect and be in force from and after the date of its passage.

Reimbursement Bill

SENATE BILL No. 274.

By Senator Napier

To provide for the payment of monies borrowed by The Capitol Building Fund from the Internal Improvement Permanent Fund.

Be it enacted by the General Assembly of the State of Colorado:

Section 1. For the purpose of making repayment to the Internal Improvement Permanent Fund of the monies borrowed from the State fund by The Capitol Building Fund, together with interest thereon, the Auditor of the State is hereby directed to issue certificates of indebtedness in favor of the State Treasurer, as custodian of the Internal Improvement Permanent Fund and payable from the Capitol Building Fund as follows:

Ten (10) Certificates of Indebtedness of Five Thousand (\$5,000.00) Dollars each, payable from monies accruing to the Capitol Building Fund from revenues of the year 1919;

Ten (10) Certificates of Indebtedness of Five Thousand (\$5,000.00) Dollars each, payable from monies accruing to the Capitol Building Fund from revenues of the year 1920;

Ten (10) Certificates of Indebtedness of Five Thousand (\$5,000.00) Dollars each, payable from monies accruing to the Capitol Building Fund from revenues of the year 1921;

Ten (10) Certificates of Indebtedness of Five Thousand (\$5,000.00) Dollars each, payable from monies accruing to the Capitol Building fund from revenue of the year 1922.

Sec. 2. Said certificates of indebtedness shall bear interest at the rate of 4 per cent (4%) per annum.

Sec. 3. The said State Treasurer is hereby authorized and directed to sell the Certificates of Indebtedness provided for in Section 1 hereof at not less than par and accrued interest, and to carry the proceeds of the sale thereof into the Internal Improvement Permanent Fund to apply to the liquidation of the indebtedness incurred under authority of an act entitled "An act for the transfer and loan of One Hundred Fifty Thousand Dollars (\$150,000.00) from the Internal Improvement Permanent Fund to the Capitol Building Fund," approved April 6, 1891.

Sec. 4. The faith and credit of the State is hereby pledged for the payment of principal and interest of said certificates of indebtedness.

Sec. 5. All acts and parts of acts in conflict herewith are hereby repealed.

Sec. 6. This act is hereby declared to be necessary for the immediate preservation of the Public peace, health and safety

Sec. 7. In the opinion of the General Assembly an emergency exists; therefore, this act shall take effect and be in force from and after its passage.

Motor Vehicle Law

H. B. 471 by Messrs. Rhoads, Jenkin, Kelley, Godsman, Sutton, Wilkins, and Senators Booth and McWilliams.

Section 1 of the act defines the terms and phrases used in the bill. "Motor vehicles" are defined as all vehicles propelled by any power other than muscular power except "road rollers, traction engines used exclusively in drawing or propelling farm machinery, any vehicle that runs on a track or travels through the air, ambulance, fire engines and apparatus and vehicles used solely on official business by federal, state, county or municipal officers."

"Motor truck" is defined as "a motor vehicle specifically equipped for the transportation over and upon the public highways of goods, wares and merchandise and used or to be used for such purpose, and having a carrying capacity of two thousand or more pounds." "Trailer" with a few exceptions, "means a vehicle constructed or specifically equipped for the transportation of goods, wares and merchandise upon the public highways and used or to be used for such purpose, and propelled or moved by being attached to a motor or other vehicle."

Motorcycles are defined as vehicles with not more than three wheels on the ground, not more than 10 horse power, and not exceeding 500 pounds weight, unladen.

Section 2 provides for registration of motor vehicles with the Secretary of State, and the furnishing of complete information in regard to the vehicle and owner, as well as for a public registration of this information.

Section 3 provides for issuance of license tags. The change in the law makes it necessary after 1919 that owners shall carry a license tag both on the front and rear of the vehicle.

Sections 4 and 5 cover the manner of charging license fees. Up until January 1, 1920, the charge is to be based on horse power, the system used at the present time. After January 1, 1920, the charge is to be made on a cost basis, determined by the cost to owners f. o. b. factory, and the license fee shall be one-half of one per cent of the original cost price to owners.

provided that no license shall be less than \$5.00 per year. A reduction of 30 per cent is allowed on vehicles purchased five years previous to the calendar year in which they are registered with an additional reduction of 20 per cent on vehicles purchased eight years previous to registration or re-registration. These provisions apply to passenger or visiting cars. The following are exempted from license: cars used exclusively in the service of the state, any municipality or county, federal government, charitable, or philanthropic association.

Sections 6 and 7 relate to motor trucks and trailers, and, as the licensing of these constitutes the main purpose of the act, they are given in full:

Section 6. (a) The following annual registration license fees are to be paid to and collected by the secretary of state or his authorized agent upon the registration or re-registration of motor trucks.

(b) The annual registration license fee for the registration or re-registration of a motor truck with a carrying capacity of one ton shall be ten dollars; of more than one ton and not to exceed two tons, seventeen dollars and fifty cents; of more than two tons and not to exceed three tons, twenty-five dollars; of more than three tons and not to exceed four tons, thirty-seven dollars and fifty cents; of more than four tons and not to exceed five tons, fifty dollars; and for each additional ton or fractional part thereof over five tons, twenty-five dollars.

(c) The annual registration license fee for the registration or re-registration of motor vehicles used in the transportation of passengers for hire and which seat nine passengers shall be twenty dollars; provided, a further and additional annual fee of one dollar shall be charged for each additional seat capacity provided for passengers in such vehicles.

(d) The provisions herein for the payment of such annual registration license fees for the registration or re-registration of such motor trucks and trailers and of motor vehicles used in the transportation of passengers for hire shall not be held to apply during the year 1919 to any such vehicle that may have been registered or re-registered for the said year 1919 under any previous enactment of the General Assembly of Colorado.

(e) No city, county or town shall require of any person any registration license fee for any motor vehicle or trailer in addition to the registration fees to be paid to the Secretary of State or his agents as provided for in this act.

Section 7. (a) The following annual registration license fees are to be paid to and collected by the Secretary of State, or his authorized agent, for the registration or re-registration of a trailer:

For any such trailer having a carrying capacity of one ton and less than two tons an annual registration license fee of Ten dollars shall be charged; and for every additional ton of carrying capacity over and above said one ton, an additional and further fee of Five dollars shall be charged for each such additional ton of carrying capacity; provided further, a small vehicle having a carrying capacity of not to exceed fifteen hundred pounds shall not be classed or rated as a trailer within the meaning of this act.

Dealers in passenger cars are required by Section 8 to pay \$20 for the first vehicle or trailer, with an additional \$2.50 for each car or trailer up to and including five, with a \$10.00 fee for each vehicle over five. Motor truck dealers are required to pay \$30 for the first truck, \$10.00 for each additional registration up to and including five, and \$20.00 for each registration over five. Dealers in motorcycles are charged one-third the fees on cars other than trucks.

Section 9 provides for registration and licensing of "chauffeurs," the latter being defined as those driving a motor vehicle for hire. Section 10 provides for a 10-day temporary license at 25 cents each. Non-residents of the state are exempted from paying a license on other than trucks or trailers, for 90 days, under Section 11.

Sections 12, 13 and 14 provide for: carrying certificate of registration; penalty of \$100 for false statements; penitentiary term of three years for alteration or falsification of tags.

Sections 15 and 16 provide for destruction of obsolete tags; cancellation of license upon transferal of motor vehicles.

Section 17 directs the disposal of funds collected through license fees. After expenses of operation shall have been paid the state treasurer is ordered, not later than the 20th day of each month, to:

"Pay to the credit and account of the State Highway Fund fifty (50) per cent of the moneys received by him under the provisions of this act; provided, said fifty per cent of such moneys so paid to the credit and account of said State Highway Fund shall be expended under the direction of the State Highway Commission for the construction, maintenance and improvement of the state highways of this state, and for no other purpose.

"The remaining fifty (50) per cent of such moneys so paid by the Secretary of State to the State Treasurer under the provisions of this Act shall, not later than the Twentieth day of each calendar month, be paid by the State Treasurer to the county treasurers of the different counties in which such moneys were collected during the preceding calendar month; provided, such payments shall be made in equal proportion to the moneys collected in each such county under the provisions of this Act; provided, further, such moneys so paid to said county treasurers shall be credited to the road funds of such counties and shall be expended under the "direction of the board of county commissioners of each such county for the construction, maintenance and improvement of the county roads and bridges of such county, and for no other purpose."

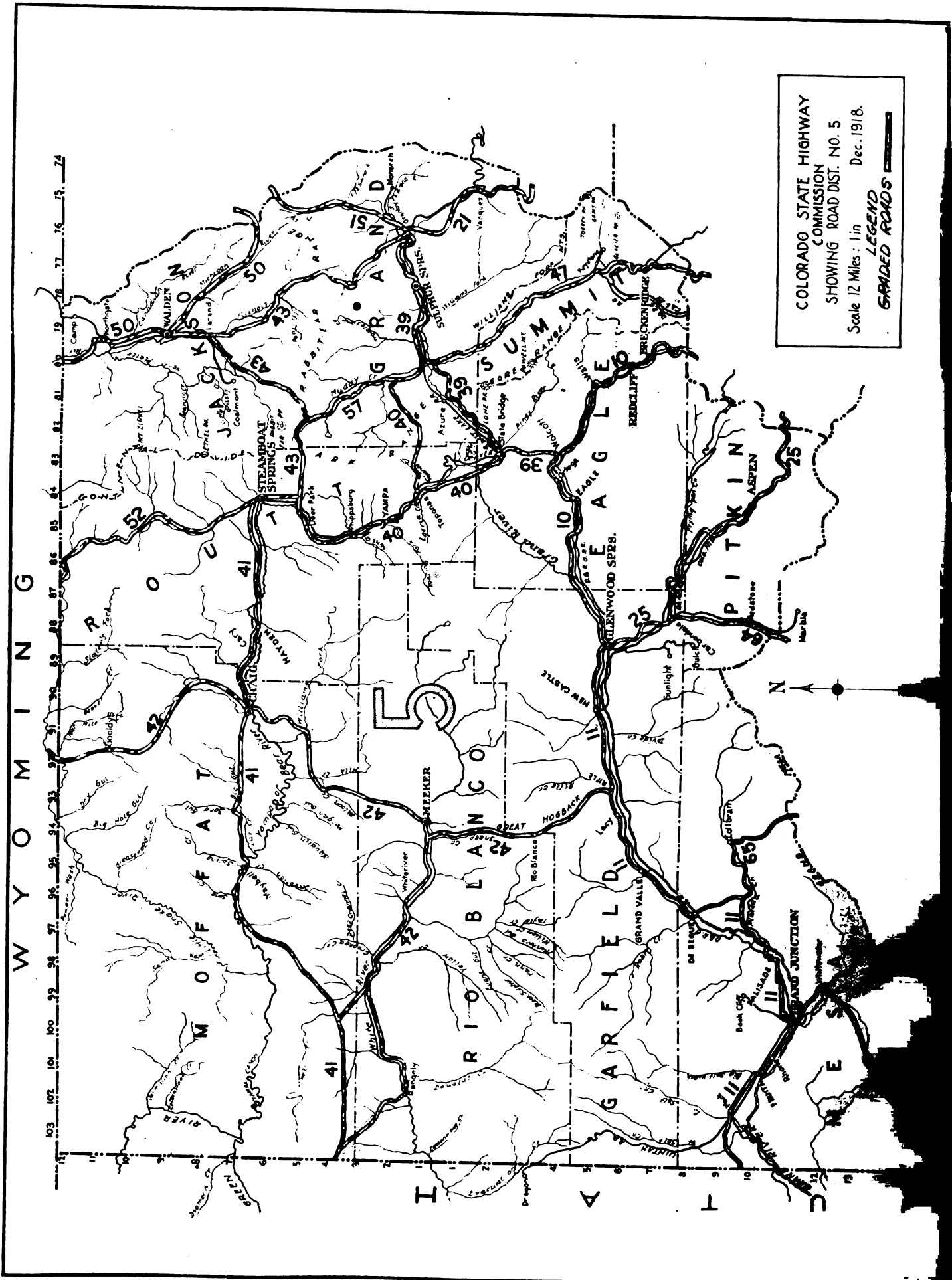
Section 18 authorizes the Secretary of State to expend not more than five per cent of the total annual gross receipts from licenses and penalties, for administration of the law. The county clerk and recorder of each county, except Denver, is designated by Section 19 as the authorized agent for administration of the provisions of the act in his county. Section 20 and 21 are concerned with details of administration, the motor supervisor, to be appointed by the Secretary of State, and motor vehicle license inspectors being given police powers with respect to enforcement of the provisions of this act.

Section 22 gives the Secretary of State and motor vehicle supervisors power to revoke licenses, but no license may be revoked unless the driver or owner has been convicted of violation of the law in police court, or unless final judgment has been entered against him in a civil suit, and in any event, the judge before whom the case was tried must have requested the revocation in writing.

Section 23 prohibits any person from driving a machine while under the influence of intoxicants or drugs. Section 24 provides for penalties. Section 25 directs the manner of transmitting fines and penalties to the Secretary of State. Section 25 is as follows:

"Any person convicted of destroying, removing, altering or defacing any motor vehicle engine or motor number for the purpose, or with the intent of concealing the identity of such vehicle or engine or motor, shall be deemed guilty of a felony, and upon conviction thereof shall be punished by imprisonment in the state penitentiary for a term of not less than two years nor more than five years."

Any one having in his possession a motor vehicle upon which the number has been destroyed or removed is required to have a new number assigned by the Secretary of State and stamped upon the engine, according to Section 25. Section 26 authorized the Secretary of State or motor vehicle inspector to administer oaths. Section 27 authorized the Secretary of State to have published the copies of this act. The remaining sections merely refer to repeal of conflicting provisions, the safety and emergency clauses.



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June, 1919

Colorado in Her Most Prosperous Year
Auto Line Between National Parks
Colorado Commission Highly Honored
"Little Zeb" and Pike's Peak
Professor Deplores Politics in Road
Work
Bonifaces of Rockies

Issued by the
State Highway Department

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A fine field of corn in Montrose County with an unusually attractive centerpiece.

CONTENTS

Colorado is in the Midst of Most Prosperous Year.....	5
Automobile Line Between National Parks.....	7
Fishermen Like Good Roads.....	8
Colorado Commission is Highly Honored.....	11
"Little Zeb" Climbs Part Way Up Pike's Peak.....	14
Work Begins in Poudre Canon.....	14
Bonifaces of Rockies to Motor Around Pike's Peak.....	18
Professor Deplores Politics in Road Work.....	19
Surveys and Plans for State and Federal Aid Projects.....	21
Speeding Federal Road Work.....	23
County Commissioners Are Busy.....	23

New Work in Western States
Road Records in April
The Big Thompson Road
Progressive Military Maps

COLORADO HIGHWAYS BULLETIN

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by the



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Department

Denver, Colorado.

With the approval of the Colorado State Auditing Board.

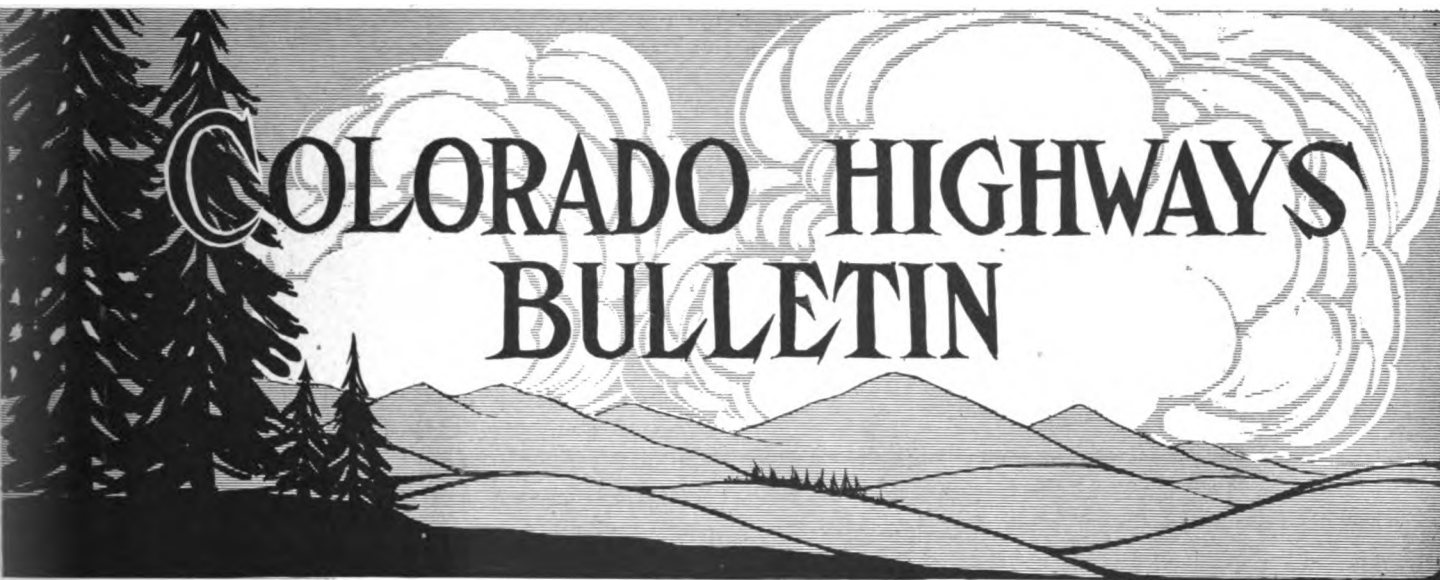
Address all communications to Colorado Highway Department, attention J. G. Hilliard, editor, Colorado Highways Bulletin.

Owing to the necessarily limited edition of this publication it will be impossible to distribute it free to any persons or institutions other than state and county officials actually engaged in the planning or construction of highways, instructors in highway engineering, newspapers and periodicals and civic associations. Others desiring to obtain Colorado Highways can do so by sending 10 cents for each number desired. Associations desiring to distribute the magazine can obtain it at cost in lots of from 500 copies up.

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Nature's Sentinel Obelisk in Roxborough Park, Twenty Miles Southwest of Denver.



Colorado Is In Midst of Most Prosperous Year

By Howard D. Sullivan

THE State Immigration Department was called upon a few days ago to give to the Colorado Highways Bulletin some statistics illustrative of general business conditions in Colorado at present, as compared with conditions existing before the United States entered the World War. In the compilation of the figures necessary for making the required comparisons a good many facts were brought out which are of interest, as illustrating the progress and present prosperity of the State of Colorado as a whole.

Agricultural conditions have never been more favorable throughout the State at this season of the year than they are now. Reports on acreage of all crops planted now being received from county assessors indicate that the acreage cultivated this year will be the largest in the history of Colorado. These reports show that a large acreage of raw land is being put into crops for the first time this year, and that most of the land previously cultivated is being cropped. Though no definite data on the acreage of raw land put into crops in 1917 and 1918 is available, it is estimated that at least 200,000 acres that had never been plowed before were broken in response to the government's call for increased production of food and feed crops. Apparently the amount of raw land broken for 1919 crops will be close to 50,000 acres.

The value of all crops grown in Colorado in 1916 was approximately \$91,000,000. Last year the value of all crops was somewhat above \$150,000,000. It is too early to build substantial hopes on what the farm output of the State will be this year, for those who are familiar with our

extremely variable rainfall understand that for the non-irrigated districts much depends upon conditions that prevail after June 1. For the irrigated districts, however, at least fair crops are almost certain, for the snowfall in practically all watersheds of the State was heavy during the winter and early spring, and a good supply of water for irrigation is assured. The rainfall in the non-irrigated districts up to May 20th was generally ample for all requirements, and winter wheat and rye have never been in better condition at this time of the year. The acreage of both crops is the largest in the history of the State, and favorable conditions until harvest would result in a production of winter wheat nearly 2,000,000 bushels greater than the largest production of winter and spring wheat combined for any previous year. The outlook for fruit is especially favorable. The blossom was especially heavy in all fruit-producing districts, and no damage from frost has been reported.

So much for the agricultural outlook. It has never been better, but many discouragements usually await the farmer between the time of planting his crop and harvesting it. If nature smiles upon him this year he will make a new high record for crop production in Colorado.

Perhaps there is no better index to the prosperity of any state than its bank deposits. On December 27, 1916, the total deposits in all banks in the State, according to compilations made in this office from the reports of all state, private and national banks and trust companies, were \$228,154,528.14. On December 31, 1918, total deposits were \$255,887,031.82. These figures do not show

the true increase in the cash resources of the people of Colorado, for between the two dates given they invested more than \$100,000,000 in Liberty Bonds and War Savings Stamps, to help Uncle Sam in his great battle against German militarism and autocracy. A very large amount of this sum was withdrawn from savings and other bank deposits, and much which would have gone into bank deposits was diverted to meet deferred payments on these securities. In addition to these purchases of war securities the people of Colorado, between the dates named, subscribed many millions of dollars to the American Red Cross and all other agencies engaged in war work.

From these figures it may be seen that the people of Colorado had in their banks at the beginning of 1918 more than \$27,000,000 in excess of what they had two years previous and owned more than \$100,000,000 worth of Liberty Bonds. The population of the State is estimated at about 1,030,000. This means that there has been an increase of more than \$25 per capita in bank deposits and an increase of nearly \$100 per capita in cash assets on account of Liberty Bonds, provided there has been no material change in the population. There has, of course, been some increase in population during this period, but it has been comparatively slight, for the reason that about 42,000 Colorado boys entered military service between January 1, 1917, and January 1, 1919, and a comparatively small number of them had returned to their homes on the latter date.

The assessed valuation of all property in Colorado for 1916, as returned by the State Tax Commission, was \$1,211,697,278. The value of all property assessed for 1918 was \$1,424,811,288. This is not an abnormal increase in assessed valuation for the State, yet it shows a healthy state of growth, while it does not represent fully the increases in value of agricultural lands that have been apparent in the past two years. There has been but little variation in the selling prices of city real estate since the United States entered the World War, though a better demand is evident now than has been apparent for some years. Farm lands, however, are commanding higher prices than they have ever commanded before in Colorado, and are selling freely. In some of the non-irrigated districts the increases in the prices of farm lands since the beginning of 1917 have been 100 percent and even more, while there has been rather a general increase in the prices of irrigated land, though the percentage of increase has not been nearly so high as for dry farming land. Dealers in farm lands report that the sales of farm land in eastern Colorado during the last eighteen months have been larger than during any like period for a good many years, the purchasers including many experienced farmers from the states immediately east of Colorado, who have sold their higher priced lands at home and have come to Colorado, where land prices, despite the recent advances, still are much lower than in Nebraska, Kansas, Missouri, Iowa and similarly located states. Sales of land in other sections

of the State have been much heavier than usual during the past two years.

There has been a material increase in the number of live stock in the State since the beginning of 1917, as shown by the estimates compiled by the Bureau of Crop Estimates of the United States Department of Agriculture. For example, the number of stock cattle on farms on January, 1919, was estimated by this authority, 1,361,000, compared with 1,200,000 on January 1, 1917, and the number of milk cattle on the two dates were 254,000 and 237,000 respectively. On the same dates the number of hogs on farms was 406,000 and 352,000. Increases were shown for all other classes of livestock. The prices prevailing for livestock at this time are of course much higher than at the beginning of 1917. Losses of stock, particularly cattle and sheep, have been somewhat heavy since the 1919 estimates were made, due to unfavorable weather conditions in the late winter and early spring and to shortage of feed crops, but the number of stock to be marketed this year will be considerably greater than for 1917. The general conditions of livestock at this time in Colorado is not quite as good as usual for this season of the year, due to the unfavorable weather and shortage of feed above referred to, but pastures are in excellent condition and the outlook for production of feed crops is exceptionally good.

The latest official figures on the manufacturing output of the State were compiled by the Federal Census Bureau for the year 1914. These show that the value of all manufactured goods produced in the State that year was \$136,839,321. There has been a very substantial increase in the volume of manufactured output since that time, and heavy increases in prices. Such data as is available indicates that the total value of all goods manufactured in Colorado in 1918 was approximately \$200,000,000. There has been a slight falling off in manufacturing activity in several lines during the early part of this year, due largely to stoppage of government demand for war materials, but the output of the State this year should be materially greater than that for 1914.

Metal mining is the one industry in which conditions have not been so favorable for a year past as they were for a time before the entry of the United States into the war. This has been due to several causes, among which have been a falling of prices for zinc and lead, shortage of labor in the mining camps, high cost of all materials used in mining, and the fixed value of gold, which has not permitted that metal to share in the general advance in prices that has been enjoyed by nearly all standard commodities. The market for tungsten, molybdenum, and the metals of the radium group has been very unstable for several months, and production of these metals has fallen off materially.

There are, however, indications of a revival in the mining industry in Colorado in the very near future. The rising price of silver has encouraged operators to open up many silver properties that had been closed down for

(Continued to Page 23)



A beauty spot on the Fall River Road in Rocky Mountain National Park.

Automobile Line Between National Parks

Secretary Lane of the Interior Department announced May 16th a plan for stimulating motor touring between three large and popular national parks of the West, which will in his opinion mark the beginning of a new epoch in American travel. This project contemplates the establishment of an automobile line from Denver, Colorado, to and through Rocky Mountain, Yellowstone, and Glacier National Parks, via Boulder and Loveland, Colorado; Cheyenne, Douglas, Casper, Thermopolis, and Cody, Wyoming; and Livingston, Bozeman, Boulder, Townsend, Helena, and Choteau, Montana. Improved road conditions next year will make it possible to change the route so as to include several other important cities in all of the states traversed.

The equipment to be used in this service consists of large new touring cars of seven and ten-passenger capacity. The fleet is to be placed in operation by Mr. H. W.

Child of Helena, Montana, and Mr. Roe Emery of Denver, Colorado, who now operate the transportation lines in Yellowstone, Glacier, and Rocky Mountain National Parks. In succeeding seasons this service will probably be extended to other national parks of the Pacific Northwest, California, and the Southwest.

It is Secretary Lane's belief that the Federal Government ought to actively encourage travel to American health and recreation resorts, regardless of whether or not they are in the great national park system. In other words, he believes that the National Park Service, which is in more than one sense the travel bureau of the Federal Government, ought to perform the same service for the American public that the Swiss, French, and other foreign government travel bureaus accomplish for European resorts. Co-operation to this end between the Interior Department and the United States Railroad Administration

has resulted in a marked stimulation of railroad travel to the national parks, and it is certain that a similar development would follow enlightened co-operation between the Government and associations and individuals who are zealously working to improve motor highways and encourage private automobile travel throughout the country.

Travel to the West by private automobile increased at a tremendous rate prior to the war, and the continued improvement of road conditions on the main highways, especially between the national parks, will result in bringing the private automobile traffic to phenomenal proportions.

Secretary Lane feels that the private motor-car is going to be quite as important a factor in American tourist travel as the railroad facilities. He, however, is encouraging the use of every means to stimulate outdoor living and the enjoyment of our great natural resources for recreation, health and observation, in order that the habit of using these resources may be firmly ingrained in the American people.

To further the plan to link together with a great system of highways the national parks of the western United States, a meeting of the representatives of the commercial clubs and chambers of commerce of the states of Idaho, Utah, California, Washington, Oregon, Montana, Wyoming and Colorado will be called as a result of the meeting in Helena May 23rd of the presidents of Montana commercial clubs and good roads men.

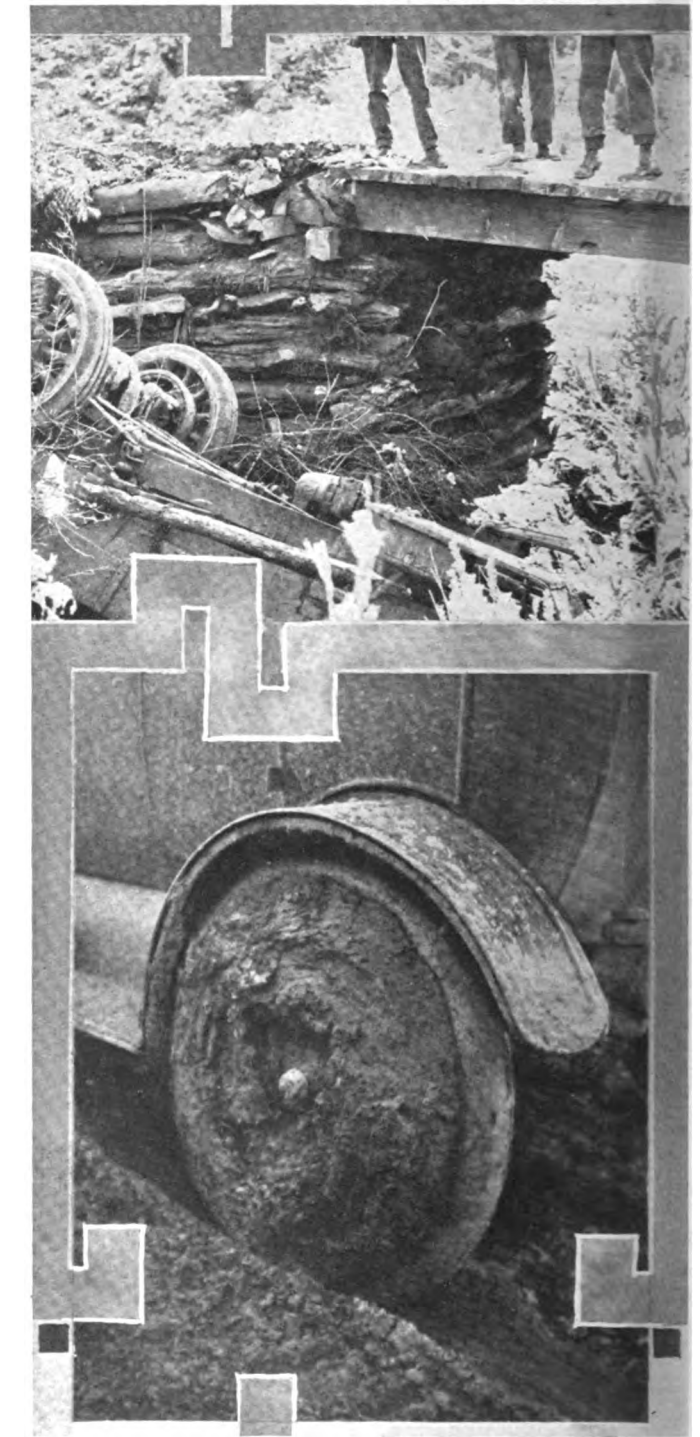
Yellowstone park is the suggested meeting place. Committees will be named to take the matter up with other states and perfect arrangements for calling the meeting.

Fishermen Like Good Roads

Good roads have no finer function in Colorado in summer than to enable enthusiastic Waltons to reach the fishing streams and resorts of the State. From May 25 to October 31, when the fishing season closes, the mountain roads accommodate many ambitious anglers. The fishing has become so popular in Colorado and the State has grown so famous for its trout that State authorities have adopted strenuous measures to preserve the supply of the speckled beauties in its streams.

Retaining ponds in which young trout will be nursed and protected until they are large enough to take care of themselves are to be established in every part of the State, according to Roland G. Parvin, State Game and Fish Commissioner.

This plan, he said, will eliminate the methods of former years of dumping annually into the rivers and creeks millions of fish fry which are not able to survive the battle for existence. According to the Commissioner,

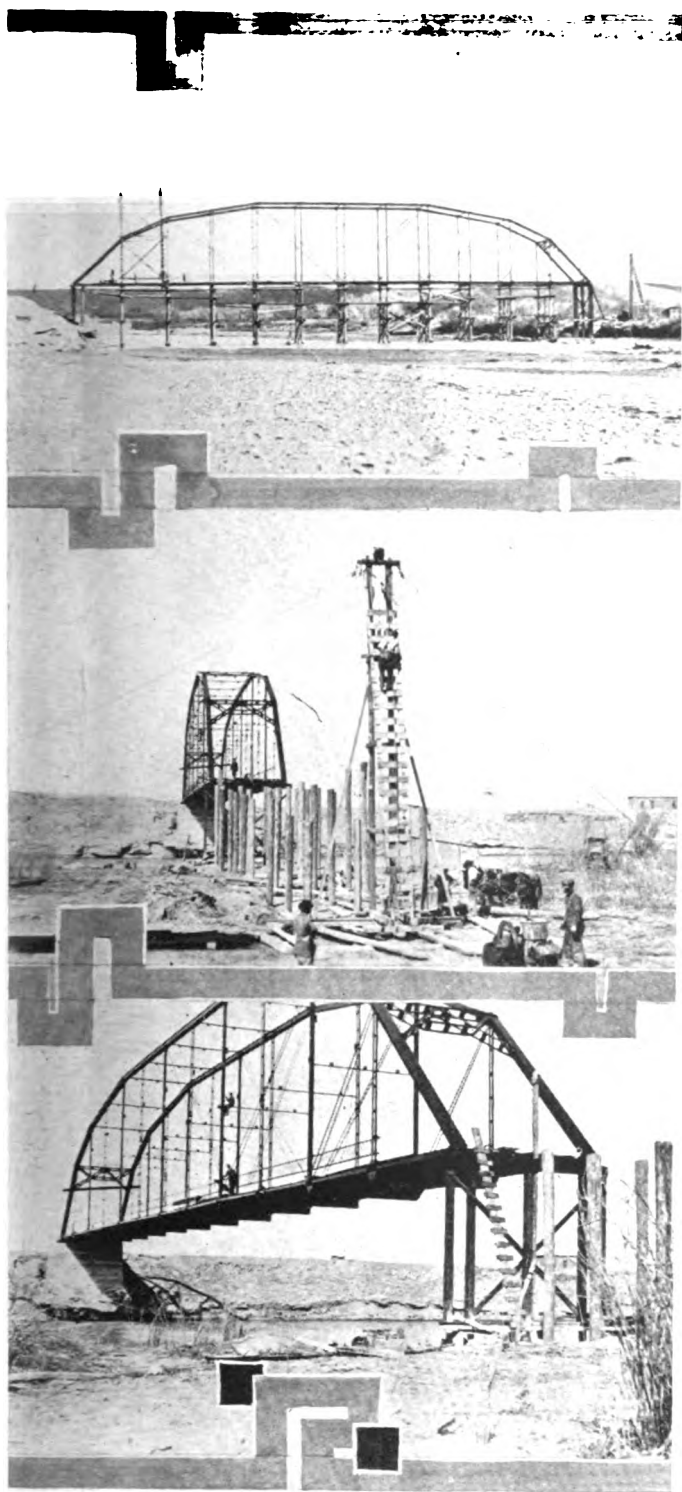


Above—Wilson 3-ton truck wrecked at Maverick Draw Bridge, account narrow bridge and dangerous approach. This bridge is located seven miles east of Naturita on the Rainbow Route, Section 20, State Highways.

Below—Wheel of a Ford Car taken in muddy road three miles west of Naturita, State Highway, Section 20, Rainbow Route.

only five percent of the small fish fry placed in mountain streams live.

“My aim,” he said, “is to establish nursing ponds, so the department may place fingerlings instead of fry in the streams. Statistics show that 85 percent of fingerlings placed in streams survive.”



New bridge across San Juan River which opens the road from Durango, Colo., to Gallup, N. M., connecting with the Santa Fe Trail. An outlet for all of Southern Colorado and one of the most important bridges ever built in the state.

New Work In Western States

During the last few weeks reports from all over the country indicate that waiting for roads is soon to be replaced by actual work. Secretary Houston, of the Department of Agriculture, issued a statement May 2nd in which he said that sentiment was growing throughout the country, even in the newer sections, in favor of more sub-

stantial roads. That this is true is indicated by recent awards for concrete highway construction aggregating about a hundred miles, these being but a few of those reported.

In several other western states there is unusual activity, as well as in Colorado. Some of the principal work about to be undertaken in the West is as follows:

Kansas. Two counties in Kansas have awarded large contracts for concrete highways. Near Wichita, in Sedgewick County, a contract for seven and three-eighths miles of eighteen foot concrete road has been awarded to the Smith-Graham Construction Company of Augusta. Price, \$208,585. The six concrete bridges on the road were awarded to the Missouri Valley Bridge Company of Kansas City. Near Topeka, in Shawnee County, ten miles of eighteen foot concrete road on the Fort to Fort road was awarded in two contracts to Cook & O'Brien and J. O. Patterson & Co., both of Kansas City. The price for the four miles let to Cook & O'Brien was \$137,291, and for the six miles to J. O. Patterson & Co., \$250,330.

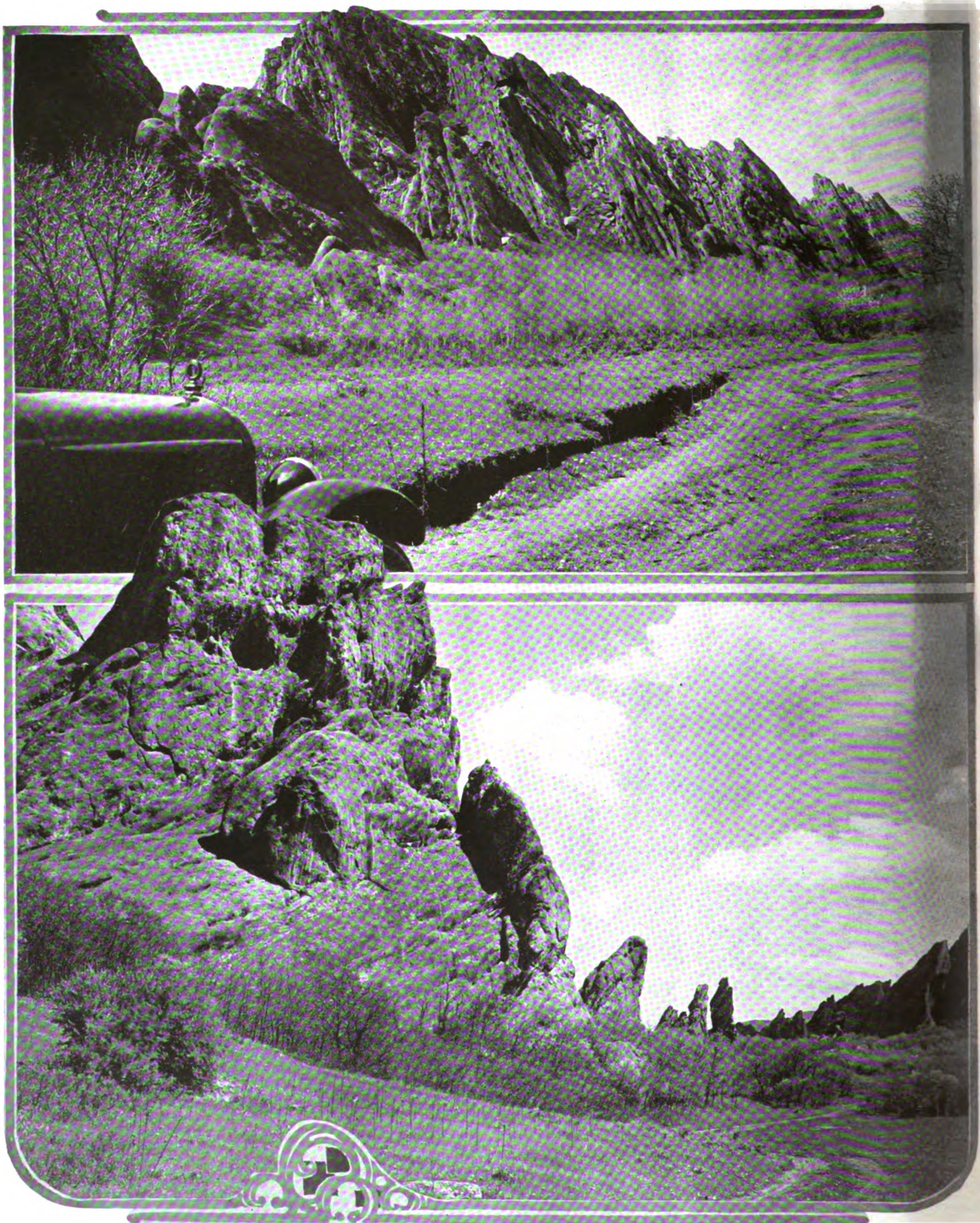
Oklahoma. Tulsa County has commenced work on its \$2,000,000 bond issue project by awarding contracts for about eight miles of 18-foot concrete road to C. O. & H. Frye of Tulsa. This is part of the Ozark Trail. Price, \$2.08 and \$2.35.

Minnesota. Anoka County, Minn., let a contract on March 28th to the Wydell Construction Company, of Mankato, Minn., for 6.6 miles of 18-foot concrete road. The contract price is \$2.03½ per square yard. The pavement will be six inches thick at the sides, eight inches at the center and reinforced. Crush trap rock aggregate will be used. Eleven proposals were received from contractors for this improvement.

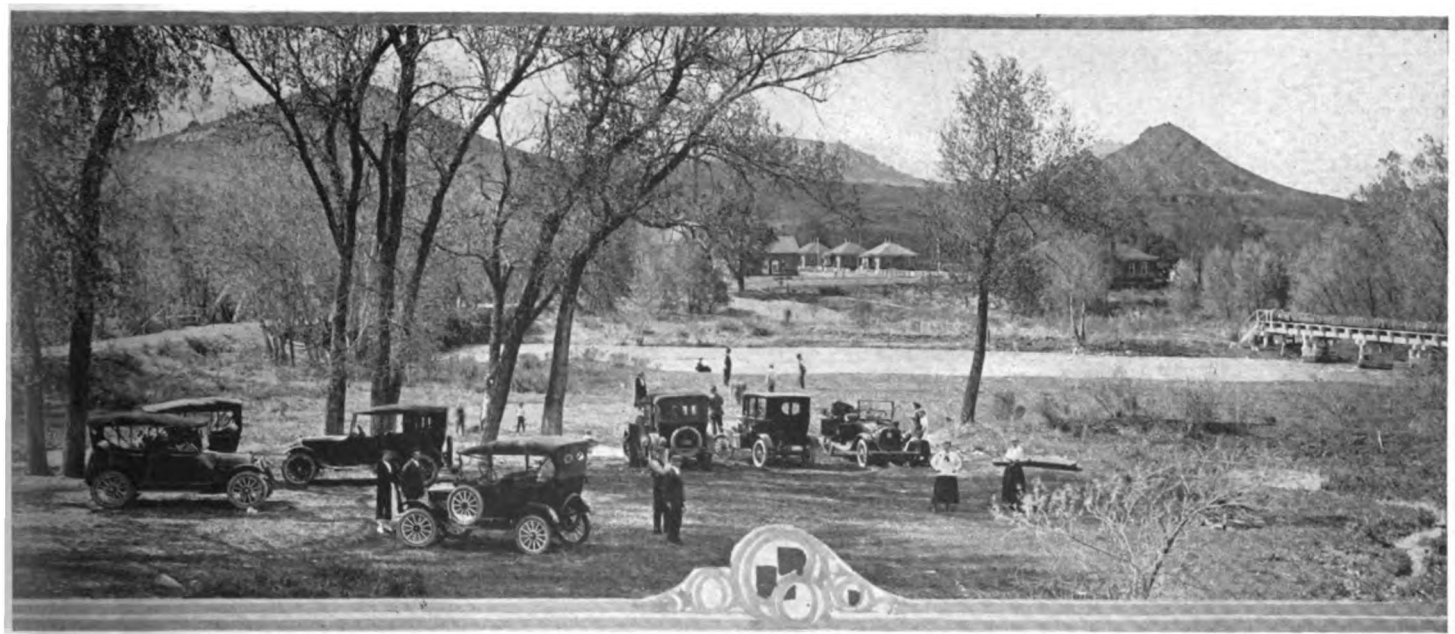
California. O. G. Richie of Niles has been awarded a contract by the State Highway Department for 11.4 miles of concrete road that will complete connection of San Diego with the Imperial Valley district. The contract price was \$233,273.

Made Road Records In April

During April, 1919, the Secretary of Agriculture approved project statements for 120 Federal-aid projects, involving the improvement of 923.53 miles of road, at a total estimated cost of \$16,261,326.51. On these roads Federal aid amounting to \$7,538,550.68 was requested. This represents the largest number of project statements approved, the largest total estimated cost and the greatest amount of Federal aid requested during any month since the passage of the Federal-aid road act. The Secretary and the several state highway departments executed 55 project agreements, involving the improvement of 521.51 miles of road, at a total estimated cost of \$4,626,415.48, and on which \$2,039,614.99 Federal aid was requested and set aside in the United States Treasury. In addition, agreements to cover 72 other projects were placed in process of execution during the month.



Two pictures of Roxborough Park, a natural park with formations rivaling the Garden of the Gods and only 45 minutes from Denver's Broadway. This park will prove a great magnet for tourists when roads now contemplated are completed.



Sunday motorists parked in a picturesque spot in Platte Canon.

Colorado Commission is Highly Honored



E. E. Sommers

A signal honor was conferred upon Chairman E. E. Sommers of the Colorado State Highway Commission in his appointment by Robert Sterling Yard, Chief of the Educational Section of the National Park Service, to be a member of the National Parks Educational Committee. Mr. Sommers received notice of this new distinction May 3rd. At a meeting in Washington May 22nd this committee resolved itself into The National Parks Association, Mr. Sommers becoming automatically a member of that organization.

Following is the letter from Mr. Yard to Mr. Sommers notifying him of his appointment:

DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
WASHINGTON

May 3, 1919.

Dear Mr. Sommers: From what we hear of you in Secretary Lane's office, and and what Mr. Albright tells me of your interest in national parks and your influence and popularity through the State, we are anxious to interest you in a nation-wide movement outside of Government to realize the higher uses, chiefly educational, of the national parks.

I invite you to become a member of the National Parks Educational Committee, a list of whose members I enclose. Undoubtedly you know a number of these men. At a meeting in Washington on May 22nd, this Committee will resolve itself into the National Parks Association. By joining the Committee now you will become one of the charter members of the Association, which is what we earnestly wish. It is desirable that Denver

should be importantly represented in the outset of a movement which its projectors feel is destined to nation-wide usefulness and success.

The purpose to use the national parks for a popular educational movement in the natural sciences is not new to us in Government, but it is an idea which cannot be successfully carried out under Government as Congress limits departmental activities to the protection, development, and maintenance of national parks as concrete properties. A year ago, therefore, the Educational Committee, with Dr. Charles D. Walcott, head of the Smithsonian Institution, as Chairman, was organized to study the opportunity.

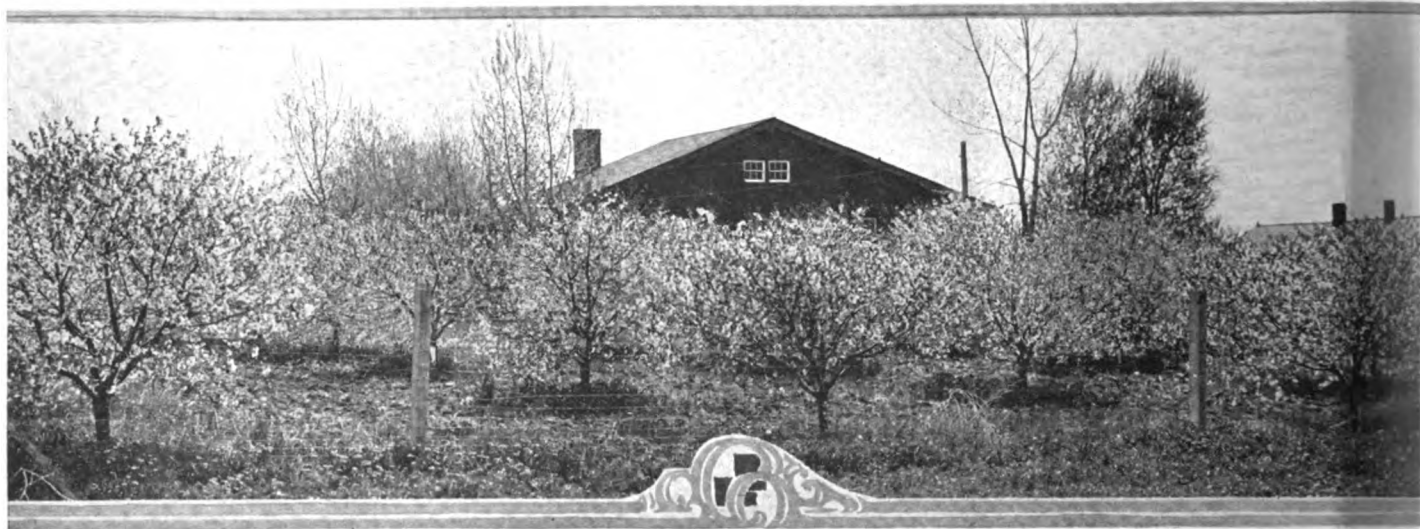
The investigation of this Committee showed a large field ripe for the working; it showed universities ready for leadership, scientific institutions anxious for popularizing medium, schools greatly interested, motion picture producers anxious for popular suggestions and many other agencies accessible. It remained only to finance an association and go to work. The Committee now feels justified in going forward upon broad nation-wide lines. The National Parks Association is the result. I need not add that the Association will be wholly non-partisan and independent. It will have no connection with Government, but will work in harmony with National Park Service.

Besides its educational work, it will stand for the development of a national park system representative of the best that America has, which means with few exceptions the best in the world. It will work to make the title National Park a national trademark. It will seek earnestly to make our national parks widely known abroad. It will be a militant organization.

If you will accept membership in the Educational Committee, and I earnestly hope you will, kindly write immediately to Henry B. F. Macfarland, Chairman of the Executive Committee, Evans Building, Washington, D. C.

Sincerely,

ROBERT STERLING YARD,
Chief, Educational Section,
National Park Service.



Apple Blossoms on Happy Canon Road, Near Denver.

Mr. Elmer E. Sommers,
State Highway Commission,
Denver, Colorado.

Following is the membership of the National Parks Educational Committee:

National Parks Educational Committee

INDIVIDUALS

Clinton L. Babcock—travel expert,
Belmore Browne—explorer, author, artist,
H. K. Bush-Brown—sculptor,
Allen Chamberlain—journalist,
William Morris Davis—geographer and geologist,
Leonidas Dennis—conservationist,
George B. Dorr—publicist,
Charles W. Eliot—educator,
Frederick Farrington—educator,
Gerit Fort—Assistant Director, U. S. Railroad Administration,
Howard H. Hays—Bureau of Service, National Parks and Monuments, U. S. Railroad Administration,
Emerson Hough—author,
William Kent—Donor Muir Woods—former Congressman,
Henry B. F. Macfarland—publicist,
Marion Randall Parsons—author, mountaineer,
George D. Pratt—Conservation Commissioner State of New York,
Charles D. Sheldon—explorer, author,
Robert Sterling Yard—author, National Park Service,

REPRESENTATIVES OF INSTITUTIONS

Arthur E. Bestor, President, Chautauqua Institution,
J. Walter Fewkes, Chief, Bureau of American Ethnology,
William H. Holmes, Curator National Academy of Art, Head Curator, Anthropology, U. S. National Museum,
William T. Hornaday, Director, New York Zoological Park,
E. O. Hovey, Curator, American Museum of National History,
LaVerne Noyes, President, Board of Trustees, Chicago Academy of Science,
Charles D. Walcott, Secretary, Smithsonian Institution.

REPRESENTATIVES OF SOCIETIES AND ASSOCIATIONS

Lorne W. Barclay, Director, Department of Education, Boy Scouts of America,
Henry G. Bryant, Explorer, President, Geographical Society of Philadelphia,
James H. Burnham, President, American Game Protective and Propagation Association,
William E. Colby, President, Sierra Club,
William B. Greeley, Chairman, Conservation Committee, Camp Fire Club.

George Bird Grinnell, President, Boone and Crockett Club,
George F. Hubbell, President, Camp Fire Club of America,
Lella Mechlin, Secretary, American Federation of Art,
J. Horace McFarland, President, American Civic Association,
D. W. Roper, Director, Prairie Club,
Edmund Seymour, President, American Edison Society,
LeRoy Jeffers, Secretary, Associated Mountain Clubs,
T. Gilbert Pearson, Secretary, National Association Audubon Societies,
Edmond S. Meany, President, the Mountaineers,
Charles D. Fay, President, American Alpine Club,
George F. Kunz, President, American Scenic and Historic Preservation Society,
Mrs. John D. Sherman, Conservation Chairman, General Federation of Women's Clubs.

REPRESENTATIVES OF UNIVERSITIES

Alexander Meiklejohn, President, Amherst College,
R. B. Von Kleinsmid, President, University of Arizona,
Benjamin Ide Wheeler, President, University of California,
Clyde A. Dunlway, President, Colorado College,
N. M. Lehnerts, Professor of Geology, Columbia University,
Wallace T. Atwood, Professor of Physiography, Harvard University,
Edgar Everett King, Professor of Railway Engineering, University of Illinois,
E. H. Lindley, President, University of Idaho,
David S. Boyd, President, University of New Mexico,
John H. Findley, President, University of State of New York,
Edward K. Graham, President, University of North Carolina,
P. L. Campbell, President, University of Oregon,
John Grier Hibben, President, Princeton University,
Robert L. Slagel, University of South Dakota,
Ray Lyman Wilbur, President, Stanford University,
Robert E. Vinson, President, University of Texas,
Aven Nelson, President, University of Wyoming,
William L. Bryan, President, University of Indiana,
Walter A. Jessup, President, University of Iowa,
Frank A. McVey, President, University of Kentucky,
Marion LeRoy Burton, President, University of Minnesota,
Ellis W. Shuler, Professor of Geology, Southern Methodist University, Texas,
Willis T. Lee, Professor of Geology, University of Oklahoma.

This auxiliary to the federal national parks service has been formed by citizens interested in the work of popularizing and improving the nation's pleasure grounds.



A Denver summer beauty spot—orchard scene near University Park.



In the middle of the war the plan was projected by Mr. Stephen T. Mather, but it has been in abeyance until the public mind was sufficiently released from war's endeavor. The sponsors for the National Parks association are Dr. Charles D. Wolcott of the Smithsonian Institution, William Kent of California, Henry B. Macfarland of Washington and Robert Sterling Yard of the national park service, who were responsible in large measure for the National Parks Educational committee, that has been studying the best means to realize certain uses of the national parks outside of what is being done by governmental agency. Mr. Yard will be in charge of the new organization and will resign from the government to give his sole attention to the work.

The principal objects to be attained by this body are:

1. To interpret the natural sciences which are illustrated in the scenic features, flora and fauna of the national parks and monuments, and circulate popular information concerning them in text and picture.
2. To encourage the popular study of the history, ex-

ploration, tradition and folk lore of the national parks and monuments.

3. To encourage art with national parks subjects, and the literature of national parks travel, wild life and wilderness living, and the interpretation of scenery.

4. To encourage the extension of the national parks system to represent by consistently great examples the full range of American scenery, flora and fauna, yet confined to areas of significance so extraordinary that they shall make the name national park an American trade mark in the competition for the world's travel; and the development of the national monuments into a system illustrative of the range of prehistoric civilization and early exploration and history.

5. To enlist the personal service of individuals and the co-operation of societies, organizations, schools, universities and institutions in the cause of the national parks and monuments.

With such an organization that will be national in the

(Continued to Page 22)



"Little Zeb," battle-scarred war tank, on Victory Loan climb up Pike's Peak. The tank reached an altitude of 11,200 feet, or to within seven miles of the summit, breaking world's records for winter travel.

"Little Zeb" Climbs Part Way Up Pikes Peak

Gay with camouflage, the Stars and Stripes floating proudly from its battle-scarred turret, and "Pikes Peak or Bust" painted on its ugly snout, "Little Zeb," the war tank that essayed to conquer His Majesty Pikes Peak in the interests of the Victory Loan campaign, "Busted" on the tenth mile of its climb to the summit.

Bucking its way through snowbanks 10 feet deep, this little tankster fought as game a fight to the finish against the overwhelming odds as did its namesake, Lieut. Zebulon Pike, over a century ago, and like him, failed to reach the coveted goal.

The climb was made on April 16 and 17 over the Pikes Peak Auto Highway in the Pike National Forest near Colorado Springs. A truck with supplies indicating an Arctic expedition instead of a mountain trip in April followed the tank as far as snow conditions would permit. A special auto bus of newspaper men, photographers, and moving picture operators equipped with sweaters, arctics, trench coats, helmets and sun glasses, trailed the terror of the battle fields to its "death." Four motion picture companies covered the trip, Hearst International, Pathe, Kinograms and the Colorado Springs Chamber of Commerce. W. I. Hutchinson of the District Office represented the Forest Service.

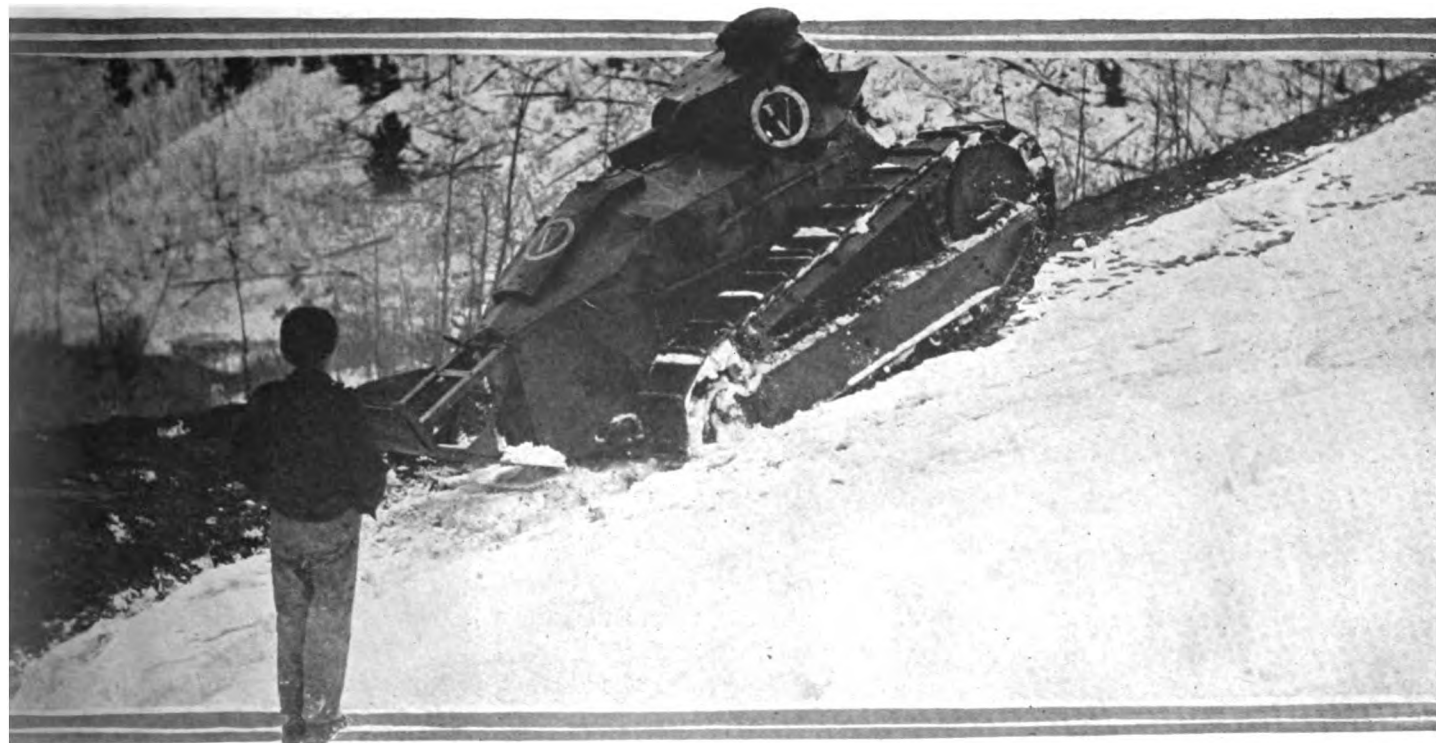
The tank broke down after climbing two of the hardest miles of the highway, within sight of Glen Cove, the halfway point on the road to the summit. Ice and snow that became wedged in the caterpillar traction apparatus caused one of the track plates to break, making a complete renewal

of the part necessary before the tank could be moved. On account of lack of time, and the necessity of keeping up the schedule of visits to other Colorado towns, the trip to the summit was abandoned, and the tank, after being repaired, returned to Colorado Springs.

The hike overland to Glen Cove from the point where the tank broke down never will be forgotten by any members of the baker's dozen that made it. They struggled through snowdrifts, waist deep, loaded down with movie equipment and blankets, until when the Inn at the Cove finally was reached, several members of the party were in an exhausted condition. To the Forest Officer with the party, who had one of the two pairs of snowshoes on the job, fell the "honor" of packing the grub for nine men from the tank to Glen Cove; also the cooking for the party, most of whom were "Tenderfoots."

Work Begins In Poudre Canon

Dooling Brothers, prominent railroad and highway contractors of the West, have been awarded the contract for completion of the Poudre River State road westward from Fort Collins along that historic stream, and began work of grading Monday morning, June 2. The funds for this road, which will be about 30 miles long, are supplied half by the State of Colorado and half by the County of Larimer, \$35,000 in all. The work is being done by the contractors on force account, and is to be completed September 1.



The War Tank making a stiff grade up the motor highway to the summit of Pike's Peak. The Whippet was able to negotiate such drifts without much trouble until the hardening snow broke some of the tractor plates.

State Highway Commissioner Elmer E. Sommers, Harold Schuck of the State Engineering Department and Roe Emery, president of the Rocky Mountain Park Transportation Company, motored over the present Poudre Canon road May 25 and found the contractors about ready to start business. The road will be one of extraordinary beauty. It lies some twenty miles north of the Big Thompson canon road and is practically parallel thereto. At a point about 30 miles west of Fort Collins there will be built a link running southward to connect with the Fall River road, which runs westward from Estes park through Rocky Mountain National park over the Continental Divide to Grand Lake. This link is to be built this fall also.

The geographical and transportation value of such a link as the one projected to connect the Poudre Valley road with the Fall River road is incalculable. It will make Jackson County in northern Colorado, formerly a part of Routt County, with untold riches of both anthracite and bituminous coal, precious metals and stock and agriculture, tributary to Colorado instead of to Wyoming, now its easiest outlet. It will also make that region accessible from Denver and Fort Collins. It will be one of the most valuable roads that could possibly be built in Colorado, both from a commercial and a scenic standpoint.

The "link" road will be built by the Federal Government, which is said to have appropriated \$500,000 for that purpose. The road will not be a long one, but the heaviest sort of work will be encountered on it and it is understood that it will be graded and surfaced in the most perfect manner. It will be the shortest route from Wyoming into the park, and, as Uncle Sam is extremely proud of this, his "baby" park, he is going to make it as easily accessi-

ble as possible, not only to the people of Colorado but to those of other and neighboring states.

The contract for grading and surfacing Federal Aid Project No. 12, in Chaves County, New Mexico, amounting to over \$100,000, has been let to Alfred Olson and L. A. Burnham, of Laverne, Oklahoma.

Funds Are None Too Great

Congress has made available for the current year something like \$80,000,000 for general road work. This is expected to be supplemented by the states to an equal amount. For the three years ending with 1921 a fund of \$275,000,000 from the federal treasury is expected to be available for "postroads." A lot of money this, some may say, and it is very much better than what has gone before. But look what is being done abroad, in countries that had roads that were roads before the war. France, that suffered such ravages from the Hun, is not neglecting her highways and \$152,000,000 has been set aside already for road repair and extension. England has appropriated \$50,000,000.

France has one and three-quarters miles of road for every square mile of area; England, a little over two and one-half miles; the United States three-quarters of a mile. There are 108 French citizens for one mile of road; 239 Englishmen and 42 Americans. We would have to have something like 7,500,000 miles of good roads to equal the ratio of English road mileage. At present we have just a third of that in good, bad and indifferent roadways.



The Big Thompson Road

It may be somewhat of a disappointment to tourists to learn that the road up the Loveland and Big Thompson canons to Estes and Rocky Mountain National parks is not to be rebuilt and double-tracked this season. But when they understand that it will be necessary to close the road entirely to do the necessary widening and surfacing, they will doubtless take a different view of the situation.

Work on the Big Thompson road will begin September 1, and will be completed sometime in November, according to present plans of the Highway Commission. Chief Engineer Maloney has pointed out that it will be a physical impossibility to keep the road open while the heavy work necessary to rebuild it is in progress. Thousands of blasts will have to be fired into the granite walls of the canon to remove the obstructing masses of rock and it would not be safe or even possible to operate the road.

To clinch the resolve of the Highway Commission to defer road construction on the Big Thompson, came delegations from Fort Collins, Longmont, Loveland, Lyons and Boulder, the principal gateways to the Park, requesting that they be permitted ingress to the canon during the summer, for it would be practically impossible for them to reach the famous playgrounds with the Big Thompson closed.

Accordingly, Dooling Brothers, contractors who will do the work on the Big Thompson road, were set at the task of building the Poudre River road, westward from Fort Collins, a much less traveled, though highly important road, June 1. The work on the Poudre will be completed in time to move their equipment to the Big Thompson September 1, when the tourist rush to the parks is practically over.

The wisdom of the Commissioners in keeping the present Big Thompson road open this summer will not be questioned, when it is considered that this is the most heavily traveled road into Estes and Rocky Mountain National parks, and that practically all of northern Colorado is forced, for geographical reasons, to use this route. The people from that part of the State have played no small part in making Rocky Mountain the most popular of all national parks, for this playground, which has been open but four years, received more visitors, even as early as its second year of existence, than any other two national parks in the Nation combined.

Progressive Military Maps

One benefit derived from the war is the mapping of the states under specifications of the War Department, as shown by a sample on the back page of the Bulletin this month, named "Progressive Military Maps." While the work was originally designed for the use of the Army and covers the whole nation, it will be of great use in civil affairs.

Roads are a prime feature in such maps and are of interest in times of peace as well as in war. Nearly all the work in this State has been done by the Highway Commission, though the U. S. Forestry Service is assisting, especially in reports that accompany such maps in the mountain districts.

Advance sheets as per sample, have been prepared throughout eastern Colorado, that is, east of the mountains. They are yet far from complete. A large part of this district has never been surveyed for contours, which will have to be done, and other data obtained before they can be considered complete. But they are valuable as far as they go, and contain all the information available. It is hoped the local officials will assist in making them useful.

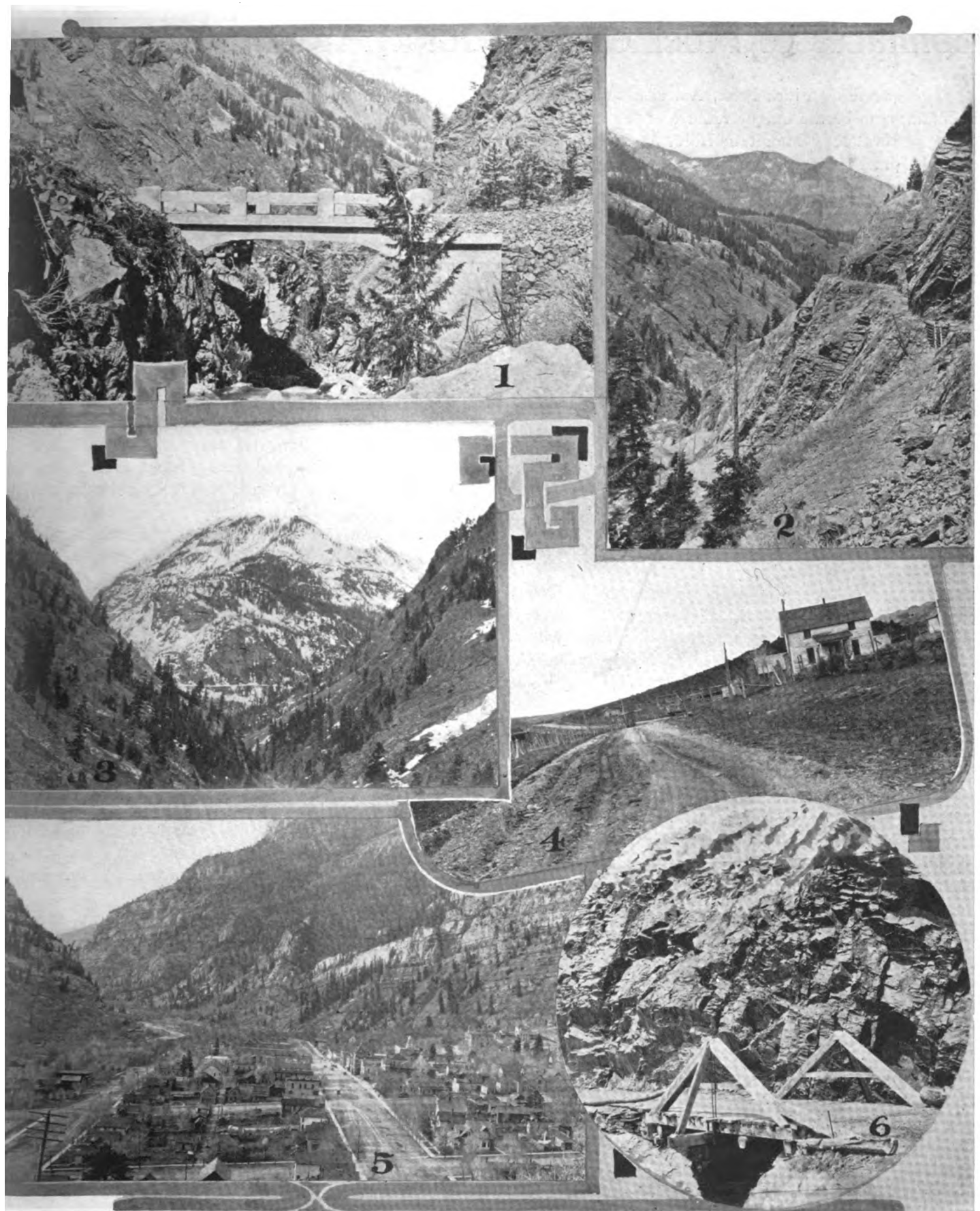
There will be 448 pages in this atlas in Colorado, like the sample, embracing fifteen minutes of latitude and the same of longitude; that is, $17\frac{1}{4}$ miles North and South, and average 13 miles East and West. The scale is about one mile to one inch, making it convenient for a book to take on the desk and study map information.

The reference number at the upper left hand is for use of military men. It may not be necessary in dealing with the whole nation, but in Colorado we have paging at the bottom of the sheet which is more easily understood, so that we can quickly find adjoining sheets.

By bearing in mind that pages are in alphabetical order from North to South and in numerical order from West to East, we can follow a line of investigation across the state in any direction.

The whole system is flexible, easily corrected and kept up-to-date.

One of the most commendable pieces of municipal road building that has been projected in Colorado for years is about to be undertaken by the city of Fort Collins, and will extend from the Edmunds store in that city to the Colorado Agricultural College. This road will be of cement and will be 160 feet wide, costing \$100,000.



State bridge over Uncompahgre River, near Ouray. 2. View of Colorado Federal Aid Project No. 26, north from state bridge, P. H. E. 1473. 3. Mt. Abrams, elevation about 13,000 feet. 4. Colorado Federal Aid Project No. 4, showing ruts in shale surface at Rio Blanco, May 5, 1919. 5. Bear Creek Bridge, Colorado F. A. 26.

Bonifaces of Rockies To Motor Around Pikes Peak

Circumscribing Pikes Peak, America's most famous mountain, is to be the unique feature of the annual June outing of the Rocky Mountain Hotel Association, which will take place June 10, 11 and 12, 1919, with Colorado Springs and Manitou as headquarters.

This remarkable motoring exploit is made possible by the construction in recent years by the State of Colorado of two extraordinary mountain roads. The latest of these is one comprising the second leg of the trip around the peak, that from Cripple Creek to Canon City, forty-five miles in length. The other of the comparatively new roads, that from Canon City to Colorado Springs, fifty-one miles in length, was built by convicts from the State Penitentiary at Canon City about eight years ago.

At Manitou, six miles west of Colorado Springs, the hotel men, who are among the State's most ardent advocates of good roads, will be the guests of the president of their association, Mr. E. E. Nichols, proprietor of the famous Cliff House, who is State Highway Commissioner of District No. 2, comprising the district in which these famous roads are located. Mr. Nichols was appointed to the State Highway Commission by Governor Oliver H. Shoup three months ago, and his well-known "faddism" for good roads, coupled with a characteristic dynamic energy, furnish grounds for prophecy that there will be more and more of the remarkable kind already built in the mountains in the vicinity of Colorado Springs and Manitou.

Hoteles which will entertain the association at Colorado Springs are the Broadmoor, W. S. Dunning, general manager; the Antlers, Charles A. Schlottler, manager; the Acacia, J. W. Atkinson, proprietor; the Alta Vista, H. Hoyt Stevens, proprietor; and the Alamo, Robert Hoffman, manager, in addition to the Cliff House of Mr. Nichols. A definite program of entertainment is now being arranged by these operators.

The following letter has been sent out by President Nichols and Secretary A. H. Stevens of the association to members announcing the event:

Office of Secretary

Rocky Mountain Hotel Men's Association

Denver, Colorado, May 26, 1919.

The trip will be made in automobiles, which will leave the Broadway side of the Brown Palace Hotel at 8:30 a. m., Tuesday, June 10, and go to Colorado Springs, where we will be the guests of the Colorado Springs hotel men, who have arranged an elaborate program of entertainment.

We will leave Colorado Springs at 8 a. m., Wednesday, for Canon City, via Cripple Creek and Phantom Canon, where we will be the guests of Mr. W. H. H. Dye, proprietor of the Strathmore Hotel, for luncheon, after which we will leave for Colorado Springs, remaining over night, and returning to Denver Thursday evening.

The only charge that will be made is for automobiles, which will be \$8 for each person.

Please notify the secretary as soon as possible, as we cannot provide seats in automobiles for extras.

A. H. STEVENS, Secretary.

The drive from Colorado Springs to Canon City by way of the Ute Pass, the great gold mines at Cripple Creek and Victor and the Phantom Canon should prove thoroughly enjoyable. Nearly all hotel members have seen the gold camp, but practically none have ever motored through the famous Phantom Canon. This route was formerly monopolized by the Florence & Cripple Creek Railroad, built into Cripple Creek in the very early days of the camp and said to be the only railroad ever built that paid its cost in the first year of operation. When it is considered that the work of construction was among the heaviest ever attempted, and that the road runs through almost impenetrable canons from an altitude of 6,000 feet at Canon City to one of 11,000 at Altman, in the Cripple Creek District, then the highest incorporated town in the world, the extreme early richness of Cripple Creek is appreciated.

But, with the completion of the Cripple Creek Short Line from Colorado Springs to Cripple Creek the gold ore ceased to flow down the Phantom Canon and came down the Short Line and the Midland Terminal Railroads by those easterly and northerly routes to the big mills of the United States Reduction and Refining, the Portland, and the Golden Cycle companies at Colorado Springs. The Phantom Canon Railroad, although marvelous scenically, fell into disuse and the old roadbed has been converted into one of the finest auto roads in Colorado within the past two years. The old iron bridges of the railroad are used by the state road and the "water grade" devised by the railroad engineers twenty-six years ago are ideal for motoring. This new road will be a revelation to the hotel travelers.

The famous road up Ute Pass from Colorado Springs to Cripple Creek is not new to Coloradoans. It is one of the finest in the State and is historically interesting in that it is the route employed by General John Fremont when he made his famous pilgrimage across the continent to California for the War Department in 1848.

From Canon City to Colorado Springs the 51-mile, convict-built road around Cheyenne Mountain will be used. When the motorists pull up to the Antlers Hotel at Colorado Springs upon their return, they will have completely encircled Pikes Peak, and by the shortest possible route, skirting the foot of the famous pile of iron and granite the entire distance. Its vastness can be appreciated when it is realized that the mileage on the wonderful trip from the time of leaving Colorado Springs until the return to that city is 155, with scarcely an unnecessary turn or grade in the entire circumference of the base of the mountain.

Professor Deplores Politics in Road Work

THE element of politics should not enter into the work of any state highway commission, according to Professor Richard R. Lyman, head of the Department of Civil Engineering at Utah University, who was a visitor to Denver May 23rd, and called upon the Colorado Highway Commission at the State Capitol.

For nine years, up to 1917, Professor Lyman was a member of the Utah State Roads Commission. The organization then consisted of the Governor, the State Treasurer, the State Engineer and two "non-partisan" members. Nine years were spent by this board in organizing its work and its engineering force. In 1916, when the commission had finally got to "going good," there were six gangs on concrete road work in Utah, to say nothing of bitulithic, macadam and other classes of highway construction.

But, in 1917 came a new administration, and with it a legislature which created a highway law constituting the personnel of the State Roads Commission as follows: Governor, Secretary of State, Auditor, Attorney General and State Engineer.

The result of this innovation was to brush aside the entire fabric of organization which had been builded so carefully. There was not left an engineer, a county supervisor or even a clerk. The result has been that the new organization has had to learn over many of the things that had been mastered by the former commission, which had really just "swung into the stride." Besides, there was Politics rearing its head, for the new law provided that five of the principal officers of state should guide the destinies of the commission.

Logan Waller Page told Professor Lyman ten years ago that the proper procedure for any state in the selection of its Roads Commission would be for the Governor to appoint one man, the Regents of the State University another and the State Agricultural College a third. A year ago he wrote a letter to Professor Lyman reiterating this belief.

Professor Lyman was, during his tenure of office as a member of the Utah Roads Commission, and is now a member of the faculty of the Utah University. He is a graduate of the University of Michigan, class of '95, Civil Engineering, and of Cornell, '03, M.C.E., and Cornell, '05, Ph.D. Good roads has always been his hobby and he has had the finest of opportunity to keep up with the times in his professional and public work in Utah. William Peterson of the Utah Agricultural College was the other non-partisan member of the former Utah Commission.

The State of Utah has available from its treasury \$4,000,000 in state funds for good roads purposes. It has coming from the Federal Government \$3,000,000, and a grand total of \$15,000,000 from all sources, as fast as it

can be spent. For example, wherever the Roads Commission decides to build a road it gets additional money from the city or county in which the road is located, and a property tax, where the property abutting or served has sufficient property value.

For instance, the Road Commission went into the City of Provo with \$6,000 of state money with which to aid in building the main street. The county gave a like amount and the city a third \$6,000. The street railway built 22 feet of the width of the road for the entire distance of one mile to be made and abutting property did the rest. Everyone, state, county, city tramway and property owners, did their part and no bond issue was required. This street, or road, is 99 feet wide and of concrete.

Thus, in Utah, the money of the State is virtually used as a bait. The Commission went into Salt Lake County with \$10,000 and raised \$250,000 with the first sum as a nucleus to build concrete roads. The first concrete roads in Salt Lake County, built about ten years ago, cost approximately \$10,000 per mile, with prison labor. If free labor had been used, the cost would have been probably \$12,000. These roads are 16 feet wide, 8 inches thick in the middle and six inches on the sides. Material is right at hand in Salt Lake County, so the expense of far-fetched road ingredients is eliminated.

Based on long experience, Professor Lyman has his own ideas on the relative values of varying kinds of construction. As to the merits of macadam roads as compared with concrete highways he relates the following experience:

In 1912 the street railway company in Salt Lake City built two miles of macadam road in the northern part of the city, at a cost of about \$8,000 per mile. The same year the City built four miles of concrete road, connecting with the macadam road and subject to exactly the same traffic. The macadam road had to be repaired the first year and had to be sprinkled all the time. It had to be fixed up even more the second year, the third year it could hardly be repaired at all and the fourth year it had to be replaced with concrete. Recently new concrete roads have been built to connect with the old concrete and the original road now appears as good as the new part.

"I believe the Utah State Roads Commission will be compelled to come to the same conclusion as Wayne County (Detroit), Michigan, did sixteen years ago," declared Professor Lyman, "and that is that nothing will do for permanent roads short of concrete. Roads built then in that county are still good, although the traffic is among the heaviest in the world."

Bitulithic roads do well in Utah, much better than macadam, in fact, although both species fall short of the performances of concrete.



A page of Colorado bridges, showing rugged types of iron and concrete. 1. Bridge at Station 207+00. 2. Bridge at Station 472+50. 3. Bridge at Station 308. 4. Bridge at Station 631+00. 5. Bridge at Station 766. 6. Bridge at Station 664, Colorado F. A. No. 9. 7. Bridge at Station 1060. 8. Bridge at Station 151.

Surveys and Plans for State and Federal Aid Projects

These notes are intended as a general guide for the Engineers, in field and office, who are in charge of surveys and plans.

PARTY: The party will be made up of a Field Engineer in charge, Instrument man, Rodman; two Chainmen, one or more Axemen when necessary; Camp man when necessary.

The party should be equipped with a transit with level bubble attachment, a hand level, level rod, two sighting poles, two 50-foot metallic tapes, marked in tenths, in cases, one 100-foot steel band tape, marked every five feet, one single bit axe, two small hand axes, tin case for papers and maps; transit and level books, receipt books, voucher books, weekly report blanks, monthly pay-roll blanks, and tax-exemption blanks for the party. Detail, profile and cross-section paper should be taken.

The engineer in charge will see that all items of expense chargeable to the State are covered by a receipt for each item, and remember that the State Auditing Board will not allow any War Tax payments.

Stakes for the work can be arranged for at the nearest local lumber yard.

In transportation payments, if an automobile belonging to any one of the party is used, the Auditing Board will allow eight cents per mile for Ford and ten cents per mile for all other automobiles.

In Federal Aid work it must be in mind that a project statement is first to be submitted. This is in the nature of a preliminary estimate and description. In some cases a reconnaissance survey is necessary to obtain data for this estimate.

When the project starts at a city or town limits, the zero point should be tied into the street system, so that the adjacent street lines may be shown. In other locations the zero point should be tied into section corners and property lines and referenced by such ties as will enable the point to be readily replaced. For the final location the stationing is to be carried through on the located line, running in the curves and carrying the stations around on the curve.

The P. I. should be carefully referenced so it can be readily replaced.

The following information should be obtained:

All fence and property lines, streets and intersecting roads. These should be carried back at least 300 feet. Telephone, telegraph and power lines—the number on several of the poles should be noted, and street or stream or electrical railroad lines crossing or parallel to surveys, if within 500 feet, culverts and syphons. The span, width of roadway, and character of all bridges, also diameter, length and kind of culverts—also the angle at which the stream crosses the road, the profile of the stream crossings and all information that can be had as to depth of foundation and area of drainage—also a profile up and down

stream for 500 feet is to be taken when the bridge is on a stream that is liable to scour.

Stakes are to be placed every 100 feet, and the line referenced at least every 1,000 feet. Location and character of all material suitable for road surfacing or for construction should be noted.

For concrete work it is very necessary to locate possible sources of sand and gravel. In all marking on the stakes use blue Keil.

Edges of present traveled way and all trees within present or proposed line, buildings along line and mail boxes are to be located.

An approximate classification of material, such as rock and earth, is to be noted.

BENCH MARKS: It is desired to carry the levels on the survey based upon elevation above sea level. U. S. Geological Survey B. M.'s are to be tied to whenever possible. B. M.'s should be established along the line in as permanent shape as possible and should be fully described in the notes. These B. M.'s should be placed at every quarter mile, and at any favorable point along the line of survey.

GRADE LIMITS: The grade should be not to exceed 6 per cent, except that for short distances of not to exceed 2,000 feet, 7 per cent may be used if necessary to avoid heavy work.

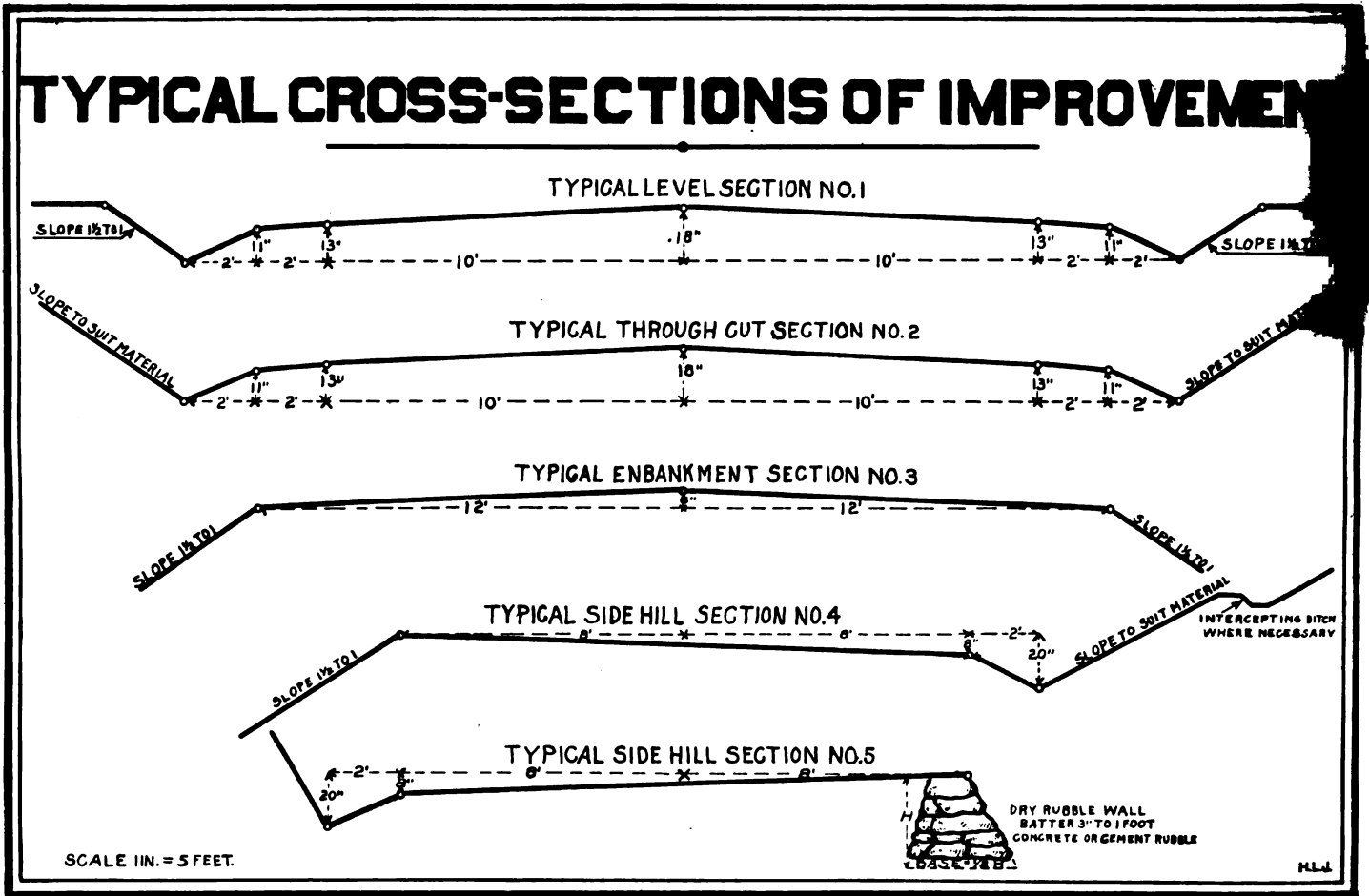
It is to be borne in mind that this location is to be the final for many years to come, and the grading and surface improvements will be made upon it from time to time to meet the traffic conditions. So to avoid an entire new location in the future the grade should be placed where it is going to stay.

CURVATURE: The U. S. Bureau recommends a radius of not less than 100 feet. This can be adhered to very closely in the valleys and plains. In the mountains this is not possible, except at an unreasonable expense, but it is desirable that the radius shall be as large as possible within a reasonable cost. It is suggested that a radius of not less than 40 feet be used on any switchback or curve. A great many of the present curves on the roads are unnecessary and could be eliminated by a little grading work.

In relocating a road or stretches of an existing road, the location of the old road should be made in every case.

LEVEL DATA: A center line profile of road points is to be taken at least every 100 feet, and intermediate when necessary. Elevation at inlet and discharge of each culvert and profile under bridge. Cross-section every 100 feet and at such intermediate points as are necessary to give an accurate measurement of the yardage. Cross-sections should extend each side of road far enough to give the ground slope for any possible cut or fill, and to allow for a slight shifting of the line.

In running to section corners or other points, remem-



ber that we are not relocating or replacing corners or correcting property lines; we are simply tying our line to these points.

In all cases the survey should cover the entire distance between the terminus, even though it is not intended to work upon the entire distance.

PLANS: The line and profile is to be placed upon the plan and profile cloth. Scale for line to be 1"=100 ft.

And for profile horizontal 1"=100 ft.

Vertical 1"= 10 ft.

Cross-sections to be platted on paper, using a scale of 1"=5 ft.

The grade line to be used on profile is the surface of the finished road at the center.

Cross-sections are to be platted from the lower left hand corner up, and as close as may be convenient. Area of cut and fill to be noted on each section and cu. yards excavation and embankment between the sections. Vertical curves should be shown on the profile giving the elevation of the P. C. and E. C., also the length of curve. A general structure sheet is to be made showing types of culverts headwalls and summary of quantities, also sheets giving plan, profile and details for any bridges included in the project. Present ground surface is to be shown by a short dash line, and proposed grade line by a full line. Careful inspection of the cuts and fills along the line must be made so that overhaul will be avoided as much as possible, the free haul limit being 800 ft. All drainage structures must be shown on the profile.

All sheets to be 36"X22" with a 1/2" margin on top right and bottom, and a 2" margin on the left.

Typical sections for earth roads are as given herewith.

Colorado Commission Honored

(Continued from Page 13)

best sense congress will soon take a greater interest in the development of the present parks and the extension of the system. The public will require this of its servants. It is not longer a "fad," as members of congress were wont to infer not so long ago.

From this campaign the people will come to know nature and the majesty of their own land. Students will be aided in their work in investigating the secrets of nature as contained in the parks. The public will be enabled to visit with greater ease and, in time, less expense the chain of parks. The new organization will keep in close touch with transportation companies; it will have a marked influence on road building and repair and it will deign to use the "movie" to acquaint the many with the beauties of the parks. The aim will be to make the national parks an economic asset. The educational campaign will not be confined to this country. Before long thousands of tourists from foreign lands will be coming this way every year, thus reversing the old order. Government and banks tell us that almost unbelievable sums will go abroad to maintain Americans in Europe in the coming years. There ought to be a "drawback."



Colorado's Most Prosperous Year

(Continued from Page 6)

years, and others are to be worked anew as the season advances. Lower production costs are encouraging a somewhat larger output of gold and many gold-producing properties that did little but unproductive development work during the last year of the war will soon begin to produce at full capacity.

There is much inquiry from men in other states for investment opportunities in Colorado, in agriculture, in mining, in manufacturing and in general lines of business. The influx of land buyers from other states to Colorado is somewhat above normal, though not so heavy as it has been at other times during the past two years.

These facts, which have been conservatively stated, indicate that, with continued favorable conditions, the year 1919 should be one of the most prosperous in the history of the State. The road building program for Colorado this year is the most ambitious yet undertaken, and the construction and improvement of new roads has had much to do with the rapid development of all lines of industry in the past few years, and particularly of farming and the manufacturing and other industries that depend directly upon the products of the farm.

County Commissioners Are Busy

Harris Akin of Fort Collins and C. M. Garrett of Larimer County Commissioners, County Attorney Lee and Secretary Edmunds of the Commercial Association at Fort Collins were visitors at the Highway Commission offices in the State Museum building for the purpose of arranging for the starting of work on the Poudre Valley Road, where Dooling Brothers and Crook and Hoffman are contractors. As a result of this conference with the State Commissioners, work was begun June 1.

County Commissioner A. Lindstrom of Dillon and Mr. Morris of Breckenridge, Summit County, visited the Capitol to arrange with State Engineer J. E. Maloney for a survey of the proposed road down the Blue River from Breckenridge to Kremling. Accordingly, Deputy Engineer Allen Tanner was despatched to make the survey. This road will be 48 miles long and picturesque and will be part of a wonderfully scenic circle trip from Colorado

Springs and Denver to Kremling, which is situated on the Midland Trail at the confluence of the Blue with the Grand. Commissioner T. J. Ehrhart and Engineer Maloney recently motored out from Denver and inspected this road, crossing Hoosier Pass from Breckenridge to Hartsel.

Speeding Federal Road Work

Initial steps in Federal road building, which will demand expenditures of \$1,500,000 in Colorado this year, will be taken soon, when the bureau of public roads of the United States department of agriculture will open bids for \$500,000 worth of construction on the fifty miles between Silverton and Durango. This is the largest of the projects covered by the expenditure for the year.

The bids on the Monarch Pass road construction, opened May 24th, were rejected. J. S. Bright, district engineer of the bureau of roads, declared that the work on that section will be completed this year, even if the bureau must do the work itself. These bids were turned down because the contractors failed to bid on the complete twenty-seven miles, and because they did not come within the appropriation for the work.

The Monarch Pass road, running from Garfield to Sargent, will connect Salida and Montrose, and cross the continental divide 30 feet lower than the present highway over Monarch Pass.

T. J. Ehrhart, State Highway Commissioner, and Mr. Bright, made an inspection trip over this route in the last week in May.

Contract will be let immediately by the bureau of roads for construction work on the Deadwood-Hot Springs, S. D., road, bids for which were opened Monday, May 26th.

The bureau will open bids for the Wind River road to the Yellowstone National Park, and others for the Buffalo-Tensleep route in Wyoming.

Good news has been received in a telegram from the Department of Agriculture to the effect that 97 trucks have been awarded Colorado for the use of the State Highways Department. These are part of the 20,000 trucks built for use of the War Department for use in Europe and no longer needed there.

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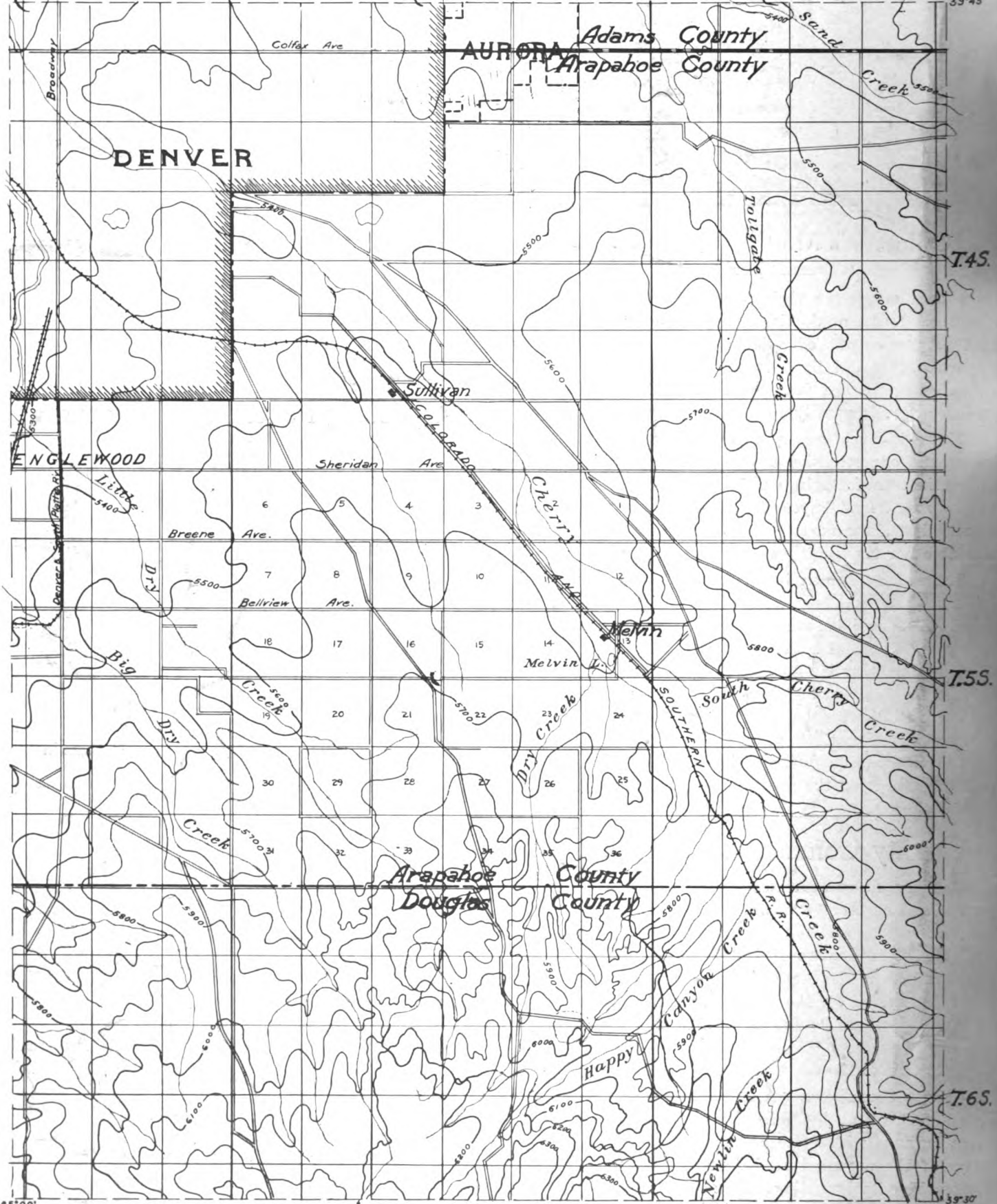
DENVER SHEET-PROGRESSIVE MILITARY MAPS

Lat. 39°30' to 39°45', Long. 104°45' to 105°00'

May 1919 R.67W. Reported by _____

R.68W.

R.66W.



105°00'

39°30'
104°45'

F-17

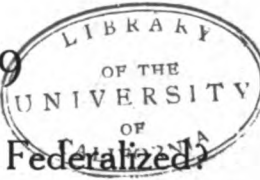
State of Colorado
Highway Dept

GIFF
JUL 1 1919



COLORADO HIGHWAYS BULLETIN

July, 1919



Should Highways Be Federalized?

The New Roads Budget

Roads Keep Pace With State's Development

The Denver Tractor Show

Commission Transacts Important Business

Federal-Given Road Equipment Coming

Colorado the Hunting and Fishing Mecca

Issued by the
State Highway Department

COLORADO HIGHWAY OFFICIALS

STATE HIGHWAY COMMISSION

ELMER E. SOMMERS, Chairman, District No. 1, Denver.

FRED J. RADFORD, District No. 3, Trinidad.

FREDERICK GOBLE, Vice-Chairman, District No. 4, Silverton.

E. E. NICHOLS, District No. 2, Manitou.

ROBERT E. NORVELL, District No. 5, Hayden.

N. A. BALLOU, Secretary.

ROBERT H. HIGGINS, Federal Aid Deputy.

T. J. EHRHART, Commissioner.

J. E. MALONEY, Chief Engineer.

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CONEJOS—Bonifacio Gonzales, Magote; Frank E. Thomas, Manassa; W. F. McClure, Antonito; Frank Russell, La Jara; J. C. Cantu, Manassa.

COSTILLA—Amos P. Rodriguez, San Luis; A. H. Martin, San Luis; S. N. Smith, San Luis; T. Manchego, Garcia; W. R. Morris, Ft. Garland.

CROWLEY—J. E. Downey, Ordway; L. W. Walter, Ordway; Wm. Broadbent, Ordway; Frank McNary, Sugar City; J. H. Cowden, Olney Springs.

CUSTER—L. H. Schoolfield, Westcliffe; August Koppe, Silver Cliff; Harry Kettle, Westcliffe; Chas. A. Barton, Wetmore; F. S. Canda, Westcliffe.

DELTA—H. K. Gibbs, Delta; Oliver B. Cook, Delta; J. E. Beckley, Delta; Thomas J. Harshman, Cory; Charles T. Rule, Paonia.

DENVER—J. A. Burnett, Mgr. Improvements and Parks; F. J. Altwater, Highway Commissioner; J. B. Hunter, Engineer.

DOLORES—Thos. C. Young, Rico; A. E. Arms, Rico; G. L. Garren, Rico; Chas. Engel, Rico; R. Bradfield, Lewis.

DOUGLAS—Harry Jones, Castle Rock; D. N. Stewart, Castle Rock; S. H. Stream, Sedalia; Ed. G. Seldensticker, Castle Rock; Jas. P. McInroy, Larkspur.

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EL PASO—E. A. Jackson, Colorado Springs; C. O. Ford, Colorado Springs; J. W. Potter, Fountain; Harry A. Scholton, Colorado Springs; J. B. Fowler, Colorado Springs.

FREMONT—Jonathan Seaman, Canon City; James Buntin, Canon City; J. V. McCandless, Florence; G. V. Hodgkin, Canon City; Jas. Belknap, Hillside.

Note—In the appended list of county officials the first name in each county is that of the county clerk, the second name is that of the county surveyor, and the last three names are those of county commissioners.

GARFIELD—Carleton L. Hubbard, Glenwood Springs; P. C. Thurmond, Glenwood Springs; L. F. Grace, Glenwood Springs; R. P. Coulter, New Castle; Geo. Newton, De Beque.

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GRAND—H. J. Harrison, Hot Sulphur Springs; F. I. Huntington, Hot Sulphur Springs; Simon Olson, Parshall; J. H. Cather, Kremmling; J. B. Stevens, Fraser.

GUNNISON—C. C. McWilliams, Gunnison; J. H. Robinson, Gunnison; W. H. Whalen, Crested Butte; Geo. L. Miller, Gunnison; C. L. McDonald, Gunnison.

HINSDALE—L. E. Shull, Lake City; E. L. Defenbaugh, Lake City; Jno. C. Gavin, Lake City; E. W. Wiley, Lake City; E. W. Soderholm, Lake City.

HUERFANO—J. G. Archuleta, Red Wing; J. O. Francisco, La Veta; Walter Hamilton, La Veta; J. T. Trujillo, Red Wing; Chas. E. Furphy, Walsenburg.

JACKSON—E. N. Butler, Walden; M. C. Ward, Walden; A. J. Monroe, Walsuan; W. G. Mellen, Coalmont; Chas. L. P. Winacom, Walden.

JEFFERSON—Frank N. Felch, Golden; Chester A. Lytle, Critchell; J. R. Cruise, Mt. Morrison; Gus A. Johnson, Golden; R. L. Downes, Evergreen.

KIOWA—Ed. M. Low, Eads; C. E. Bell, Eads; C. C. Wolever, Eads; Wurt Bailey, Towner; Ed. Houston, Arlington.

KIT CARSON—Miss Clio S. Judy, Burlington; D. D. Buck, Flagler; I. D. Messenger, Stratton; A. L. Anderson, Burlington; J. O. Hendricks, Seibert.

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LA PLATA—Helen Galloway, Durango; W. H. Wigglesworth, Durango; Ole M. Lee, Durango; Geo. Oibert, Oxford; Jacob Fritz, Durango.

LARIMER—G. R. Cushing, Ft. Collins; James G. Edwards, Ft. Collins; J. M. Graham, Loveland; Harris Akin, Ft. Collins; C. M. Garrett, Laporte.

LAS ANIMAS—Juan B. Romero, Trinidad; Hal Barnes, Trinidad; A. G. Prosser, Trinidad; J. J. Cordova, Aguilar; Robert C. Scott, Trinidad.

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OURAY—R. Whinnerah, Ouray; J. H. Doran, Ouray; W. S. Rose, Ridgway; Geo. B. Croft, Ouray.

PARK—Harry L. Moyer, Fairplay; W. H. Powless, Alma; G. S. Singleton, Shawnee; J. F. Rhodes, Fairplay; J. Tol. Witcher, Howbert.

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PROWERS—L. M. Markham, Lamar; F. W. Smith, Holly; Fred Williams, Wiley; J. B. Rhodes, Granada; A. P. Knuckey, Holly.

PUEBLO—Wm. Barber, Pueblo; C. A. Reese, Pueblo; Geo. Herrington, Pueblo; J. M. Sare, Pueblo; J. C. Harbour, Pueblo.

RIO BLANCO—C. J. Wilson, Meeker; D. Kirk Shaw, Meeker; Fred A. Nichols, Meeker; J. A. Bills, Meeker; H. S. Harp, Meeker.

RIO GRANDE—H. G. Trapp, Del Norte; W. W. Reilly, Monte Vista; August J. Weiss, Del Norte; W. W. Wright, Monte Vista; M. S. Woods, Monte Vista.

ROUTT—J. D. Crawford, Steamboat Springs; C. W. Harkness, Hayden; Claude J. Smith, Clark; Wm. Scheer, Oak Creek; Henry J. Summer, Hayden.

SAGUACHE—Birt Clare, Saguache; A. H. Smith, Saguache; Geo. Woodard, Saguache; A. V. Shippey, Villa Grove; Adam Deltrich, Center.

SAN JUAN—C. E. Dresback, Silverton; A. W. Harrison, Silverton; Gail Munyon, Silverton; J. Ernest Shaw, Silverton; Edward Meyer, Silverton.

SAN MIGUEL—Lillian C. Kenyon, Telluride; Ben W. Purdy, Telluride; T. B. McMahon, Telluride; A. T. Woods, Placerville; J. R. Galloway, Norwood.

SEDGWICK—Nellie E. Nichols, Sedgwick; E. C. Hamilton, Sedgwick; H. H. Hodges, Julesburg; Frank Nagel, Julesburg; J. G. Mowbray, Sedgwick.

SUMMIT—Geo. F. Forman, Breckenridge; James D. Galloway, Breckenridge; A. Lindstrom, Dillon; W. H. Hampton, Frawley; Eli Fletcher, Breckenridge.

TELLER—J. H. White, Victor; E. P. Arthur, Jr., Cripple Creek; T. J. Wicks, Cripple Creek; Tom Foster, Woodland Park; I. N. Riley, Victor.

WASHINGTON—L. Roy Cummings, Akron; Elbert Lewis, Akron; Homer Evans, Akron; R. M. Buckmaster, Abbott; E. A. Lewis, Burdett.

WELD—Chas. E. Littell, Greeley; L. L. Stimson, Greeley; A. F. Peters, Mead; T. Elmer Rowe, Greeley; J. W. Birkle, Platteville.

YUMA—John Adcock, Wray; A. C. Cary, Wray; Harry F. Strangways, Wray; H. W. Jackson, Yuma; Alex. Shaw, Wray.



This is not exactly a good roads picture, but the Rocky Mountain canaries always manage to get there. A tourist pack in the Rocky Mountain Forest.

CONTENTS

Should Highways Be Federalized.....	5
New Roads Budget Amounts to \$2,322,500.....	10
Commission Transacts Important Business.....	12
Roads Keep Pace With State's Development.....	14
Denver Tractor Show Was Biggest Ever.....	15
Federal-Given Road Equipment Is Coming.....	21
Colorado Is Hunting and Fishing Mecca.....	22
Work Booms in District 2.	Roosevelt Military Highway.
Highways Benefit City.	Proposed Federal Commission.
Ancients Paved Roads Deep.	Property Owners Should Pay.
Public Should Watch Roads.	Higgins Is F. A. Deputy.

COLORADO HIGHWAYS BULLETIN

Published Monthly
by the



Colorado Highway
Department

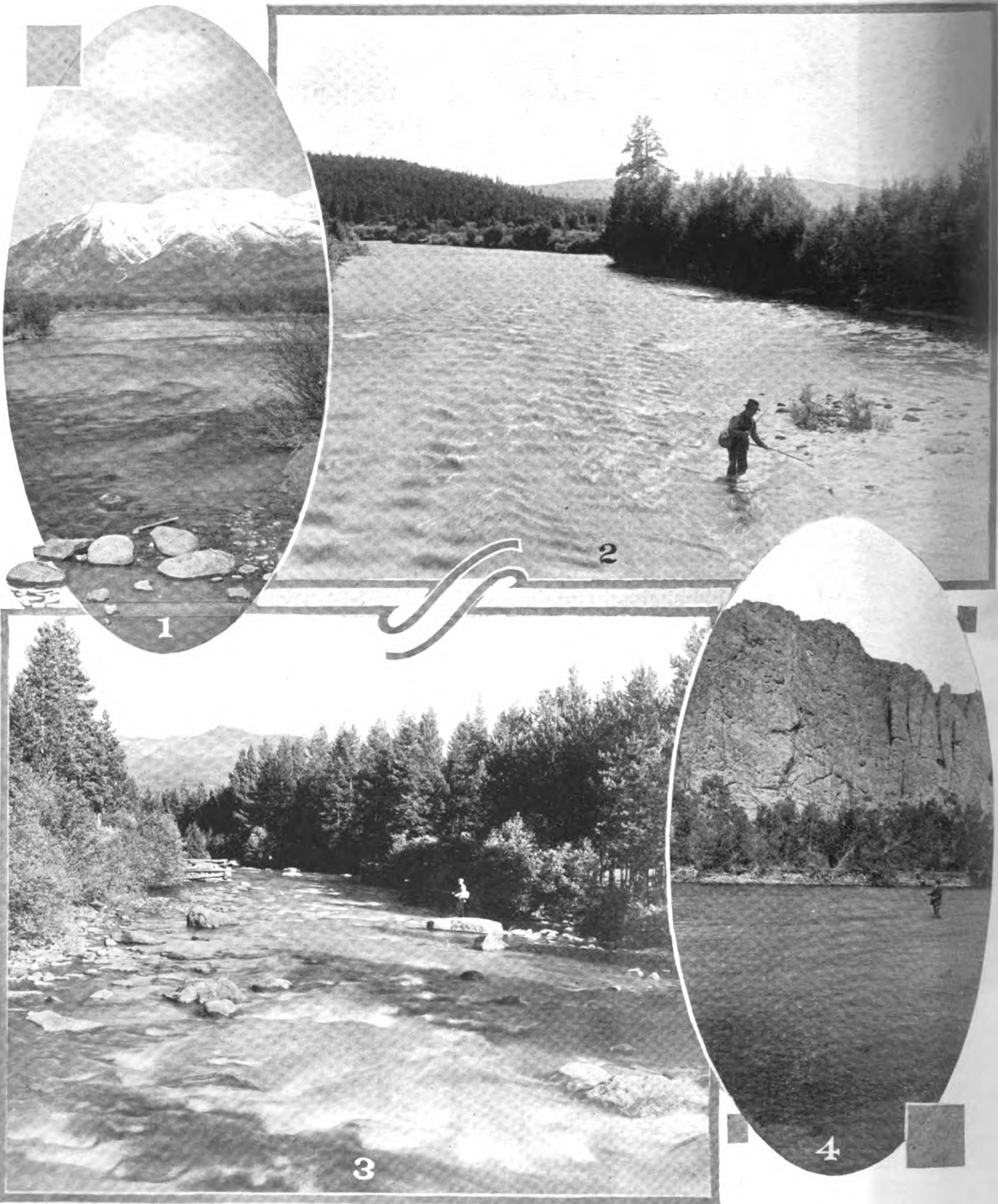
Denver, Colorado.

With the approval of the Colorado State Auditing Board.

Address all communications to Colorado Highway Department, attention J. G. Hilliard, editor, Colorado Highways Bulletin.

Owing to the necessarily limited edition of this publication it will be impossible to distribute it free to any persons or institutions other than state and county officials actually engaged in the planning or construction of highways, instructors in highway engineering, newspapers and periodicals and civic associations. Others desiring to obtain Colorado Highways can do so by sending 10 cents for each number desired. Associations desiring to distribute the magazine can obtain it at cost in lots of from 500 copies up.

Subscription Price, \$1.00 per year.



Some of the larger of Colorado's wonderful streams, which are a lure to sportsmen the world around. 1. Lake Creek and Mt. Elbert, Colorado, taken from Holy Cross Way. 2. Fishing Scene on the Grand River above Granby, Grand County. 3. Fishing on the Grand just below Grand Lake, Grand County. 4. Fishing scene on the greatest of all trout streams, the Gunnison River, Gunnison County.



COLORADO HIGHWAYS BULLETIN

VOL. II

JULY, 1919

NO. 7

Should Highways Be Federalized? Two Views

Secretary Houston of the Department of Agriculture is in Favor of Carrying Out Present System of Federal Aid. Dr. Rowe Would Like to See Proposed Federal Commission Created. Is it a Case Where Well Enough Should Be Let Alone?

SECRETARY HOUSTON, in response to a communication from a city chamber of commerce requesting his views regarding the creation of a federal highway commission and the wisdom of taking the federal supervision of highways from the Department of Agriculture and placing it under such a commission, has sent the following reply:

"I have your letter of May 2, in which you state that your chamber of commerce has been asked to adopt a resolution calling on the Congress of the United States to create a federal highway commission and that you note that such resolution has been adopted by a number of commercial organizations, including the United States Chamber of Commerce. You ask for an expression of my views on the matter and particularly whether, in my opinion, it would be wise to take the federal supervision of highways from the Department of Agriculture and place it under such a commission as that proposed.

"Before expressing my views, it might be well for me to point out certain fundamental considerations which should be borne in mind in determining any sound policy of highways administration and development: (1) The roads in each section of the country are of varying degree of importance in the service which they render or may render to that particular locality, to the state and to the Nation as a whole. (2) This is a big country and the traffic conditions and needs vary greatly from section to section. (3) The state highway departments, being in immediate touch with local conditions, are best able to classify the roads properly on the basis of the economic purpose which they may serve. (4) The federal government, under

the present Bankhead Federal Act, is co-operating in the improvement of the roads of greater importance, the classification of which is fixed by the state highway departments; and (5) when this classification has been carefully made and by agreement between the highway departments of adjoining states, the roads of first importance generally meet at state boundaries and, therefore, become interstate highways of nation-wide utility. The federal government, under the present law, is aiding the state highway departments in the classification of their roads on the basis of importance and needs, and federal aid is rapidly being extended for their improvement, on projects submitted by the states and approved by this department.

"Having these points in mind, I have been unable to see the need for the creation of a separate federal highway commission or the wisdom of substituting for the present co-operative program a plan which would commit or limit the federal government to the construction of two federally owned and maintained trunk lines in each state of the Union. There was a bill introduced in the Senate of the United States on February 13, 1919, embodying these suggestions. This proposed legislation provides for a federal highway commission of five, each receiving a salary of \$10,000 a year, whose duty, among other things, would be to establish, construct and maintain a system of highways 'to compromise not less than two main trunk line roads in each state and joining the national highway system in the adjacent states and countries.' The commission is given the power to select the trunk line roads to be constructed after having requested the state highway departments to recommend routes. The federal government is to assume

the maintenance of these roads. The commission is furthermore empowered to take over the work of all existing federal agencies relating to highway transportation, and to purchase, lease, rent, operate and maintain such motor and other transportation facilities as it may deem necessary in performance of its duties under this act."

"In July, 1916, the Bankhead Road Act was passed. It provided appropriations out of the federal treasury, to be matched by equal sums from the states, for the construction of roads, and provided further that no state should receive any of the money appropriated unless it had a highway department with adequate powers. The law placed the administration of the act in the hands of the Secretary of Agriculture, in co-operation with the forty-eight state highway departments. It was enacted only a short time before we entered the European war and its operation was necessarily greatly interfered with by the disturbed conditions. There were also certain features of the law that made its smooth administration difficult. After the cessation of hostilities, with the approval of the President, I requested Congress to make a large additional appropriation to aid the states in highway construction and also to make certain amendments to the law, the necessity for which experience had demonstrated. Congress, through the Bankhead amendment to the Post Office Appropriation Bill, provided an additional appropriation of \$209,000,000 and substantially made the amendments suggested.

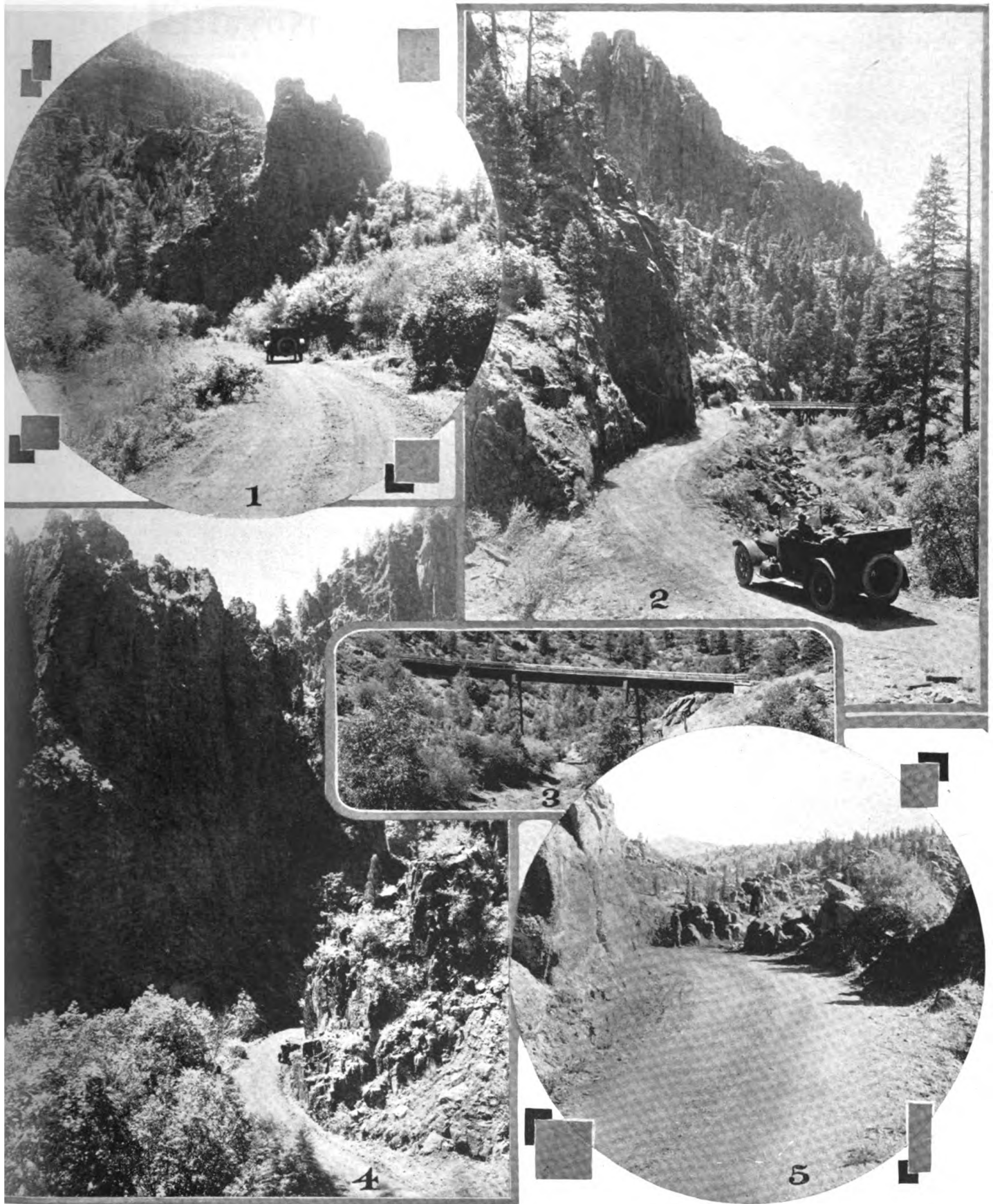
"Under existing legislation, there is no special obstacle, so far as I can see, to the construction, in the different states of the Union, of these roads to serve the greatest economic needs. In the first place, the definition of the kind of roads that can be constructed has been greatly broadened and, in the second place, the limitation on the federal contribution for any one road has been increased from \$10,000 to \$20,000 a mile. Following this legislation, the regulations governing the administration of the act and the standards for plans, specifications and estimates have been modified and one of the most successful former state highway engineers in the country has been placed in immediate charge of the federal aid road work. He has at his disposal a considerable staff of local and district engineer aids and no pains will be spared to provide any further federal assistance that may be needed. The machinery provided by the Bankhead amendment includes not only the Federal Bureau of Public Roads, one of the largest and most effective organizations of its kind in the world, but also the forty-eight state highway departments, the two agencies working in close co-operation. It is also a part of the plan to have an advisory committee composed of representatives of the state highway departments, selected by the American Association of the State Highway Officials with due regard to geographic consideration, work in intimate touch with the federal bureau, meeting with its officers at stated periods and at such other times as may be necessary. This machinery, in effect, is an expert national commission intimately in touch through its various parts with all sections of the Union, having no other purpose than that of serving the public interest. It is difficult to see what need there can be for additional machinery.

"Very properly the Bankhead Act places on the highway authorities of the several states responsibility, in large measure, for selecting the roads to be constructed. Obviously, the local authorities are in a better position to judge what roads would serve the largest economic needs than any group of men sitting in Washington would be. It is the duty of the federal bureau, with its district engineers, to see that the provisions of the law are complied with. It is giving, and will continue to give, all possible assistance to the state authorities in all their technical problems, as well as in the planning of state systems and in the classification of roads. It has been the policy of the department from the outset, in order to prevent haphazard action, to have the state highway authorities prepare and present tentative state systems of roads. It was apparent that a rigid system, not subject to modifications as conditions might require, would be impossible. Each state authority has worked out a system and, in general, it is being followed in the development of projects and the construction of roads. In a number of instances systems in general terms have been adopted by state legislatures. Of course, in formulating these systems the engineers gave due regard to interstate connections, that is, to roads connecting the system of one state with that of another, and it is difficult to see why, as progress is made, the construction of through roads will not follow as a matter of course.

"It seems scarcely likely, in view of the fact that nearly \$300,000,000 are now available out of the federal treasury, that the Congress, in the light of the financial situation, will make additional large appropriations, and it would be impossible, without creating many complications, to divert the existing appropriations from the purpose and plans already under the co-operative arrangements with the states. A considerable part of the available appropriations has already been formally tied up under agreements with state departments and contracts for large sums have been let. Additional large amounts are being pledged monthly. Every state has accepted the federal act and many of them have by law directed its agencies to co-operate with the Secretary of Agriculture. A number of the states have large sums available for co-operation, in many instances much in excess of what is necessary to meet the requirements of the federal act, and other states are preparing greatly to increase their appropriations. These state laws and arrangements cannot easily be changed and perhaps would not be. After the original act was passed, more than a year elapsed before many of the states were able to secure legislative action which would enable them to comply with the federal law and to begin the construction of roads. With the passage of the amendment carrying a large additional appropriation, there arose a necessity for further legislative action in some of the states. It seems to me that, instead of asking for more or different legislation, we should now proceed actively and vigorously with the construction of roads under existing arrangements.

"I am convinced that nothing material would be gained by the proposed change. Much would be lost. As has been pointed out, many complications would be introduced. The creation of a commission would entail unne-

(Continued on Page 20)



Picturesque Phantom Canon Road, built on a former railroad grade, with steel railroad bridges intact, through which Commissioner E. E. Nichols of District No. 2 piloted the Rocky Mountain Hotel Association, of which he is president, June 11. 1. Delicate mountain flowers vie with stern cliffs. 2. Cliff, road and bridge. 3. A solid steel auto road bridge, formerly a railroad trestle. 4. A castle rock, between Cripple Creek and Florence. 5. Motoring at railroad grade through the heart of the Rockies.

Work Booms in District No. 2

Work is booming in District No. 2, with big crews of men and many pieces of equipment on the roads that are being built or improved there. The allotment to that district is \$357,000 for the year, and practically this entire sum is to be spent for grading and draining.

Roads to be improved in District No. 2 are the following:

Cherry Creek road to Colorado Springs Junction, a distance of forty-eight miles, the Burlington road in Kit Carson county for ten miles north, east and west, the Limon east road for ten miles, the Colorado Springs-Canon City road, the Colorado Springs-Cripple Creek road, the Castle Rock river road, the Cheyenne Wells, either north or west; Woodland Park to Cripple Creek in Teller county; Buena Vista-Salida road in Chaffee county; Buena Vista to Divide in Chaffee county; the Peyton-Ramah road in El Paso and Park counties and the Farmers' highway in Lincoln county.

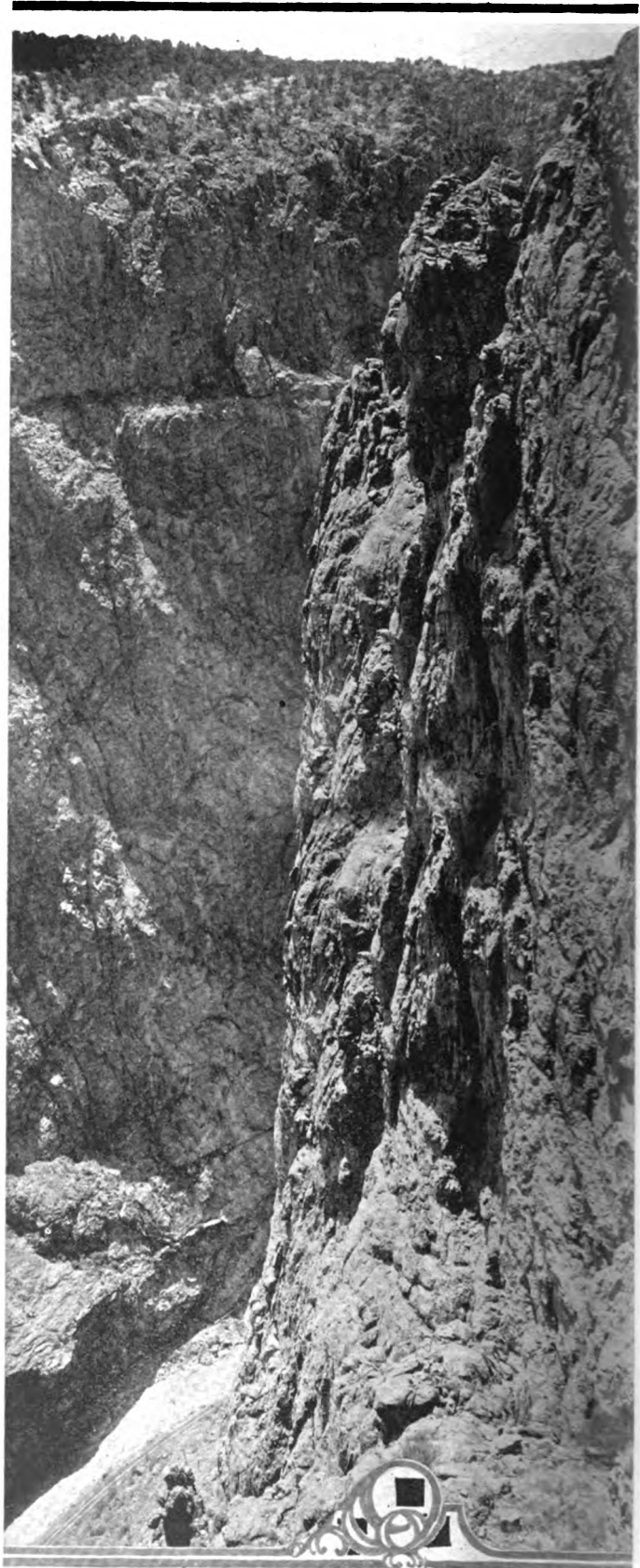
Commissioner E. E. Nichols of District No. 2 declared, following the announcement of the allotment for his district, that this money will effect some very much needed changes and improvements. Commissioner Nichols made a motor trip to Roswell, N. M., for the purpose of bringing his son home and found the New Mexico roads in good shape. He passed and met many motorists who said, "Wait till we get to the Colorado line; then we'll find good roads."

"These people may have exaggerated the condition of our Colorado roads," declared Mr. Nichols, "but it is up to us to make good, and we will. I found the most active work I have seen in Colorado for a long time when I struck the outfits working for Commissioner Fred J. Radford of District No. 3 on the Walsenburg-Trinidad road, on the main Highway which connects New Mexico with Colorado."

Highways Benefit City, Too

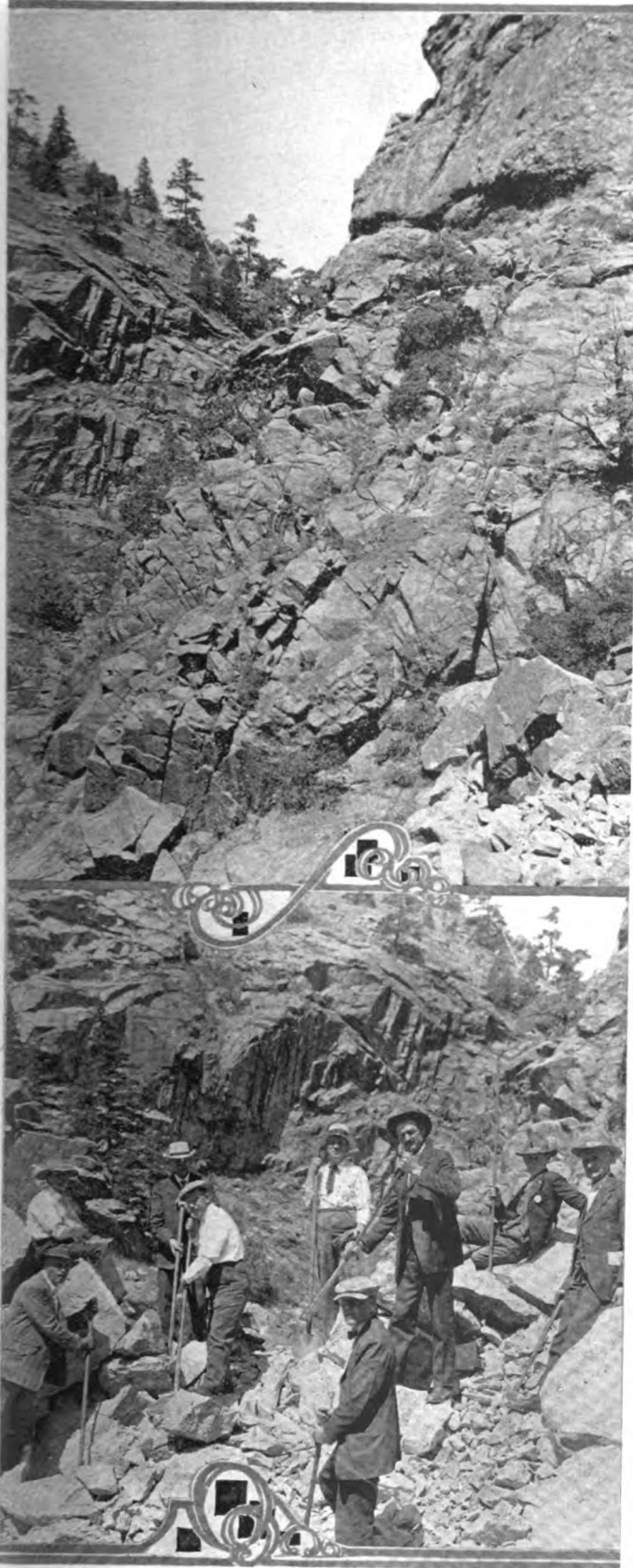
"Improved highways of a permanent type providing motor express and passenger transportation facilities spell opportunity today to the city which intends to lay the foundation for a healthy, permanent future growth. For, if we but admit that hope lies in a more even distribution of the population over the acres lying within a city's sphere of influence, then we are committed to the task of arranging facilities to permit that adjustment to take place in a natural way. Improved highways that make possible rapid motor transportation 365 days out of every year will just as certainly permit and stimulate our people to move out on to the surrounding country acres as a fast and free flowing stream will deliver at its mouth the piece of bark flung in at its source."—W. O. Rutherford, Vice President Goodrich Rubber Co.

The Royal Gorge



The Royal Gorge, Colorado's most famous chasm. An auto road has been built to the top, 2,600 feet sheer above the D. & R. G. Railroad and the Arkansas River.

Poudre Canyon Road



Heavy work to be done by contractors on the Poudre Canon Road, which they will complete on force account this year. Highway commissioners and state engineering "gang" on the ground.

Ancients Paved Roads Deep

Road-building is not a modern science, according to an automobile enthusiast attached to one of the government departments who states that although modern methods have done much to simplify and popularize road-building in all parts of the world, the science itself dates back to the days of ancient Babylon.

"The earliest systematic road-making is credited to the Carthaginians," said this official, "but the greatest road-builders of ancient times were the Romans.

"In general, Roman roads were built in straight lines, regardless of ordinary grades, and were paved deeply, the several layers of stone and concrete sometimes being three feet in thickness. The Appian way, built in 312 B. C., is the earliest notable piece of permanent road work. It still is an excellent highway.

"France appears to have been the leader in modern road construction. In 1556 a stone road fifteen feet wide was built from Paris to Orleans, with about twenty feet of unpaved public way on each side. In 1775 Tresaguet a French engineer, had evolved a system of improved road construction similar to that widely used today throughout the world.

"On an earth foundation parallel with and about ten inches below the surface of the proposed road Tresaguet laid large stones on edge and covered them with a layer of smaller stones with their top surface smoothed as much as possible. On top of this he put on a third layer of hard stones broken to the size of an English walnut and spread by a shovel. This general system was continued in France until 1820, when Macadam, the great English highway engineer, introduced his plan to the French, who officially adopted it in 1830. Macadam's system was not greatly different. His most notable departure was the raising of the stone bed above the earth at each side to facilitate drainage.

"The modern macadam road is simply an elaboration of the engineer's early plan to insure perfect drainage by grading, and binding the broken bits of hard stone into a solid mass."

French Highways

The French have three classes of highways. The first class are fine roads for heavy traffic, the second class are narrower, and the third are trails or by-ways. Any one of these types would be to us a fine road, as they are substantially built of water-bound macadam, usually starting with a Telford base. These roads form a vast network, reaching every place. Some of the old roads are very deep and were started in the time of the Romans. They are mostly the result of a long period of cheap and hard hand labor.

New Roads Budget Amounts to \$2,322,500

Colorado Highways Commission Contemplates Expenditure of About Two and One-Third Millions of Dollars This Year in the Five Districts of the State as the Beginning of a Program Which Will Put the State in an Entirely New Class in Transportation Realization

A BUDGET of practically two and one-third millions of dollars has been prepared by the Colorado Highways Commission for this year's work on the roads of the state. The exact amount to be expended in the five districts is \$2,322,500. The largest amount allotted to any district is to No. 1, for which the amount is \$922,000. This district comprises a greater population and present road mileage than any other district, from and including Denver northward, and some exceedingly interesting work is planned there. Following are the working plans, with points and mileages for the various districts:

PROPOSED WORKING PLAN

DISTRICT NO. 1

(Total \$922,000.00)

Project No.		
30	Denver-Morrison, 3 miles	\$ 75,000.00
31	Denver to Hospital east, 2 miles.....	44,000.00
32	Denver-Brighton, 10 miles	230,000.00
33	Ft. Collins, 3 miles	75,000.00
34	Greeley, 3 miles	75,000.00
35	Platteville south, 2 miles.....	50,000.00
36	Longmont south, 2 miles.....	45,000.00
9	Loveland-Estes Park-Big Thompson.....	30,000.00
37	Boulder east, 2 miles.....	45,000.00
38	Morgan-Brush, 2 miles.....	45,000.00
39	Akron-Brush	48,000.00
40	Wray-Schramm	30,000.00
29	Morrison-Baileys	60,000.00
41	Sterling to Merino.....	70,000.00
		\$922,000.00

DISTRICT NO. 2

(Total \$357,000.00)

Project No.		
42	Cherry Creek Road to Colorado Springs Junction (about 48 miles).....	\$ 35,000.00
43	Burlington north, 10 miles.....	15,000.00
44	Burlington west	10,000.00
45	Burlington east	5,000.00
46	Limon east, 10 miles.....	15,000.00
47	Colorado Springs-Canon City Road.....	30,000.00
48	Colorado Springs-Palmer Lake.....	30,000.00
49	Colorado Springs-Cripple Creek.....	10,000.00
50	Castle Rock-River Bend.....	50,000.00
51	Cheyenne Wells, north or west.....	25,000.00
52	Woodland Park to Cripple Creek.....	25,000.00

53	Buena Vista-Salida	35,000.00
54	Buena Vista to Divide.....	40,000.00
55	Peyton-Ramah	17,000.00
56	Farmer's Highway, 18-s to Boyero.....	15,000.00
		\$357,000.00

DISTRICT NO. 3

(Total \$404,600.00)

Project No.		
2	Trinidad-Walsenburg	\$240,000.00
57	Prowers and Baca.....	50,000.00
58	Baca	10,000.00
59	Las Animas City east.....	35,000.00
60	La Junta west.....	11,000.00
61	Rocky Ford east.....	11,000.00
62	Manzanola west	23,600.00
63	Fowler east	24,000.00
		\$404,600.00

DISTRICT NO. 4

(Total \$357,000.00)

Project No.		
64	Ft. Garland to San Luis.....	\$ 30,000.00
68	Monte Vista-Saguache	85,000.00
65	Silverton-Ouray	30,000.00
66	Top Norwood Hill to No. 7.....	50,000.00
67	Rico north	20,000.00
69	Delta-Montrose to Ouray County line.....	40,000.00
70	Delta-Hotchkiss	30,000.00
71	Durango-Mancos	40,000.00
72	Bayfield-Dyke	27,000.00

\$352,000.00

DISTRICT NO. 5

(Total \$309,400.00)

Project No.		
80	Steamboat Springs north, 15 miles.....	\$ 59,400.00
73	Walden-Rand	30,000.00
74	Craig west to Maybell, 30 miles.....	75,000.00
75	Kremmling north	30,000.00
76	Meeker-Rifle	22,500.00
77	Grand Junction-Palisade	50,000.00
78	Battle Mountain	40,000.00

\$306,900.00



A handsome stretch of concrete between Littleton and Denver, built in 1919.

- Whitewater to Gateway.
- DeBeque to Colbran.
- Grand Junction-Fruita.
- Craig west.
- Walden-Willow Creek Road.
- State Bridge-Wolcott.
- Grand Junction-Delta.
- Glenwood to Aspen.
- Glenwood to Wolcott.
- Craig north.

It may be that some of the roads suggested for improvement will not be within the classification required for federal aid, so provision should be made, when passing the apportionments, that in the event of any project not coming within the provisions of the Federal Aid Road Act, then the amount apportioned for that work shall pass into the contingent fund to be reappropriated by the commission to other roads.

Respectfully submitted,
 J. E. Maloney,
 Chief Engineer.

Roosevelt Military Highway

That the Roosevelt military highway will be of great value to Oregon and to Portland by providing a means of bringing produce into the market at reasonable cost, as well as creating a highway which for wonderful beauty will not be excelled in the world, are but a few of the points emphasized by S. C. Pier, president of the Oregon Highway Association, who has written personal letters to Portland city officials asking their support of the bond issue at the coming election in the state. In addition to the great need of a government highway for national defense, this proposed road along the coast of Oregon will open up to development one of the most productive sections in the state. The coast counties have been practically isolated commercially. As a scenic road also it will even outclass the Columbia River highway, which is one of the finest in the United States. The proposed highway will connect Portland with the Mexican line. By unanimous vote of both houses a bill was authorized to issue bonds to the amount of \$2,500,000 for its construc-

tion, providing, however, the federal government appropriate an equal amount for the same purpose. After the highway has been constructed it will be maintained by the government without cost to Oregon, thus taking the burden of taxation from the shoulders of the people of the state.

Public Should Watch Roads

One of the things the public should take an interest in is the preservation of roads. Many states have laws to prevent the destruction of roads by improper use of them. Instances of such injurious use should be reported to the proper officials. Nobody hesitates to report attempts to break in and steal on his neighbor's property, or, in most cases, to offer physical interference with the marauders. The man who knocks a good road to pieces with a traction engine or damages it by driving heavy loads on narrow tires on wet days is damaging public property unnecessarily and should be held to account just as much as housebreakers. The state and county officials cannot be everywhere all the time; they have to rely on the public spirit of private individuals to keep them informed of transgressions of the kind named.

The public can also render great help by reporting lax work by the small gangs sent out to make repairs, by giving prompt information concerning defective road conditions as they develop, and informing the authorities of the location of good road-building materials. Road-building is not such a simple matter as it seems to many persons who have not taken an active part in it, and probably a good many ill-advised suggestions concerning road work will be made by individuals through ignorance of all the facts relating to it but the right kind of road officials are glad to have such suggestions because they afford an opportunity of showing to interested persons what is really involved in building and maintaining good roads.

The education of highway engineers by the colleges to provide capable construction men is urged by Senator Bankhead of Alabama as a subject of prime importance to the future of highway development.



Spanish Peaks and town of La Veta as viewed from La Veta Pass Road, in Commissioner Radford's district.

Commission Transacts Important Business

ALL members were present at the meeting of June 9, also Commissioner Ehrhart and Secretary Ballou. The meeting was called to order by Chairman E. E. Sommers.

The sum of \$5,000.00 was appropriated to be used for surfacing road No. 70 in Las Animas County under the direction of Commissioner Radford.

A communication was read from Mr. Delph Carpenter, attorney for the La Poudre Valley Irrigation District, entering a protest against the construction of state highway up the Poudre Canon in accordance with the contract as entered into between Dooling Brothers and the Crook Construction Company and the County of Larimer. Mr. Lee, county attorney of Larimer County, appeared before the board, explaining Larimer County's position in the matter and claiming a priority of right-of-way for the highway. Mr. E. E. Sommers made the statement that he investigated the matter as above referred to and that it appeared to him that the whole question should be taken

up by the Board of County Commissioners of Larimer County and the officers of the Poudre Valley Irrigation Company and that some determination should be finally made between them. Upon information by telephone to Mr. Ehrhart, Mr. Carpenter, attorney for the irrigation district, asked that the board hear his statement in regard to the question before any final determination. Later Mr. Carpenter appeared before the board and stated that he had endeavored to obtain some satisfactory arrangement with the Board of County Commissioners whereby they would jointly agree to make a survey for the road above the water line of the proposed reservoir, and that the county commissioners had refused to co-operate with him; and for that reason he was making his appeal to the State Highway Commission, as he did not want the solid formation of rock at the mouth of the Poudre Canon disturbed, as it would cause them unnecessary expense in building their dam at some future time. The commission informed Mr. Carpenter that they would have Mr. Ehrhart take the



plainly visible from Denver, over 100 miles distant.

whole proposition up with the Board of County Commissioners of Larimer County and endeavor to use their influence in order that the matter might be arranged satisfactorily to both parties.

Upon motion by Mr. Radford, seconded by Mr. Norvell, Mr. E. E. Sommers was delegated to go to Washington to see if he could not speed up the distribution of motor trucks, air compressors and road working machinery which has been assigned to the State Highway Department by the Agricultural Department. Also to endeavor to obtain a lower railroad freight rate on crushed stone for use in surfacing Federal Aid Project No. 2.

The sum of \$3,000 was appropriated for the payment of a certain piece of work on the North Fork Road in Grand County, said work now being under construction by R. W. McQueary. The appropriation of \$2,000 to \$1,000 heretofore made to Grand County under appropriation resolution No. 125 was cancelled.

It was ordered that \$1,000 be transferred from Road No. 27 to Road No. 21 in Jefferson County as per the request of commissioners of Jefferson County.

The State Highway Commission was instructed to purchase one gasoline operated air compressor outfit at a

cost of not to exceed \$3,500, for the use of N. I. Jacobson on the east end of the Fall River Road, with the understanding on the completion of this contract the compressor shall be delivered by Jacobson at the cost of the State Highway Department to some railroad point as designated by the highway commissioner.

The State Highway Commissioner was instructed to purchase a gasoline operated air compressor drilling outfit at a cost not exceeding \$3,500 for the use of E. B. Harlan on the Independence Pass work.

One thousand five hundred dollars was appropriated to Alamosa County on a two to one basis.

The sum of \$4,000 was appropriated to Park County on Road No. 35 on the one state and two county basis.

The State Highway Commissioner was instructed to expend for the improvement of road over Trout Creek Pass in Chaffee County the sum of \$1,000.

The sum of \$400 was appropriated to Prowers County for the improvement of Road No. 34.

\$1,000 was appropriated to Larimer County on the one to one basis, for use on road from Loveland to the mouth of the Big Thompson Canyon, State Route No. 51.

The sum of \$750 was appropriated for the use of Delta County on Road No. 12, the same on the basis of one to one.

The sum of \$300 was appropriated to Montrose County on a one to one basis, to be expended on improving the Black Mesa Road.

Hinsdale County was appropriated the sum of \$2,000 on the basis of 100 per cent, and the appropriation formerly made to Hinsdale County on the basis of \$2,000 to \$1,000 was cancelled.

The road from Delta to Nucla was declared a state highway, subject to satisfactory maps and plats being filed with the Highway Department.

The sum of \$750 was appropriated to repair bridge on Route No. 18 over Fountain Creek between Manitou and Colorado Springs, and the State Highway Commissioner instructed to have repairs made under his supervision.

Mr. Fred Boyer was employed as assistant bookkeeper for the Highway Department at a salary of \$150 per month.

Commissioner Ehrhart was authorized to approve the personal bond as offered by J. Fred Roberts Construction Company, provided J. Fred Roberts and two other good and sufficient sureties sign said bond, and that the said J. Fred Roberts should deposit in escrow deeds to his property to the amount of \$100,000. This bond for the purpose of covering contract of the J. Fred Roberts Construction Company on Federal Aid Project No. 2.

Commissioner Ehrhart was authorized to approve bonds of Allen & Lafferty and J. A. Osner Construction Company on the same or similar basis as provided for in the resolution covering the Roberts Construction Company's contract.

Mr. W. B. McQueary was appointed superintendent of construction on the west end of the Fall River Road at a salary of \$200 per month, and he is to be paid in

(Continued to Page 23)

Roads Keep Pace with State's Development

Colorado's 25,000 Miles of Highway in 1909 Have Grown to 45,000 in 1919. Improved Roads Show Increase of From 4,000 to 8,000 in Decade. This Extraordinary Progress Has Made Possible the Wonderful Agricultural Showing the State is Making--By Howard D. Sullivan

MOST of us are accustomed to measuring our progress from day to day or from year to year, comparing what we accomplished today with the results of yesterday's efforts, or the achievements of this year with those of last year. It is only occasionally that we look back over the records of a decade to get a comprehensive idea of the speed with which we are actually going forward.

The United States census makes a survey of industrial progress for us every tenth year. The latest census survey was for 1910. The next one will be made next year. It will show a percentage of growth and development in Colorado and other states of the Rocky Mountain west that will surprise most of us, for the reason that we have been accustomed to measuring the position we occupy this year on the industrial development route with that which we occupied last year.

The biggest advance made by any industry in this state in the past decade has been in agriculture; road building, perhaps, stands second. The former has been the result of bringing under cultivation hundreds of thousands of acres of fertile land in nearly all sections of the state and of the introduction of better methods in eastern Colorado. The latter has been largely the result of the agricultural growth of the state, for new and better highways have been required to transport the immensely increased products of our farms to market.

The census of 1910 showed 46,170 farms in Colorado, comprising a total of 13,532,113 acres. Reports now being made to the state board of immigration by county assessors indicate that there are approximately 60,000 farms in the state at this time, with a total area of more than 22,000,000 acres.

The census of farm production is always for the year preceding that in which the census figures are compiled; so that the 1910 census gives data on agricultural production for 1909. That year the area in cultivation in Colorado, exclusive of orchards, was 2,614,312 acres. This year, according to the indications from the partially complete reports of county assessors, the area in cultivation will be about 4,500,000 acres, an increase of more than 70 per cent. Final figures from county assessors may show an even larger increase.

In 1909 the area devoted to wheat in Colorado was 340,729 acres. This year more than twice that area is devoted to winter wheat alone and winter and spring wheat combined account for more than 1,000,000 acres of the cultivated area of the state, or more than 35 per cent of the total acreage cultivated in 1909. There were 15,715 acres of rye raised in the state in 1909. This year the acreage is approximately 120,000 acres, an increase of more than

600 per cent. There were 326,559 acres of corn reported to the census bureau for 1909. This year, according to the incomplete returns in the hands of the Immigration Department, there are in excess of 600,000 acres of corn in the state.

There has been some increase in the acreage cultivated to other crops, with the possible exception of oats and potatoes. There has been a very large percentage of increase in the acreage of dry beans and broom corn, though the acreage devoted to each crop this year will be less than that of last year. Hay has always been Colorado's biggest crop. The acreage, however, has shown but slight increase since 1909, compared with the increase in other crops.

These figures are given to illustrate in a measure the agricultural development of Colorado in the past ten years. The value of all crops grown in 1919, according to the estimates of the census bureau, based upon prices current at that time, was \$50,974,958. The value of all crops last year was slightly above \$150,000,000, and with favorable weather conditions this year should show a considerable increase over last year.

The increases in acreage cultivated are not confined to any particular section of the state, though the heaviest increases have been in the non-irrigated sections of eastern Colorado and in Moffat county. The increase in road building has touched every county in the state.

In 1909 there were perhaps 25,000 miles of highway in Colorado, though such records as are available placed the mileage somewhat above that figure. Of this amount only 25 miles were classed as "improved" by the Bureau of Public Roads of the United States Department of Agriculture. The Colorado State Highway Commission was organized in January, 1910, under an act of the legislature approved May 5, 1909. That body estimated the expenditures on roads in Colorado in 1910 at "close to \$1,250,000," but did not vouch for the accuracy of the figures.

There are approximately 45,000 miles of highways in Colorado at the present time, of which 8,000 miles may properly be classed as "improved," that is, properly graded and surfaced with some special surfacing material. In 1919 there is approximately \$2,500,000 available from the counties for road construction and improvement, while approximately \$1,000,000 is available from all sources to be spent under the direction of the Highway Commission in the various counties.

The rapid increase in road construction in Colorado has been one of the most important factors in making possible the agricultural development shown above. The cost of transportation to shipping points is one of the big

(Continued on Page 21)



Kenosha Pass. One of the highest and most important passes over the Rockies. Road is being rebuilt here.

Denver Tractor Show Was Biggest Ever

Colorado Showed Itself to be Tractor Hungry, so That it Appears Probable That the Sentiment for Good Roads Will Grow Accordingly, for Good Roads are the Tractor's Big Brother, so Helpful

GOOD roads bear a strong relationship to tractors, paradoxical as the expression may seem. The good road is not the mother of the tractor, for these uncanny products of the automobile factory can go most anywhere, in war or peace, whether there are roads to run on or not. But good roads might honestly be called the big brother of the tractor, for the former is such a big help to the latter.

When the Denver Civic and Commercial Association and the Denver Tractor Club proposed several months ago to organize and hold a tractor show in this city, they little dreamed that they were laying the foundation of the biggest event of the kind in history. But Colorado's capital city and her broad plains were attraction sufficient to bring here the biggest display of up-to-date farm motive power and interesting demonstrations ever assembled or staged. The exhibition was known as the Rocky Mountain National Tractor Show and was held at Denver June 8-13.

For the farmers it was a thorough, comprehensive and convincing demonstration of the fact that successful, economical and efficient farming today is automotive farming.

For the demonstrators it was a record-breaking week of business. More tractor and implement sales were made

that week than ever have been made at previous tractor demonstrations, according to all the exhibitors.

From the standpoint of the Denver public it was an educational and entertaining exhibition never paralleled by events of this kind in the past. The variety of exhibits and the breadth of scope of the entire affair have never before been equaled.

From the standpoint of Denver business generally, it was a tremendous boon of prosperity, for it brought at least 150,000 people from all parts of the country into the city.

And as for the tractor and implement manufacturers, it was a revelation of the virgin prairies of the West. For in many respects this event was a greater demonstration for the tractor and implement manufacturers than it was for anyone else.

The demonstrators, including the manufacturers, are unanimous in a remarkable discovery—the discovery that soil that had never been touched by plows before, was ideal for the purposes of the demonstration. It put the tractors to the severest test they ever had. And the big, fine thing about it is that every machine in the field stood the test and conquered the vast expanse of hard, unyielding prairie in a manner to make every manufacturer

(Continued on Page 21)



The Proposed Federal Commission

THE question of advisability of the creation of a Federal Commission for the building of a national highway system has been taken up, for and against, by leading authorities and is attracting no end of attention. Two of the most interesting expressions have come from Secretary David Houston of the Department of Agriculture and Dr. H. M. Rowe, past president of the American Automobile Association and a member of the special committee of the A. A. A. Good Roads Board, which is devoting much time to federal highway legislation.

The arguments of these two leaders are well worthy of careful thought. That of Secretary Houston, wherein he advocates a policy that will not interfere with the present comprehensive system, which is now being carried on practically without interruption and is giving splendid results where the states are properly organized along highway lines, seems plausible indeed. It is certainly true that the states themselves know what they need and that it would be little trouble to connect up the principal intra-state and transcontinental highways so as to serve every purpose.

It is also true that different kinds of roads are needed for different communities. New federal regulations permit the government to contribute as its share of the cost of state roads as high as \$20,000, as against the former maximum of \$10,000 per mile. T. H. MacDonald, former chief engineer for the Iowa Highway Commission, has been made director of the U. S. Bureau of Public Roads at Washington, and he has a staff of former successful state and district engineers. It is to be presumed that the Department of Agriculture takes as much interest in the matter of good roads, the administration of which is vested in that department, as it says it does. Secretary Houston declares that he has "no prejudice against any sort of a road but a bad road."

The states seem to be co-operating very heartily with the federal government in the matter of good roads. The State of Colorado is doing so, at least, and big things are being accomplished or are projected. "Why at this stage introduce complications and embarrassments, and why should not the friends of the movement for roads to serve the people co-operate?" is a pertinent inquiry of the Secretary of Agriculture.

In this issue of the Colorado Highway Bulletin are set forth the views of Secretary Houston and of Dr. Rowe. They should be read carefully by everyone who has the interests of the traveler and especially of the motorist at

heart. Dr. Rowe seems to fear that state highways might not meet properly at the boundaries of the respective commonwealths and that they might not be of sufficiently uniform construction. However, there are very few states in which the principal roads do not meet at the state lines with the important roads of the neighbor states, and there is no conceivable desire on the part of any of the states to alter this condition. Furthermore, every state wants the best sort of roads it can possibly get.

Colorado is as vitally interested in seeing its roads properly connected with those of surrounding states as is any other state of the Union, and there is no reason to think that present direct road connections with other states will ever be disturbed on north, south, east or west.

It may be just as well to let a good thing alone. In Colorado, which is, in many ways, typical of all the states, and in other particulars is in greater need of good roads than almost any, the highways are being administered in such manner as to promise easy ingress from other states and to make accessible the remarkable points of interest within the state. Other states also are doing their best, especially since the federal government has begun to lend its aid.

Property Owners Should Pay

COLORADO is in the best position in its history to realize its long cherished ambition to possess one of the best systems of highways in the nation. There are still tremendous problems to be met, however, and they must be faced squarely.

To complete the road construction necessary to place Colorado on the map as one of the most productive of states and as the playground of the nation necessitate the expenditure of considerable sums of money. Funds from several sources are now available, including taxation, gasoline tax and Federal aid. But there is one source of good-roads building revenue which is being drawn upon by other states which has never been touched in Colorado. That is the charge upon abutting property.

Especially in the farming districts is the property adjacent to the highways benefited by good roads. It would be a queer sort of farmer who would not be willing to pay a fair proportion of the cost of a hardsurface road running past his land. Yet where Colorado is building or is contemplating the construction of good roads the property nearest the road gets the benefit without a cent of cost to its owner.

In Iowa there was passed a law by the last legislature which is expected to solve the abutting property problem in that state. The law provides that County Supervisors shall name a board of three resident freeholders to apportion 25 per cent of the total cost of the improvement upon property close to the proposed road, giving due consideration to fair market value per acre, relative location and productivity, relative proximity and accessibility to the improvement. After the assessment is apportioned, the auditor sets a date for hearing before the board of supervisors at which interested parties may appear and be heard. Enlargement of the district to include benefited property may be recommended by the appraisers to the supervisors, but this recommendation must be approved by the State Highway Commission before it becomes effective.

The law prescribes no basis of assessment, but the Iowa Service Bulletin shows how 25 per cent of the cost of a road can be assessed against benefited property without entailing hardship on the land owner. For instance, on a hard surfaced road costing \$20,000 per mile, the adjacent property pays 25 per cent, or \$5,000. There is a benefit zone three miles wide, or one and one-half miles on either side of the road. It is suggested that the first quarter mile bear 32 per cent, the second quarter mile 25.6 per cent, the third quarter mile 19.6 per cent, the fourth quarter mile 12.8 per cent, the fifth quarter mile 6.4 per cent and the sixth quarter mile, comprising the last property in the benefited zone, 4 per cent of the \$2,500 assessed against the one side of the road.

This scheme would work out in the following fashion in an average farming district:

	Per cent	Per Acre	Per 40	Per 160
First quarter mile pays.....	32	\$5.00	\$200	\$800
Second quarter mile pays..	25.6	4.00	160	640
Third quarter mile pays.....	19.2	3.00	120	480
Fourth quarter mile pays..	12.8	2.00	80	320
Fifth quarter mile pays.....	6.4	1.00	40	160
Sixth quarter mile pays.....	4.0	0.625	25	100
	100.0			\$2,500

There is no economy in narrow roads. Traffic follows good roads. The tonnage soon increases beyond the capacity of a narrow pavement to carry it, with the result that the expense of maintaining macadam or gravel shoulders exceeds in a very short time what it would cost for a wider slab.

Carload shipments of automobiles from the factories for May will show more than 24,000 carloads, compared with 17,833 carloads in May, 1918, indicating that motor car production is on the increase to meet the demand caused by the shortage of cars last year, when the industry made approximately a million cars less than the original programs called for. For the year ending April 30, carload shipments were 189,429 compared with 224,805 carloads in the previous year.

Compile Highway Statistics

Compilation of statistical data designed to show railway, waterway and highway rates in detail will be undertaken at once by the highway transport committee of the Council of National Defense. At the request of officials of the council, Capt. A. G. Stevens, finance division of the war department, has been assigned to the work.

Captain Stevens was engaged in railroad tariff compilation for a number of years before entering the government service. During the period of America's participation in the war he was in charge of the section which issued vouchers on all railroad freight charges, the amounts frequently running as high as \$30,000,000 a month. He is considered one of the foremost authorities on the subject in this country.

The rate survey is planned as one of the features of the post-war program of the highways transport committee. Investigations conducted by that body have developed a surprising lack of definite information regarding highway transportation operating costs. Thus far little or no effort has been made to classify highway freight, while the range of charges even between units operating in the same districts has been remarkably wide, indicating an inexact knowledge of operating costs upon the part of the haulers.

U. of C. Tractor School

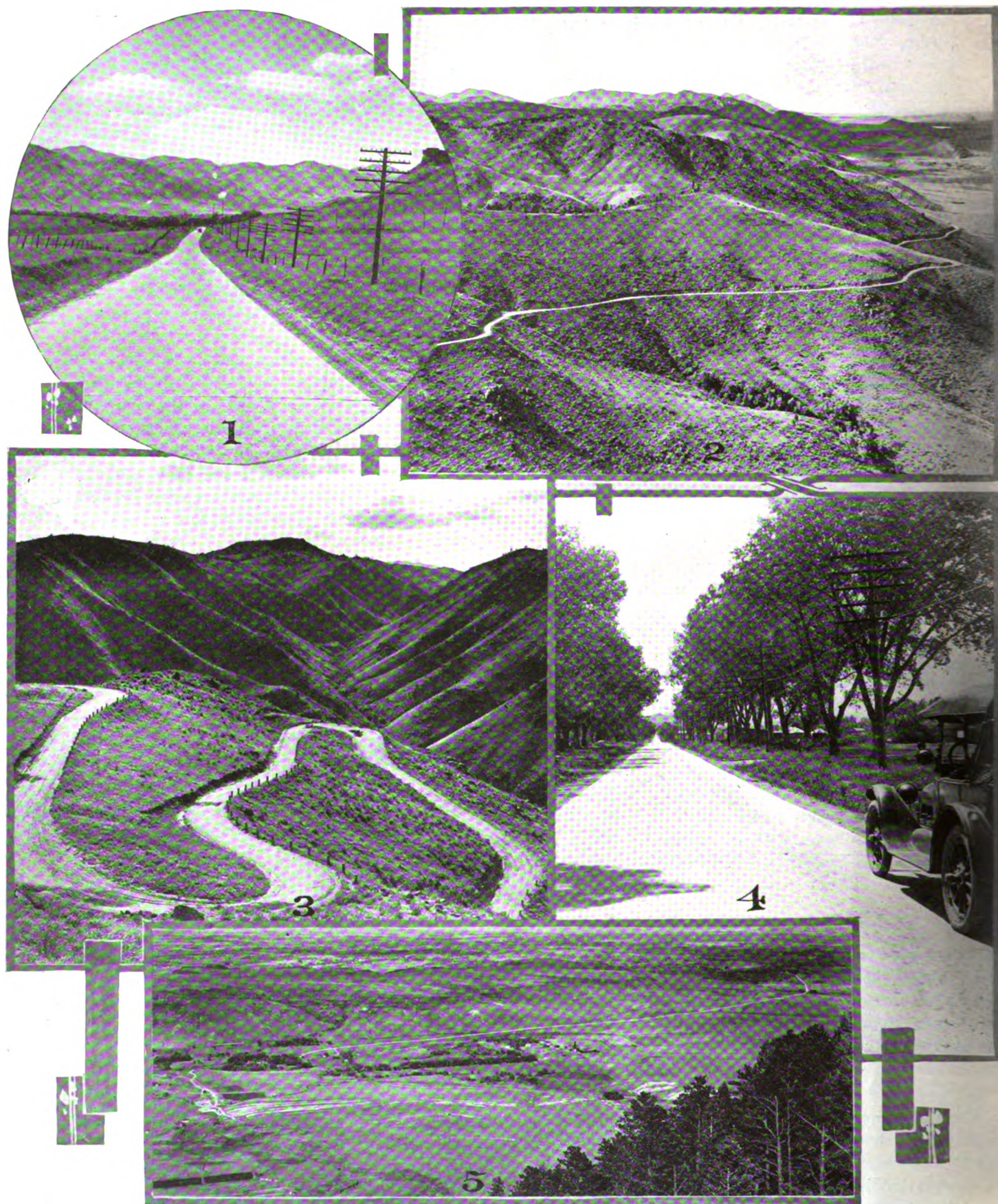
Director C. G. Sargent, in charge of vocational education at Colorado University, has launched a plan for short courses of instruction in the use of tractors. The first of these was held recently in connection with the Logan County High school at Sterling.

In this school the state and federal government are co-operating under the Smith-Hughes act in industrial arts. In this short course many farmers, as well as boys, who are taking the course in agriculture, were present and instructions were provided.

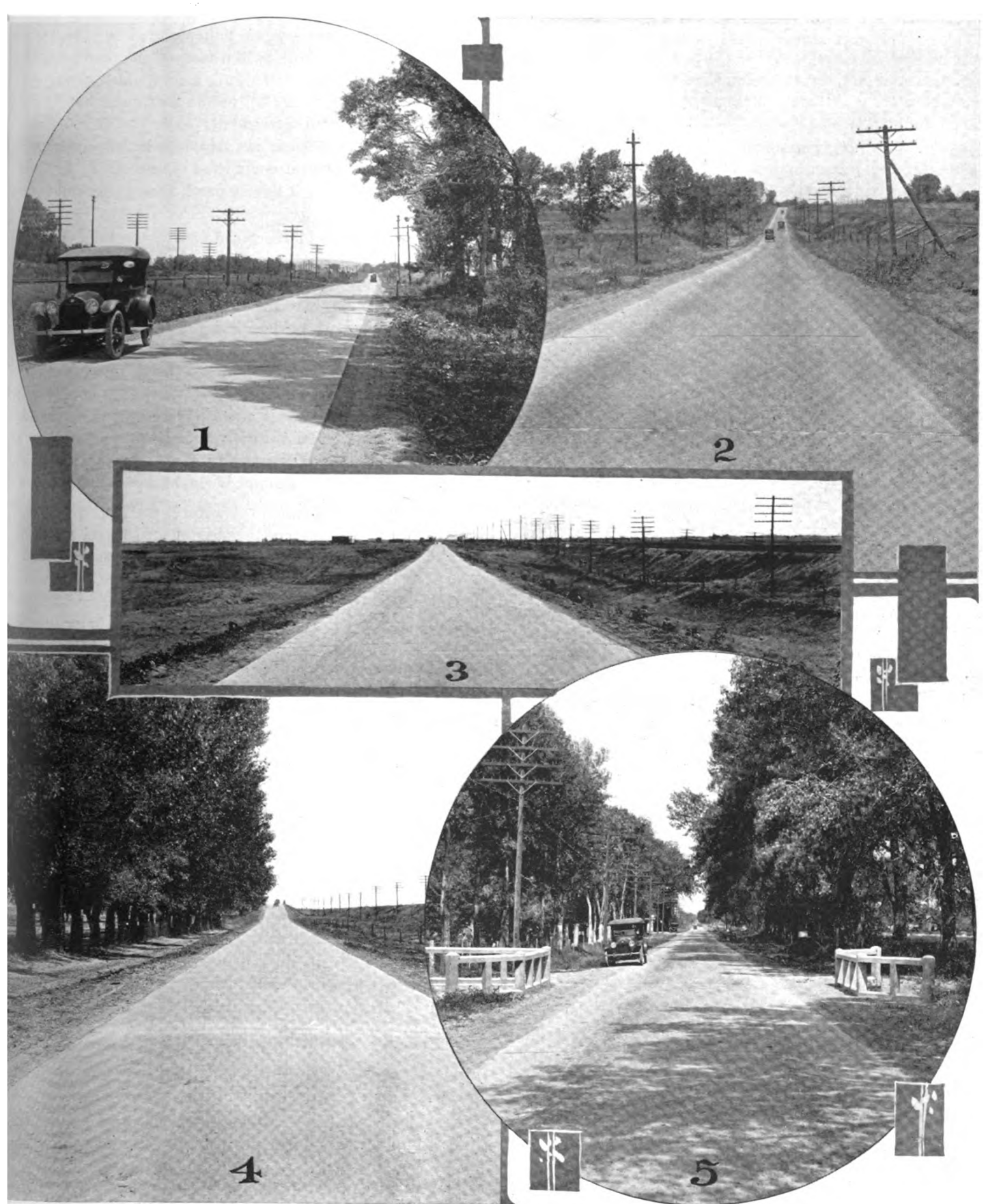
It is said that more than \$200,000 was expended in tractors in this county last year and there were eleven makes demonstrated at the short courses.

Not only does existing traffic shift to paved roads, but what was once termed a theory has in practice proved to be a fact: the time saved in marketing on concrete roads results in greater production on farms and truck gardens, since more time is available for cultivating a larger acreage or for cultivating the same acreage more intensively. This adds to the tonnage which the roads must carry, and also to the profits of those who enjoy their time-saving advantages.

Road workers employed by Fairbanks & Hunt, contractors, at Nevada City, Calif., unearthed a quartz ledge bearing free gold and heavily mineralized while grading for the new highway south of that city. A company has been organized and \$30,000 already has been raised for the development of the property.



A concrete highway leading from Denver to Golden, and the finest of graveled mountain road, that up Lookout to Denver's Municipal Park. 1. Stretch and curve between Denver and Golden. 2. The gravel mountain road. 3. Lariat Loop on mountain road. 4. A shady stretch of the Denver-to-Golden road. 5. The concrete road viewed from top of Lookout, with Denver visible 16 miles away.



Views of three concrete roads near Denver, showing valiant work of Highway Commission in past two years. 1. Road to Littleton, paralleling two trunk lines of railroad. 2. Grade on same road. 3. Looking north on Denver-to-Brighton road. 4. Another view of same road. 5. Shady stretch on road from Denver to Golden.

Should Highways Be Federalized?

(Continued from Page 6)

sary additional administrative expenditures and the commission could not do anything that cannot now be done more effectively by the existing co-operative machinery. There would also be a radical change of policy. I do not think that the people of the states will be willing to substitute for the present policy of developing roads on the principle of serving the largest economic purposes that policy advocated by those whose interest is in two main or trunk line automobile roads in each state, nor do I think that they would be willing, even if it were legal or practicable, to have existing funds diverted from the present or contemplated projects, worked out with the aid of the state highway departments, solely to the construction of such roads. The largest service will be rendered, not only to farmers, but, in the long run, also to urban people, by following the principle of constructing roads of the greatest economic importance, selected after careful consideration by the state agencies having adequate knowledge and approval by the federal department. It seems to me clear also that, as the work proceeds, we shall have roads which will be equally serviceable not only to those interested immediately in long distance automobile travel and motor truck transportation, but also to those interested in getting their farm produce to the market in the easiest and the most effective manner and in the transportation of the mails. I have no prejudice against any sort of road except a bad road, or against any sort of construction except wasteful and unsubstantial construction. If traffic conditions require heavy construction, then I am in favor of it; and in any case, under the law, the construction must be substantial.

"The road construction movement is growing very rapidly. The Federal Aid Road Act has done much to promote it. It has stimulated financial aid and has caused many state legislatures to create central highway departments. Experience has brought about amendments to the law and helpful changes in administration. Comprehensive road programs have been inaugurated and are being used vigorously. They will result, in a shorter time than most people imagine, not only in a network of good, substantial roads in the various states of the Union, but also in the requisite interstate highways.

"Why at this stage introduce complications and embarrassments? Why should not the friends of the movement for roads to serve the people co-operate? It is difficult for me to see why all who are animated by high public spirit in their thinking concerning highways should not co-operate in the development of present programs and in the perfection of the existing processes, instead of attempting to overthrow them. I believe that many of those who are backing the proposed change do not know the facts and are not aware of existing conditions and possibilities. I believe also that their proposal stands very little chance of being enacted into law."

The opinion of Secretary Houston, as cited above, is not shared by some other experts. One who dissents is quoted herewith at some length:

DR. ROWE WANTS COMMISSION.

"That a commission, as contemplated by the Townsend-Bankhead Bill, will be the method of administration adopted by Congress for building a national highway system is indicated not only by public sentiment but by the weight of government precedent," says Dr. H. M. Rowe, past president of the American Automobile Association and a member of the special committee of the A. A. A. Good Roads Board, which will devote much time to federal highway legislation.

"Highways should be considered in the same class of public activity as railways, waterways, merchant marine, the national banking system, and, in fact, any of the great distinctly national undertakings," continues Dr. Rowe. "It seems a self-evident proposition that the building of a national system of highways will form an enterprise of such magnitude and such complexity as to put it entirely beyond the sphere of a single bureau or other subdivision of an executive department and if, therefore, it be considered in the class of these greater national enterprises I have named, we should naturally expect to see the same kind of administrative machinery established for highways.

"By way of precedent, therefore, we may point out that the railroads while under government control are managed by a director general who is not subject to the control of any cabinet officer and that in the absence of government operation of railroads the Interstate Commerce Commission functions independently of executive departments. When we turn to the great shipbuilding and merchant marine industry, we find these are managed by the shipping board and the emergency fleet corporation, both functioning apart from executive departments. If we turn to the national banking system, we find the federal reserve board instead of a bureau of the Treasury Department. Other examples might be cited. Bureaus of executive departments are principally engaged in investigative and educational work and in the routine performance of a government activity more or less inherently and continuously a part of the executive machinery.

"There is no existing department which could legitimately take over the entire task of building a national highway system. It might be contended that the Department of Agriculture should do the job because of the agricultural interests affected by highways, but immediately the counter contention might be made that the War Department should build the system because of the military and national defense needs of the Nation. The Postoffice Department might very logically claim that its rural delivery and parcel post service should entitle it to control.

"The Department of the Interior being almost entirely a public works department might contend that a constructive engineering task should fall in its domain.

"As an outcome of these various contentions must come the realization that highways are of such an all-embracing and of such general importance as to make it impracticable to entrust the task as a minor undertaking to any single government department. A commission would consider the needs of all of the departments.

Federal-Given Road Equipment Is Coming

Automobiles, Trucks, Tractors and TNT Donated by Uncle Sam for Use of His Bureau of Post Roads and the State of Colorado Ready for Shipment. Commissioner Sommers Goes to Washington to Arrange Transportation

THAT Colorado's good roads program will be given big impetus by the Federal Government's offer to give the state construction equipment and motive power is the opinion of the State Highway Commission.

In addition to 2,000,000 pounds of TNT supplied free, which is arriving as needed, over twenty light automobiles, thirty-five motor trucks and four Cleveland tractors are being shipped to Denver from Washington and Eastern Army centers for the use of the state and the United States Bureau of Public Roads in the Denver District of post roads, comprising those in Arizona, New Mexico, Wyoming and Colorado, and of both forest and post roads in the Black Hills of the Dakotas and in Nebraska. Steam shovels also are to arrive shortly.

State Highway Commissioner E. E. Sommers of District No. 1 left Denver for Washington June 10 to arrange for the transportation of Colorado's new Federal-given equipment on the several consignments necessary to bring it here.

These machines and explosives, J. S. Bright of the engineering staff of the post roads bureau headquarters in Denver declares, are part of the bureau's 10 per cent share of the government's wartime equipment for the army. With hostilities ended, the War Department recently ordered this surplus material distributed free on the basis of 10 per cent to the Federal Bureau of Public Roads, and 90 per cent to state highway departments.

The Colorado Highway Department, T. J. Ehrhart commissioner, received notification some time ago that it would receive a number of gasoline-power machines, and has rented a warehouse in which to store them until they are needed. The New Mexico highway department has bought a five-acre field on which to build housing for its forthcoming "gifts."

The immensity of these supplies which are to be presented free to the states and bureau was indicated by Mr. Bright when he said: "There are two dumps in France, covering nine square miles, in which you can find anything from a locomotive to a screw driver, and there is an enormous supply station at El Paso."

The TNT is coming from Fort Wingate, N. M., where 13,000,000 pounds of this high explosive is said to be stored, and Venetia, Calif.—1,000,000 pounds from each station. No. 8 detonators are supplied free with the explosive by the government.

"TNT in road construction work is practically as efficient as dynamite," said Mr. Bright, "and it is equal to the 40 per cent grade. Nitric acid is used in its composition. On that account it cannot be used to advantage in confined places, because of the nitric fumes it gives off, but in the open it is very satisfactory. It is more susceptible to moisture than dynamite, but when properly used and kept it is fully as safe and reliable as the better-known explosive."

Roads Keep Pace With Development

(Continued from Page 14)

Factors in the total cost to the farmer of producing and marketing his crop. Improved highways and improved method of highway transportation which are possible only on good highways have made possible the production of large crops at considerable distance from railroads, which could not have been marketed at a profit except for the highway improvements made in the past ten years.

There has also been a very marked increase in land prices in Colorado in the past ten years. This increase has been apparent in every section of the state, but the largest advances have been in districts lying at considerable distances from railroads, along newly constructed and well maintained highways. Such increases are justified by the fact that farmers in these districts are able, by reason of the better roads and motor transportation, to market crops at a profit, where in the past their farming operations have been confined almost exclusively to the raising of livestock. The economic advantages of good roads for the farmer are now beginning to impress themselves upon the farmer and the general public, and the development of highway construction in the agricultural districts in the next ten years may be expected to be more rapid and extensive than it has been in the past decade.

Denver's Tractor Show Biggest Ever

(Continued from Page 15)

and every tractor and plow dealer proud. But the manufacturers discovered that plowing land in the West is NOT plowing land in Iowa, or even Kansas.

The farmers came and saw and were convinced that power farming is no longer an experiment. They saw tractors and cultivators and plows and automotive packers, discers, harrows and seeders, literally grinding and moulding that stubborn soil into condition for cultivation. And they learned their lesson well. How well they learned is demonstrated by the fact that they bought tractors and other automotive implements, as the dealers will testify, in greater numbers than they have ever purchased at tractor demonstrations before.

They found that a tractor demonstration in Denver is a glorious outing in God's own country, where the air is always sweet with the tang of the mountains, where the sun is bright, though the days are never uncomfortably warm, and where the nights are cool and exhilarating. The glorious trip they made through the Mountain parks as the guests of the Denver Tractor club before the demonstration began was enough to convince them that no other place in the country can vie with Denver for hospitality and for ideal outing facilities.

Colorado is Hunting and Fishing Mecca

State is Recognized as Sportsman's Paradise and for That Reason it Has Been Found Necessary to Pass Precise if Not Drastic Laws for the Protection of Fish and Game. A Symposium of the Laws Passed by the Last Legislature is Given, Including New Alien Law

COLORADO is a hunter's and fisherman's paradise. Good motor roads are available to all or nearly all favorite haunts of the nimrod or the Izaak Walton and there is no more ardent advocate of fine highways than the sportsman.

The popularity of the Centennial State as a hunting and fishing ground has made necessary the passage of carefully devised laws for the protection of fish and game. The trout season is now on, and the sport of angling for the speckled beauties is apparently more popular than ever this year.

R. G. Parvin, state game and fish commissioner, has prepared a summary of the fishing and hunting laws for 1919-1920, as amended by the last legislature and this synopsis is reproduced herewith for ready reference by Bulletin readers. It is as follows:

1919 COLORADO 1920
Game and Fish Laws, Condensed.

(As restricted by Federal Migratory Bird Treaty Act.)

Open Season—(Both Dates Inclusive)

Game Animals

Elk, Mountain Sheep, Antelope, Beaver—no open season. Deer, having horns with two or more points on each horn, Oct. 1 to Oct. 4.

(Animals larger than coyotes classed big game.)

Game Birds

Wild Turkey, Quail, Pheasant, Partridge, Pigeon, Ptarmigan, Dove, Wood Duck, Swan, Crane, Curlew and all other waterfowl, wading, marsh and shore birds, except those specified below—no open season.

Duck, Goose, Brant, Coot, Gallinule, Black-bellied and Golden Plover, Wilson or Jacksnipe and Yellow-legged Snipe, Sept. 16 to Dec. 31; Rail (other than Coot and Gallinule), Sept. 16 to Nov. 30; Prairie Chicken, Mountain and Willow Grouse, Sept. 15 to Oct. 1; Sage Chicken, Aug. 15 to Sept. 1.

Nongame birds (except English or European House Sparrow, Sharp-shinned Hawk, Cooper's Hawk, Goshawk, Duck Hawk, Great-horned Owl, Pinon Jay, Magpie, Bluejay, Eagle), no open season.

FISH

Trout and Grayling (none shorter than 7 inches): In running streams, May 25 to Oct. 31; lakes, not exceeding 7,500 ft. altitude, May 1 to Oct. 31; over 7,500 ft., June 15 to Oct. 31. Whitefish, Bass, Catfish, Sunfish, Perch and Wall-eyed Pike, May 25 to Oct. 31.

Fishing permitted from 4 a. m. to 8:30 p. m., with line and rod held in hand.

Bag Limits and Possession

Deer—One during open season.

Game Birds: 20 Ducks, 8 Geese, 8 Brants, 20 in all of Rails, Coots and Gallinules, 20 Wilson or Jacksnipe, 15 in all of Plovers and Yellowlegs, 10 in all of Prairie and Sage Chickens, Mountain and Willow Grouse, in a day. Not more than aggregate of 20 Migratory Game Birds in a day.

Fish: 15 pounds in a day.

Permitted in possession: Prairie and Sage Chickens, Mountain and Willow Grouse, 15 in all; other Game Birds, 35 in all; Fish, 20 pounds; during open season and first five days of close season. Storage Permit issued by commissioner au-

thorizes storage, possession and use 90 days next ensuing open season (except Migratory Game Birds, 10 days).

Licenses

Must be in possession. Obtainable from commissioner, county clerks and other agents: Resident combined fishing and small game hunting license, \$1.00; resident big game hunting license, \$2.00; non-resident fishing license, \$2.00; non-resident bird hunting license, \$5.00; non-resident big game hunting license, \$25.00.

Fishing licenses not required by females or by males under 16. Children under 12 may not hunt except on own premises or those of parent or guardian nor take more than half bag limit of game or fish. Boys under 16 without fishing license entitled to only half bag limit. No person under 18 permitted to hunt big game.

Aliens not permitted to hunt, nor to own or possess firearms.

Reward

will be paid for evidence leading to conviction for killing: Elk, \$100; Mountain Sheep, Antelope, Deer, \$50; Pheasant, \$25.

Transportation

Shipments lawful during open season and five days thereafter, within state: Deer, when coupon is attached. Birds and fish, when bearing conspicuously attached a domestic certificate in following form:

"State of Colorado

I hereby certify that the (insert kind and number of birds or fish) to which this certificate is attached were lawfully taken by.....in.....county, Colorado, on the..... day of....., 19..... Signed....."

Shipments out of or into Colorado require transportation permit, issued by the commissioner.

R. G. Parvin,

State Game and Fish Commissioner,
Capitol Building, Denver, Colo.

ALIEN LAW

Provisions of House Bill No. 348, passed by the 1919 session of the Colorado General Assembly. Effective on and after June 19, 1919.

Unlawful for unnaturalized foreign-born resident to hunt, capture or kill in Colorado wild birds or game except in defense of person or property. Alien cannot own or possess firearm of any kind.

Penalty on conviction, fine not less than \$25, nor more than \$250, or imprisonment in county jail not less than ten days or more than three months, or both.

Guns found forfeited to state and sold by the game and fish commissioner. All officers of game and fish department, forestry and peace officers can arrest, without warrant, aliens found in possession of guns of any kind. Can also apply for search warrant when they suspect the concealment of guns by an alien.

Justice of the peace has jurisdiction. Any alien living in Colorado one day shall be considered a resident and amenable to the act. Money collected on fines: One-third goes to county, two-thirds to the game and fish commissioner. Justice must make report in writing within twenty days to commissioner.

For further information, or full text of the law, apply to

R. G. Parvin,
State Game and Fish Commissioner,
June 10, 1919. Capitol Building, Denver, Colo.

Commission Transacts Business

(Continued from Page 13)

In addition to his salary the sum of 10 per cent on his pay roll, said 10 per cent being remuneration to him for the use of his tools, tentage and camp equipment used on this work, it being further understood that the rate of wages shall be as follows: 50c per hour for laborers, 50c per hour for teams, 60c per hour for foreman and 60c per hour for powder man.

An appropriation of \$6,350 was made to cover the account of William Williams, said account being certified to the board by the state auditing board.

Mr. N. I. Jacobson was employed as superintendent of construction on the east end of the Fall River Road at a salary of \$200 per month. Mr. Jacobson will be allowed the sum of 10 per cent on his pay roll for payment for the use of his tools and camp equipment, it being further understood that the rate of wages shall be as follows: 50c per hour for laborers, 50c per hour for teams, 60c per hour for foreman and 60c per hour for powder man.

Upon adoption of this resolution Mr. Jacobson notified the commission that he would accept the terms as proposed by the commission in lieu of his contract and requested that the old contracts be cancelled and new contracts be drawn up.

Mr. Cowden, county commissioner of Crowley County, appeared before the board in reference to machinery heretofore purchased by Crowley County, asking that the commission grant them some relief by paying for part of this road machinery.

Crowley County was appropriated \$1,000 to be expended on Route No. 20-S on the basis of 100% state.

The Geo. W. Pierce Laboratories Company of Denver was employed to test all cement and metal culverts to be used by the State Highway Department on federal aid or other projects, at any time when in the opinion of the chief engineer of the highway department they deem said tests necessary.

Commissioner Ehrhart was authorized to employ Mr. R. H. Higgins as special agent of the State Highway Commission to assist in lining up federal aid projects in this state. His remuneration is to be \$200 per month and necessary traveling expenses.

Commissioner Ehrhart was authorized to employ two time keepers, one for Mr. McQueary's force and one for the force employed by N. I. Jacobson, said time keepers to report directly to Commissioner Ehrhart and to receive a salary of \$125 per month and expenses.

The sum of \$2,000 was appropriated for the use of Pitkin County to be expended under the direction of the State Highway Commission. Nothing to be paid by the county.

Two thousand dollars was appropriated to Ouray County, 100 per cent state, \$1,500 to be used on Road No. 3 and the \$500 on Road No. 44.

Five thousand dollars, 100 per cent state funds, were appropriated to Moffat County for the purpose of completing the work on State Primary Road No. 42 from Wise Hill to Hamilton Ranch.

The board adjourned until July 14, 1919, 10:00 a. m.

Higgins Is F. A. Deputy



Robert H. Higgins

Robert H. Higgins, former state treasurer of Colorado, was selected special Federal Aid Deputy to the State Highway Commission at the June meeting of that organization. There are many perplexing problems in the administration of the Federal Aid law, conjointly by Nation and State, and "Bob" Higgins is believed by the commission to be the man to solve them.

The new deputy commissioner has been in Colorado twenty-nine years and for the past fifteen years at least of that time has been actively identified with what he terms the "road game." He has become such an authority on good roads and his opinions, recommendations and services along improvement lines have been so eagerly sought, that he has actually traveled 140,000 miles in Colorado and has driven but 100 miles of that distance himself. His duties in his new capacity will be to see that proper apportionments are made to the various counties, so that none is cheated and none gets too much.

Before he was elected state treasurer, Mr. Higgins was president of the Colorado Good Roads Association for six years and had been for almost as long president of the Colorado County Commissioners' Association. He is so well known nationally on account of his good roads achievements that he is now vice-president for Colorado of several transcontinental good roads organizations, such as the Pike's Peak Ocean to Ocean Highway and the Santa Fe Trail, and is Colorado director for the National Highways Industries Association, the object of which is to further the interests of the Townsend bill.

"Bob" Higgins is so used to road bills and appropriations that he can take a tabulated statement of Colorado's counties and work on it with two pencils, one in either hand, telling in a moment just how much too much or too little the respective counties have received or have been allotted.

The organization of the Colorado Good Roads Association in 1911 was due largely to the hard preliminary work of Mr. Higgins, who was elected its first president. This was the real beginning of the good roads movement in Colorado, as Mr. Higgins expressed it. He is given credit for securing the extension of the Santa Fe Trail from Hutchinson, Kan., to Pueblo, and later secured the Rainbow Route.

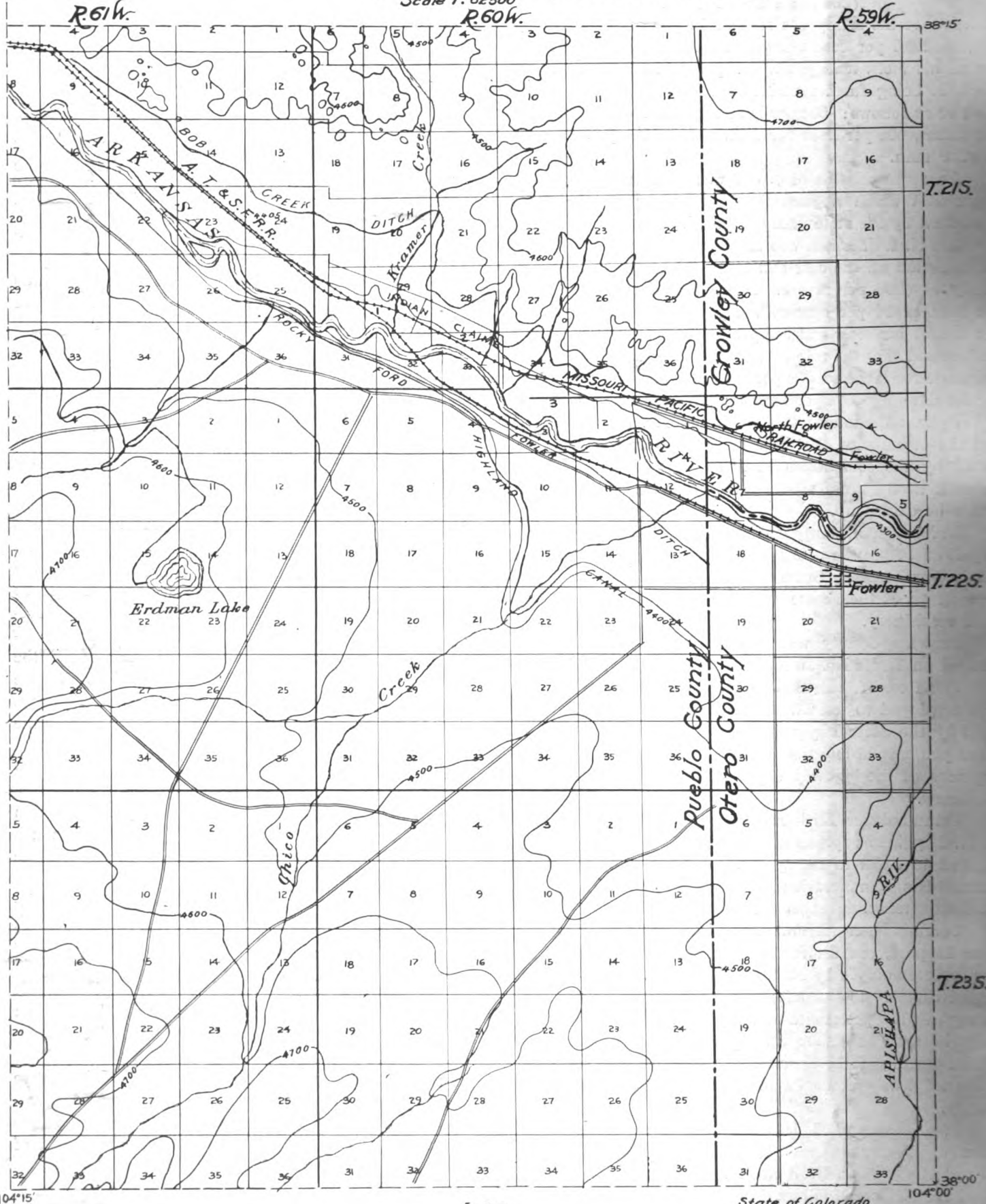
Robert Higgins, son of Robert H. Higgins, is in France with the 28th U. S. Engineers, and has been there practically ever since his enlistment in June, 1917, the same month in which he graduated from the State School of Mines at Golden.

The U. S. Department of Agriculture, through its Bureau of Markets, has offered its co-operation to the operators of motor express lines in establishing a system of rural transportation on regular schedule.

NEPESTA SHEET-PROGRESSIVE MILITARY MAPS

334-S.IV-E/2

Lat. 38°00' to 38°15' Long. 104°00' to 104°15'
May 1919 Reported by
Scale 1:62500




104°15'

L-20

State of Colorado
Highway Dept.

104°00'

GIFT
AUG 8 1919



COLORADO HIGHWAYS BULLETIN

August, 1919

Highway Department Activities

Funds for Many Roads

Good Roads Develop Farms

Fifty Government Trucks Arrive

Road Connecting National Parks

Winds Build Roads

Prospects for Lincoln Highway

Future Roads to Estes Park

Issued by the
State Highway Department

COLORADO HIGHWAY OFFICIALS

STATE HIGHWAY COMMISSION

ELMER E. SOMMERS, Chairman, District No. 1, Denver.

FRED J. RADFORD, District No. 3, Trinidad.

FREDERICK GOBLE, Vice-Chairman, District No. 4, Silverton.

E. E. NICHOLS, District No. 2, Manitou.

ROBERT E. NORVELL, District No. 5, Hayden.

N. A. BALLOU, Secretary.

ROBERT H. HIGGINS, Federal Aid Deputy.

T. J. EHRHART, Commissioner.

J. E. MALONEY, Chief Engineer.

COUNTY AND DENVER ROAD OFFICIALS

ADAMS—Fred O. Pearce, Brighton; Peter O'Brian, Brighton; Peter Oleson, Westminster; H. G. Tiffany, Denver; Harry C. Flanders, Bennett.

ALAMOSA—Robert Ginn, Alamosa; Chas. M. Johnston, Alamosa; A. E. Headlee, Monte Vista; Cris Wallrich, Alamosa; D. W. Kirkpatrick, Alamosa.

ARAPAHOE—Harry C. Curtis, Littleton; A. F. Goddard, Littleton; Theodore Taylor, Englewood; D. J. Crockett, Littleton; Ernest Quick, Aurora.

ARCHULETA—Eleanor H. Todd, Pagosa Springs; R. A. Howe, Pagosa Springs; Fred Catchpole, Pagosa Springs; David Hersch, Pagosa Springs; Grant Shahan, Chromo.

BACA—Chas. E. Howell, Springfield; J. H. D. Terral, Springfield; Geo. W. Elley, Stonington; Jas. A. Stinson, Springfield; Onda Young, Two Buttes.

BENT—J. W. Nelson, Las Animas; C. W. Beach, Las Animas; B. T. McClave, McClave; D. E. Heizer, Las Animas; Levi Dumbauld, Las Animas.

BOULDER—Francis Beckwith, Boulder; Arthur J. Boase, Boulder; S. A. Greenwood, Boulder; H. E. Miller, Longmont & Boulder; Guy Miller, Boulder & Nederland.

CHAFFEE—F. A. Bromley, Buena Vista; Howard Sneddon, Salida; O. S. Mason, Buena Vista; J. I. Glenn, Salida; W. L. Philborn, Salida.

CHEYENNE—E. H. Akerly, Cheyenne Wells; D. H. Zuck, Cheyenne Wells; Walter Ramsay, Kit Carson; Anton I. Johnson, Wild Horse; J. W. Shy, Cheyenne Wells.

CLEAR CREEK—Benj. A. Holley, Idaho Springs; C. D. McFadden, Georgetown; W. C. Ives, Idaho Springs; T. W. Cunningham, Georgetown; Jno. Green, Idaho Springs.

CONEJOS—Bonifacio Gonzales, Magote; Frank E. Thomas, Manassa; W. F. McClure, Antonito; Frank Russell, La Jara; J. C. Cantu, Manassa.

COSTILLA—Amos P. Rodriguez, San Luis; A. H. Martin, San Luis; S. N. Smith, San Luis; T. Manchego, Garcia; W. R. Morris, Ft. Garland.

CROWLEY—J. E. Downey, Ordway; L. W. Walter, Ordway; Wm. Broadbent, Ordway; Frank McNary, Sugar City; J. H. Cowden, Olney Springs.

CUSTER—L. H. Schoolfield, Westcliffe; August Koppe, Silver Cliff; Harry Kettle, Westcliffe; Chas. A. Barton, Wetmore; F. S. Canda, Westcliffe.

DELTA—H. K. Gibbs, Delta; Oliver B. Cook, Delta; J. E. Beckley, Delta; Thomas J. Harshman, Cory; Charles T. Rule, Paonia.

DENVER—J. A. Burnett, Mgr. Improvements and Parks; F. J. Altwater, Highway Commissioner; J. B. Hunter, Engineer.

DOLORES—Thos. C. Young, Rico; A. E. Arms, Rico; G. L. Garren, Rico; Chas. Engel, Rico; R. Bradfield, Lewis.

DOUGLAS—Harry Jones, Castle Rock; D. N. Stewart, Castle Rock; S. H. Stream, Cedalia; Ed. G. Seldensticker, Castle Rock; Jas. P. McInroy, Larkspur.

EAGLE—Mrs. Ora R. Kelly, Red Cliff; W. H. Lea, Gypsum; M. A. Walsh, Red Cliff; T. J. Dice, Eagle; Andrew Oleson, Gypsum.

ELBERT—Frank D. Hart, Kiowa; C. A. Mathews, Elbert; C. A. Huff, Simla; Fred Albin, Kiowa; Wm. J. Park, Kutch.

EL PASO—E. A. Jackson, Colorado Springs; C. O. Ford, Colorado Springs; J. W. Potter, Fountain; Harry A. Scholton, Colorado Springs; J. B. Fowler, Colorado Springs.

FREMONT—Jonathan Seaman, Canon City; James Bunten, Canon City; J. V. McCandless, Florence; G. V. Hodgkin, Canon City; Jas. Belknap, Hillside.

NOTE—In the appended list of county officials the first name in each county is that of the county clerk, the second name is that of the county surveyor, and the last three names are those of county commissioners.

GARFIELD—Carleton L. Hubbard, Glenwood Springs; P. C. Thurmond, Glenwood Springs; L. F. Grace, Glenwood Springs; R. P. Coulter, New Castle; Geo. Newton, De Beque.

GILPIN—Frank G. Moody, Central City; S. A. Rank, Central City; Joseph Borzago, Black Hawk; Neil McKay, Central City; R. I. Hughes, Russell Gulch.

GRAND—H. J. Harrison, Hot Sulphur Springs; F. I. Huntington, Hot Sulphur Springs; Simon Olson, Farshall; J. H. Cather, Kremmling; J. B. Stevens, Fraser.

GUNNISON—C. C. McWilliams, Gunnison; J. H. Robinson, Gunnison; W. H. Whalen, Crested Butte; Geo. L. Miller, Gunnison; C. L. McDonald, Gunnison.

HINSDALE—L. E. Shull, Lake City; E. L. Defenbaugh, Lake City; Jno. C. Gavin, Lake City; E. W. Wiley, Lake City; E. W. Soderholm, Lake City.

HUERFANO—J. G. Archuleta, Red Wing; J. O. Francisco, La Veta; Walter Hamilton, La Veta; J. T. Trujillo, Red Wing; Chas. E. Furphy, Walsenburg.

JACKSON—E. N. Butler, Walden; M. C. Ward, Walden; A. J. Monroe, Walden; W. G. Mellen, Coalmont; Chas. L. P. Winscom, Walden.

JEFFERSON—Frank N. Felch, Golden; Chester A. Lytle, Critchell; J. R. Cruse, Mt. Morrison; Gus A. Johnson, Golden; R. L. Downes, Evergreen.

KIOWA—Ed. M. Low, Eads; C. E. Bell, Eads; C. C. Wolever, Eads; Wurt Bailey, Towner; Ed. Houston, Arlington.

KIT CARSON—Miss Clio S. Judy, Burlington; D. D. Buck, Flagler; I. D. Messenger, Stratton; A. L. Anderson, Burlington; J. O. Hendricks, Selbert.

LAKE—John Gregory, Leadville; Fred J. McNair, Leadville; B. H. Martin, Leadville; Dan Colahan, Leadville; Geo. Bennett, Leadville.

LA PLATA—Helen Galloway, Durango; W. H. Wigglesworth, Durango; Ole M. Lee, Durango; Geo. Olbert, Oxford; Jacob Fritz, Durango.

LARIMER—G. R. Cushing, Ft. Collins; James G. Edwards, Ft. Collins; J. M. Graham, Loveland; Harris Akin, Ft. Collins; C. M. Garrett, Laporte.

LAS ANIMAS—Juan B. Romero, Trinidad; Hal Barnes, Trinidad; A. G. Prosser, Trinidad; J. J. Cordova, Aguilar; Robert C. Scott, Trinidad.

LINCOLN—Henry A. Johnson, Genoa; J. W. Pershing, Limon; Alex McCallum, Arriba; W. M. Smith, Rush; Ed. Riekenberg, Hugo.

LOGAN—Mabel E. Whiteley, Sterling; John W. Black, Sterling; Arthur W. Hand, Sterling; C. M. Morris, Fleming; W. E. Henning, Peetz.

MESA—Chas. S. Jones, Grand Junction; Frank R. Hall, Grand Junction; Gus J. Johnson, Grand Junction; Geo. M. Masters, Mesa; D. Gover Rice, Grand Junction.

MINERAL—Wm. G. Messinger, Creede; S. B. Collins, Creede; Chas. H. Lees, Creede; James Seward, Creede; A. M. Collins, Creede.

MOFFAT—Mrs. L. O. Haughey, Craig; W. P. Finley, Craig; Thomas A. Forkner, Craig; R. S. Hamilton, Hamilton; R. B. Overholt, Maybell.

MONTEZUMA—Samuel M. Burke, Cortez; Geo. Mills, Mancos; R. B. Dunham, Dolores; Chas. B. Kelly, Mancos; W. I. Myler, Dolores.

MONTROSE—T. W. Monell, Montrose; W. H. Fleming, Montrose; John W. Lamb, Montrose; Howard P. Steele, Montrose; Cory S. Heath, Montrose.

MORGAN—A. H. Asmus, Ft. Morgan; J. A. Gilbertson, Brush; Jas. Hurley, Ft. Morgan; J. K. Samples, Brush; J. H. Osborn Wiggins.

OTERO—Oran Walker, La Junta; Mark Denson, Rocky Ford; W. F. Green, Rocky Ford; J. N. Johnston, Manzanola; Geo. Barr, La Junta.

OURAY—R. Whinnerah, Ouray; J. H. Doran, Ouray; W. S. Rose, Ridgway; Geo. B. Croft, Ouray.

PARK—Harry L. Moyer, Fairplay; W. H. Powlles, Alma; G. S. Singleton, Shawnee; J. F. Rhodes, Fairplay; J. Tol. Witcher, Howbert.

PHILLIPS—Geo. L. Coleman, Holyoke; C. A. Guernsey, Holyoke; Fred D. Hotaling, Holyoke; Albin Johnson, Haxtun; Lyman Foster, Holyoke.

PITKIN—Mary E. Mellor, Aspen; Chas. S. Armstrong, Aspen; B. M. Strawbridge, Aspen; E. J. Grover, Aspen; J. J. Gerbaz, Aspen.

PROWERS—L. M. Markham, Lamar; F. W. Smith, Holly; Fred Williams, Wiley; J. B. Rhodes, Granada; A. P. Knuckey, Holly.

PUEBLO—Wm. Barber, Pueblo; C. A. Reese, Pueblo; Geo. Herrington, Pueblo; J. M. Sare, Pueblo; J. C. Harbour, Pueblo.

RIO BLANCO—C. J. Wilson, Meeker; D. Kirk Shaw, Meeker; Fred A. Nichols, Meeker; J. A. Bills, Meeker; H. S. Harp, Meeker.

RIO GRANDE—H. G. Trapp, Del Norte; W. W. Reilly, Monte Vista; August J. Weiss, Del Norte; W. W. Wright, Monte Vista; M. S. Woods, Monte Vista.

ROUTT—J. D. Crawford, Steamboat Springs; C. W. Harkness, Hayden; Claude J. Smith, Clark; Wm. Scheer, Oak Creek; Henry J. Summer, Hayden.

SAGUACHE—Birt Clare, Saguache; A. H. Smith, Saguache; Geo. Woodard, Saguache; A. V. Shippey, Villa Grove; Adam Deltrich, Center.

SAN JUAN—C. E. Dresback, Silverton; A. W. Harrison, Silverton; Gail Munyon, Silverton; J. Ernest Shaw, Silverton; Edward Meyer, Silverton.

SAN MIGUEL—Lillian C. Kenyon, Telluride; Ben W. Purdy, Telluride; T. B. McMahon, Telluride; A. T. Woods, Placerville; J. R. Galloway, Norwood.

SEDGWICK—Nellie E. Nichols, Sedgwick; E. C. Hamilton, Sedgwick; H. H. Hodges, Julesburg; Frank Nagel, Julesburg; J. G. Mowbray, Sedgwick.

SUMMIT—Geo. F. Forman, Breckenridge; James D. Galloway, Breckenridge; A. Lindstrom, Dillon; W. H. Hampton, Frawley; Eli Fletcher, Breckenridge.

TELLER—J. H. White, Victor; E. P. Arthur, Jr., Cripple Creek; T. J. Wicks, Cripple Creek; Tom Foster, Woodland Park; I. N. Riley, Victor.

WASHINGTON—L. Roy Cummings, Akron; Elbert Lewis, Akron; Homer Evans, Akron; R. M. Buckmaster, Abbott; E. A. Lewis, Burdett.

WELD—Chas. E. Littell, Greeley; L. L. Stimson, Greeley; A. F. Peters, Mead; T. Elmer Rowe, Greeley; J. W. Birkle, Platteville.

YUMA—John Adcock, Wray; A. C. Carr, Wray; Harry F. Strangways, Wray; H. W. Jackson, Yuma; Alex. Shaw, Wray.



Entrance to public park and free camping ground of City of Trinidad, donated by C. F. & I., and maintained by Trinidad Chamber of Commerce.

CONTENTS

Board Devises 1920 F. A. Budget.....	5
Men, Machinery and Macadam Make Trail.....	7
Several F. A. Roads Already Completed.....	14
Big Wheat Tonnage Demands Good Roads.....	16
Good Work Planned and Done in Grand County.....	17
State's Share of War Material is Increased.....	20
Fall River Road Progressing.....	20

COLORADO HIGHWAYS BULLETIN

Published Monthly
by the



Colorado Highway
Department

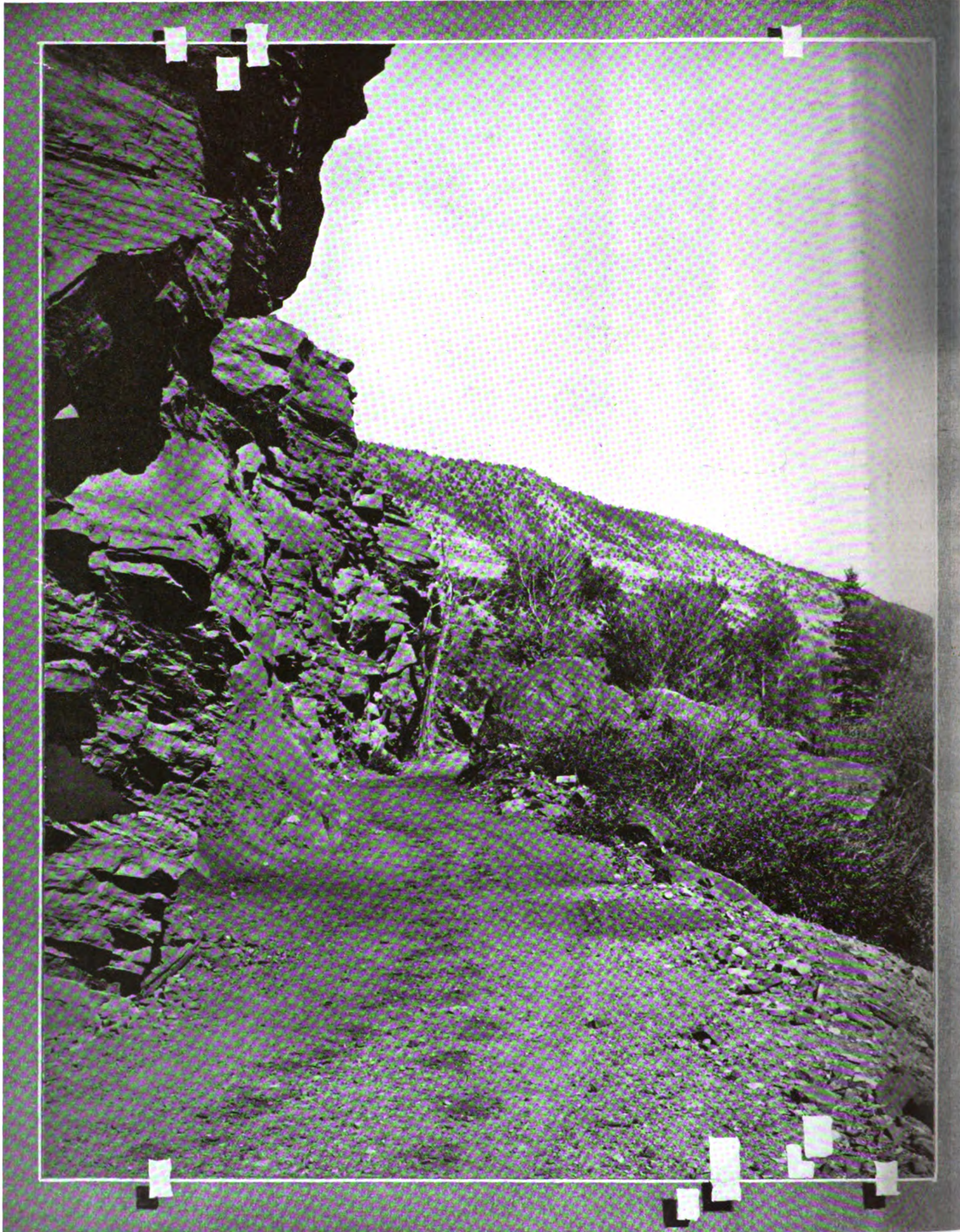
Denver, Colorado.

With the approval of the Colorado State Auditing Board.

Address all communications to Colorado Highway Department, attention J. G. Hilliard, editor, Colorado Highways Bulletin.

Owing to the necessarily limited edition of this publication it will be impossible to distribute it free to any persons or institutions other than state and county officials actually engaged in the planning or construction of highways, instructors in highway engineering, newspapers and periodicals and civic associations. Others desiring to obtain Colorado Highways can do so by sending 10 cents for each number desired. Associations desiring to distribute the magazine can obtain it at cost in lots of from 500 copies up.

Subscription Price, \$1.00 per year.



The famous stone wall of Southern Colorado and monumental tributes to pioneer heroes.



COLORADO HIGHWAYS BULLETIN

VOL. II

SEPTEMBER, 1919

NO. 9

Board Devises 1920 Federal Aid Budget

Sums to be Used in Four of the Five Districts of Colorado are Determined, With Appropriate Amounts Designated to the Various F. A. Projects. District No. 2 Remains to be Outlined. Counties Will be Asked to Contribute so as to Make State Funds Match Those Given by Government.

THE State Highway Commission at its meeting of August 11 appropriated the sum of \$1,683,000 for the furtherance of federal aid projects in 1920. Appropriations were made for all districts except No. 2, which were deferred owing to the unavoidable absence from the meeting of Commissioner E. E. Nichols of that district. The session, which was the regular monthly meeting, was presided over by Chairman E. E. Sommers of District No. 1 and continued over parts of three days.

The monthly meeting of the State Highway Commission was held Monday, August 11, 1919, at the Capitol, with Chairman E. E. Sommers presiding.

The secretary was instructed to correct the minutes of the meeting of July 14, 1919, so that the resolution in regard to the distribution of trucks from the U. S. Government to the Highway Department reads: "That the basis of distribution of 97 trucks received shall be on the basis of 40 per cent to District No. 1, 15 per cent to District No. 2, 17 per cent to District No. 3, 15 per cent to District No. 4 and 13 per cent to District No. 5, all equipment received hereafter to be distributed to the various counties according to the agreements which may be entered into by the Highway Commission."

Resolution No. 151, making appropriation to Jefferson County on the basis of \$2,500 of state funds to \$1,500 of county funds, was made to read, "\$2,500 state funds and nothing for Jefferson County."

On account of the revenue from the state not being in sufficient amount to meet the federal aid apportionment from the federal government for the years 1919 and 1920, so that there would be a shortage of funds to meet the fed-

eral aid apportionments of approximately 25 per cent of the total, it was decided that all counties in which federal aid projects are now laid out be required to appropriate 25 per cent of the cost of such projects and each board of county commissioners will be furnished with a copy of a resolution requesting an immediate reply so that the Highway Commission may be informed of the decision of the respective counties in this regard.

The sum of \$12,500 was apportioned to Boulder County on a 1 to 1 basis, \$4,000 of this amount for construction of a bridge on South Fork near Lyons and \$8,500 for repairs on the Lyons-Estes Park Road.

The sum of \$6,000 was appropriated to Montezuma County on a 100 per cent basis.

State Highway Commissioner Ehrhart's approval of contracts to the following firms for road construction was ratified:

Contract of M. J. Kinney for construction of concrete pavement on the Brighton Road.

Engineers' Construction Company contract for concrete pavement on the Greeley Road.

Contract of Colorado Bridge & Construction Co., for concrete pavement on the Boulder Road.

Contract of Colorado Bridge & Construction Co., for concrete pavement on the Longmont Road.

Contract of Monarch Engineering Co., for a bridge across Lake Creek near Granite.

Contract to Montrose County for Section A, Federal Aid Project No. 7.

Contract of A. R. Young for painting the old tramway powerhouse, \$375. Also contract to A. R. Young for installing electric light switches and plug attachment, \$215. Also contract to A. R. Young for plumbing in the amount of \$515, and also the additional cost for extending pipe line and putting in crossing at curb at entrance to powerhouse, the sum of \$76.54.

The sum of \$1,080 was appropriated to Montrose County on the basis of 100 per cent state funds.

The sum of \$1,250 was appropriated to Chaffee County on a basis of 1 to 1.

The sum of \$5,000 was appropriated for the special state project known as the Independence Pass Road.

The State Highway Commissioner was instructed to purchase four 4-wheel combined road graders and scarifiers at a cost of not to exceed \$4,500, three to be used in District No. 1 and one in District No. 3.

The salary of the stenographer's position, now occupied by Mrs. M. Horst, was increased from \$100 to \$125 per month, to take effect August 1, 1919.

The salary of Superintendent of Construction W. W. Whitmore was increased from \$200 to \$225 per month, to be effective from August 1, 1919.

The salary of Chief Inspector C. E. Brook was increased from \$150 to \$175 per month, to date from August 1, 1919.

Mr. Fritz Altwater was appointed a mechanical engineer at a salary of \$175 per month, to take effect August 1, 1919.

Superintendent of Construction N. I. Jacobson, on the Fall River Road, was authorized to include in his expense bills the cost of the operation of his truck, which has been used for the state by Mr. Jacobson to haul men and supplies to and from his camp, at the rate of 15 cents per mile. This is to include the mileage from the date of June 1, 1919.

The following appropriations for federal aid projects were adopted:

FEDERAL AID PROJECTS FOR 1920.

DISTRICT NO. 1—\$1,041,085.

Vernon Canon	\$ 35,000.00
Denver-Morrison	87,000.00
Denver-Colorado Springs	110,000.00
Littleton South—	
Morgan-Brush	58,000.00
Ft. Collins south.....	58,000.00
Loveland south	58,000.00
Boulder east	58,000.00
Longmont south	58,000.00
Brighton-Ft. Lupton	176,000.00
Idaho Springs to Central City.....	40,000.00
Yuma to Idalia.....	16,000.00
Yuma to Burlington.....	14,000.00
Total	\$748,000.00

DISTRICT NO. 3—\$442,461.00.

County 15.000, State 15.000.

County.

Las Animas—Trinidad to Hoeme.....	\$ 20,000.00
Pueblo—Pueblo east	70,000.00
Crowley—Ordway east and west 16 miles.....	40,000.00
Fremont—Canon City east.....	40,000.00
Kiowa—Eads east and west.....	25,000.00
Otero—LaJunta west	80,000.00
Prowers—Lamar east and west.....	90,000.00
Baca—Springfield north	20,000.00
Bent—East	60,000.00
Total	\$445,000.00

DISTRICT NO. 4.

Del Norte-Saguache	\$ 30,000.00
Durango	80,000.00
Silverton-Ouray	50,000.00
Placerville-Dry Creek	30,000.00
Montrose-Delta	50,000.00
Rico-Lizzard Head	40,000.00
Total	\$280,000.00

Allotment \$390,406.00.

DISTRICT NO. 5—\$338,352.00.

Eteambo east	\$ 30,000.00
Maybell to state line.....	60,000.00
Grand Junction-Palisade	50,000.00
Grand Junction-Fruita	50,000.00
Gilman-Minturn	20,000.00
Total	\$210,000.00

The following resolution was adopted:

Be it Resolved, That the State Highway Commission of the State of Colorado does hereby release, relinquish and transfer unto the United States Government and to the department thereof having control of the national parks and highways therein, the control, management, maintenance and supervision now exercised by said Highway Commission of the public highways located and situated within the boundaries of the Rocky Mountain National Park in the State of Colorado, with the exception, however, of what is known and designated as the Fall River Road, which is now in process of construction and shall be completed by said State Highway Commission; and upon the completion thereof the maintenance, control and supervision of said excepted road shall pass to the United States Government as in this resolution provided.

The salaries of field engineers were made within the limits of \$175 to \$200 per month and the State Highway Commissioner and Chief Engineer were authorized to promote such field engineers to the salary of \$200 per month when they deem it to be to the best interest of the service. The classification for salaries of draftsmen was increased to the limit of \$150 per month and the Commissioner and the Chief Engineer were authorized to promote such draftsmen as may demonstrate their efficiency to the class carrying that salary.

(Continued on Page 21)



Commercial Street, Trinidad, Colo., still part of the Santa Fe Trail and a leading thoroughfare of the fourth city of Colorado. Forty years ago the street was crowded with ox teams, which have given way to a thorough saturation of motor vehicles.

Men, Machinery and Macadam Make Trail

Dick Wootton's Dream of a Santa Fe Trail Worthy of the Name is Being Realized Through the Efforts of Contractors Working Under the Direction of Commissioner Fred J. Radford of District No. 3. Plenty of Romance and Tragedy Attached to the Early Days of the Trail.

MUCH of the romance and adventure in the history of the days before our state abandoned its swaddling clothes and its irresponsible youth to step into its place as one of the great states of the Union, is to be found in the study of the history of Southern Colorado.

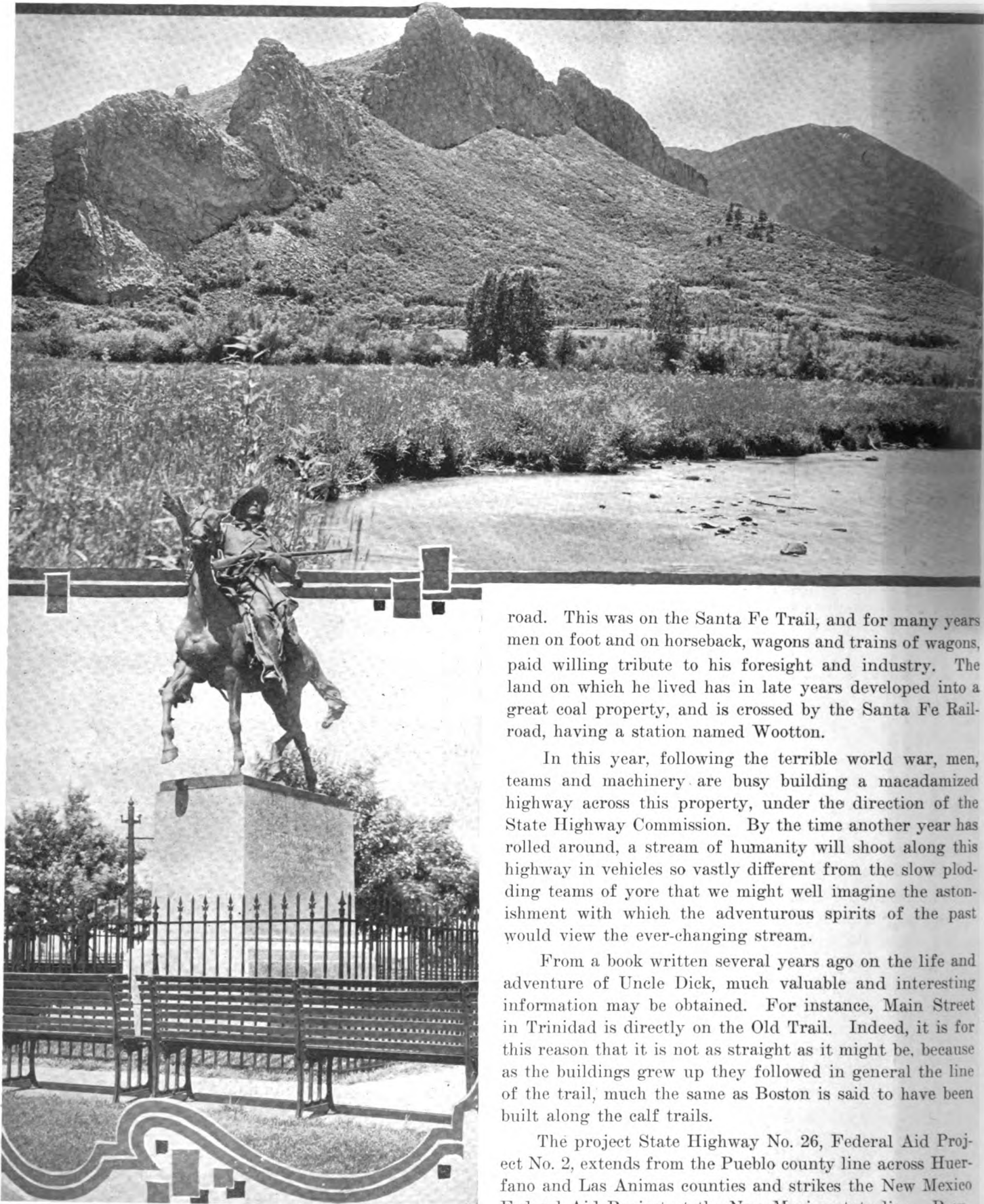
The Santa Fe Trail, as it is known by all the West, was but a trail in those days, and the oldest men now living were but children. A trail it still remains in name, although destined soon to become a splendid highway, surfaced and ready to bear the burden of countless industrial and pleasure automobiles as they serve as a means of communication in a manner undreamed of in the days when the pony and horse cart bore the cargoes of human freight and its accompaniments. Civilization traveled westward and the empires of the great West expanded and grew until now they rival and may ultimately excel the wealthy and over-crowded East.

One seldom stops to think now that the town of Santa Fe, the goal of this trail, is the oldest civilized town save one in the United States. Within a day's motor journey of the city of Trinidad, a little more than three hundred years ago the adventurous Spaniards, pushing northward into the vast unknown, established here the first permanent human habitations, which for generations maintained its

hold in the sunlit land, and furnished the destination or resting place for those virtuous and intrepid early Americans to whom we should extend our gratitude for our present homes in a beautiful and happy land.

The Santa Fe Trail started properly at St. Louis. It was established early in the century and ultimately reached the golden shores of California. The people of Missouri in 1825 secured a Congressional appropriation of \$30,000 for the building of a better road to Santa Fe. The survey was made, but the road was never completed. The first Santa Fe Trail was directly westward from Independence, Missouri, to the mountains of Colorado near Trinidad, thence south to Taos, north of Santa Fe. Later the favorite old Santa Fe Trail was along the Arkansas, thence across to Cimmaron and thence in a direct line to Wagon Mound, Las Vegas, etc.

Attracted by the possibilities of adventure and profit, a young man not out of his 'teens set out with a trading party for the West in the year 1836. This young man, then known as Richard Wootton, and in later years and until he passed over the Great Divide, familiarly and affectionately known as Uncle Dick Wootton, finally settled down on a homestead a few miles south of Trinidad, where, through government aid, he was enabled to establish a toll



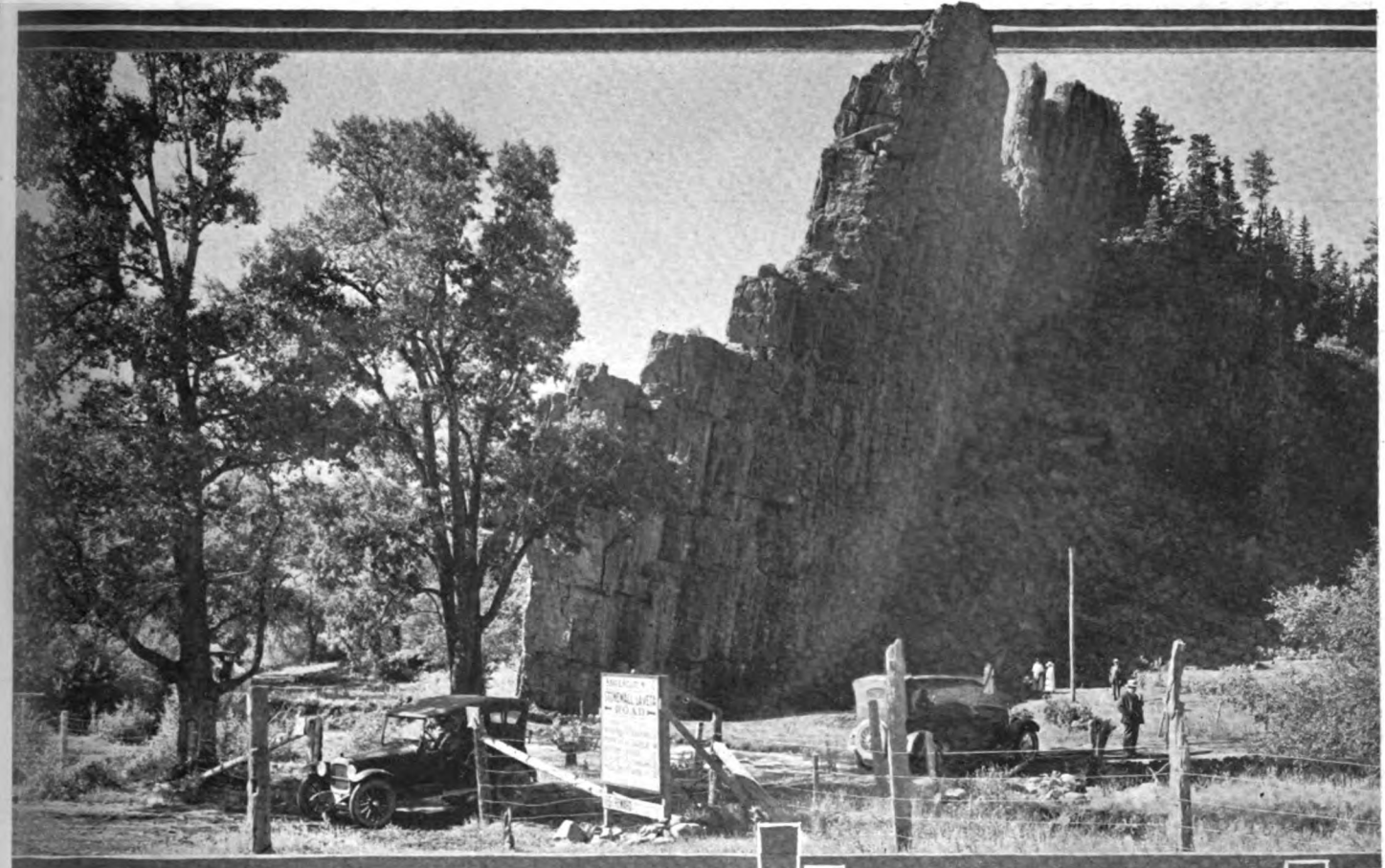
Top—Section of stone wall and the Western Spanish Peaks south of LaVeta, showing Cuchara Creek near Cuchara Pass. Statue of Kit Carson, City Park, Trinidad.

road. This was on the Santa Fe Trail, and for many years men on foot and on horseback, wagons and trains of wagons, paid willing tribute to his foresight and industry. The land on which he lived has in late years developed into a great coal property, and is crossed by the Santa Fe Railroad, having a station named Wootton.

In this year, following the terrible world war, men, teams and machinery are busy building a macadamized highway across this property, under the direction of the State Highway Commission. By the time another year has rolled around, a stream of humanity will shoot along this highway in vehicles so vastly different from the slow plodding teams of yore that we might well imagine the astonishment with which the adventurous spirits of the past would view the ever-changing stream.

From a book written several years ago on the life and adventure of Uncle Dick, much valuable and interesting information may be obtained. For instance, Main Street in Trinidad is directly on the Old Trail. Indeed, it is for this reason that it is not as straight as it might be, because as the buildings grew up they followed in general the line of the trail, much the same as Boston is said to have been built along the calf trails.

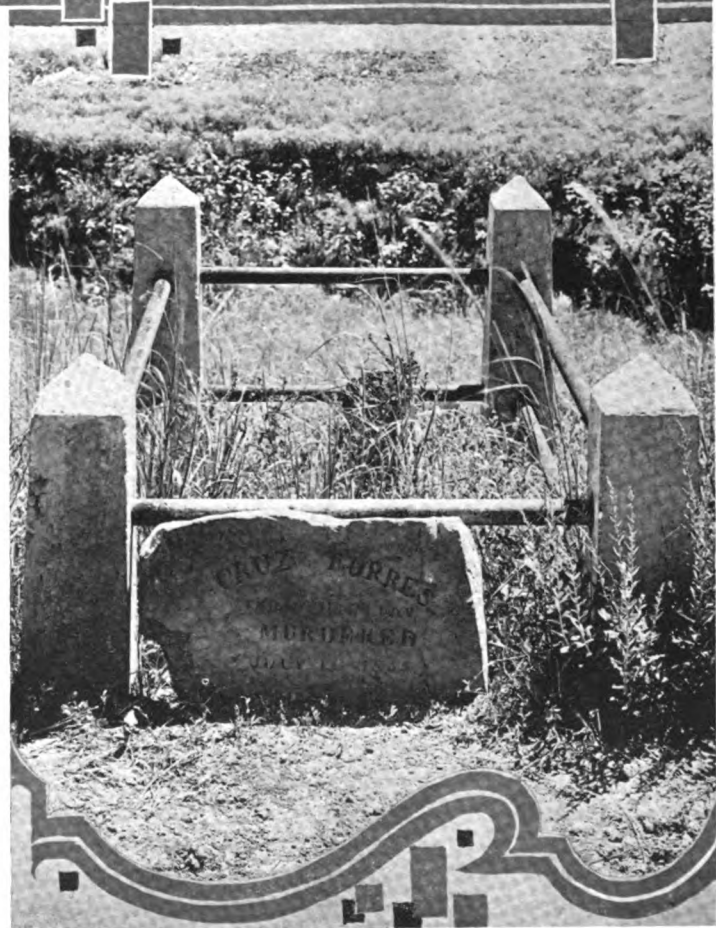
The project State Highway No. 26, Federal Aid Project No. 2, extends from the Pueblo county line across Huerfano and Las Animas counties and strikes the New Mexico Federal Aid Project at the New Mexico state line. Properly speaking, therefore, it runs onto the Santa Fe Trail at Trinidad. It is also a part of the Colorado-to-Gulf Highway, the Florida-to-Colorado Highway and the whole distance of the National Old Trails.



It is therefore destined to see an immense amount of travel from east to west and from north to south. At the present time it is being graded by three separate contractors, employing an immense number of laborers, teams and machinery. It will be twenty feet wide and after grading will be covered with a layer of crushed limestone six inches thick in the center and tapering to three inches at the sides, all of which will be properly rolled and compacted, so that eventually it will present a hard, even surface. It will then be possible to make the entire trip from the New Mexico line to Denver on macadamized roads.

The road runs along the eastern base of the mountains until it reaches Trinidad, where it strikes into the mountains and crosses Raton Pass at an altitude of 8,000 feet. For the whole distance it traverses one of the largest coal mining districts of the West, where immense amounts of coal and coke are produced. East of the road is an important and rapidly growing agricultural community. A part of the land is under irrigation, but the greater part is devoted to so-called "dry land" farming. Here many hardy settlers from the South and Southwest are building homes and helping to make the desert blossom as the rose. Few people realize the immense possibilities of farming in the dry land section. It is destined to produce large quantities of foodstuffs for the feeding of the nations.

Leaving Pueblo County line the first town one reaches is Walsenburg, a city of about 4,000 people located in a rich coal mining district. From there south the road passes a number of small coal mining towns, passes through the



Top—Section of the stone wall which extends for 150 miles north and south through New Mexico and Colorado. At bottom is grave of Corp. Cruz Torres, First New Mexico Cavalry, murdered July 13, 1865.



Rebuilt residence of old-time character, Dick Wootton, on the old toll road, which he built fifty years ago across Raton Pass. Wootton crossed the plains in 1836 and did as much as any other man to encourage travel westward. His memory is highly honored.

town of Aguilar and in twenty miles more reaches the city of Trinidad.

Trinidad is one of the earlier settled places, having attained considerable importance in the early Santa Fe Trail days as a trading and outfitting center. It is now a prosperous city of 15,000 people, the fourth city in size in Colorado. Is on four railroads and destined sooner or later to be a city of much importance.

On the northern limits of the city is a mountain known as Simpson's Rest. On top of this mountain is the grave of an early day resident, George Simpson. It is related that at one time he found refuge from the Indians at that point, and requested that it be the resting place of his mortal remains. The point is now surmounted by a large electric sign, which bears the word "TRINIDAD."

Immediately to the south of Trinidad is one of the most beautiful and picturesque peaks in America, named Fisher's Peak or Raton Mountain. The following notes give something of the history of this famous mountain:

(From "Notes on the Overland March of the 'Army of the West,' " en route from St. Louis via the Santa Fe Trail through Southern Colorado and New Mexico to California under Col. Kearney.)

"It was in the year 1846 that we were crossing the Purgatory, or River of Lost Souls—*Rio de las Animas* in Mexican—and camped on its banks, under the shadow of the Raton Mountain. Magnificent views of mountain and plain had almost beguiled us into forgetfulness of fatigue and annoyance on the march. In front was the Raton Mountain, with its precipitous cliffs and mesa-like top and with its sentinel peak standing guard at its northern end.

"During one of our halts Capt. Waldemar Fischer of the St. Louis Artillery ascended the peak and Lieut. Emory named it after him. It is 'Fisher's Peak' on the map.

Those of our volunteers and of the regulars with us, who in New and Old Mexico and in California perished in battle or by disease, are nearly all forgotten; but the adopted citizen is immortal in geography. When he came down from the peak he said to us:

" 'Ah, gentlemen, I did find a little flower up dere, and did wish my goot wife could be dere; but I have him—see—in my pocketbook, and I send him in a letter, and den she say—Oh, if only my Waldemar was here.' "

Trinidad is the Mexican name for Trinity. It is on the banks of the Purgatory, changed after years of usage to the local name, "The Picketwire."

One views with interest the streets crowded to capacity with modern automobiles and then reads with amusement a local item published forty years ago in a Trinidad paper to the effect that the city council contemplated an ordinance prohibiting the owners leaving their ox teams tied along the street, because of interference with traffic.

This was in the days of Uncle Dick Wootton. After outfitting with supplies at Trinidad, the slow-moving stream of humanity behind ox carts, teams, and on horseback, struck south and in a few miles paid toll to Uncle Dick for the privilege of using the road he had constructed under territorial charter over the Raton Pass. A photograph herewith shows the house (now much enlarged) in which he lived, and at least one of the trees to which he attached the chain that served as a gate to his toll road. The new highway passes this house.

A short distance south of this house is an ancient grave, bearing on the headstone the following inscription: "Cruz Torres—Corporal 1st New Mexico Cavalry. Murdered July 13, 1865." The highway also goes directly past this grave, which marks an epoch of our history that can never be repeated. It represents the bold, free life, fraught



La Primera Casita, or the first cottage, summer home of Commissioner Fred J. Radford, District No. 3, at Stonewall, Colo., 34 miles west of Trinidad. The real stone wall is only one-quarter mile distant and there are 14 other fine cottages of Trinidad people there, costing up to \$3,500 each.

with adventure and danger, that the early and hardy pioneers lived, that we might reap the benefit.

A few of the pioneers of this part of the state, among whom are Judge Archibald, State Senator De Busk and others, have an interesting stock of tales about the early days which space does not permit reproducing.

The few distinct tales now in existence, and the distinctive land marks, are rapidly losing their identity as the years go by, and soon there will be but the indistinct memory left. The D. A. R., however, are patriotically preserving by monuments along the Santa Fe Trail, markers that will keep alive the memory of the old Santa Fe Trail. Likewise in Trinidad is the Kit Carson Monument and park (the gift of another old timer, Daniel L. Taylor) to further perpetuate the memories of the past.

As time goes on the present road will give place to a macadam highway, and that to the paved, making traveling a pleasure and delight to the citizens of the future. Let us then from time to time gratefully refresh our memories with thoughts of those hardy pioneers who made it all possible.

Demand Highway Reports

Highway reports as well as weather forecasts have been made a phase of the work of the United States weather bureau in several states and so valuable has the service proved to be that a national demand for its extension is springing up.

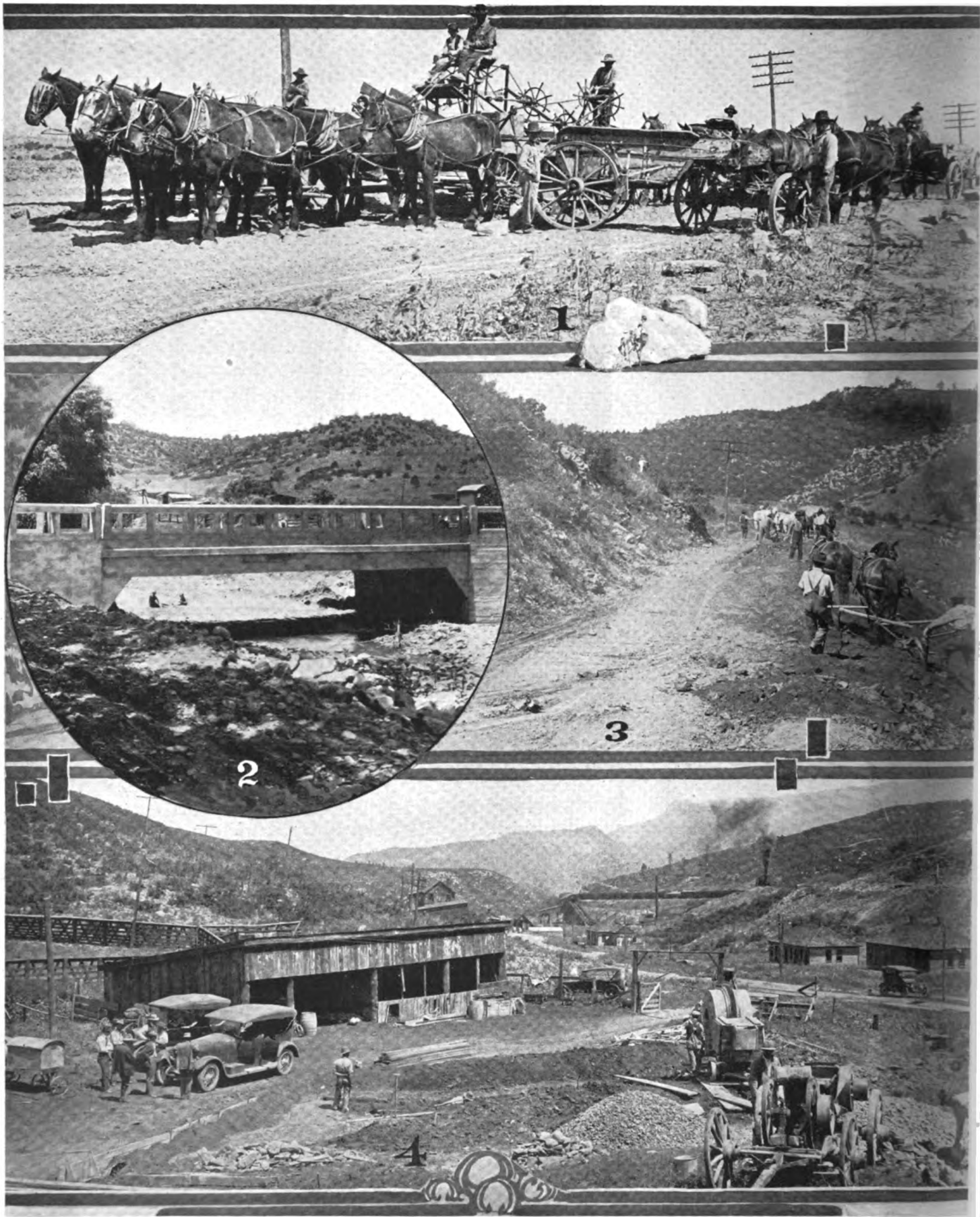
Lieut. Col. J. M. Ritchie of the motor transport corps has been designated by Secretary of War Newton D. Baker as a member of the highways transport committee of the council of national defense.

A network of communicating roads which serve to bring all parts of the island into close touch with its principal towns is planned on Catalina Island. Several automobile lines are already running on daily schedules, a bank has been established at Avalon and the entire island is awakening to new life as a result.

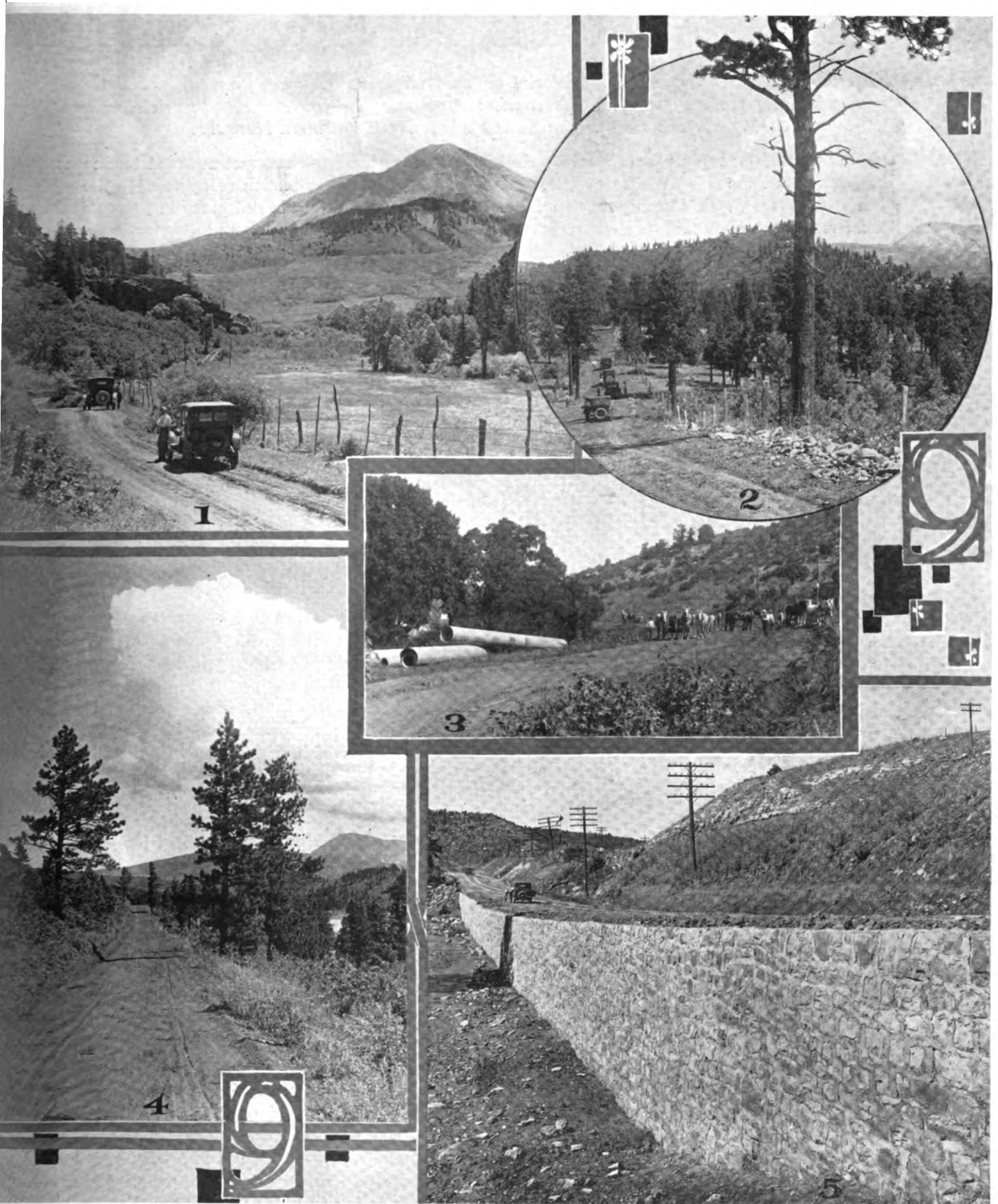
As the Bulletin goes to press many delegates from seventeen states had arrived at Durango, Colo., for the convention of the National Old Trails Association. Standish L. Mitchell, secretary of the Automobile Association of Southern California, was in the chair for President J. M. Lowe of Kansas City, who was East on business. Mitchell had piloted a party of several cars from Los Angeles by way of Gallup, N. M. The visitors were to be entertained later by a trip into Mesa Verde National Park.

Plans are being completed by the Rocky Mountain Automobile Trades Association for the biggest and best convention of members of the industry ever held in the West. The third annual convention of the Mexico, Utah, Idaho, Northern Texas, Western Kansas and Western Nebraska will be held in Colorado Springs October 6, 7 and 8. At least 1,000 members of the industry are expected to attend this three-day meeting.

No contractors appearing and the community fearing that the federal aid it had secured would go by the board, public spirited citizens of Riverton, Wyo., organized the Riverton Construction Company with a capitalization of \$50,000 to build a 35-mile strip of the Wind River Road between Riverton and Jackson Hole, which will afford a new route to the southern entrance to Yellowstone National Park.



Road building in Commissioner Radford's District, No. 3, Southern Colorado. 1. Elevator grader outfit at work on Federal Aid Project No. 2, eight miles south of Trinidad, August, 1919. 2. Concrete bridge over Raton Creek near Trinidad. 3. Allen & Lafferty's teams grading on Raton Pass, eight miles south of Trinidad, toward Raton Pass, August, 1919. 4. Work on concrete culvert where the road begins to climb Raton Pass. Santa Fe train in distance is one-fourth mile from Raton Tunnel.



scenes, work and achievements in District No. 3, August, 1919. 1. Looking through a break in the stone wall toward one of the Spanish Peaks. This wall is continuous from Colorado Springs to the Texas line. 2. Road No. 70 from Stonewall to LaVeta, Spanish Peaks to right, $3\frac{1}{2}$ miles north of Stonewall, along the wall. 3. Allen & Lafferty road grading outfit working near Trinidad. 4. Section of Road No. 70, July, 1919. Showing Monument Lake, five miles north of Stonewall. 5. Completed rubble wall 12 feet high, 5 miles from Trinidad on Federal Aid No. 2, just south of Starkville, August, 1919.

Several F. A. Roads Already Completed

Interesting Report by Chief Engineer J. E. Maloney of Colorado State Highway Commission Shows that Rapid Progress is Being Made by State and Government at Finishing Federal Aid Road Projects in the State. Details of Work on Some Forty Projects are Given Herewith.

WORK is proceeding rapidly on important road projects in all the five districts of Colorado. Chief Engineer J. E. Maloney of the State Highways Department makes an interesting report this month in which he details the degree of completion on all Federal Aid work.

The report announces the completion of the Denver-Littleton Road (concrete) and that the bridges over the canals on Boulevard F, or Federal Boulevard, are very nearly completed. The Floyd Hill wash is repaired and the improvement of the road from Floyd Hill to Bergen Park, between Idaho Springs and Denver and on the west approach to the Denver Mountain Parks, is well under way.

Work has been begun on the Fort Morgan Road and contractors are ready to begin on the Brighton Road. Work at Pueblo will be started at once. Grading is in progress on all sections of the Walsenburg-Trinidad Road, concrete being the nature of the work on Sections C and B. The upper section of the Granite-Twin Lakes Road (No. 3) has been completed by Superintendent Harlan with day labor. Grading on Rifle-Meeker Road No. 4 is 90 per cent complete, with surfacing 22 per cent complete. Work is finished on Lamar-Springfield Road No. 6 and the county is now placing gravel on the surface.

Surveys and plans are complete for a dozen other important projects. The North and South St. Vrain roads, badly washed out by recent heavy rains, are being rapidly repaired and measurements have been made and plans are being drawn for a concrete-iron bridge to replace the one on the road from Petersburg to Fort Logan which was recently washed out.

Chief Engineer Maloney's report is as follows:
Denver, Colorado, Aug. 7th, 1919.

Mr. T. J. Ehrhart,
State Highway Commissioner,
Denver, Colorado.

Dear Sir: I desire to report as follows upon the condition of the engineering and construction work under charge of this department:

FEDERAL AID PROJECTS.

Denver-Littleton, No. 1—Completed.

Walsenburg-Trinidad, No. 2—Grading work in progress on all sections. Concrete work in progress on Sections C and B. Work in charge of Superintendent Whitmore and Engineer E. E. Montgomery. Field Engineer Hal Barnes and party on Sections C and D. Field Engineer Francisco and party on Sections A and B. Field Engineer Reno on surveys, maps and estimate. Inspectors Smith, Beal, White and Palmer on concrete, piling and office work.

Granite-Twin Lakes, No. 3—Upper section completed by Superintendent Harlan and day labor. Bridge at Lake

Creek advertised and contract awarded to Denver Steel & Iron Works. Lower section ready to advertise if desired. Field Engineer Edwards and party in charge of the work.

Rifle-Meeker, No. 4—Grading 90 per cent completed. Surfacing 22 per cent completed. Field Engineer P. C. Thurmond and party in charge of work.

Project No. 5—Withdrawn.

Lamar-Springfield, No. 6—Work completed. County now placing gravel on surface. Field Engineer I. C. McBride in charge of work.

Naturita-Norwood, No. 7—Project statement and plans completed and approved by U. S. office. Contract awarded to County of Montrose. Field Engineer Becker in charge.

Meeker North to County Line, No. 8—Project statement in. Surveys and plans 100 per cent complete. Field Engineer Snelson in charge.

Big Thompson Canon Road, No. 9—Surveys and plans completed. Work advertised. No bids received. Work postponed to fall. Assistant Engineer E. E. Montgomery in charge of surveys.

Denver-Brighton, No. 10—Surveys and plans completed. Work re-advertised. Contract awarded to W. J. Kinney of Denver. County will meet difference. Field Engineer Randall in charge.

Wray-Idalia, No. 11—Surveys completed. Plans 90 per cent completed. Contract submitted, ready to be filed. Field Engineer Randall and Field Engineer Edwards in charge.

Greeley-Denver, No. 12—Surveys and plans completed. Contract awarded to Engineers' Construction Company of Greeley. Field Engineers Randall and Edwards in charge.

Denver-Boulder, No. 13—Surveys and plans completed. Approved by U. S. office. Work to be contracted by Colorado Bridge & Construction Company.

Longmont Road, No. 14—Surveys and plans completed. Approved by U. S. office. Work to be contracted by Colorado Bridge & Construction Company. Field Engineers Randall and Edwards in charge.

Merino Bridge, No. 15—Surveys complete. Plans waiting establishment of road as post road. Field Engineer in charge.

Morgan-Brush, No. 16—Surveys and plans completed. Contract awarded to Colorado Bridge & Construction Company. Field Engineers Randall and Edwards in charge.

Colorado Springs Road, No. 17—Surveys completed. Records received from county engineer July 11, 1919, and are now being put in shape to send to U. S. office. Surveys by Mr. Ford, county engineer.

Pueblo East, No. 18—Surveys and plans completed. Work advertised. Two bids received, both over estimate. It was understood that there would not be enough funds to bring this stretch to the cemetery gates from the city limits

and the matter was talked over with County Commissioner Herrington. It was agreed to put in the project to the cemetery gate and Pueblo County was to put in enough money to carry the work to that point, if the bids ran over the appropriation. Arrangements were made by the commission with the Orman & Vedder Construction Company to do this work at the engineer's estimate for flag concrete or at an agreed figure for gravel and concrete, subject to the approval of the engineer.

Lamar-Springfield, Nos. 19 and 20—Surveys 90 per cent and plans 75 per cent completed. Field Engineer Byrnes in charge.

Rocky Ford, No. 21—Surveys and plans completed. In U. S. office. Field Engineer Ernest Montgomery in charge.

La Junta Road, No. 22—Surveys and plans completed. In U. S. office. Field Engineer Ernest Montgomery in charge.

Delta-Montrose Road, No. 23—Surveys under way. Engineer J. Bertholf in charge.

Ft. Garland-San Luis Road, No. 24—Surveys and plans completed. Approved by U. S. office. Work advertised. No bids received. Work re-advertised August 8. Bids to be received August 22. Field Engineer J. Cheney in charge.

Montrose-Delta, No. 25—Surveys completed. Plans 10 per cent completed. County Engineer Fielding in charge of surveys.

Ouray-Red Mountain, No. 26—Surveys completed. County Engineer Winnerah in charge of plans and surveys.

Grand Junction-Palisade, No. 27—Surveys completed. Plans 50 per cent complete. Engineer J. Bertholf in charge.

Blue River Road, No. 28—Surveys complete. Plans 80 per cent complete. Field Engineer A. Tanner in charge.

Turkey Creek Road, No. 29—Morrison-Bailey. Surveys complete for 15 miles. Plans 10 per cent complete. Field Engineer Donovan in charge.

Denver to Hospital, No. 31—Surveys 100 per cent complete. Field Engineer Walters in charge.

Morgan-Brush, No. 38—Surveys completed. Field Engineer R. Randall in charge.

Burlington North, Nos. 43-44-45—Surveys 100 per cent completed. Plans 30 per cent completed. Field Engineer Edwards in charge.

Canon City-Denver Road, No. 47—Surveys under way. County Engineer Ford in charge.

Castle Rock-River Bend, No. 50—Surveys 90 per cent completed. Plans 30 per cent completed. Field Engineer Littlefield in charge and County Engineer Matthews assisting.

Lamar North, No. 57—Surveys and plans completed. Field Engineer H. C. Byrnes in charge.

Lamar-Springfield, No. 58—Surveys 80 per cent completed. Plans 50 per cent completed. Field Engineer Byrnes in charge.

Las Animas City East, No. 59—Surveys and plans under way. Field Engineer Geo. Beach in charge.

La Junta Road, No. 60; Rocky Ford Road, No. 61;

Manzanola Road, No. 62; Fowler Road, No. 63—Surveys and plans completed. In U. S. office. Field Engineer Ernest Montgomery in charge.

Ft. Garland-San Luis, No. 64—Surveys completed. Field Engineer J. Cheney in charge.

Ouray-Silverton, No. 65—Surveys completed. Plans under way. County Engineer Winnerah in charge.

Rico North, No. 67—Surveys started. Engineer J. Bertholf in charge.

Monte Vista-Saguache and Saguache-Del Norte—Surveys completed. Plans started. Field Engineer J. Cheney in charge.

Craig West, No. 74—Surveys under way. Field Engineer Carson in charge.

Grand Junction-Palisade, No. 77—Surveys under way. Engineer Bertholf in charge.

Battle Mountain, No. 78—Surveys 75 per cent completed. Engineer E. E. Montgomery and L. Jenness in charge.

Steamboat Springs North, No. 60—Surveys and plans under way. Field Engineer Carson in charge.

Denver to Morrison, No. 30—Surveys completed. Field Engineer Walters in charge.

Denver to Brighton, No. 32—Surveys completed. Field Engineer Walters in charge.

Ft. Collins South, No. 33—Surveys completed. Field Engineer Spitzer in charge.

Greeley, Three Miles, No. 34—Surveys completed. Field Engineer Spitzer in charge.

Longmont South, No. 36—Surveys completed. Field Engineer Spitzer in charge.

Boulder East, No. 37—Surveys completed. Field Engineer Spitzer in charge.

Wray-Schramm, No. 40—Surveys completed. Field Engineer Edwards in charge.

Naturita to Top of Norwood Hill, No. 66—Surveys begun. Field Engineers Becker and Fleming in charge.

Durango-Mancos, No. 71—Surveys under way. Field Engineer Cheney in charge.

Bayfield to Dyke, No. 72—Surveys under way. Field Engineer Cheney in charge.

Kremmling North to Muddy Creek, No. 75—Surveys under way. Field Engineers Polhamus and Evans in charge.

Surveys for the Fall River Road have been completed from the end of the work on the east side to the top of the ridge, dropping down to the lakes on the west side by Field Engineer Becker and party.

Field Engineer Huntington is running the line of survey to meet Mr. Becker's survey at the top of the divide from the west side.

Superintendent of Construction Jacobson reports the completion of the work to the end of the Hokasono contract and he is now working on the line to the top of the hill.

Superintendent McQueary expects to start work on the top of the ridge within a few days so as to do as much as possible in that altitude while the weather is favorable.

(Continued on page 22)

Big Wheat Tonnage Demands Good Roads

Not Only for Tourists and Sightseers Must Good Roads be Built in Colorado, but for Movement of the Crops and Produce, Which Have Increased by 75 Per Cent in the Last Decade and are still in Their Infancy. Roads in Wheat Districts Would Also Accommodate Automobile Traffic from East.

BY HOWARD D. SULLIVAN

THE development that has taken place in all lines of industry in Colorado in the past ten years has taxed the transportation facilities of the state to their utmost. There has been comparatively little railroad building in the Centennial State in the past decade, yet the tonnage of freight that is now being transported into and out of the state is perhaps fully 75 per cent greater today than it was ten years ago and the volume of freight being hauled within the state has shown an almost equally large increase.

This enormous increase in tonnage of freight accounts in a measure for the greatly increased demand for better highways. Ten years ago there was not a mile of hard surfaced road in the state outside of the incorporated cities. There was very little surfaced road of any kind in Colorado then. In the plains counties highways were little more than worn tracks across the prairie, with the grades that nature made and an occasional bridge or culvert. In the mountains the roads were moderately good where there were roads, but the grades were heavy, the turns were sharp and the tracks were narrow.

Yet there was less demand for highway construction then than there is now. Those who were forced to travel over such highways as were available were used to just such highways as they had and were not particularly ambitious for better ones, especially if it were necessary to increase the tax levy to get them. There were few automobiles any place and very few in Colorado. There were no motor trucks and farm tractors. There was little farming except near the railway lines, and the livestock that was raised in the more remote districts did not need highly improved roads over which to tramp to market.

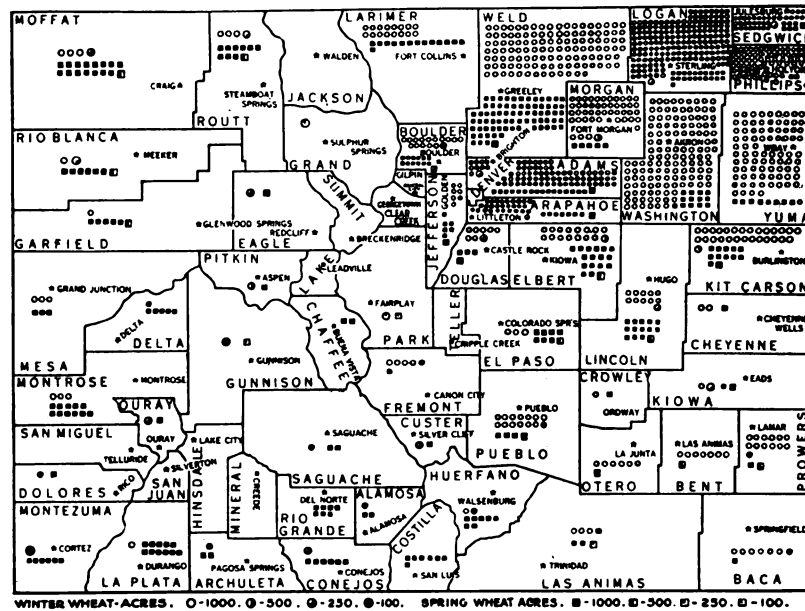
But all that is changed today. Whereas the amount of wheat grown in Colorado in 1909 was but little more than was required to supply the needs of Colorado people,

there are today being shipped from the state perhaps 7,000,000 bushels annually, or about as much as was raised in 1909, and there still remain about 10,000,000 bushels to be moved about more or less within the state to supply the needs of Colorado people. That is not an especially large amount of wheat for a big state like Colorado, but the increase has been very

marked in the decade and has required a vast improvement in transportation facilities to meet it. The increase in production of other crops has been equally marked. The value of metals produced, when the newly developed metals such as vanadium, uranium, tungsten and molybdenum are considered, has increased considerably in the past ten years, and the tonnage of ore that must be handled to produce the same amount of values has increased very sharply. The output of the state's factories has increased steadily and the production of coal is nearly twice what it was ten years ago.

Naturally this heavy increase in tonnage to be transported has placed a vast burden upon the highways of the state, for the simple reason that there has been very little railroad development in the past decade. Automobiles, trucks and wagons are moving thousands of tons of freight of various kinds today over highways that were only trails a decade ago, and yet the railroads are hauling more freight than they ever hauled before. There is a more urgent demand for good roads in Colorado today than there has ever been because it comes from nearly all the people and it is principally an economic demand. The farmer feels that he can well afford to pay \$1 more on each \$1,000 of the value of his farm if by so doing he can market his crops more quickly and can save \$10 in marketing expense for each \$1 he spends in road taxes.

When the period of real road development began in Colorado the demand for improved roads came chiefly from those who are interested primarily in increasing tourist



This map shows the distribution of winter wheat and spring wheat in Colorado this year, as indicated by the acreage reports made to the State Immigration Department by the several county assessors.

(Continued on page 22)

Good Work Planned and Done in Grand Co.

Federal Appropriation of \$35,000 is Made for Muddy Creek Road and State Gives Sum to Repair Road from Grand Lake to Fall River. State Also Gives Sum for Discretionary Use of County Commissioners. Grade on Copeland Hill Reduced. Steel Bridge Across Grand at Parshall Big Help.

Grand County, Colorado, is getting results along road building lines by co-operating with the State Highway Commission. The county's foremost newspaper, the Krenmling News, of which George Swan is editor, is also a big factor in stimulating interest in improving highways and in keeping citizens well informed on work accomplished.

Chairman Simon Olson and Commissioner J. H. Cather of the Grand County board of county commissioners attended a recent meeting of the State Highway Commission and secured additional appropriations totaling \$3,400 for Grand County roads, declares the News. They were assured that engineers would be here soon to begin work on the Muddy Creek Road, for which an appropriation of \$35,000 federal money was approved a few months ago.

Of the new appropriations of state road funds, \$3,000 is to be used as the commissioners may direct on state primary roads in the county. This will enable the commissioners to carry on the improvements started this year and which have been hampered greatly by the lack of funds.

Upon showing the Highway Commission that the funds appropriated were not sufficient to complete the repairs on the road connecting Grand Lake with the new Fall River Road to Estes Park, the commission gave the Grand County commissioners \$400 in addition to the funds already appropriated for the road.

Under direction of Chairman Simon Olson of the county commissioners the county road outfit is improving the Williams Ford Road by reducing one of the most dangerous and difficult grades, known as the Copeland Hill. The hill, formerly 10 per cent to 18 per cent grade, is being rebuilt on the survey made several years ago by County Surveyor F. I. Huntington, which provides for a maximum grade of 7 per cent.

The road will be lengthened considerably, but the additional mileage will be more than compensated for by the elimination of the steep pitches and dangerous curves that made it impossible for cars to negotiate the hill in any gear except low.

Another big improvement in the Williams Ford Road for which the people who travel that way should thank Mr. Olson is the steel bridge across the Grand River at Parshall. The bridge was ordered last year and was opened for travel last spring. It replaced a wooden bridge that had become a constant menace to the lives of those who drove over it and a continual source of expense to the county. The new bridge is a permanent structure with broad, substantial approaches and will withstand the assaults of spring floods for many years.

County Commissioner J. B. Stevens, of the Fraser District, has had men working on the Cottonwood Divide Road the last two weeks, and the culverts and small bridges

that have been washed out or destroyed by traffic have been replaced with new ones. There were two small bridges near the Tovey Ranch that were broken into kindling wood, leaving dangerous holes that threatened serious damage to cars. These have been rebuilt and the road is now in first class condition.

Mr. Stevens has had the Berthoud Pass section of the main highway in his district well taken care of this year and it is in better condition than ever before. The pass was opened a month or more earlier this year than in any previous year, owing to the lightness of the snow on top, and the extreme dryness of the spring and summer has made it possible to work the road without interruption. Mr. Stevens has taken advantage of the conditions and has had much work of a permanent nature done. One of the big improvements is the placing of plank driveways across the numerous corduroy bridges on the steeper parts of the hill. These give cars and wagons a smooth track over the rough log bridges.

Another big improvement in the county roads, for which credit must be given to the present board of commissioners, is the building of the so-called Blayney fill. For years the Blayney hill has been a bugbear to motorists and to those who have been forced to drive over it with teams. At the foot of the hill was the Blayney lane, which passed over two rickety wooden bridges and through the bottom land that was flooded every spring, leaving an impassable bog. County Surveyor Huntington laid out a new grade which provided for using the gravel taken off the hill to build a new grade through the lane. With the help of state money this work was accomplished this year, Robert Williams, Jr., being the contractor. The new grade is 1,900 feet long and resembles somewhat the fill built to replace the old Krenmling Viaduct on the Blue River Road. It is above high water at ordinary flood stages and gives a permanent, solid roadbed that will be passable at all times.

By taking the gravel from the hill to make the fill, the grade has been reduced so that cars have no difficulty in making it. The work cost \$3,100.

The bridges across the Grand River have been repaired temporarily, but next year, the commissioners have been assured by the highway commission, state help will be provided for the building of a street bridge to replace the present wooden structure.

In Commissioner Cather's district concrete culverts have replaced several wooden ones and the road has been straightened in many places, eliminating dangerous curves and steep ditches in the Blue River Road. Some improvements have been made in the Muddy Creek Road and additional work is being done on this road now.

A. F. Polhamus has been selected by the State High-

(Continued on page 22.)



Begin to Talk Bond Issue

IN November, 1920, Colorado will be called upon at the general election to vote upon the question of a \$5,000,000 bond issue for the furthering and betterment of the good roads system of the state.

The people of the state of California voted a \$40,000,000 good roads bond issue on July 1, 1919, by a majority of 8 to 1. By this action of the citizens of the Golden State will be created the third fund of the kind there, and results are already apparent in highways of the finest sort in almost every direction.

But Colorado has better natural road surfaces than California, and the good roads program in the Centennial State is being carried on here very rapidly with the state funds available and the extremely hearty co-operation of the federal government, which seems to be taking a very especial interest in Colorado's good roads ambitions. If the bond issue is carried a year from next November this state will have about enough money for all the roads it can find men and machinery to build. In fact, state and government have laid out a program for 1919-20 which contemplates the expenditure of a sum about equal to next year's proposed bond issue, although the 1920 program has not been completed.

It is absolutely necessary to the continued prosperity of the state that this bond issue carry. That it will "make the grade" appears assured, but no right-minded citizen should take any chances on his neighbor going wrong on the subject. There are always some misinformed or willfully obdurate people who choose the wrong road and others who sow seeds of dissension against any worthy project. It is none too early to begin talking in favor of the 1920 good roads bond issue. Colorado should do as well as California, in which state they are wondering who the one fellow in every eight who voted wrong really was.

A synopsis of the bill which proved so popular in California appears in this issue, and gives readers an idea of what they propose to do in that state. It was supplied to the State Highway Bulletin by the Los Angeles Chamber of Commerce at our request.

Should Make 1920 Program

CHIEF ENGINEER J. E. MALONEY is very anxious to see fixed definitely the road-building program of Colorado for 1920. As soon as the schedule for next year is complete he will be able to make his surveys, plans and specifications for the work to be done.

Then construction work can start early in the spring, instead of being delayed until summer.

Some departments of state are inclined to demur at the spending of money for preliminary work, such as surveys. However, this part of road building is just as important as the real physical work that comes later, and it must be done with even greater care and precision. It is by no means a waste of time and money, but a great saving can be made if surveys and plans are made well in advance of the season when climatic conditions make it possible to build the roads. Valuable time is wasted if surveys are not made until time when the actual construction should begin.

It is to be hoped that the 1920 program will be devised as soon as possible, and that no stones of expense disapproval will be placed in the way of the state engineer when he starts to anticipate next year's work this fall by sending out his surveying crews to the roads designated by state and government to be built in 1920.

Heavy snows sometimes fall in September in parts of the state where new roads are needed and from that time on weather conditions will more and more impede the progress of the state engineer's workers.

Otero's Ambition

A MAP drawn according to the latest government requirement for Federal Aid projects is found on the back of this number of the Highway Bulletin. The map shows Federal Aid Project No. 62, in Otero County, which will be first advertised Monday, August 18, and the contract for which will be let September 2. This project extends from Manzanola a mile in the direction of Fowler and calls for a mile of standard concrete pavement, 18 feet wide. The estimated cost is \$28,000.

At the same time there will be advertised a mile of concrete road one mile east from Fowler and another mile one mile West from La Junta, both also on the Santa Fe Trail. Succeeding annual state road programs will provide for the connecting up of intervening spaces, so that Otero County will in all likelihood be crossed from east to west by a solid ribbon of concrete within three years. Otero will probably be the first county in Colorado to enjoy such a distinction.

Pueblo County also has an ambitious program, which will carry it to the western Otero County boundary with a paved road. With the completion of such a road across both Pueblo and Otero counties the Santa Fe Trail will of a truth become a wonderful artery for Eastern automobile traffic into Colorado. The distance across Otero County is

40 miles. The distance to be added in 1920 is four miles, which in addition to the four miles to be laid this year will comprise 20 per cent of the total distance, or a start which will insure early completion.

The survey for the eight miles of concrete to be built this year and next in Otero County was completed as recently as June 15, giving but little time for advertisement for bids. It is this sort of action which is going to carry Colorado's ambitious road building program through in record time.

Federal Aid Project Index

THE tremendous scope of the work planned and now being done by the state of Colorado with the useful adjunct of federal aid along road-building lines is indicated by the following table of routes prepared by Chief Engineer James E. Maloney for the State Highways Bulletin. No citizen can fail to be impressed with the work in contemplation, which is here set forth succinctly and should be saved for ready reference:

- No. 1—Denver-Littleton.
- No. 2—Walsenburg-Trinidad.
- No. 3—Granite-Twin Lakes.
- No. 4—Rifle-Meeker.
- No. 5—Withdrawn.
- No. 6—Lamar-Springfield.
- No. 7—Naturita-Norwood.
- No. 8—Meeker north to county line.
- No. 9—Big Thompson Canon.
- No. 10—Denver-Brighton.
- No. 11—Wray-Idalia.
- No. 12—Greeley-Denver.
- No. 13—Denver-Boulder.
- No. 14—Longmont Road.
- No. 15—Merino Bridge.
- No. 16—Morgan-Brush.
- No. 17—Colorado Springs Road.
- No. 18—Pueblo east.
- No. 19-20—Lamar-Springfield.
- No. 21—Rocky Ford Road.
- No. 22—LaJunta Road.
- No. 23—Delta-Montrose Road.
- No. 24—Ft. Garland-San Luis Road.
- No. 25—Montrose-Delta.
- No. 26—Ouray-Red Mountain Road.
- No. 27—Grand Junction-Palisade.
- No. 28—Blue River Road.
- No. 29—Turkey Creek Road-Morrison-Baileys.
- No. 30—Denver to Morrison.
- No. 31—Denver to Hospital.
- No. 32—Denver to Brighton.
- No. 33—Ft. Collins south.
- No. 34—Greeley, three miles.
- No. 35—Plattsville south, 2 miles.
- No. 36—Longmont south.
- No. 37—Boulder east.
- No. 38—Morgan-Brush.
- No. 39—Akron-Brush.

- No. 40—Wray-Schramm.
- No. 41—Sterling-Merino.
- No. 42—Cherry Creek Road to Colorado Springs Jct.
- Nos. 43-44-45—Burlington north.
- No. 46—Limon east 10 miles.
- Nos. 47-48—Canon City-Denver Road.
- No. 49—Colorado Springs-Denver Road.
- No. 50—Cheyenne Wells north.
- No. 51—Castle Rock-River Bend.
- No. 52—Woodland Park-Cripple Creek.
- No. 53—Buena Vista-Salida.
- No. 54—Buena Vista-Divide.
- No. 55—Peyton-Ramah.
- No. 56—Farmers Highways.
- No. 57—Lamar north.
- No. 58—Lamar-Springfield.
- No. 59—Las Animas City east.
- No. 60—LaJunta Road.
- No. 61—Rocky Ford Road.
- No. 62—Manzanola Road.
- No. 63—Fowler Road.
- No. 64—Ft. Garland-San Luis Road.
- No. 65—Ouray-Silverton.
- No. 66—Naturita to top of Norwood Hill.
- No. 67—Rico north.
- No. 68—Monte Vista-Saguache.
- No. 69—Delta-Montrose.
- No. 70—Delta-Hotchkiss.
- No. 71—Durango-Mancos.
- No. 72—Bayfield to Dyke.
- No. 73—Walden-Rand.
- No. 74—Craig west.
- No. 75—Kremmling north to Muddy Creek.
- No. 76—Same as No. 4.
- No. 77—Grand Junction-Palisade.
- No. 78—Battle Mountain.
- No. 79—Blank.
- No. 80—Steamboat Springs north.

Counties Asked to Help

In order to prevent \$900,000 of the money appropriated by the federal government for road work in Colorado from being given to another state, the State Highway Commissioners have authorized the sending out of letters to counties, asking them to appropriate 25 per cent of the state's share of the expense of constructing roads in their respective counties. About \$120,000 has been kept for Colorado already through the assistance of the counties.

Members of the board also authorized the signing of the contract for the building of the \$90,000 road project in the Big Thompson Canon. This road and one through the South St. Vrain Canon, which the commissioners also plan making a federal aid project, lead to Estes Park.

Arrangements for the spending of \$25,000 by the state and Boulder County are being made to rebuild the roads in that county which were washed out during the recent heavy rains.

State's Share of War Material is Increased

Colorado Will Receive from Government's Surplus of Army Supplies 384 Army Trucks and Cars Instead of 200 Originally Allotted. Complete List of Material Available for all States is Given. Commissioner Ehrhart Orders Carload of Iron Fence Posts from Uncle Sam's Store.

COLORADO is scheduled to receive 358 motor trucks and twenty-six passenger cars for highway improvement from the federal government, according to an interesting communication setting forth the amount of war materials available for the state highway departments of Colorado and other states just sent to Congress by C. F. Marvin, acting Secretary of Agriculture.

The communication sets forth the four allotments of trucks and the two allotments of passenger cars to Colorado and declares that these allotments are final.

The allotments of trucks follow:

First, ninety-seven.

Second, forty-one.

Third, seventy-one.

Fourth, one hundred and forty-nine.

The two allotments of passenger cars are seventeen Fords and nine other cars.

Highway Commissioner T. J. Ehrhart on August 16 wired an order to the War Department for a carload of iron fence posts, which he had been informed are available for state purposes.

A request for construction and operating equipment based on the estimated needs of the several states was sent to the War Department. The Secretary of War in reply-

ing to the request stated that the War Department would deliver to the Department of Agriculture out of the surplus in the United States or France a sufficient amount of equipment to meet the estimate, which is as follows:

Four hundred road rollers, steam and gas driven; 700 concrete mixers; 600 road graders; 400 elevating graders; 200 sprinkling wagons; 200 road oilers; 125 derricks, thirty to sixty feet boom; 100 piledriver outfits complete; 200 complete air drill outfits; 250 steam pumps up to four inches; 150 centrifugal pumps up to four inches, with power; 75 diaphragm pumps, gasoline driven; 500 rock crushing outfits complete, capacity 125 tons to 200 tons per day; 200 clamshell, orange peel and bottom-dump buckets; 125 road scarifiers; 50 caterpillar and drag-line excavators; 700 road and railroad plows; 300 rooter plows; 160 automotive cranes; 3,600 trailers for tractors; 1,000 miles industrial railway track; 200 industrial railway locomotives; 3,500 industrial railway dump cars; 15,000 feet rubber hose, 5,000 feet steam hose; 40 portable asphalt plants; 200 steam shovels, capacity one yard or less; 6,500 dump wagons; 250 conveyors, gravity and power; 35 donkey, 200 hoisting and 75 gasoline engines, 5 to 30-horsepower; 375 complete steam drill outfits; 250 portable air compressor outfits with power; 100 boilers, 15 to 40-horsepower; 275 electric motors, 2 to 50-horsepower; 1,300 pulley blocks.

Fall River Road Progressing

PROGRESS as rapid as possible under the untoward physical circumstances which obtain there is being made on the Estes Park-Grand Lake Road, now being built by state and government. The survey has been completed by Field Engineer Frank I. Huntington from the west side to the top, and construction is well under way on the "High Line."

It has been found that a maximum grade of 6 per cent will suffice for the west end of the road. The road is practically finished to Milner Pass, a distance of 5.3 miles. The use of T.N.T. and compressors has greatly expedited work on the Estes Park-Grand Lake, or Fall River Road, as it is sometimes called. Following is a report of Field Engineer Huntington to State Chief Engineer Maloney on the progress of construction of this road:

Hot Sulphur Springs, Colo., Aug. 14, 1919.

Mr. J. E. Maloney,

Chief Engineer,

Denver, Colorado.

Dear Sir: Have to report that I have extended the western slope surveys of the "Fall River Road" up and on to the "High Line" and connected with the terminus of the Becker surveys on top. Beginning at Sta. 1-50 of the

old McQueary contract, the distance to Becker's terminal is 2.46 miles and the maximum grade is 6 per cent with a considerable section under 6 per cent.

Construction is well under way on the High Line, and am carrying it up the cross section as fast as the timber is removed—about 3,600 feet has been cleared to date. The T.N.T. does a clean job of this.

The road is nearly finished to Milner Pass, a distance of 5.3 miles, there being about ten days hand finishing, and the installation of a few culverts to complete same.

I have pulled off the force on the work between the foot of the grade and Grand Lake, as the work was progressing in an unsatisfactory manner, due to the lack of proper construction supervision. This work consisted of about one mile of new road, and now lacks the finishing touches, which can be applied when the connecting link of road is built to Grand Lake next year.

Am well pleased with the compressor and air drills. We can easily run 175 feet of holes a day, which is equivalent to the work of about 36 hand drillers.

Yours very truly,

(Signed) FRANK I. HUNTINGTON,

Field Engineer.

Board Devises 1920 Federal Aid Budget

(Continued from Page 6)

San Juan County was appropriated \$1,000 on a basis of 1 to 1.

Delta County was apportioned \$1,500 on a 1 to 1 basis.

There was appropriated \$10,000 for construction on Road No. 70 in the county of Las Animas, to be expended under the supervision of Commissioner Radford, \$5,000 to be retained from the budget appropriation to Las Animas County for 1920.

A committee consisting of Mr. Sommers, Mr. Nichols and Mr. Radford was appointed to confer with Governor Shoup to request that he include in his call for a special session of the Legislature some relief for the State Highway Commission in the way of providing additional revenue to cover federal appropriations for federal aid projects.

Commissioner Eshhart was instructed to purchase a Twin City tractor for the use of District No. 1 in grading and scarifying roads, the cost of this tractor not to exceed \$3,500.

Commissioner Ehrhart was instructed to approve the amended agreement between the D. & R. G. R. R. and the State Highway Commission for the construction of a side track at the lime quarry in Huerfano County, Colorado, construction of this siding to be paid for by the State Highway Commission in the sum of not to exceed \$3,450.

A communication from the County Commissioners of Weld County was read regarding the controversy between the Commissioners of Weld County and the McDonald Construction Company relative to the Hyle Bridge in Weld County. They ask the commission to stand one-half the cost of exposing the piers of bridge for the purpose of making an examination of them. The letter claimed that reports are being circulated to the effect that the piers were not constructed according to specifications of State Highway Department and that they are defective. The sense of the commission seemed to be that the commission would stand one-half of cost of the examination, which, in the opinion of the County Commissioners of Weld County, would cost about \$1,000 for each of the thirteen piers.

Commissioner Ehrhart was directed to enter into a contract with Dooling Brothers and Hoffman & Crook for construction work through the Big Thompson Canon, known as Federal Aid Project No. 9, as per terms and prices in their proposal as follows:

Force account proposed by Dooling Brothers and Hoffman & Crook for the construction work through the Big Thompson Canon between Loveland and Estes Park, Federal Aid Project No. 9, under the following conditions and rates, the State Highway Commission reserving the right at any time to terminate the agreement if unsatisfactory:

For ordinary labor, \$3.50 per man per day, which it is understood is now the going rate for such labor, and in the event it shall later become necessary to pay an increased rate for such labor, then such rate as may become agreed upon between the party of the first part and the parties of the second part, not to exceed the sum of \$4 per man per day.

For teams employed in said work, the sum of \$3.50 per day when at work and the sum of \$2.25 per day when idle.

For the camp outfit, including cooking outfit, dining room, sleeping quarters, drilling equipment, etc., \$200 per month.

For salary of camp superintendent, \$150 per month and board.

For salary of time keeper, \$100 per month and board.

For corral man, \$100 per month and board.

For night watchman, \$75 per month and board.

For rental of tools, as follows: For time actually in use, blade machines, \$1 per day; wagons, 50c per day; carts, 50c per day; fresnos, 25c per day; plows, 35c per day; slips, 15c per day, and mormons, 15c per day.

Repairs, picks, shovels, steel and all other small tools required to be paid for at cost, the party of the second part agreeing to take over such of said tools, shovels, steel, etc., as shall at the close of the work be found to be usable, at such price as shall be agreed upon by appraisalment, arrived at by two appraisers, one to be chosen by each of the parties hereto.

All material, powder, railroad fares, freight, insurance, etc., to be paid for by the party of the first part at actual cost, it being the intention of this agreement that all legitimate expenditures incurred in the prosecution of said work shall be considered and added together in arriving at the basis of actual cost. Thereupon and after the arrival of said figure of actual cost, fifteen (15%) per cent additional shall be allowed and be paid to the parties of the second part, to be their compensation for their obligation of general supervision, actual personal superintendence and general office and clerical hire.

It was agreed that during the progress of the work, a representative of the State Highway Commission shall at all times be in direct charge of operations.

Big Progress in Jarre Canon

THE federal fellows are making great progress on the Jarre Canon Road, which extends from Sedalia west to Deckers, on the south branch of the South Platte River. For ten miles of its length the road is superb and it will be completed this fall, there remaining about an equal distance to be completed. Besides affording easy access to some of the finest scenery in Colorado, the road eliminates the dangerous Nighthawk Hill, which was formerly the only route to Deckers, and forms an important link in the road from Denver to Colorado Springs by way of Deckers, West Creek and the Ute Pass, through Woodland Park, Cascade and Manitou. Also it makes easily accessible by a new and beautiful route the beautiful Platte Canon resorts, such as Buffalo, Pine and Baileys, and forms one-half of a circle trip to those points, the return portion of which would be Elk Creek Canon and either Bear Creek or Turkey Creek Canons. The Jarre Canon Road will be one of the most useful in this part of the state, both for commercial and scenic purposes.

"Illuminated" Road to Springs

Seventy-five miles of illuminated highway between Denver and Colorado Springs is the latest plan of the State Highway Commission, E. E. Sommers, chairman of the commission and principal speaker, told the members of the Lions Club at their meeting recently. It will be the only highway of its kind in the world, Chairman Sommers said. The trucks and other road building equipment recently secured from the War Department will be used in making the improvements.

The speaker told of the co-operation he had received from Colorado senators in his efforts to secure the army trucks and 100 tons of T.N.T. when he was in Washington. He explained the apportionment of trucks to the different states, and said Colorado had received a supply of tents, crushers and other equipment for road building as well as trucks.

James R. Noland, secretary of state, told members of the club that there was now in Colorado one automobile for every ten persons, or a total of 110,000 registered automobiles so far this year. Last year he said but 82,000 cars were registered. There are 19,000 cars registered in Denver, he said.

He reminded the club that an act passed at the last session of the legislature placed a minimum license tax of \$5 on all automobiles, and that above that the cars were taxed according to their factory price.

Several F. A. Roads Already Completed

(Continued from page 15)

Field Engineer Cheney completed his work on the Twin Lakes Road so that Superintendent of Construction Harlan can carry this work as far forward toward the top of Independence Pass as possible this year.

The Floyd Hill washout spoken of in the last report was repaired and the work on the improvement of the road from Floyd Hill to Bergen Park is under way under Superintendent Williams.

Many washouts have been reported to this office during the past month, due to the very heavy rain storms—particular damage being done on the North and South Saint Vrain Roads. Some bridges were washed out in many of the counties. The bridge on the road to Ft. Logan, near Petersburg, was washed out. Measurements have been made and plans are now being drawn for the replacing of this bridge with a concrete-iron structure.

The contractor has started work on the Ft. Morgan Road, and Contractor Kinney is about ready to start on the Brighton Road. Contractor Orman reports that he is ready to start work on the Pueblo work.

Bridges over the canals on Boulevard F are very nearly completed.

I desire again to call your attention to the desirability of an early decision on the plans for 1920, as it will be a great advantage to us in pushing forward the surveys and plans so as to have them ready for spring work.

All of which is respectfully submitted.

J. E. MALONEY, Chief Engineer.

Big Wheat Tonnage Demands Good Roads

(Continued from page 16)

travel to and through the state. Tourist roads were the first laid out by the State Highway Commission. Tourist roads were the first built and advertised.

The demand for tourist roads is just as strong today as it was then and there are hundreds of miles of wonderfully fine scenic highway in Colorado as a reward to those who first realized the need of making our mountain scenery accessible. As a further and more substantial reward it is generally conceded by those whose task it is to count the tourists and relieve them of some of their war profits that there has never been so many of them in Colorado as this year.

But added to the call for good roads for tourists is another and even stronger call for good roads for Colorado people—for the farmer, the stockman, the miner and the manufacturer. Everybody wants good roads, and most everybody is beginning to realize that the only way to get good roads is to pay for them.

The State Immigration Department has had prepared a "Wheat Map of Colorado for 1919," the first map of the kind ever made for the state. It shows the distribution of both winter and spring wheat in the state, as indicated by the reports of county assessors. A glance at the map will show where wheat is grown in Colorado and how extensively. A small symbol is used to represent each 1,000 acres of wheat grown, and the counties in the northeast corner of the state are so crowded with these symbols that there is hardly room left for the names of the counties. Four counties in this district have grown more wheat this year than was grown in the entire state in 1909, and seven counties here have about two-thirds of the state's wheat acreage.

Good Roads Planned and Done

(Continued from page 17.)

way Commission to survey the new route for the Kremmling-Martin Road, and Mr. Polhamus has arrived at Kremmling.

An appropriation of \$35,000 of federal funds was secured for the improvement of this road earlier in the year. The highway commission plans call for numerous changes from the present route, the widening of the road and the reduction of all the steeper grades.

Mr. Polhamus is considered one of the best engineers in the state. He has been a resident of Grand County for many years and will bring to this government work an intimate personal knowledge of the conditions to be met and obstacles to be overcome that is expected to expedite the survey.

It is not expected much will be accomplished this year beyond the completion of the survey and the starting of preliminary construction work. The highway commission has been hampered all year by lack of efficient engineers and, the county commissioners were told, it was impossible to start the work earlier for this reason.



FRED GOBEL, Colorado Highways Commissioner for District No. 4, Southwestern Colorado, has been a resident of Silverton for upwards of twenty years. He is a prominent lumber and coal dealer of that city and has been its mayor. He has always been an ardent advocate of good roads.

Some of the most picturesque portions of Colorado are found in the district of Commissioner Gobel. It surrounds the Mesa Verde National Park and the Rocky Mountains are seen at their best at various localities there. It is already much traveled by tourists and with the development of good roads already under way the number of visitors will be increased manifold.

The pet project of Commissioner Gobel is the Durango-Silverton Highway, a Forest Service project, and next in his affections is the Silverton-Ouray project, which is really a continuation of the same road and is largely reconstruction work. Mr. Gobel was the first appointee on the Highway Commission after the four original members quit, and has served four years in his present capacity.

The A. A. A. reports that the greatest transcontinent motor traffic in history will flow westward this summer.

Concrete in Pennsylvania

Over 376 miles of reinforced concrete roads, costing more than \$13,450,000, have so far been let in Pennsylvania under the \$50,000,000 bond issue program voted last fall.

Up to July 28 the Pennsylvania State Highway Department had let contracts for 470 miles of roads this year. That more than 376 miles of this should be the highest type of reinforced concrete indicates that Pennsylvania is spending its money wisely.

The information bureau of the Pennsylvania State Highway Department, which has given out the above figures, says that advertisements of new work will continue throughout August and September, so that before the end of the active letting season the concrete mileage will be appreciably increased.

Utah Leads in Concrete

Contracts awarded for concrete highway construction in Utah from January 1 to June 28, 1919, show that a total of 741,513 square yards has been let.

Although this yardage is not so great as that contracted for in a number of other states, it nevertheless has brought to Utah the distinction of having awarded, this year, the greatest concrete pavement yardage per 100,000 of population of any state in the Union. According to latest figures available, Utah population is 373,351, and this gives to Utah 198,797 square yards of concrete pavement per 100,000 population.

A number of other highway paving projects in Utah are being promoted for concrete or are about to be placed under contract and before the end of the active letting season the total yardage will be considerably increased, and it is expected that this will enable Utah to retain its present distinction.

Compressors Save Labor

A total of 200 feet a day, as compared with the thirty feet which so far has been the maximum highway record with a double jack and hand drill, is expected to be attained with air compressors which the State Highway Commission received this month. The two compressors are of the portable type, weigh 8,500 pounds each, generate forty horsepower and carry a pressure around the drum of 130 to 140 pounds. They are mounted on four-wheeled trucks so that they may be easily transported. One of them will be sent to E. B. Harlan, who is in charge of construction on the Independence Pass highway, and the other will go to I. W. McCrary, who is carrying on the Fall River Road building near Granby.

Only Roads Get "Illuminated"

Chairman Sommers of the State Highway Board declares that inasmuch as roads are about the only things in the Nation that can get "illuminated" any more, it seems meet and fitting that the highway to the Springs should be "lit up" with real lights.

GIFT
OCT 7 1919



COLORADO HIGHWAYS BULLETIN

October, 1919



Mountain Roads Inspected by Commissioner
Forestry Presents Colorado Roads Scheme
The Only Way Out
Lest Colorado Forget
Keep Travelers in Colorado

Issued by the

State Highway Department

Digitized by

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T. J. EHRHART, Commissioner.

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EAGLE—Mrs. Ora R. Kelly, Red Cliff; W. H. Lea, Gypsum; M. A. Walsh, Red Cliff; T. J. Dice, Eagle; Andrew Oleson, Gypsum.

ELBERT—Frank D. Hart, Kiowa; C. A. Mathews, Elbert; C. A. Huff, Simla; Fred Albin, Kiowa; Wm. J. Park, Kutch.

EL PASO—E. A. Jackson, Colorado Springs; C. O. Ford, Colorado Springs; J. W. Potter, Fountain; Harry A. Scholton, Colorado Springs; J. B. Fowler, Colorado Springs.

FREMONT—Jonathan Seaman, Canon City; James Bunten, Canon City; J. V. McCandless, Florence; G. V. Hodgin, Canon City; Jas. Belknap, Hillside.

NOTE—In the appended list of county officials the first name in each county is that of the county clerk, the second name is that of the county surveyor, and the last three names are those of county commissioners.

GARFIELD—Carleton L. Hubbard, Glenwood Springs; P. C. Thurmond, Glenwood Springs; L. F. Grace, Glenwood Springs; R. P. Coulter, New Castle; Geo. Newton, De Beque.

GILPIN—Frank G. Moody, Central City; S. A. Rank, Central City; Joseph Borzago, Black Hawk; Neil McKay, Central City; R. I. Hughes, Russell Gulch.

GRAND—H. J. Harrison, Hot Sulphur Springs; F. I. Huntington, Hot Sulphur Springs; Simon Olson, Parshall; J. H. Cather, Kremmling; J. B. Stevens, Fraser.

GUNNISON—C. C. McWilliams, Gunnison; J. H. Robinson, Gunnison; W. H. Whalen, Crested Butte; Geo. L. Miller, Gunnison; C. L. McDonald, Gunnison.

HINSDALE—L. E. Shull, Lake City; E. L. Defenbaugh, Lake City; Jno. C. Gavin, Lake City; E. W. Wiley, Lake City; E. W. Soderholm, Lake City.

HUERFANO—J. G. Archuleta, Red Wing; J. O. Francisco, La Veta; Walter Hamilton, La Veta; J. T. Trujillo, Red Wing; Chas. E. Furphy, Walsenburg.

JACKSON—E. N. Butler, Walden; M. C. Ward, Walden; A. J. Monroe, Walden; W. G. Mellen, Coalmont; Chas. L. P. Winscom, Walden.

JEFFERSON—Frank N. Felch, Golden; Chester A. Lytle, Critchell; J. R. Cruise, Mt. Morrison; Gus A. Johnson, Golden; R. L. Downes, Evergreen.

KIOWA—Ed. M. Low, Eads; C. E. Bell, Eads; C. C. Wolever, Eads; Wurt Bailey, Towner; Ed. Houston, Arlington.

KIT CARSON—Miss Clo S. Judy, Burlington; D. D. Buck, Flagler; I. D. Messinger, Stratton; A. L. Anderson, Burlington; J. O. Hendricks, Seibert.

LAKE—John Gregory, Leadville; Fred J. McNair, Leadville; B. H. Martin, Leadville; Dan Colahan, Leadville; Geo. Bennett, Leadville.

LA PLATA—Helen Galloway, Durango; W. H. Wigglesworth, Durango; Ole M. Lee, Durango; Geo. Olbert, Oxford; Jacob Fritz, Durango.

LARIMER—G. R. Cushing, Ft. Collins; James G. Edwards, Ft. Collins; J. M. Graham, Loveland; Harris Akin, Ft. Collins; C. M. Garrett, Laporte.

LAS ANIMAS—Juan B. Romero, Trinidad; Hal Barnes, Trinidad; A. G. Prosser, Trinidad; J. J. Cordova, Aguilar; Robert C. Scott, Trinidad.

LINCOLN—Henry A. Johnson, Genoa; J. W. Pershing, Limon; Alex McCallum, Arriba; W. M. Smith, Rush; Ed. Riekenberg, Hugo.

LOGAN—Mabel E. Whiteley, Sterling; John W. Black, Sterling; Arthur W. Hand, Sterling; C. M. Morris, Fleming; W. E. Henning, Peetz.

MESA—Chas. S. Jones, Grand Junction; Frank R. Hall, Grand Junction; Gus J. Johnson, Grand Junction; Geo. M. Masters, Mesa; D. Gover Rice, Grand Junction.

MINERAL—Wm. G. Messinger, Creede; S. B. Collins, Creede; Chas. H. Lees, Creede; James Seward, Creede; A. M. Collins, Creede.

MOFFAT—Mrs. L. O. Haughey, Craig; W. P. Finley, Craig; Thomas A. Forkner, Craig; R. S. Hamilton, Hamilton; R. B. Overholt, Maybell.

MONTEZUMA—Samuel M. Burke, Cortez; Geo. Mills, Mancos; R. B. Dunham, Dolores; Chas. B. Kelly, Mancos; W. Myler, Dolores.

MONTESE—T. W. Monell, Montrose; W. H. Fleming, Montrose; John W. Lamontrose; Howard P. Steele, Montrose; Cory S. Heath, Montrose.

MORGAN—A. H. Asmus, Ft. Morgan; A. Gilbertson, Brush; Jas. Hurley, Ft. Morgan; J. K. Samples, Brush; J. H. Osborn, Wiggins.

OTERO—Oran Walker, La Junta; Madison Denson, Rocky Ford; W. F. Green, Rocky Ford; J. N. Johnston, Manzanola; George Barr, La Junta.

OURAY—R. Whinnerah, Ouray; J. I. Doras, Ouray; W. S. Rose, Ridgway; George B. Croft, Ouray.

PARK—Harry L. Moyer, Fairplay; W. I. Powless, Alma; G. S. Singleton, Shawnee; J. F. Rhodes, Fairplay; J. Tol. Witche, Howbert.

PHILLIPS—Geo. L. Coleman, Holyoke; C. A. Guernsey, Holyoke; Fred D. Hotalin, Holyoke; Albin Johnson, Haxtun; Lyma Foster, Holyoke.

PITKIN—Mary E. Mellor, Aspen; Chas. S. Armstrong, Aspen; B. M. Strawbridge, Aspen; E. J. Grover, Aspen; J. J. Gerba, Aspen.

PROWERS—L. M. Markham, Lamar; J. W. Smith, Holly; Fred Williams, Wiley; B. Rhodes, Granada; A. F. Knuckey, Holly.

PUEBLO—Wm. Barber, Pueblo; C. J. Reese, Pueblo; Geo. Herrington, Pueblo; M. Sare, Pueblo; J. C. Harbour, Pueblo.

RIO BLANCO—C. J. Wilson, Meeker; Kirk Shaw, Meeker; Fred A. Nichols, Meeker; J. A. Bills, Meeker; H. S. Har, Meeker.

RIO GRANDE—H. G. Trapp, Del Norte; W. W. Reilly, Monte Vista; August Weiss, Del Norte; W. W. Wright, Monte Vista; M. S. Woods, Monte Vista.

ROUTT—J. D. Crawford, Steamboat Springs; C. W. Harkness, Hayden; Claude J. Smith, Clark; Wm. Scheer, Oak Creek; Henry J. Summer, Hayden.

SAGUACHE—Birt Clare, Saguache; A. F. Smith, Saguache; Geo. Woodard, Saguache; A. V. Shippey, Villa Grove; Adam Detrick, Center.

SAN JUAN—C. E. Dresback, Silverton; A. W. Harrison, Silverton; Gail Munyon, Silverton; J. Ernest Shaw, Silverton; Edward Meyer, Silverton.

SAN MIGUEL—Lillian C. Kenyon, Telluride; Ben W. Purdy, Telluride; T. B. McMahon, Telluride; A. T. Woods, Placerville; J. R. Galloway, Norwood.

SEDGWICK—Nellie E. Nichols, Sedgwick; E. C. Hamilton, Sedgwick; H. E. Hodges, Julesburg; Frank Nagel, Julesburg; J. G. Mowbray, Sedgwick.

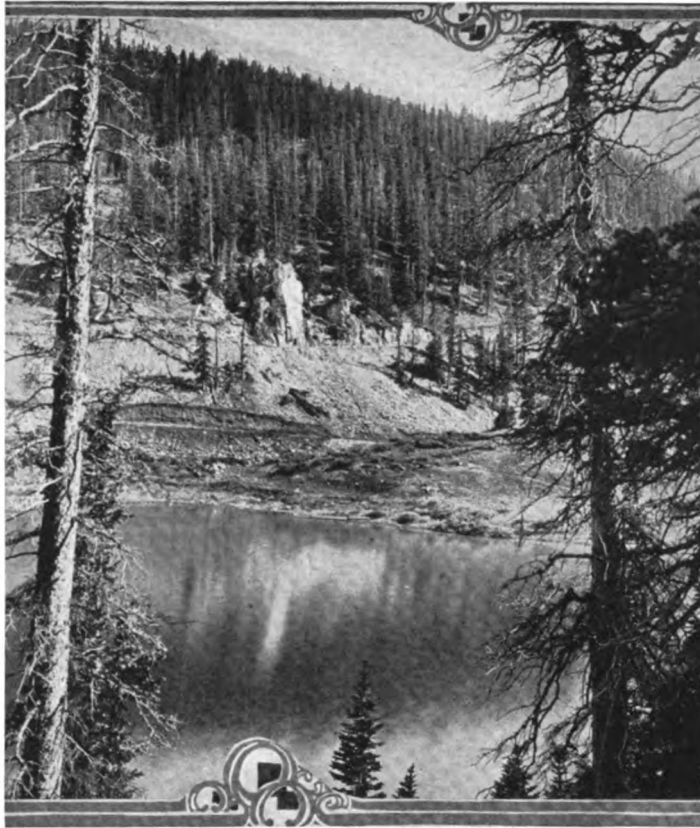
SUMMIT—Geo. F. Forman, Breckenridge; James D. Galloway, Breckenridge; A. Lindstrom, Dillon; W. H. Hampton, Frawley; Eli Fletcher, Breckenridge.

TELLER—J. H. White, Victor; E. I. Arthur, Jr., Cripple Creek; T. J. Wick, Cripple Creek; Tom Foster, Woodland Park; I. N. Riley, Victor.

WASHINGTON—L. Roy Cummings, Akron; Elbert Lewis, Akron; Homer Evans, Akron; R. M. Buckmaster, Abbott; E. A. Lewis, Burdett.

WELD—Chas. E. Littell, Greeley; L. I. Stimson, Greeley; A. F. Peters, Mead; Elmer Rowe, Greeley; J. W. Birke, Platteville.

YUMA—John Adcock, Wray; A. C. Cary Wray; Harry F. Strangways, Wray; H. W. Jackson, Yuma; Alex. Shaw, Wray.



Poudre Lake, on Continental Divide on road from Grand Lake through Rocky Mountain National Park.

CONTENTS

Mountain Roads Inspected by Commissioner.....	5
Forestry Presents Colorado Roads Scheme.....	14
Utah Will Cover Concrete Roads.....	15
Half-Section Roads	15
The Only Way Out.....	16
Keep Travelers in Colorado.....	16
Lest Colorado Forget	17

COLORADO HIGHWAYS BULLETIN

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Department

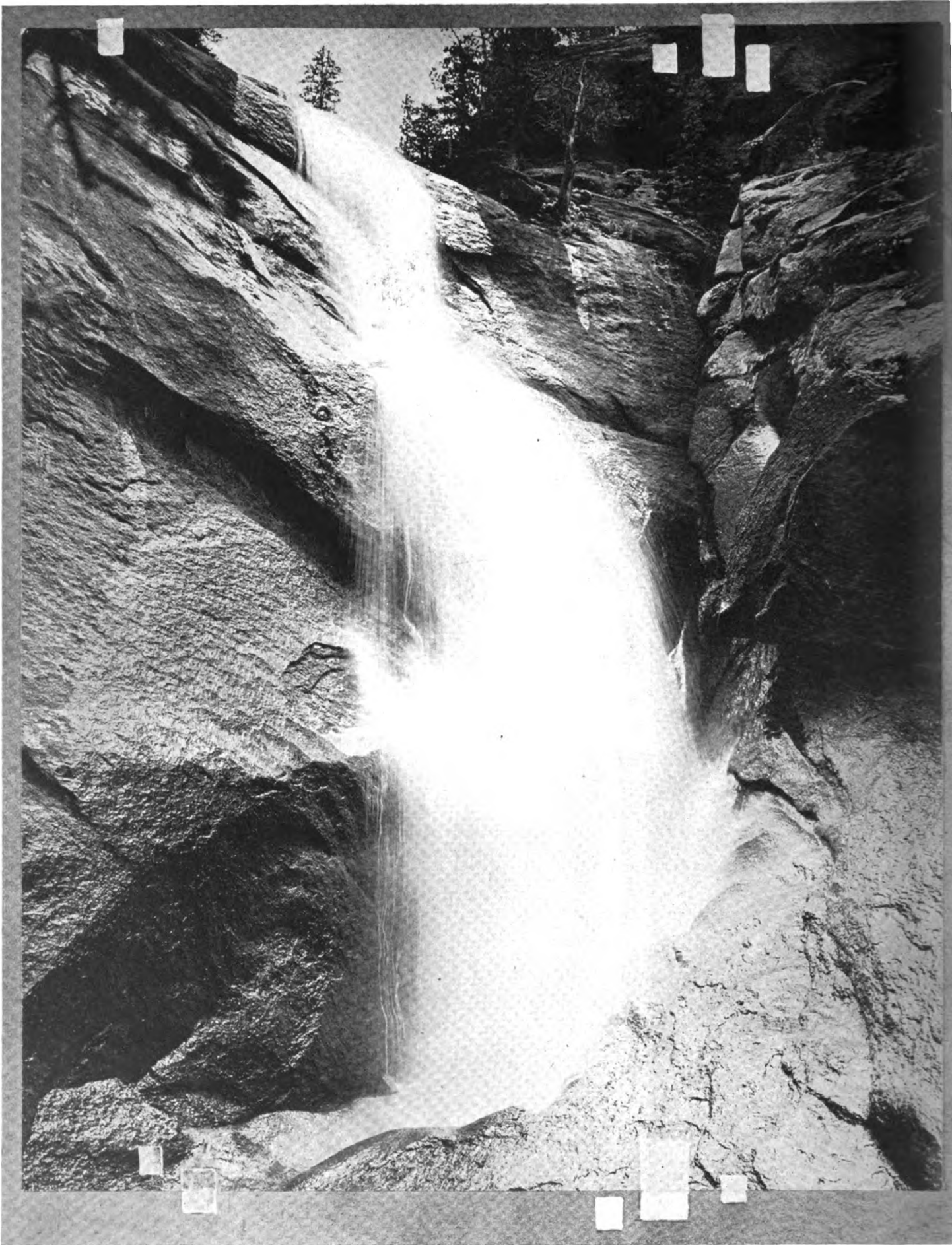
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Owing to the necessarily limited edition of this publication it will be impossible to distribute it free to any persons or institutions other than state and county officials actually engaged in the planning or construction of highways, instructors in highway engineering, newspapers and periodicals and civic associations. Others desiring to obtain Colorado Highways can do so by sending 10 cents for each number desired. Associations desiring to distribute the magazine can obtain it at cost in lots of from 500 copies up.

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Lake Creek Falls, three miles west of Twin Lakes on new Independence Pass road to Aspen. This point is now easily reached from Denver over a road that is good practically all the way and is well worth a visit by any nature lover. The distance from Denver is 165 miles.



COLORADO HIGHWAYS BULLETIN

VOL. II

OCTOBER, 1919

NO. 10

Mountain Roads Inspected by Commissioner

800-Mile Motor Trip Discloses Progress on Many Road Building Projects in Colorado. Good Headway is Being Made on Such Important Roads as That to Independence Pass and from Grand Lake to Rocky Mountain Park. Observations En Route Make Trip One of Educational Value.

IN order to inspect certain important roads now being built in Colorado, including those across the Continental Divide by way of Independence Pass to Aspen and from Grand Lake into and through Rocky Mountain National Park, as well as some twenty Federal Aid projects of importance, two State Highway Department officials recently made an 800-mile motor trip westward from Denver. Except for the 32-mile round trip from Denver to the foothills, every mile of this remarkable journey was in the mountains. The "Backbone of the Continent" was crossed five times at altitudes varying from 9,400 to 11,300 feet, and roads good, bad and indifferent were encountered. State Highway Commissioner Thomas J. Ehrhart was at the wheel of the highway commission's car over the entire distance and proved himself an accomplished driver under all circumstances.

Although most of the trip was made over District No. 5 of Commissioner Robert H. Norvell, portions of District No. 1, E. E. Sommers, commissioner, and District No. 2, E. E. Nichols, commissioner, were also traversed. Five national forests and fourteen Colorado counties, most of which are as large individually as an average New England state, were included in the itinerary.

The party which made this 800-mile exploration trip consisted of State Highway Commissioner Thomas J. Ehrhart, Chief State Engineer James T. Maloney, Editor J. G. Hilliard of the State Highway Bulletin, Staff Photographer K. P. Howe and W. Pyke Johnson, Washington representative of the National Automobile Chamber of Com-

merce. Mr. Johnson is former editor of the State Highway Bulletin.

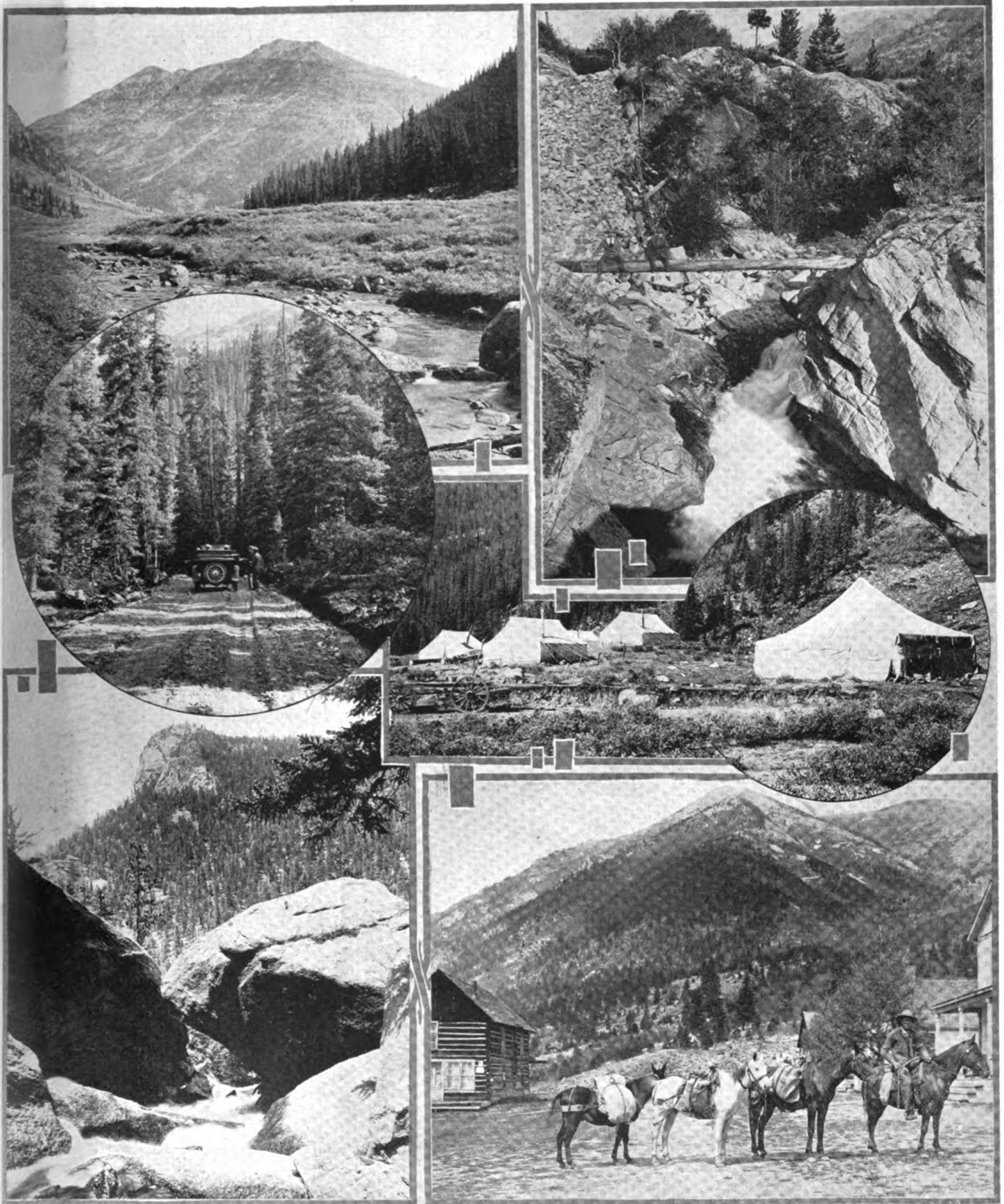
Leaving Denver Saturday morning, August 23, at 9 o'clock, the party was complete with the exception of Chief Engineer Maloney, who was picked up at his home in Littleton, ten miles to the southward, 20 minutes later. The next stop was made at Platte River Bridge, on the western outskirts of Littleton, where a comfortable coterie of campers attracted attention. Investigation proved them to consist of two men and their wives from Springfield, Ohio, who had "done" the mountain parks near Denver and were prepared to start on their 1,600-mile journey homeward on the following day. Having just finished breakfast, they were adjusting rod and reel in an effort to coax a succulent South Platte trout or two into a strike. Inasmuch as this party appeared to be skilled and practiced campers, their pictures were taken, as illustrative of the possibilities for "living out" in the immediate neighborhood of the smaller cities surrounding Denver.

"Colorado roads are better than those of Missouri and Kansas," declared Mr. Frank McCullough, one of the men of the party, "although the roads in those states are not bad except when it rains. When that happens, one might as well tie up until the precipitation is over."

It was a case of "Westward, Ho!" for the "Highwaymen," so they struck out with their backs to the rapidly rising sun toward Turkey Creek Canon, the narrow defile through which is soon to be built a first class road by state and government collaboration. En route, the commissioner



Summer camping in and near the Rockies is a favorite pastime of Easterners. Upper left, Mr. and Mrs. Frank McCullough and daughter and Mr. and Mrs. James Baxter of Springfield, O., camping on the South Platte at Littleton, Colo. Center, Miss McCullough fishing. Lower left, Mr. and Mrs. T. B. Johnson of Whatcheer, Ia., and Mrs. H. L. McMannamy of Denver camping between Rabbit Ear and Walden. Upper and lower right, campers in free municipal grounds, Rocky Mountain Park, Denver.



Scenes in the rugged Rockies which dominate the Twin Lakes country and along the road being built by the Highway Commission from the lakes over Independence Pass to Aspen. Mt. Champion and Lackawanna Gulch from head of road work. At right, Johnson and Hilliard courting calamity on log over roaring Lake Creek while a mink grinned from the bottom. Center left, lodgepole pines near Harlan's camp; at right, Harlan's camp. Below, Lake Creek, Sheephead Rock; outfit bound for sheep camp.

took his passengers past Lake Marston of the old Denver Union Water Company, now taken over by the city and operated as one of the departments of municipal government. City employees were pursuing their annual pastime of combing the accumulated kelp from the water, in order to remove from Denver's domestic supply as far as possible the "fishy" taste and odor which characterizes the water when the kelp is at its longest growth, in August and September. It was the yearly fight against Denver's fresh water seaweed.

The diversion to Littleton and Lake Marston made the distance to the mouth of Turkey Creek Canon, some three miles south of the town of Morrison, twenty-six miles. This is a beautiful canon, which will eventually be as well known as any of the gateways to the Rockies near Denver. It is parallel with Bear Creek Canon, which is from three to five miles farther north and is part of the circle trip through Denver's famous municipal mountain parks. The excessive motor traffic over the mountain parks is bound, however, to divert a heavy volume of travel to Turkey Creek, which is quite as beautiful, when the projected road is completed up the latter canon.

Turkey Creek is the nearest route from Denver to the wonderful South Platte Valley and Canon, and is bound to be as important a route commercially as it is scenically. The present road is narrow and for the most part unimproved, but is traversible and this summer has accommodated the traffic of thousands of automobiles, probably as many as a hundred daily, on the average, since June 15. The new road will be built by the state with federal monetary assistance, for it is a post road and the development of the region, especially from a summer cottage standpoint, may be expected to follow rapidly, after the manner of Evergreen Heights and Troutdale on the nearby Bear Creek road.

After passing Beaver Creek Ranch and Clifton Farm, the divide between Turkey Creek and Elk Creek, which flows into the Platte, was crossed and the descent to the level of the latter stream begun. At 42 miles Conifer was reached and at 47 Shaffer's Crossing, the junction with the road from Bear and Cub creeks and Evergreen to the north and beautiful Elk Creek Canon, which takes one to the town of Pine on the South Platte, to the south. Keeping straight ahead, however, the "highwaymen" came out at noon at Baileys on the Platte, which the speedometer showed 57 miles from Denver. Ten miles should be deducted from this mileage for direct, on account of the diversions to Littleton and Lake Marston.

The Jefferson-Park County boundary was passed near Shaffer's Crossing, and the fine road entered upon the Park County side was only indicative of what was discovered to be the rule for the approximate 100 miles to be traversed later in that county. It was no difficulty whatever to roll down "Crow Hill" into Baileys at 30 miles per hour, having negotiated the distance from Denver in three hours, despite stops at the Platte River Bridge and at Littleton and losing 20 minutes in a two-mile detour in getting away from Marston Lake. The road from Shaffer's

Crossing to Baileys is extremely beautiful, with its lining of silver spruce, quaken aspen and pine.

At Bailey's luncheon was eaten and the trip westward up the Platte Valley was resumed at 1 p. m. At Glen Isle, two miles distant, the speedometer showed 59 miles, at Grousemont 61 and at Shawnee 63. At the 66-mile point is the elegant home of Commissioner Singleton of Park County, in a fine setting by a pretty lake. To this official's enterprise are due the good roads which we had traversed for twenty miles and were destined to enjoy for a much greater distance.

Proceeding up the valley, Cassell's was passed at 68 miles and Grants, the last point in the valley or wide canon, at 69. Although the Platte Canon was developed and dotted with numerous resorts, even below Baileys, by the building of the South Park Line of the Colorado & Southern Railroad some 40 years ago, inadequate train service and practically no roads until comparatively recently have kept it from becoming what it deserves to be—one of the most popular resort and summer home districts in Colorado.

It is now accessible, however, from Denver by a road which Park County has made very good at the west end, and, as heretofore noted, the Turkey Creek Canon Road, the connecting link between the Denver-Morrison Road and the Park County Road, from near Shaffer's Crossing to Baileys and by Elk Creek Canon to Pine, has already been approved as a Federal Aid project and will probably be built next year. Then, with Denver connected with Platte Canon by a perfect automobile road, the Valley of the Platte will flourish as never before. It is also reached from Colorado Springs by way of Ute Pass, Woodland Park, Westcreek, Decker's and Gill's by a wonderful scenic road. There is also another route from Denver, that by way of Salida, the new Jarre Canon Road, Decker's, Gills and the cutoff from the latter place, situated on the south branch of the South Platte, to Buffalo, two stations east of Baileys, and Pine, one station east.

That a road will be built straight down the South Platte Canon by way of the Denver Union Water Works and Littleton is practically assured, but this road has not as yet been approved as a state, county or Federal Aid project. This road will be, when built, tremendously scenic and of great value commercially.

But the travelers who figure in this recital had arrived at the farther, or western, end of the beautiful canon and crossed over the top of it into the fertile South Park. At 2:15 they met the eastbound South Park passenger train, bound on its tortuous way from Leadville to Denver, and two miles farther along, or at the 82-mile point, passed the "Lazy-H" Ranch. South Park is dotted with hay and cattle ranches and is flanked on the west and north by the snow-covered peaks of the Continental Divide. It is a scene of indescribable beauty, and its level floor, dotted with myriad hay stacks, gives evidence of wondrous plenty. The finest hay and "feeder" cattle of the world are grown here.

At 82 miles is the junction with a road to Colorado Springs, Jefferson being the name given the postoffice nearest the meeting point of the two roads on the east and Como being immediately west. A sign board avers that the distance to the Springs is but 78 miles from this point, that to Denver being about 72, without detours such as were made on this trip. This road to Colorado Springs joins the Pike's Peak route 40 miles west of the Springs and 34 miles west of Manitou at the head of Ute Pass near the town of Florissant.

Passing through the town of Como, where is the junction of the South Park Railroad line with its branch to the old mining camp of Fairplay, the county seat of Park, the road passes just to the west of that city and the Antero Reservoir. This huge artificial lake is a grand sight, as viewed from the road, two miles westward. Its capacity is 60,000 acre-feet of water and from the flood waters which it imprisons are irrigated thousands of acres of land in the vicinity of Denver, nearly 100 miles distant by water line, the South Platte River being the medium of conveyance.

It was still Park County and roads continued good, bearing evidence of recent careful work. At Antero the record showed 117 miles from Denver and where the line was crossed into Chaffee County, 125 miles. Roads continued good to Buena Vista, where the mark was 142 miles, indicating that the Chaffee commissioners also have been busy. The Marmon of the Highway Commission flew into Buena Vista alongside the first section of Denver & Rio Grande No. 1, the crack Pacific Coast train of that railroad, which had left Denver at 8:15 a. m., or 45 minutes ahead of the automobile. The railroad route is by way of Colorado Springs, Pueblo and the Royal Gorge and is considerably longer than the route taken by the automobile. Nevertheless, the highway folks had stopped a total of two hours en route and had detoured ten miles at the start of their journey. The inevitable conclusion is that Colorado's mountain roads are not so bad, when an automobile can beat a limited train across the backbone of the continent.

At the 160-mile point, Granite, on the line between Chaffee and Lake counties was passed, and five miles farther the main road to Leadville was left to the eastward and the detour to Twin Lakes taken. This magnificent combination of lakes, mountains and sky was reached at 5 p. m., the speedometer showing 170 miles from Denver, from which should be deducted the ten miles detoured for actual distance. The trip from Denver had been made in total elapsed time of eight hours and could easily have been accomplished in two hours less. It is one of the most beautiful trips out of Denver and all too few people know the delights of the trip and the extraordinary scenery at the end.

At Twin Lakes the travelers bivouacked for the night at the well-conducted little hotel of Mrs. Foxall. The beauty of a sunset on Twin Lakes must be seen to be appreciated. Some of the highest peaks of the Rockies o'er-shadow these two marvelously Siamesed bodies of water, each of which is three miles long and half as wide. The 14,000-foot baldy granite craniums of Elbert, Faith, Hope and Perry are the most conspicuous, although on three

sides are these opalescent bodies of water hedged about by the high peaks of the Continental Divide, rising sheer from their clear surfaces. Tourists gasp and even the hardened Coloradoan who has seen almost everything else in the way of mountain scenery is forced to confess that he has at last found the cap sheaf of the shock. Then he usually volunteers, "What a grand place for a fine hotel."

The principal reason for Twin Lakes' comparative isolation up to this time is its remoteness from the railway, which runs no nearer than Granite. But the automobile stage now connects the two places and the roads are good and, then, nearly everyone motors all the way from metropolis to mountain in these days. The day of lovely Twin Lakes is at hand. The world will no longer be denied.

(Editor's note: Up to this point, ten miles should be deducted from all distances recorded, on account of the detour to Littleton and Lake Marston, before reaching the mountains. Other detours will be made which will be noted further along in the narrative.)

Sunday morning, August 24, at 7 o'clock the temperature at Twin Lakes was 40 degrees, having dropped to that point from 75 degrees during the night. The altitude of the Lakes is 9,500 feet and air and sleeping conditions are ideal. Commissioner Ehrhart decided to make a 28-mile round trip detour to inspect the work being done by Superintendent E. B. Harlan on the road to Independence Pass, on the route to Aspen. A good road was found up Lake Creek west of Twin Lakes and a number of pictures were made by Photographer Howe on the way to the Harlan camp. Lake Creek is a beautiful stream and the road over Independence Pass is bound to prove immensely popular with tourists and invaluable for commercial purposes when it is finished, which will be next summer.

Superintendent Harlan had done so much good work on either side of Twin Lakes that the Highway Commissioner was prepared to see some interesting activity where his crews were working at the farthest west. Harlan's men are now "finishing up" the road at Timberline, for Independence Pass is 12,800 feet, one of the highest in the state. The superintendent conducted the party to his camp, at the foot of Lackawanna Gulch, famous for its mineral production, where the survey turns in a series of "hogbacks" to ascend the real Continental Divide to the pass, five miles farther west. Aspen and Independence towns are the main objectives, although for scenery the road will be unexcelled. Work in the immediate future consists of cutting through granite walls that look to the unpracticed eye to be impregnable.

At the Harlan camp are several of the state's recently received government surplus war material trucks and air compressors, ready for the heavy work ahead. Close to the present terminus of the road in Lackawanna Gulch are the Beeler mine and mill, at an altitude of 12,000 feet, and towering above them on Mt. Champion is the Champion mine, which has produced a fortune and is now being worked actively at the extraordinary height of 13,500 feet above sea level.

Harlan declared that he would be able to work until October 1 at the great altitude at which the Independence



Fair Mountain Climbers at Twin Lakes. On fence, Miss Ruth Stewart, Mercedes, Tex.; center, Miss Warren, Mercedes, Tex.; right, Mrs. Mary McDonald, Twin Lakes.

Pass Road then found him. He will then remove his outfits to Twin Lakes for additional work on the road from that place to Granite. Everywhere that this man operates he produces some of the best roads in the state, no matter how rough or how steep the going.

The long narrow glade of Elk Creek showed at its best as viewed by the scouting party from the bridges on that sunny Sunday morning. Several pictures were taken, each view more alluring than the last. It was with regret that the party returned to Twin Lakes to resume the more prosaic journey across the "cut-off" to the Buena Vista-Leadville Road. A stop was made for a picture of Lake Creek Falls, with Johnson and Hilliard in perilous position astride a log which spans the creek directly over the falls, while a mink grinned from the swirling, shaded waters below.

Commissioner Ehrhart and Chief Engineer Maloney began to vision dreams of a magnificent three-day circle trip from Denver to this extraordinary region. With the completion of the Independence Pass Road, what a drive it will be from Denver by way of Baileys to Twin Lakes and Independence Pass, then doubling back to Buena Vista and returning by way of Salida and Canon City, thence to Colorado Springs and Denver, whether by the Phantom Canon and Cripple Creek or by the convict-built road around Cheyenne Mountain and Broadmoor!

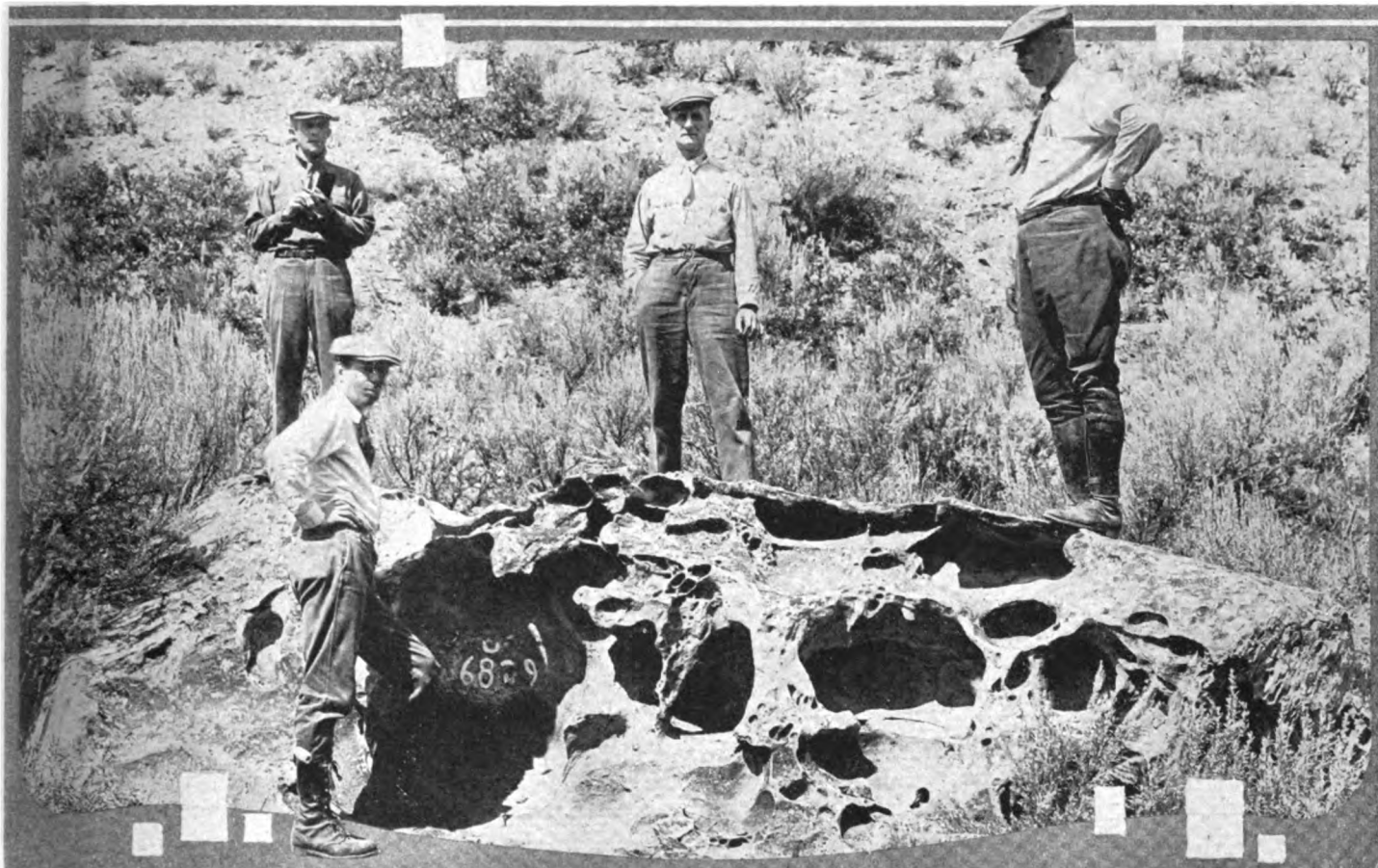
Ten miles west of Twin Lakes on this detour is obtained a splendid view of the Three Sisters Mountains. A picture was taken by Mr. Howe. The girls are very

tall, averaging 13,500 feet, and the "one in the middle" has a face. Here also was discovered "Maloney's Peek" (Peak), a fine mountain said to have been thereto unnamed, but which will hereafter glory in the fact that the chief engineer is its namesake. Also a picture was made in a sylvan glade of heavy hemlocks, through which the new road runs, just below timberline.

Interesting incidents at Twin Lakes, as viewed by the highway scouts upon their return from Harlan's camp, were the arrival of a party of Texas tourists who had left the path beaten by the railroad to seek the superior and more isolated grandeur of Twin Lakes, and the departure of a horse and burro pack train for a sheep camp on Little Willis Mountain, where the sheep munch the mountain grass and wax fat at an altitude of 13,500 feet. This is said to be twice the altitude at which sheep are raised profitably in Switzerland.

Twin Lakes was left behind for the second and last time at 11:30 Sunday forenoon, with Leadville as the luncheon objective. At departure the speedometer registered 198 miles, 24 miles of this distance being represented by the detour to Harlan Camp, and making a total of 34 to be subtracted to determine actual distance from Denver. From this detour total should be taken six miles representing the difference in the road direct from Granite to Leadville and the detour to Twin Lakes, leaving 28 miles as the detour total.

Leadville was reached at 12:10 p. m. (17 miles, or a speedometer register of 215 from Denver), or in 40 min-



"Bughole" Rock, a remarkable volcanic formation six miles north of Meeker. Altitude, 6,829 feet.

utes from Twin Lakes. The Midland Trail or Pike's Peak Route, which connects with the cutoff from Twin Lakes at the Half Moon Dredge, is, from Buena Vista to Leadville, one of the best roads in Colorado. The Marmon had no difficulty in negotiating 45 and 48 miles per hour over this road. In fact, Park and Lake County roads had been uniformly good everywhere.

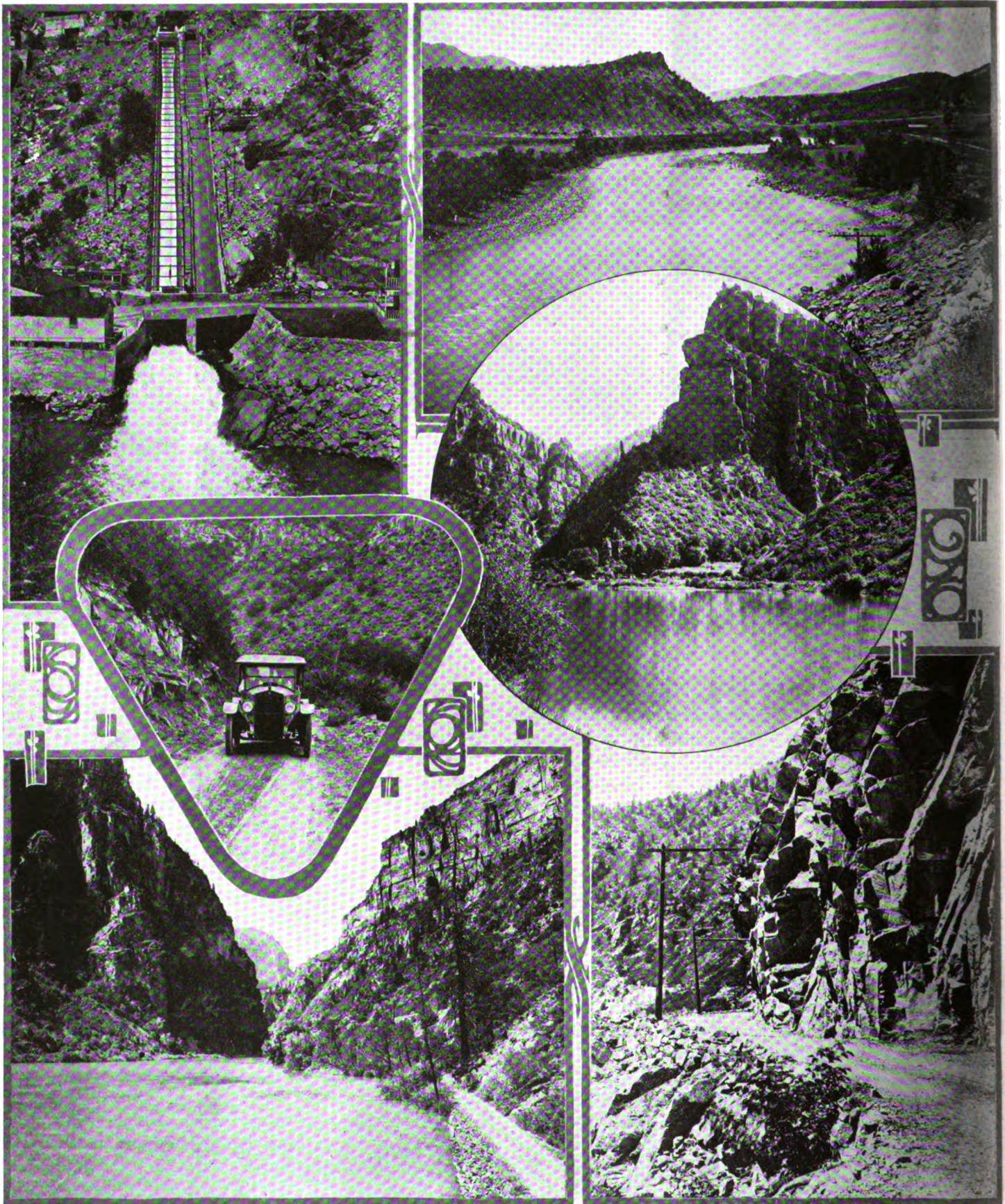
At Tennessee Pass (10,500) the speedometer showed 225 miles from Denver, or about 197 actual distance. To Grand Junction the distance from the pass is 186 miles and to Colorado Springs 141. The pass marks the boundary between Lake and Eagle counties and the point where the waters run two ways, down the Atlantic and the Pacific slopes. Down the canon of the Eagle River the road runs to Red Cliff, the county seat of Eagle. Past the town of Gilman, three miles west of Red Cliff, there is now being done some of the most interesting, difficult and important road work in the state.

The present road from Red Cliff to Minturn, still further down the Western Slope, runs up the precipitous gorge of the Eagle to the town of Gilman and through it. The bottom of the canon is monopolized by the Denver & Rio Grande Railroad, whose "double track" occupies the bank on either side of the river. There is not room on either side for an automobile road, so the highway has to seek a line some place up the mountain side. As now traveled the road is tortuous and dangerous, hanging like a narrow thread 2,000 feet sheer over the river, with tremendous grades and very sharp curves.

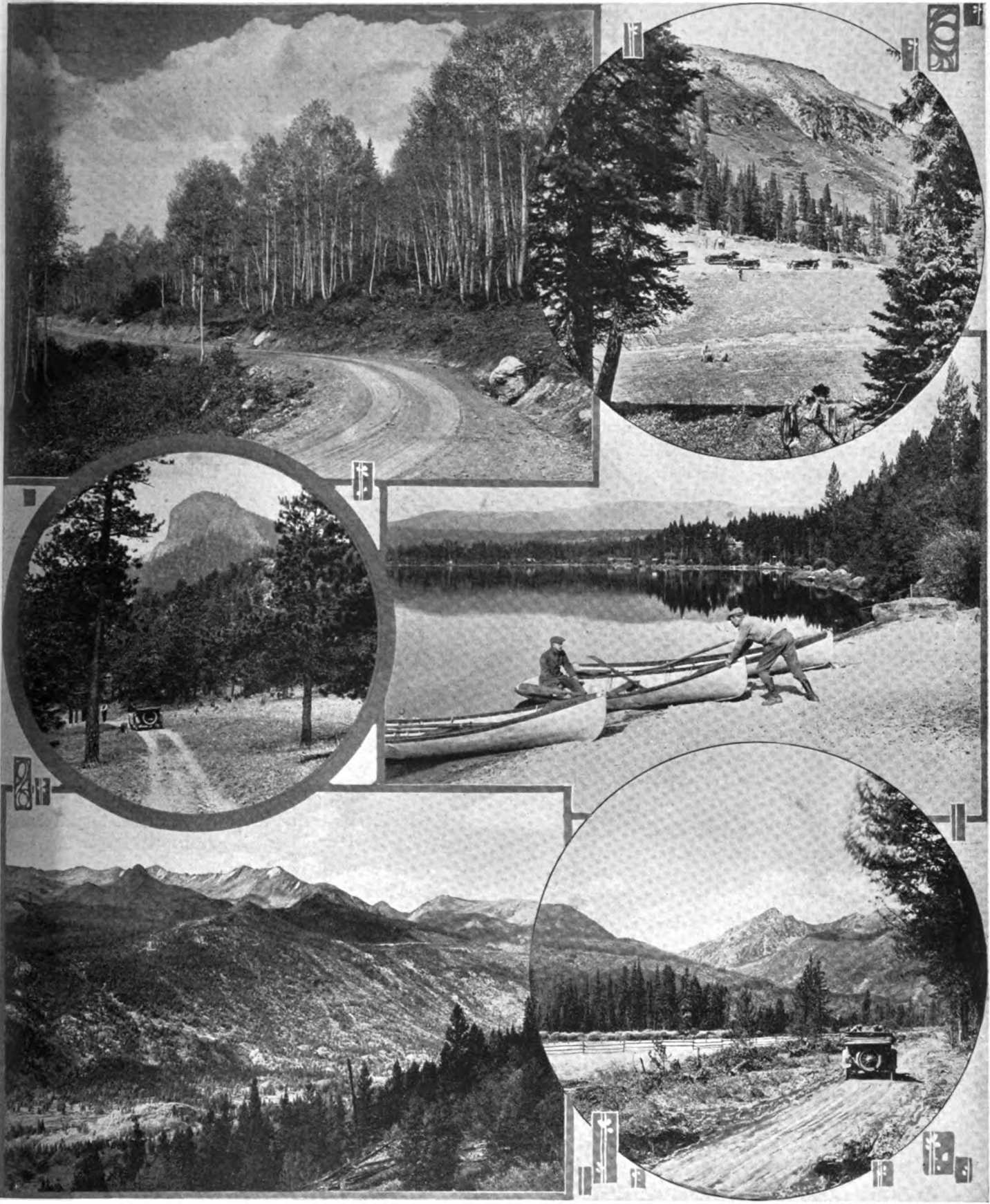
A line for a new road which will eliminate a considerable portion of both grades and curves has been run by Engineer H. L. Jenness, formerly in the office of the Highway Commission and now one of its outside men, since his return from France, where he was for more than a year with the 109th Engineers. County Commissioner Michael Walsh of Eagle, who has done some very difficult and commendable road building, is in charge of the work on the Gilman Road, which is exceedingly heavy. Engineer Jenness' line runs through the granite wall of the canon and atop of ledges over which it would not seem possible to build a road. The new survey runs from Red Cliff past Gilman almost to Minturn, and is six miles and 200 feet in length.

A cold rain descended on the travelers from Tennessee Pass to Gilman. The rain on top of the backbone of the continent is never warm, even in August. The impersonal "it" always tries to snow, and usually succeeds, in any and every month of the year.

Minturn, 224 miles from Denver, actual distance, is a division point on the Denver & Rio Grande Railroad and interesting farms of high altitude hay and wheat dot the hillsides of the Eagle above it. A picture was taken of a farm a mile above the city and almost "straight up." There were in the yards strings of thousands of refrigerator cars, for reasons known, presumably, to the railroad company. The state engineer assisted the agile photographer to the top of a car in the second string as a proper vantage point for his "hay picture." (Cont. on page 17.)



Scenes in Glenwood Canon and along Grand River. Upper left, spillway of Colorado Power Company, five miles above Glenwood Springs. Upper right, stretch of the Grand between Glenwood and Rifle, road showing at right. Center left, Commissioner "Bob" Norvell's Essex car in canon. Right center, Castle Rocks in Glenwood Canon. Lower left, upper portion of canon, where new road has not reached. Lower right, new road in lower part of canon, accessible from west end.



Roads in the vicinity of some of Colorado's marvelous lakes. Upper left, road from Twin Lakes to Independence Pass (un-completed). Upper right, lunch hour on Berthoud Pass (timber line), August 29, 1919. Left center, rock above timber line near Twin Lakes. At right, two editors off for a row in Grand Lake, August 29, 1919. Lower left, Continental Divide from new road from Grand Lake to Estes Park; mountains in Rocky Mountain National Park as seen from road north of Grand Lake.

Forestry Presents Colorado Roads Scheme

Service Proposes to Expend \$390,000 on Important Highways in State in 1920, Including Road Over Berthoud Pass, Disclosing Program at September Meeting of Highway Commission, Which Body Adopts Interesting List of Federal Aid Projects and Transacts Other Important Business.

AS part of its plan for 1920 the Forestry Department of the United States Government proposes to expend \$390,000 on important road projects in Colorado. The scheme of the Forestry Service for next year includes the Hardscrabble road (Silver Cliff to Pueblo), the road over Berthoud Pass, the Crested Butte-Somerset road and the Red Mountain—Ouray Road.

This plan was disclosed at the September meeting of the Colorado Highway Commission and is given in detail below.

Other important business transacted at the meeting was the adoption of ten new Federal Aid projects calling for a total appropriation by the state of \$315,000, to be divided among the following roads: Burlington south, Limon east, Divide towards Lake George, Salida north and south, Kiowa west, Cheyenne Wells west, Colorado Springs north and Colorado Springs to Canon City, to Cripple Creek and to Manitou.

The regular meeting of the State Highway Commission was held at the Capitol, Monday, September 8, Chairman E. E. Sommers presiding. There were present Mr. Goble, Mr. Radford, Mr. Nichols, Commissioner Ehrhart and Secretary Ballou.

A resolution was unanimously carried, that \$220.67 be appropriated to Clear Creek County to pay the final amount due August Swanson for work on the Georgetown-Silver Plume road, State Highway No. 56.

Mr. Mendenhall of the United States Forestry Department submitted to the Highway Commission a tentative plan for the year 1920. The projects outlined for improvement are as follows:

No. 1.—The Hardscrabble road from Silver Cliff to Pueblo, at an estimated cost for the improvement of \$40,000.00.

No. 2.—Berthoud Pass, cost of improvement \$200,000.00

No. 3.—Crested Butte-Somerset road, cost of improvement \$90,000.00.

No. 4.—Red Mountain-Ouray, cost of improvement \$60,000.00.

As alternative projects, the following are such that they would be considered by the Forestry Department:

The improvement of the Poudre River road.

The Delta-Nucla road—\$95,000.00.

The Independence Pass road, and

The Antonito-Cumbres Pass road—\$40,000.00.

The sum of \$8,000.00 was apportioned to Huerfano County on a 100 per cent basis.

The sum of \$5,000.00 was appropriated for the further construction of the Palmer Lake road on a 100 per cent basis.

The sum of \$600.00 was set aside to meet a portion of the expense of oiling the road from Colorado Springs to Broadmoor Hotel, to be expended under the direction of Mr. Nichols.

The sum of \$11,000.00 was appropriated for construction on Road No. 50 in Larimer County on a 50-50 basis.

Jefferson County was appropriated \$1,000.00 on a 50-50 basis to be expended on the Coal Creek road, \$1,000.00 by the state to \$500.00 by the county on the Guy Hill road and \$1,000.00 state to \$1,000.00 county on the Evergreen-Troutdale road.

There was appropriated to Arapahoe County \$4,200.00 for the purpose of building a bridge across Bear Creek near Ft. Logan.

Commissioner Ehrhart was instructed to purchase from J. M. Derry two and one-half acres of ground near Buick in Elbert County, for a gravel pit, said two and one-half acres to cost not to exceed \$375.00.

Commissioner Ehrhart was authorized to purchase ten whole lots and eight fractions of lots in Black 8, Kensington Subdivision, as per offer of the Denver Tramway Company under date of September 9, purchase price not to exceed \$1,500.00.

The meeting adjourned until 10 a. m., Sept. 9th.

Commissioner Ehrhart was instructed to purchase for the Highway Department's garage an Imperial Welding outfit and gas generator.

The Mountain Motors Company and the H. W. Moore Company were allowed extension under their agreement to equip trucks with bodies and hoists until such time as the Highway Department garage is equipped to do this work.

The petition under date of August 19 from the Board of Trustees of the town of Aguilar requesting that the State Highway Commission designate state highway thru the town was granted, as follows:

Beginning at a point where the main highway from the north intersects to corporate limits of the town of Aguilar at Fir Street, thence running west two blocks along Aspen Street to the point of intersection of Elm Street, thence south five blocks to the intersection of the boundary line between Lakeview and Romero Additions, thence following said boundary line three blocks to the west point of intersection of West Avenue, thence south following West Avenue to Main Street, thence following Main Street in an easterly direction to a point where the main highway from the south intersects the corporate limits of the said town of Aguilar.

Commissioner Ehrhart was instructed to have a room enclosed by a wire mesh in the Highway Department garage for the purpose of storing material and spare parts of trucks belonging to the Highway Commission.

Commissioner Ehrhart was instructed to have the property adjoining the State Highway Department's garage enclosed by a good substantial fence as soon as title can be obtained, and to have a temporary shed erected for the purpose of housing the Highway road equipment.

It was decreed that repair parts for trucks furnished the State Highway Department by the United States Government be given to the counties on requisition from them at a cost of 50 per cent of the retail price.

A petition under date of Sept. 5 to change the State Highway as desired by the citizens of Walsenburg was granted as follows:

On the west side of the Catholic Cemetery instead of on the east side as now laid out.

The sum of \$10,000.00 was appropriated for construction work on Independence Pass.

The contract on the Fort Logan bridge was awarded to Carl S. Madsen at a price of \$6,597.10.

The contract for construction on the San Luis Road, Federal Aid Project No. 24, was awarded to A. Salazar & Son, Rudolph Hess and E. C. Hoagland.

Bids for construction of the Levy Construction Company on Federal Aid Project Numbers 21, 22, 60, 61, 62 and 63 were rejected.

The following appropriations for Federal Aid Projects were adopted:

FEDERAL AID PROJECTS FOR 1920

District No. 2, \$390,406.00

110	Burlington South	\$ 10,000.00
111	Limon East	30,000.00
112	Divide toward Lake George.....	30,000.00
113	Salida North and South	40,000.00
114	Kiowa West	20,000.00
115	Cheyenne Wells West	30,000.00
116	Colorado Springs North	100,000.00
47	Colorado Springs-Canon City.....	10,000.00
49	Colorado Springs-Cripple Creek.....	10,000.00
117	Colorado Springs-Manitou	35,000.00
		\$315,000.00

The Commission adjourned to October 13.

E. E. SOMMERS,
Chairman.

N. A. BALLOU,
Secretary.

A signpost in Southwestern Colorado admonishes:

YOU MIGHT MEET A FOOL!
DRIVE SLOW—

UTAH WILL COVER CONCRETE ROADS.

An important decision has been made by the state road commission of Utah. Topeka mix or bitulithic surfacing must be placed on all concrete roads henceforth. It is maintained by the commission that concrete after several years' use has to be covered, and that it is cheaper in the end to cover it at the start, hence the change in road-building policy.

The decision was reached when it was resolved to re-advertise the improvement work on the state highway from a point 5.36 miles below Midvale to American Fork, excluding the city of Lehi.

The advertisement for new bids calls for a cement concrete base four inches thick on the edge, and six inches in the center, covered with either Topeka mix or bitulithic. The same conclusion was reached as to the paving which is to be put down on Thirty-second South Street, Salt Lake City.

The contractors who had been the successful bidders, on a straight concrete basis, were willing to make the change for the same price they had bid on concrete. The commission declined, and new bids will be opened.

Experience of the state road commission with both bitulithic and reinforced concrete roadways has not been entirely satisfactory, as is evidenced by the fact that of the advertisements just authorized none is for reinforced concrete, while the bitulithic or "Warrenite" will have to compete with an unpatented binder and surfacing known as Topeka mix.

HALF-SECTION ROADS

Periodically some one suggests the advisability of paving only half the roadway on country highways, leaving the other half soft for the benefit of horse-drawn traffic. In other cases, as proposed in a bill now before the Pennsylvania legislature, soft roads on each side are advocated. Such suggestions generally emanate from those who are interested in livestock, for there can be no doubt that roads of this character are much easier on horses' feet. However, there are constructional disadvantages in these types, and in the half-section road there is one feature which tends to make the road dangerous for motor-driven traffic. In this construction it is necessary, on account of drainage, to slope the road away from the center line. Therefore, on curves where the improved strip is on the outside, there is actually a case of reverse banking. Some roads in the East built in this way, notably the Buffalo-Niagara Falls boulevard, are positively dangerous, and have been blamed for many accidents. At the same time, reversed bank curves are very uncomfortable for motorists at even moderate speed. Furthermore, the earth side roads are very expensive to maintain if there is much traffic. The maintenance on the earth section of the Buffalo-Niagara Falls Boulevard, mentioned above, is reported at about \$1,000 per mile per year.

—Engineering Record.



Let Colorado Forget

COLORADO'S scenery is her greatest asset. Nature's remarkable display of mountain grandeur in Colorado can be made accessible only by good roads.

Colorado's extraordinary agricultural resources also demand the best of roads.

Development of Colorado's scenic and industrial greatness by the medium of proper roads cannot, in the very nature of things, be delayed.

To develop an adequate road system in Colorado, as elsewhere, will require money. Funds expended for this purpose will not be wasted, but will be returned to the citizens of the State manifold.

Since the last issue of the Highways Bulletin, in which was advocated the proposed \$5,000,000 bond issue, to be voted on at the fall election of 1920, there has been started a method of financing Colorado's roads which is much preferable to the bond issue proposed.

The newer proposition is one for a \$25,000,000 bond issue, and the movement is rapidly assuming definite shape. It had its inception with several good roads and commercial organizations of Colorado and has struck a popular chord everywhere it has been broached. It should be remembered that several states, the future and very life of which do not depend upon good roads nearly as much as do those of Colorado, have recently voted large bond issues for road building purposes, as witness:

Between November 1, 1918, and July 1, 1919, state highway bonds were voted as follows: Illinois, \$60,000,000; Pennsylvania, \$50,000,000; Michigan, \$50,000,000; California, \$40,000,000; Oregon, \$12,500,000; South Dakota, \$4,500,000; Utah, \$4,000,000; Wyoming, \$2,800,000; Nevada, \$1,000,000; or a total of \$224,800,000. Other states have made definite provisions for submitting to a vote of the electors between June 30, 1919, and December 31, 1920, bond issues as follows: Minnesota, \$75,000,000; Texas, \$75,000,000; Missouri, \$60,000,000; West Virginia, \$40,000,000; Washington, \$30,000,000; Montana, \$15,000,000; Maine, \$10,000,000; Colorado, \$5,000,000; Idaho, \$2,000,000; and New Mexico, \$2,000,000. or a total of \$314,000,000. Alabama, Georgia and Virginia are each contemplating making provisions for submitting the question of issuing state highway bonds to the voters.

On May 6, 1919, the electors in Oklahoma defeated a state road bond issue providing for \$50,000,000. In New

York the question of submitting to the voters a provision for issuing \$20,000,000 in road bonds was vetoed by the governor, as was also a provision authorizing \$20,000,000 in the State of Arizona.

Without going into detail in this important matter, it is enough to say that every citizen of Colorado who has the welfare of the State at heart should put his shoulder to the wheel and work for the adoption of the larger bond proposition. As an advertisement of the resources of the State it would have no peer. If the proposition is not pushed to successful completion, Colorado will suffer by comparison with other states which have taken the lead and have already passed big bond issues, as recited above. There is scarcely one of the states included in the above epitome which has the real need of a perfect roads system which the Centennial State has today.

Keep Travelers in Colorado

THERE will be reproduced in a forthcoming issue of the Highways Bulletin the bill for a \$40,000,000 bond issue for roads building voted by the people of California July 1 last in special election. This bill carried by a vote of 8 to 1, despite the fact that two large previous bond issues had been voted.

California is a living example of the virtues and advantages of good roads. That the Golden State took the lead in roads construction is largely responsible for its rapid growth, both industrially and agriculturally, and as a mecca for tourists. It has more automobiles per capita than any state of equal population and is in the forefront of nearly all states in this regard, being ahead of all eastern states and being surpassed only by certain mid-western commonwealths where rapid agricultural development has made of the automobile an absolute necessity.

For pleasure car and touring advantages California is far in advance of all other states and its enormous absorption of motor cars has been accomplished despite the fact that it is farthest from the motor-car manufacturing centers. It is only by enormous expenditure of freight and express charges that cars are transported from factories in Detroit, Lansing, Flint, Indianapolis, Toledo and other factory cities, that cars are received in California. It would not be surprising if the next car census shows more automobiles in California than in any other state.

This is only one of the miracles that has been accomplished in California by good roads. As a population cen-

ter the state is growing almost more rapidly than any other, despite the long immigrant trip across the continent. People are attracted to this Pacific coast giant among commonwealths as much by the roads and motor-ing possibilities there as by any other feature of the state. It is said that there are ninety excellent roads out of Los Angeles which will take the traveler for distances of from 50 to 100 miles without covering the same road twice except for short connections and crossings. As a conse-quence nearly every family in the city has some sort of car and there are no more happy nor contented people in any place in the world. Also there is no large city grow-ing so rapidly as Los Angeles. It has increased from a village to a metropolis of 650,000 people almost in the time since motor cars were invented.

And Los Angeles is only one example of the wonders worked by good roads in California. San Francisco, Oak-land, San Diego and a score of smaller cities have at-tracted large populations because they were accessible from other points in the State by good roads. Flourishing agricultural and horticultural communities have been es-tablished and more such centers are springing up each year.

The only answer is found in the good roads in the State. A peculiar featurt of the manner in which Cali-fornia has been builded by good roads is that eastern homeseekers and tourists who go there are unable to reach the state in their own cars over good roads. They take their lives in their hands when they start to motor across the plains of the midwest, the Rocky, Wahsatch and Sierra Nevada Mountains and the Desert, so nearly all who go to California go by train. If they want to take their cars, they have to be shipped by rail.

In this last stated fact lies a lesson for Colorado. The way is being paved rapidly to this state, which will short-ly be reached in comfort by the motorist from the East. Illinois and Iowa each have \$50,000,000 bond issues for roads, and the latter state, which voted early and is not mentioned in the table quoted in another editorial in this issue, has already begun the carrying out of an elaborate program. Roads are being builded so rapidly in states im-mediately to the eastward of Colorado that automobiles will shortly be pouring into the Centennial state by the tens of thousands each summer. Will they find decent roads in Colorado, or will they say to each other, "Let us motor on to California"?

The Only Way Out

THE map on the back page of this issue of the State Highways Bulletin shows the route taken by Com-missioner T. J. Ehrhart and State Engineer J. T. Maloney on a recent trip of inspection over the road projects and passes in western and northwestern Colo-rado. A story of the trip, given without much detail, is published in this issue of the Bulletin.

Many things of interest in roads development were discovered by the editor, who also made the trip. That road construction in commendable measure is proceeding over important stretches of highway to the westward of Denver is something that is apparently not known by many critics of the present Highway Commission. That certain roads already built in western Colorado are as fine as any to be found anywhere is also something that carpers should realize.

More than 100 Federal Aid road projects are already either under way or authorized for Colorado and the State is taking advantage of these opportunities as best it can to create a system of highways that shall be second to none anywhere. The only drawback to rapid com-pletion of present carefully worked-out plans is lack of finances to meet the government appropriations, amount-ing to more than \$2,500,000. The last Colorado legisla-ture failed to provide funds to do this, and the state and counties have had to "dig" and "dig hard" to keep up their end. Of course, it is unthinkable that this should not be done and that the funds offered by the Federal government in liberal fashion should not be used.

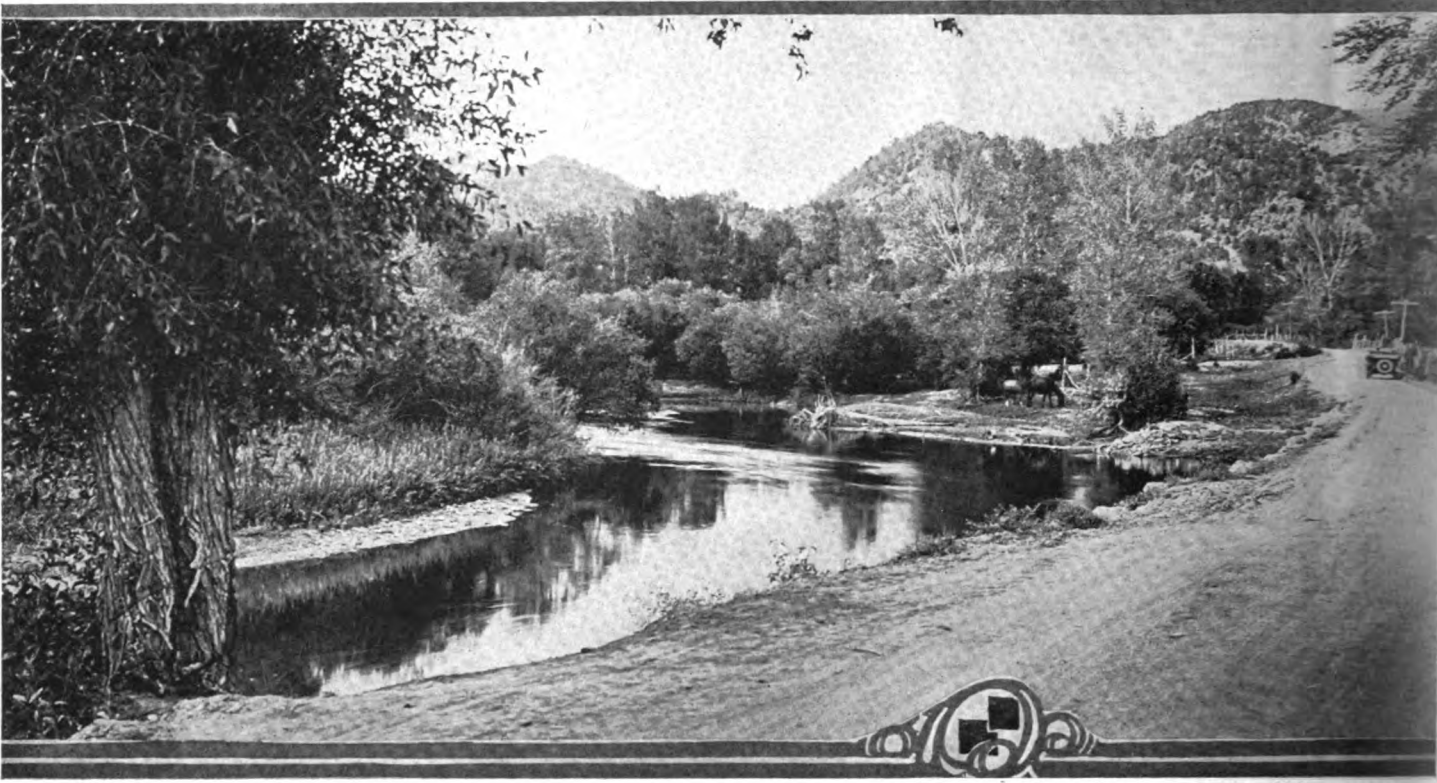
The only reasonable way out is the \$25,000,000 bond issue proposed by several public-spirited organizations to be voted on next year. Every citizen who has the interest of the State at heart should come forward and place him-self on record in favor of this proposition.

Mountain Roads Inspected by Commissioner (Continued from page 11.)

Pretty purple "posies" made the high altitude hill-sides a riot of color as the motorists descended from Leadville's snow to Glenwood's sunny glow. As they ram-bled down the Eagle the temperature rose steadily until real summer weather at last asserted itself. There is really no greater weather paradox in the United States, at least between nearby cities, than is found in the 98-mile ride down the Eagle from Leadville to Glenwood. The former city is 10,600 feet high and Glenwood is but 5,600, or 5,000 feet lower. It is always warm at the latter place in the summer, very often hot, while Leadville is one of the two most consistently cold points with which the government weather bureau has to deal in all of Uncle Sam's wide domain.

Eagle's roads are only fair, as were the first of those encountered in Garfield, which county line was crossed near Shoshone, 300 miles speedometer and 274 actual miles from Denver. The Canon of the Grand, into which had flowed the Eagle, is one of the most precipitous and forbidding (for road building purposes) imaginable. The great moun-tains of rock rise sheer above the river for 1,000 and 2,000 feet and through these on the west bank a narrow road was carved years ago down to Glenwood. For the upper part of the canon this is still the only road. It has been washed out by high waters, and passing motorists take their lives in their hands when they attempt to traverse it.

But now a county project, working up the canon of



Beautiful White River (Rio Blanco) three miles south of Rifle from a very good shale road. Where the shale has been laid three years results are fine.

the Grand, has carried a fine double track road seven miles to a point 3,000 feet below the intake of the Colorado Power Company. There are four miles to go to build the road up the dangerous part of the canon and at the present rate of construction four years' time will be required to complete it. State Engineer Maloney and Highway Commissioner Ehrhart are working hard to solve the formidable financial and physical problem of cutting this time in half or a quarter. W. H. Trumbor, who years ago built some of the road in the lower canon, has been placed in charge of the present work and the best of results are anticipated.

P. C. Thurmond, who is now in charge of Federal Aid project No. 4, from Rifle to Meeker, had built part of the new road in the lower end of the canon, and had done a good job. He came down from Meeker to meet the Highway Commission and lend his counsel to the completion of the road through the Canon of the Grand.

As the automobile carrying the state officials carefully wound its way down the upper part of the canon to the point where the new road began, the passengers realized as well as does the casual traveler what a task confronts the road builders of Garfield County in completing the thoroughfare to a point where it will be of value to Glenwood Springs, the county seat, and the entire Western Slope.

When Glenwood Springs was reached, there was Robert Norvell, State Highway Commissioner from District No. 5, of Northwestern Colorado, including this said canon road to Glenwood. Norvell, in company with his daughter; Clint P. Bowman, proprietor of the Oxford Hotel at Hayden, and himself an ardent good roads man, and Bow-

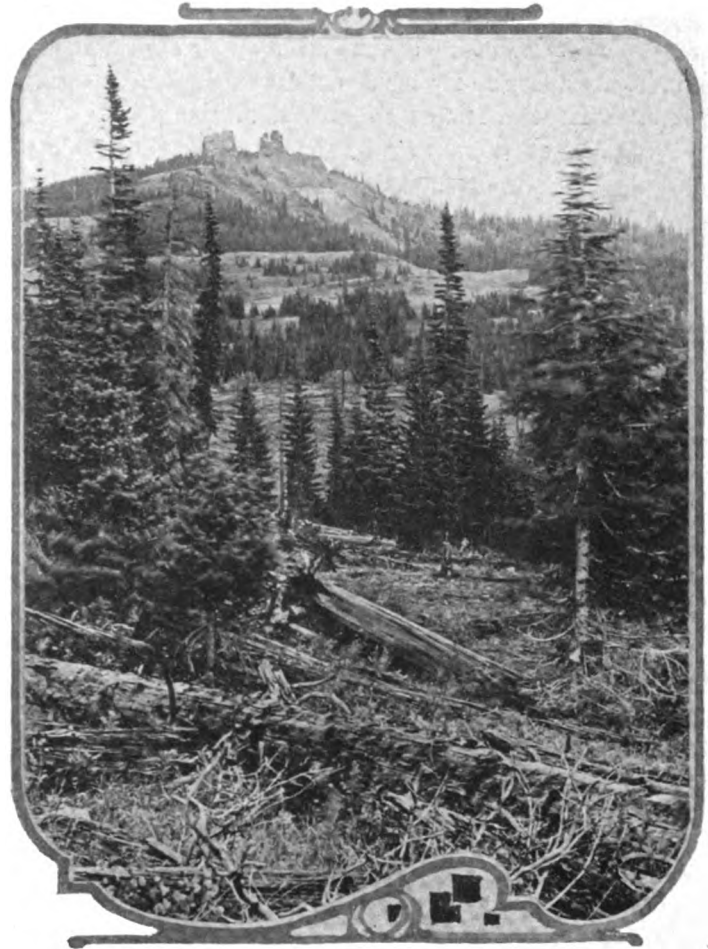
man's niece had made the drive from their homes at Hayden that day and dropped down the Canon of the Grand in Norvell's Essex just ahead of State Highway Commissioner Ehrhart and the latter's party.

"I don't care if it is my district," laconically commented the commissioner from No. 5, "I wouldn't go back home the same way for \$500. No, I'd leave my car here forever first."

In the morning there came to Hotel Colorado, where the Highway Commissioners' parties were most comfortably esconced after their arduous driving, Commissioners R. P. Coulter and L. F. Grace of Garfield County to consult with the state officials, and together all repaired to Shoshoni and the head of the new work in the canon to confer with Chief Engineer E. C. Jensen of the Colorado Power Company concerning the carrying of the new road past the intake dam of the company.

The principal problem was that of moving the 50-ton steam shovel of the commission up the canon across the wooden bridge of the power company, which crosses the intake canal. It was plain to be seen that the bridge would support scarcely a third of 50 tons, impatient as was the big gravel-eater to crowd its ponderous way on up the canon to daylight and a clear and unobstructed sky.

"How strong is a bridge?" under the conditions prevailing at Shoshoni was too big a problem to be solved in one afternoon, and Engineer Jensen was left with the task of ascertaining how to strengthen his bridge, while Superintendent Trumbor struggled with the question of how to dismantle the Panama Canal dinosaur so as to take him across in pieces.



Two of Nature's best monuments on new Colorado roads. At left, head of work on west end of Fall River Road, the editor on top of rock; right, Rabbit Ear Rock, from which pass is named.

Federal aid for the Canon of the Grand Road may be obtained from Gypsum to Dotsero, which is a post road, and the national law permits the extension of such aid to a point six miles beyond where a road may be needed. If aid from Uncle Sam can be procured on the six-mile-beyond plea, this would help to carry the road three miles into the heart of the canon, leaving only three miles more to go to complete the road in the canon. Effort will be made to federalize the project in this manner and there is hope that the road may be finished in this way in short order. Surely there is no more worthy or necessary road project in Colorado today.

The plant of the Colorado Power Company, from which is carried nearly 200 miles across the Continental Divide, the highest region of the United States, the electricity which runs Denver's street cars and lights the city, is most interesting. From the point where the water is taken out of the swirling Grand, the intake, it is carried in a tunnel 14x16 feet, two miles through the granite side of the mountain. There it is dropped 170 feet onto two turbines, producing 18,000 horsepower, or 9,000 on either wheel.

The water strikes the turbines with a velocity of 100 feet per second, being carried through nine-foot penstocks. After use in this manner the water is discharged with equal velocity into the Grand again, whose bed is lined with concrete under the spillway so that a crater of untold dimen-

sions may not be formed by the force of the water, equal to the pull of 18,000 horses.

It was an interesting angle in engineering to attempt to prophesy what would happen to the concrete river bed under these extraordinary conditions. Old-time engineers shook their heads warningly and declared that nothing, not even concrete, would withstand the impact.

But the concrete has stood the test; it is barely worn, according to Engineer Jensen. The water from the turbines scoots evenly across the river in turbulent foam, turns down the river at the other side and the Grand is itself again, not to be so disturbed until it reaches the Grand Canon of the Colorado (in the same stream) 1,000 miles farther southwest.

In order to obtain a picture of the spillway from the opposite side of the Grand, Engineer Jensen sent Photographer Howe across the river in the "bucket" which carries his men over to the railroad betimes. The result was a splendid photograph, which is herewith reproduced.

The question of making a road down the picturesque Canon of the Grand is, as is also the case with all Colorado's road projects today, one of finance. It emphasizes the pity of the fact that the last legislature failed to enact an appropriation sufficient to make available the federal funds of about \$2,500,000 for road building purposes, the government sum being conditional upon the state providing an equal amount. As a consequence of this paradox,

the Highway Commission is now forced to appeal to the counties to apportion 25 per cent of the amounts necessary to meet the federal monies appropriated.

The splendid hotel of Mr. Elmer E. Lucas, the Colorado, was bade farewell, and Glenwood Springs was left behind Monday at 2:30 p. m. The speedometer indicated that Glenwood was 274 miles from Denver, actual distance, and Newcastle is 13 miles farther down the Grand. Grand Valley, eight miles farther, was reached by braving the worst dust of the trip. The fields lie to the east of the road, and with the wind from the west the crops received a constant deluge of dust from passing automobiles. Possibly oiled roads will relieve this condition some day, when the big shale beds in the vicinity, which are said to be the finest in the United States, are brought under subjection with proper processes of refinement.

The Highway Commission was found to be putting in a substantial new bridge three miles west of Grand Valley. Rifle, 29 miles west of Glenwood, was reached at 3:30, or in an hour after leaving Glenwood, despite the ocean of dust through which the car had passed. Many prosperous appearing farms, which were apparently owned and operated by Indians, had been passed in the Valley of the Grand. "Giving the country back to 'em on account of the dust," averred Commissioner Ehrhart.

Sixteen miles west of Rifle began Thurmond's Federal Aid Project No. 4, and the first view was had of ballasting new roads with oil shale rock. This is not an experiment, for farther on, for several miles before reaching Meeker, some of the best roads in Colorado, ballasted three years ago with shale, were found. It is important that the Rifle-Meeker Road be of the highest order, for it is called upon to accommodate some of the heaviest traffic in the state. It runs through an important agricultural country through which there is no railroad. Thurmond has done and is doing good work on this road.

At a point 20 miles from Rifle, at Rio Blanco post-office at the head of Piceance Creek, is a road which follows this creek to its junction with the White River.

To Contractor Ed. O'Neill on F. A. 4 is due a great deal of the credit for making the road what it is. This project is 21 miles long and O'Neill has built practically all of it. His grading is complete and he was sure that all the shale to ballast the entire distance would be hauled and in place on the road by Thanksgiving.

O'Neill had made a trip to Craig the day before and got the promise of 25 teams to add to his force, in order that the Meeker-Rifle Road may be finished this fall. It had been impossible for months to get men to work or oats for the horses, but the "dry" farmers were then just cleaning up their crops and were looking for work. Pictures were taken of the three-year-old shale road closer to Meeker along the White River. It has a fine, hard surface and is an ideal thoroughfare.

The roads expedition passed close to the Thornberg battle ground, almost at Meeker. It was years ago that the Utes polished off some of the early settlers and Uncle Sam sent Major Thornberg from Rawlins, Wyo., the nearest army post, with a battalion of negro cavalry to chastise

the marauders. But Major Thornberg and his command were ambushed near Meeker by Utes hiding in the tall sagebrush. Twenty cavalymen were killed and all the army's cattle stolen before the Indians made off. A fine monument marks the scene of the battle ground.

Several fine photographs were made from the beautiful shale road along the White River, just before arriving at Meeker. At this city, which is the county seat of Rio Blanco, the speedometer showed 44 miles from Rifle. Headquarters were made at the Meeker Hotel, run by "Rube" Ball. Ball and sons are great hunters and the hotel lobby is full of choice mementoes of their prowess. There are skins and heads of gigantic black bear and elk, moose, deer, mountain sheep and antelope heads galore. Rio Blanco means White River and the "White River country" has been the hunters' paradise for a half century. It was here that Colonel Roosevelt, 1st., loved to come and the famous explorer was in his prime when he was equipped with "outfit" and guides and was headed for the White River hunting grounds below Meeker on the West Slope of the Rockies.

At Meeker the "highwaymen" were met by L. S. Walbridge, former Highway Commissioner from the district, who next morning took the party on "the circle trip" up the Bear River Valley. This 16-mile trip, up the east side of the valley and down the west side, is a revelation of the extremely fertile region. Hay, Colorado's foremost crop, is the principal product here and is found just above Meeker at its best. The land is irrigated from the Bear and fine crops of wheat are grown. Mr. Walbridge exhibited his 800-acre farm with justifiable pride. The valley is there six miles wide and is flanked with mountains abounding in big game. The altitude of Meeker is 6,240 feet. Rio Blanco County is claimed by its inhabitants to possess the largest deposits of shale oil rock in the country.

At the Meeker Club the party was introduced to W. S. Harmon, who had caught an 8½-pound trout in the White River 14 miles above Meeker a week before, his "fish story" being duly authenticated. An 8-pound trout, mounted, was on exhibition in the club, this being ample proof of the claim of the natives that hunting is not the only outdoor sport to be indulged in with pleasure and profit around Meeker.

Leaving Meeker Tuesday morning at 11:15, Commissioner Ehrhart pointed out the survey for the new road from that point to Axial Basin and showed where it will eliminate present curves and grades. It is proposed to build this road next spring and when it is completed there will be a first class road from Rifle to Craig, connecting up those railroad points and affording transportation facilities for that wonderfully rich region. "Bughole Rock," a curious formation six miles north of Meeker, claimed the attention of the travelers, who had their pictures taken on the rock, on which was painted, proclaiming the altitude, 6,879 feet.

At Axial Basin, 21 miles from Meeker, some big development of the tremendous coal deposits which have made Northwestern Colorado famous are being inaugurated by a Chicago concern headed by M. T. Streeter. A fine coal

camp has been built, with stores and hotel. The town of "Streeter" is ten months old and the coal mines were purchased February 18, 1919. Although far from a railroad and in one of the remotest regions of Northwestern Colorado, twelve automobiles were parked in front of the office of the Axial Basin Development Company when the Highway Commissioner drove up.

After luncheon Streeter exhibited a vein of coal 25 feet thick in his mine and assured the visitors that the property covers a deposit containing 125,000,000 tons of bituminous coal of high grade. He states that he is about to build a railroad from Mt. Streeter to a connection with the Union Pacific at Wamsutter, Wyo., and that Salt Lake interests have pledged themselves to build from that city to Meeker and Rifle by way of his camp.

Craig, the county seat of Moffat, was reached at 3:25 p. m., the distance from Mt. Streeter being 31 miles. Commissioners R. B. Overholt, R. S. Hamilton and T. A. Forkner of Moffat County were on hand to meet the state officials and inspection was made of the bridge head at the Bear River at the edge of Craig. As a result of the conference the commissioners stated they would go to work at once on the construction of a new 180-foot span bridge of modern character. The traffic is heavy and the bridge will be strong and capable.

Departure from Craig was made at 6:05 p. m., and Hayden, 20 miles distant, was reached at 7 p. m. over a fine road. Dinner was eaten there at the Oxford Hotel of Mr. Bowman and the road was taken for Steamboat Springs at 7:45. After passing two big coal camps, Steamboat, 29 miles away, was reached at 9 p. m. The road had been good all the way from Craig, a distance of 49 miles.

Steamboat Springs, the county seat of Routt, is a beautiful place and deserves a good hotel. Its springs produce over 100 varieties of hot mineral waters and there is a good bathhouse in the town. Five miles from Steamboat on the way toward the Rabbit Ear Pass is the junction with the Yellow Jacket Road and three miles farther is the connection with the road to Oak Creek, a flourishing coal camp, a short distance southeast.

The Forest Service is building a very good road from Steamboat Springs to Rabbit Ear Pass. This road overlooks the beautiful valley of the Bear or Yampa River, which is dotted with hay, wheat and oat fields. A picture was taken from the road on the heights showing over 100 haystacks in the valley below. Each stack contains about 20 tons of hay worth \$20 per acre as it stands.

Not all of this fine road was built by the Forestry Service, for both state and county have built stretches. Forestry crews were working as the Highway Commissioner passed. The grade necessitates many sharp curves, for there is a steady rise of 3,000 feet in seven miles of the distance toward Rabbit Ear. The first frost had turned the leaves on the mountain side from green to gold and the hillside above the road was a riot of clashing color.

The Rabbit Ear Pass Highway, which is one of the most important trancontinental road links in the nation, has been built by the State of Colorado, Routt, Grand and Jackson counties and the Forest Service of

the United States, according to specifications prepared by the Government. As far as built, it is a boulevard and from a scenic standpoint is unexcelled by any other pass over the Continental Divide. It was begun in 1911 and was not completed until 1917. Present work is along lines of reducing curves and improving the roadbed. The road connects Routt with Jackson and Grand counties and furnishes direct connection with Denver by way of Kremmling and Berthoud Pass, where the main range is crossed again. Also it connects with the proposed highway system of Jackson county to Fort Collins and Loveland by way of the Poudre Canon road now under construction by the State Highway Commission. By way of Grand Lake it connects with the Fall River road to be completed next year into Rocky Mountain National Park.

Rabbit Ear Pass was reached in a 25-mile drive from Steamboat Springs in one hour and fifteen minutes. If the road were not well-nigh perfect, such time would be impossible, on account of the terrific grade. The pass is 9,400 feet in elevation and is so named on account of the peculiar double-rock formation at the top that resembles, somewhat remotely, the ears of a rabbit.

Twenty-nine miles east of Rabbit Ear is the union of the two principal roads from the East, one from Kremmling and one from Walden. The Highway Commissioner chose the latter, because it is slated for early development and is the least traveled of the two. Twenty-three miles of very indifferent road across a high park brings the traveller to Hebron, the southern terminus of the Colorado, Wyoming & Eastern Railroad, and there the Highwaymen ate luncheon of canned beans and salmon in the country store. Shortly after leaving the junction with the Kremmling road a party of campers from Denver and Iowa were met. They had come from Denver by way of Tie Siding, Wyo., and Walden.

Walden, thirteen miles north of Hebron, is the county seat of Jackson county and the metropolis of its part of Northwestern Colorado. A Federal Aid road is projected from that city to Rand, 26 miles east, and thither the roadmen wended their way. They stopped all night at Rand, having found a nice, clean little hotel, although it comprises about all there is of Rand. This is in the heart of Colorado's famous North Park hay-making country and a farm scene two miles east of Rand was photographed. At the approach to Willow Creek Pass, a picture was made in a stand of magnificent lodgepole pines. The road was good and the route is believed to be extremely feasible for a main road into the North Park.

Willow Pass, on the Continental Divide, was reached in eleven miles from Rand. This is a beautiful pass, 9,550 feet in altitude, situated 26 miles east of Granby. It is $4\frac{1}{2}$ miles from the Pass to the Gilsonite Forest Ranger Station and five miles from Milstay's Roadhouse. The Pass is in the Arapahoe National forest.

The road down Willow Creek on the east side of the divide was not so good. Eleven miles east of Rand, while threading their way down the tortuous canon, the Highways party came upon one of the Commission's Nash Quad trucks which had slipped off the road in the mud in the afternoon of the day before during a heavy rain. It was lying on its side at the foot of a bank ten feet off the road. Although the accident had occurred in Grand County, it was one of the trucks that had been apportioned to Jackson County. This road is a project slated for early development and can be made one of the best and most scenic in Colorado.

Granby, Grand County, on the Grand River, 37 miles east of Rand, was reached at noon Thursday. Instead of proceeding directly to Denver, diversion was made at this point to Grand Lake, sixteen miles northward. Grand Lake is an hour's ride over roads that are very fair. At this point begins one of the most important roads scenically in the United States—that to Rocky Mountain National Park by way of Milner Pass and Fall River. The State Highway Commission is constructing this road according to Government specifications and it was the purpose of Commissioner Ehrhart and Engineer Maloney to inspect the road already built on the West slope by contractors and to note progress made. The party left Grand Lake Thursday after luncheon and proceeded northeastward to the foot of the mountains forming the divide where the new road is being built over it. It was found to be .8 mile from the postoffice at Grand Lake to the junction of the Granby road with that to Fall River. Hardly had the latter road been entered, scarcely beyond the boundary of the village of Grand Lake, when a wild doe came out of the woods and ran in the road ahead of the automobile. Seven-tenths of a mile from the Junction a sign reads "Rocky Mountain National Park." The road into the park runs along the extreme upper reaches of the Grand River, and the snows of the Continental Divide from which Grand Lake and river are formed are here in plain view. The road from the lake to the foot of the divide, where the Highway Commission's road begins, is very bad, and here, at one of the last stages of the commonwealth-covering journey, the car lost its muffler and the nut from its grease cup on rocks which formed high road centers.

Eleven and two-tenths miles from the entrance to the park, after a road which is extremely tough, begins the work of Contractor McQueary, who is building the west half of the road across the divide in the park. "Squeaky Bob" Wheeler has a hotel at the foot of the divide, although it is as yet impossible to reach it from the east side of the range except on horseback.

The road up the west slope is remarkably fine. The view from its curves as it winds its upward way is indescribable. Bald, 14,000-foot peaks form a circle of sentinels and in the immediate foreground to the west are beaver lakes. Milner Pass, at "The Top of the World" was reached in one hour and fifty minutes from Grand

Lake, despite stops to take several photographs and the bad condition of the road from the lake to the foot of the Pass. At the top of the Pass is a beautiful pair of lakes, called Poudre Lakes, because here the Poudre river, flowing eastward through Fort Collins to the Platte and the Missouri, has its source. The travellers had left but a quarter hour before the Grand River, which later becomes the Colorado and flows westward through the Grand Canon into the Gulf of California and thus finds its way into the Pacific. Truly Milner Pass is a wonder spot, guarding, as it does, both sides of the continent.

The road from the West was completed to the Pass August 28, when the officials were there, and the start was made by Contractor McQueary for the top of a ridge almost 1,000 feet higher over which the Government has specified the state must build the road. The road will traverse the top of the ridge 12,200 feet high for three miles and will afford to motorists a view which will be unbeatable.

There remains a stretch of eight miles of road to be built to connect up the work on the Western slope with that of Contractor Jacobson on the East side. There are one and one-fourth miles of West slope road blocked out and almost graded. Five and one-half miles had been built and carved out of the granite mountainside when the officials called on the contractor August 28. Labor has been scarce and hard to keep contented on the mountainside and the contractors have had many difficulties.

Contractor McQueary, working for the commission on force account, had been called to Granby because one of his drivers was accused of having taken a sack of peanuts from a railroad car. Uncle Sam demanded a bond of \$500 for the man. Almost a day of the contractor's time, including the hard trip to Granby, was required to save this man, who was badly needed on the road job. Another laborer had forged his companion's name to a check for \$50 and "beat it." Men are paid \$5 per day and are given their board for \$1.50.

Contractor McQueary figured that he would have the way cleared to the summit of the ridge by September 20. Then the snow will not lie so long next spring and work can be pushed much more rapidly than if such clearing were not done.

TNT, that marvelous explosive which cut so large a figure in the late war, has been of great assistance in the heavy work on the West slope of the road from Grand Lake through Rocky Mountain Park. The largest rocks are blown to atoms and pine stumps two feet in diameter are blown high in the air. One stump which was looser than it appeared to be, was blown across the canon, a distance of 1,000 feet, to the camp commissary and alighted at the door of Timekeeper W. H. Pigg's tent. Fortunately it injured no one. The TNT is being used economically, now that the road foremen have become used to it and they say they would dislike very much to have to return to dynamite.

Large culverts are being put under the road from Milner Pass to the ridge, for this section of the highway has proved very wet, due to snows above, which melt all summer.

Hotels will be badly needed at both Grand Lake and Granby with the completion of the road from Rocky Mountain National Park to Grand Lake, which will be some time in 1920. This is already the most popular of national parks, although it was opened as recently as 1915. It now has more visitors annually than both the next most popular parks, Yosemite and Yellowstone, which have been open for years, combined. When it becomes possible to motor from Denver to Estes and Rocky Mountain Parks and thence to Grand Lake by the new road, returning to Denver by way of Grand Lake, Granby and Berthoud, thus making a circle mountain trip as yet without a peer in the United States, the automobile passenger traffic over the route will be nothing short of tremendous. As yet, hotel accommodations are lacking, despite the fact that Grand Lake itself is one of the most beautiful spots imaginable.

It is twelve miles from Granby to Tabernash up the Fraser river and four miles farther to Fraser. At Fraser the Highway Commission's car completed its 10,000th mile since its purchase in February. Vasquez is five miles farther east of Fraser and the foot of Berthoud Pass is another five miles beyond Vasquez. Looking down on the motorist who travels this route are some of the finest peaks of the Rockies, ranging from 13,500 to 14,000 feet in height and all exhibiting some snow even at the last of August. The date of this visit was August 29.

The motorists arrived at the summit of Berthoud Pass at 1:20 p. m., having made the climb over the old road with ease. The road is easily traversible and many automobiles were on the route that morning. A new survey has been made, however, on either side of the pass, which will eliminate many curves and some of the steeper grades. The Highway Commission purposes building this road in 1920.

Berthoud Pass will probably be in time the principal crossing point of the Continental Divide from East to West in the entire United States. It is but a few feet below timberline, which fringe of tree growth is easily discernible on fifty peaks and a dozen ranges on all sides. It is the boundary between the Pike and the Arapahoe National Forests and between Grand and Clear Creek counties. It is 57 miles west of Denver and nine miles west of Empire, the nearest town, 13 miles east of Fraser and 36 miles east of Hot Sulphur Springs. There is a picturesque place to camp on the top of the pass and there were motorists, bound in either direction from all points of the compass, assembled for luncheon.

From Berthoud the road down the Atlantic side of the divide runs along Clear Creek, and there is a survey for a new road from Berthoud to connection with the

present road to Empire to be built next year. Four miles east of Berthoud and 55 miles west of Denver this road, a mile of which has already been built by the Forest Service, leaves the present road and starts for the summit along a much easier grade than that of the present road.

To Idaho Springs, 20 miles east of Berthoud Pass, the road is very fair. Five miles farther east is the foot of Floyd Hill, up which eminence has been built one of the best roads in the state, with the Highway Commission and Clear Creek county co-operating. Three-fourths of a mile from the foot of the hill is a concrete safety wall, protecting the road on a hairpin curve. Between the top of the hill and Bergen Park, the State Highway Commission was working a big crew of men and teams in widening and surfacing this important road. Superintending the work is "Cement Bill" Williams, who gained fame as the builder of the road from Golden to Denver's Mountain Parks. He declared that the new road, which is 24 feet wide, will be better than the Lookout Mountain road, for it is being better surfaced. The road is well drained by new culverts and is in perfect shape.

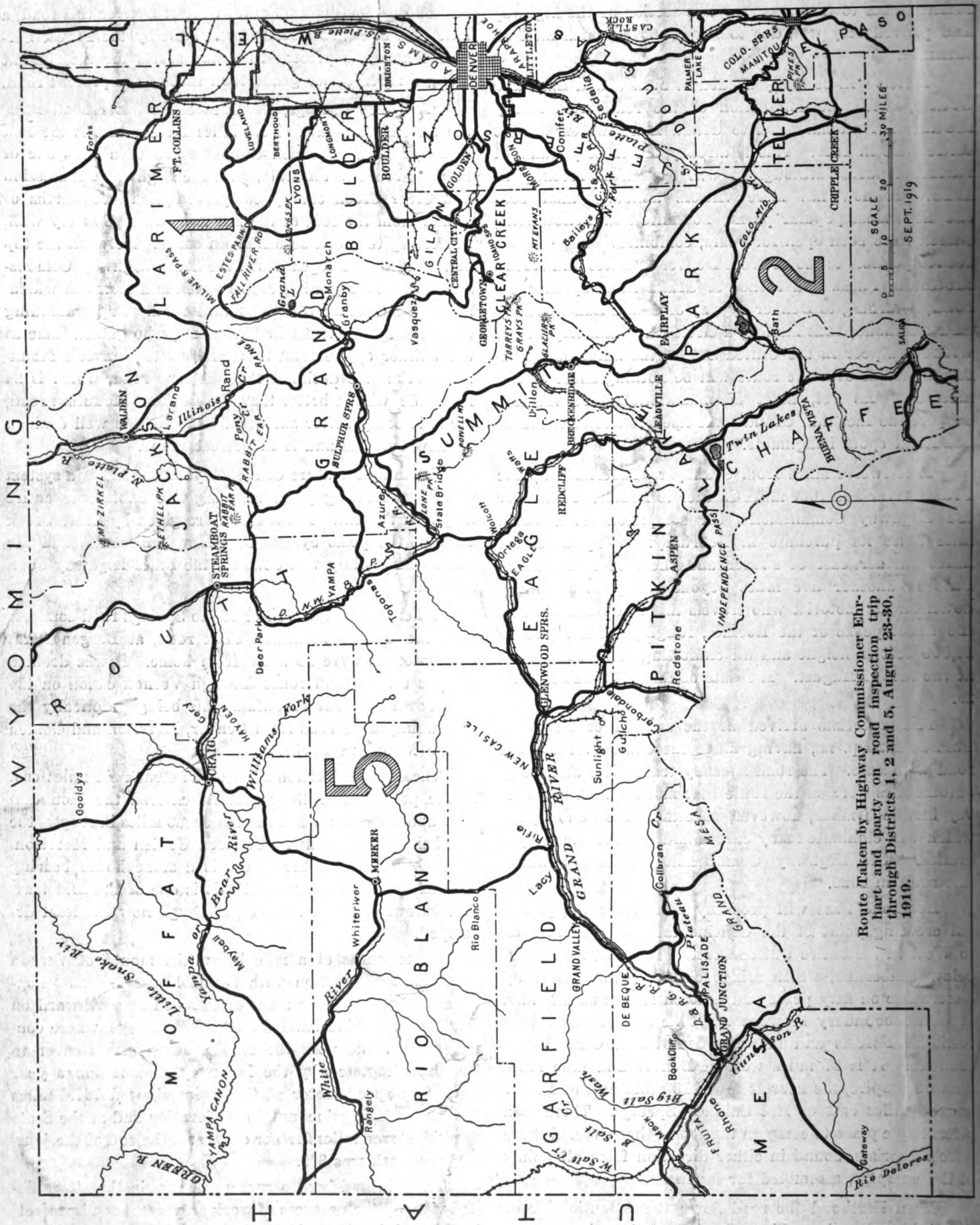
An unique feature of the Floyd Hill road is a system of new protecting posts carrying two cables the entire length of the hill. The cables were given by Clear Creek County, the posts by the City Mountain Parks and the work of installing was done by the State Highway Commission.

Where the Floyd Hill or Idaho Springs road connects with the Denver Mountain Park road, at Bergen Park, the motorists were 25 miles from home. It was decided to take the unusual route through Vernon canon on the way down Lookout Mountain, this being practically the only unimproved road from Denver, Morrison and Golden to the Mountain Parks.

The head of Vernon Canon was struck six miles east of the point where the motorists entered the Mountain park and the canon was found to be 4.3 miles in length, the foot being about midway between Golden and Morrison. Near the mouth of the canon is a stone house bearing date of 1860, indicating that this is one of the first traveled gateways to the Rockies, although now the least developed.

Three-tenths of a mile below the mouth of Vernon Canon is the junction with the Golden-Morrison "hog-back" road, and three miles and six-tenths northward on that road is the National Guard's Rifle Range, where connection is made with the cement road from Denver to Golden, completed by the Highway Commission a year ago. The speedometer at this point showed 797.4 miles for the seven days' mountain exploration and at the State Capitol, eleven miles farther eastward, the end of the journey, the mark was 808.

The trip had been a successful one, in that it exhibited visually the progress of work on present road project in Colorado's mountains and the need of new roads and of improvements on those already built.



Route Taken by Highway Commissioner Ehrhart and party on road inspection trip through Districts 1, 2 and 5, August 23-30, 1919.

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COLORADO HIGHWAYS BULLETIN ~

November, 1919

War Department May Aid
State's Federal Aid Projects
Two Roads Completed
California's Bond Issue
The Durango-Silverton Road
Empire State's Experience
Roads Encourage Farmers
Engineer's Report
The Finance Problem

Issued by the
State Highway Department

COLORADO HIGHWAY OFFICIALS

STATE HIGHWAY COMMISSION

ELMER E. SOMMERS, Chairman, District No. 1, Denver.

FRED J. RADFORD, District No. 3, Trinidad.

FREDERICK GOBLE, Vice-Chairman, District No. 4, Silverton.

E. E. NICHOLS, District No. 2, Manitou.

ROBERT E. NORVELL, District No. 5, Hayden.

N. A. BALLOU, Secretary.

ROBERT H. HIGGINS, Federal Aid Deputy.

T. J. EHRHART, Commissioner.

J. E. MALONEY, Chief Engineer.

COUNTY AND DENVER ROAD OFFICIALS

NOTE—In the appended list of county officials the first name in each county is that of the county clerk, the second name is that of the county surveyor, and the last three names are those of county commissioners.

ADAMS—Fred O. Pearce, Brighton; Peter O'Brian, Brighton; Peter Oleson, Westminster; H. G. Tiffany, Denver; Harry C. Flanders, Bennett.

ALAMOSA—Robert Ginn, Alamosa; Chas. M. Johnston, Alamosa; A. E. Headlee, Monte Vista; Cris Wallrich, Alamosa; D. W. Kirkpatrick, Alamosa.

ARAPAHOE—Harry C. Curtis, Littleton; A. F. Goddard, Littleton; Theodore Taylor, Englewood; D. J. Crockett, Littleton; Ernest Quick, Aurora.

ARCHULETA—Eleanor H. Todd, Pagosa Springs; R. A. Howe, Pagosa Springs; Fred Catchpole, Pagosa Springs; David Hersch, Pagosa Springs; Grant Shahan, Chromo.

BACA—Chas. E. Howell, Springfield; J. H. D. Terral, Springfield; Geo. W. Elley, Stonington; Jas. A. Stinson, Springfield; Onda Young, Two Buttes.

BENT—J. W. Nelson, Las Animas; C. W. Beach, Las Animas; B. T. McClave, McClave; D. E. Heizer, Las Animas; Levi Dumbauld, Las Animas.

BOULDER—Francis Beckwith, Boulder; Arthur J. Boase, Boulder; S. A. Greenwood, Boulder; H. E. Miller, Longmont & Boulder; Guy Miller, Boulder & Nederland.

CHAFFEE—F. A. Bromley, Buena Vista; Howard Sneddon, Salida; O. S. Mason, Buena Vista; J. I. Glenn, Salida; W. L. Philborn, Salida.

CHEYENNE—E. H. Akerly, Cheyenne Wells; D. H. Zuck, Cheyenne Wells; Walter Ramsay, Kit Carson; Anton I. Johnson, Wild Horse; J. W. Shy, Cheyenne Wells.

CLEAR CREEK—Benj. A. Holley, Idaho Springs; C. D. McFadden, Georgetown; W. C. Ives, Idaho Springs; T. W. Cunningham, Georgetown; Jno. Green, Idaho Springs.

CONEJOS—Bonifacio Gonzales, Magote; Frank E. Thomas, Manassa; W. F. McClure, Antonito; Frank Russell, La Jara; J. C. Cantu, Manassa.

COSTILLA—Amos P. Rodriguez, San Luis; A. H. Martin, San Luis; S. N. Smith, San Luis; T. Manchego, Garcia; W. R. Morris, Ft. Garland.

CROWLEY—J. E. Downey, Ordway; L. W. Walter, Ordway; Wm. Broadbent, Ordway; Frank McNary, Sugar City; J. H. Cowden, Olney Springs.

CUSTER—L. H. Schoolfield, Westcliffe; August Koppe, Silver Cliff; Harry Kettle, Westcliffe; Chas. A. Barton, Wetmore; F. S. Canda, Westcliffe.

DELTA—H. K. Gibbs, Delta; Oliver B. Cook, Delta; J. E. Beckley, Delta; Thomas J. Harshman, Cory; Charles T. Rule, Paonia.

DENVER—J. A. Burnett, Mgr. Improvements and Parks; F. J. Altwater, Highway Commissioner; J. B. Hunter, Engineer.

DOLORES—Thos. C. Young, Rico; A. E. Arms, Rico; G. L. Garren, Rico; Chas. Engel, Rico; R. Bradfield, Lewis.

DOUGLAS—Harry Jones, Castle Rock; D. N. Stewart, Castle Rock; S. H. Stream, Sedalla; Ed. G. Seldensticker, Castle Rock; Jas. P. McInroy, Larkspur.

EAGLE—Mrs. Ora R. Kelly, Red Cliff; W. H. Lea, Gypsum; M. A. Walsh, Red Cliff; T. J. Dice, Eagle; Andrew Oleson, Gypsum.

ELBERT—Frank D. Hart, Kiowa; C. A. Mathews, Elbert; C. A. Huff, Simla; Fred L. Albin, Kiowa; Wm. J. Park, Kutch.

EL PASO—E. A. Jackson, Colorado Springs; C. O. Ford, Colorado Springs; J. W. Potter, Fountain; Harry A. Scholton, Colorado Springs; J. B. Fowler, Colorado Springs.

FREMONT—Jonathan Seaman, Canon City; James Buntin, Canon City; J. V. McCandless, Florence; G. V. Hodgins, Canon City; Jas. Belknap, Hillside.

MONTEZUMA—Samuel M. Burke, Cortez; Geo. Mills, Mancos; R. B. Dunham, Dolores; Chas. B. Kelly, Mancos; W. I. Myler, Dolores.

MONTRÖSE—T. W. Monell, Montrose; W. H. Fleming, Montrose; John W. Lamb, Montrose; Howard P. Steele, Montrose; Cory S. Heath, Montrose.

MORGAN—A. H. Asmus, Ft. Morgan; J. A. Gilbertson, Brush; Jas. Hurley, Ft. Morgan; J. K. Samples, Brush; J. H. Osborn, Wiggins.

OTERO—Oran Walker, La Junta; Mark Denson, Rocky Ford; W. F. Green, Rocky Ford; J. N. Johnston, Manzanola; Geo. Barr, La Junta.

OURAY—R. Whinnerah, Ouray; J. H. Doran, Ouray; W. S. Rose, Ridgway; Geo. B. Croft, Ouray.

PARK—Harry L. Moyer, Fairplay; W. H. Powless, Alma; G. S. Singleton, Shawnee; J. F. Rhodes, Fairplay; J. Tol. Witchee, Howbert.

PHILLIPS—Geo. L. Coleman, Holyoke; C. A. Guernsey, Holyoke; Fred D. Hotaling, Holyoke; Albin Johnson, Haxtun; Lyman Foster, Holyoke.

PITKIN—Mary E. Mellor, Aspen; Chas. S. Armstrong, Aspen; B. M. Strawbridge, Aspen; E. J. Grover, Aspen; J. J. Gerbaz, Aspen.

PROWERS—L. M. Markham, Lamar; F. W. Smith, Holly; Fred Williams, Wiley; J. B. Rhodes, Granada; A. P. Knuckey, Holly.

PUEBLO—Wm. Barber, Pueblo; C. A. Reese, Pueblo; Geo. Herrington, Pueblo; J. M. Sare, Pueblo; J. C. Harbour, Pueblo.

RIO BLANCO—C. J. Wilson, Meeker; D. Kirk Shaw, Meeker; Fred A. Nichols, Meeker; J. A. Bills, Meeker; H. S. Harp, Meeker.

RIO GRANDE—H. G. Trapp, Del Norte; W. W. Reilly, Monte Vista; August J. Weiss, Del Norte; W. W. Wright, Monte Vista; M. S. Woods, Monte Vista.

ROUTT—J. D. Crawford, Steamboat Springs; C. W. Harkness, Hayden; Claude J. Smith, Clark; Wm. Scheer, Oak Creek; Henry J. Summer, Hayden.

SAGUACHE—Birt Clare, Saguache; A. H. Smith, Saguache; Geo. Woodard, Saguache; A. V. Shippey, Villa Grove; Adam Deltrich, Center.

SAN JUAN—C. E. Dresback, Silverton; A. W. Harrison, Silverton; Gail Munyon, Silverton; J. Ernest Shaw, Silverton; Edward Meyer, Silverton.

SAN MIGUEL—Lillian C. Kenyon, Telluride; Ben W. Purdy, Telluride; T. B. McMahon, Telluride; A. T. Woods, Placerville; J. R. Galloway, Norwood.

SEDGWICK—Nellie E. Nichols, Sedgwick; E. C. Hamilton, Sedgwick; H. H. Hodges, Julesburg; Frank Nagel, Julesburg; J. G. Mowbray, Sedgwick.

SUMMIT—Geo. F. Forman, Breckenridge; James D. Galloway, Breckenridge; A. Lindstrom, Dillon; W. H. Hampton, Frawley; Eli Fletcher, Breckenridge.

TELLER—J. H. White, Victor; E. P. Arthur, Jr., Cripple Creek; T. J. Wicks, Cripple Creek; Tom Foster, Woodland Park; I. N. Riley, Victor.

WASHINGTON—L. Roy Cummings, Akron; Elbert Lewis, Akron; Homer Evans, Akron; R. M. Buckmaster, Abbott; E. A. Lewis, Burdett.

WELD—Jas E. Littell, Greeley; L. L. Stimson, Greeley; A. F. Peters, Mead; T. Elmer Rowe, Greeley; J. W. Birkle, Platteville.

YUMA—John Adeock, Wray; A. C. Cary, Wray; Harry F. Strangways, Wray; H. W. Jackson, Yuma; Alex. Shaw, Wray.

GARFIELD—Carleton L. Hubbard, Glenwood Springs; P. C. Thurmond, Glenwood Springs; L. F. Grace, Glenwood Springs; R. P. Coulter, New Castle; Geo. Newton, De Beque.

GILPIN—Frank G. Moody, Central City; S. A. Rank, Central City; Joseph Borzago, Black Hawk; Neil McKay, Central City; R. I. Hughes, Russell Gulch.

GRAND—H. J. Harrison, Hot Sulphur Springs; F. I. Huntington, Hot Sulphur Springs; Simon Olson, Parshall; J. H. Cather, Kremmling; J. B. Stevens, Fraser.

GUNNISON—C. C. McWilliams, Gunnison; J. H. Robinson, Gunnison; W. H. Whalen, Crested Butte; Geo. L. Miller, Gunnison; C. L. McDonald, Gunnison.

HINSDALE—L. E. Shull, Lake City; E. L. Defenbaugh, Lake City; Jno. C. Gavin, Lake City; E. W. Wiley, Lake City; E. W. Soderholm, Lake City.

HUERFANO—J. G. Archuleta, Red Wing; J. O. Francisco, La Veta; Walter Hamilton, La Veta; J. T. Trujillo, Red Wing; Chas. E. Furphy, Walsenburg.

JACKSON—E. N. Butler, Walden; M. C. Ward, Walden; A. J. Monroe, Walden; W. G. Mellen, Coalmont; Chas. L. P. Winscom, Walden.

JEFFERSON—Frank N. Felch, Golden; Chester A. Lytle, Critchell; J. R. Cruse, Mt. Morrison; Gus A. Johnson, Golden; R. L. Downes, Evergreen.

KIOWA—Ed. M. Low, Eads; C. E. Bell, Eads; C. C. Wolever, Eads; Wurt Bailey, Townier; Ed. Houston, Arlington.

KIT CARSON—Miss Clio S. Judy, Burlington; D. D. Buck, Flagler; I. D. Messinger, Stratton; A. L. Anderson, Burlington; J. O. Hendricks, Seibert.

LAKE—John Gregory, Leadville; Fred J. McNair, Leadville; B. H. Martin, Leadville; Dan Colahan, Leadville; Geo. Bennett, Leadville.

LA PLATA—Helen Galloway, Durango; W. H. Wigglesworth, Durango; Ole M. Lee, Durango; Geo. Olbert, Oxford; Jacob Fritz, Durango.

LARIMER—G. R. Cushing, Ft. Collins; James G. Edwards, Ft. Collins; J. M. Graham, Loveland; Harris Akin, Ft. Collins; C. M. Garrett, Laporte.

LAS ANIMAS—Juan B. Romero, Trinidad; Hal Barnes, Trinidad; A. G. Prosser, Trinidad; J. J. Cordova, Aguilar; Robert C. Scott, Trinidad.

LINCOLN—Henry A. Johnson, Genoa; J. W. Pershing, Limon; Alex McCallum, Arriba; W. M. Smith, Rush; Ed. Riekenberg, Hugo.

LOGAN—Mabel E. Whiteley, Sterling; John W. Black, Sterling; Arthur W. Hand, Sterling; C. M. Morris, Fleming; W. E. Henning, Peetz.

MESA—Chas. S. Jones, Grand Junction; Frank R. Hall, Grand Junction; Gus J. Johnson, Grand Junction; Geo. M. Masters, Mesa; D. Gover Rice, Grand Junction.

MINERAL—Wm. G. Messenger, Creede; S. B. Collins, Creede; Chas. H. Lees, Creede; James Seward, Creede; A. M. Collins, Creede.

MOFFAT—Mrs. L. O. Haughey, Craig; W. P. Finley, Craig; Thomas A. Forkner, Craig; R. S. Hamilton, Hamilton; R. B. Overholt, Maybell.



Road over Willow Pass through Lodge Pole Pines, standing straight and fine.

CONTENTS

War Department May Aid.....	5
State's Federal Aid Projects.....	8
The Durango-Silverton Road.....	10
Empire State's Experience.....	11
Roads Encourage Farmers.....	14
Engineer's Report	15
The Finance Problem.....	16
Two Roads Completed.....	18
California's Bond Issue.....	19

COLORADO HIGHWAYS BULLETIN

Published Monthly
by the



Colorado Highway
Department

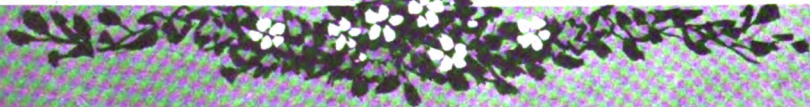
Denver, Colorado.

With the approval of the Colorado State Auditing Board.

Address all communications to Colorado Highway Department, attention J. G. Hilliard, editor, Colorado Highways Bulletin.

Owing to the necessarily limited edition of this publication it will be impossible to distribute it free to any persons or institutions other than state and county officials actually engaged in the planning or construction of highways, instructors in highway engineering, newspapers and periodicals and civic associations. Others desiring to obtain Colorado Highways can do so by sending 10 cents for each number desired. Associations desiring to distribute the magazine can obtain it at cost in lots of from 500 copies up.

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Ferns and Quaken Aspen Furnish Delightful Fall Scenery on Rabbit Ear Pass, Just off Main Transcontinental Road.

At a conference of military and Highway Commissioners held in Denver, June 18, 1917, State Highway Commissioner Ehrhart presented some concise arguments in favor of the construction of a National highway from the Canadian boundary to the Mexican border through Montana, Wyoming, Colorado and New Mexico, having in mind military necessity as well as tourist and commercial possibilities. The facts as presented at that time are still pertinent.

Such a highway as that outlined by the commissioner would begin at the north about half way between the Great Lakes and the Pacific Coast on the Canadian boundary and terminate at Fort Bliss, Texas. It would connect with very necessary military roads leading west to the Pacific and Southeast along the Rio Grande on our Mexican border. The location is ideal, for the entire route would be through a high, dry, healthful climate, with convenient deposits of natural road-building material. Such a road as the one proposed by Commissioner Ehrhart would be 1,696 miles long. If constructed of concrete twenty feet wide it would cost only about as much as two modern battleships and a cruiser or a few days of modern warfare.

The European war taught that good roads, capable of carrying the modern implements of battle are an absolute necessity—as much as the daily ration of an army. There are a number of military forts and reservations of importance near the proposed highway, as Fort D. A. Russell, Cheyenne, Wyo., and Fort Logan, Denver. Along the route is every facility for service by rail. Immense oil production in Colorado, Wyoming and in Texas closely adjacent to New Mexico; vast coal deposits, unlimited hydraulic power; millions of barrels of cement produced annually, two large powder manufactories and one of the largest steel plants in America (at Pueblo) are other features of this proposed line.

The road traverses the very center of the meat-producing section of the United States and lies at the immediate back-door of the granaries of the country. Some of the products are (average annual production):

Oats—45,000,000 bushels.
 Corn—13,000,000 bushels.
 Wheat—39,000,000 bushels.
 Barley—9,000,000 bushels.
 Hay and forage crops—7,000,000 tons.
 Horses—1,250,000 head.
 Dairy Cows—500,000 head.
 Sheep—13,250,000 head.
 Wool—94,500,000 pounds.
 Sugar—580,000,000 pounds.
 Coal—25,000,000 tons.
 Iron—800,000 tons.
 Copper—440,000,000 pounds.
 Lead—94,000,000 pounds.
 Zinc—393,000,000 pounds.
 Tungsten—5,000,000 pounds.
 Silver—24,000,000 ounces.
 Gold—25,000,000 dollars.

Oil—8,000,000 barrels.

Cement—1,600,000 barrels.

The proposed highway would be intersected by the Great Northern and the Chicago & Milwaukee Railways in Montana; the Union Pacific and Burlington Railroads in Wyoming; the Union Pacific, Burlington, Colorado & Southern, the Rock Island and the Santa Fe lines in Colorado; and the Southern Pacific, Rock Island and Santa Fe in New Mexico. It is crossed by the Lincoln Highway, the Midland Trail, the Ocean-to-Ocean Pike's Peak Route, the Santa Fe Trail, and other transcontinental motor routes.

From a commercial point of view the improvement of the proposed highway would be of great importance in the development of local communities along its entire length; as a tourist highway it would make the byways into the Rocky Mountains easily available from the Canadian border to the Rio Grande; and as a National road for military maneuvering and training, and in case the necessity should arise in connection with serious border troubles, it would be invaluable to the Nation.

At Denver is located a United States Mint, said to contain more gold and silver than any one building in the world, which should be guarded and made easily defensible by a concrete road between the city limits of Denver and Fort Logan.

This proposed highway ought to be made a national military road, and its substantial reconstruction begun at once. If every youth between the ages of 16 and 21 in the lowlands of the United States could be sent to the foothills of the Rocky Mountains for training in military duties, self-care and self-reliance, for a period of six months of each of three years, the improvement to the health, morals and physical being of these boys would be of incalculable worth to the Nation.

There is produced in the States along this route the highest quality and type of animal life, with exceptional bone, lung power and stamina. The reason for this is the nutritious elements in the native vegetation, purity of water and atmosphere. The Government owns 46,000,000 acres in the National Forest Reserves of these four states, easily accessible for camping and field maneuvering. Government horse breeding stations for cavalry and artillery purposes might be established throughout this territory, utilizing portions of these great pastures.

There are in these States 86,424,723 acres of public lands, subject to entry, as follows:

Montana—16,649,725 acres.

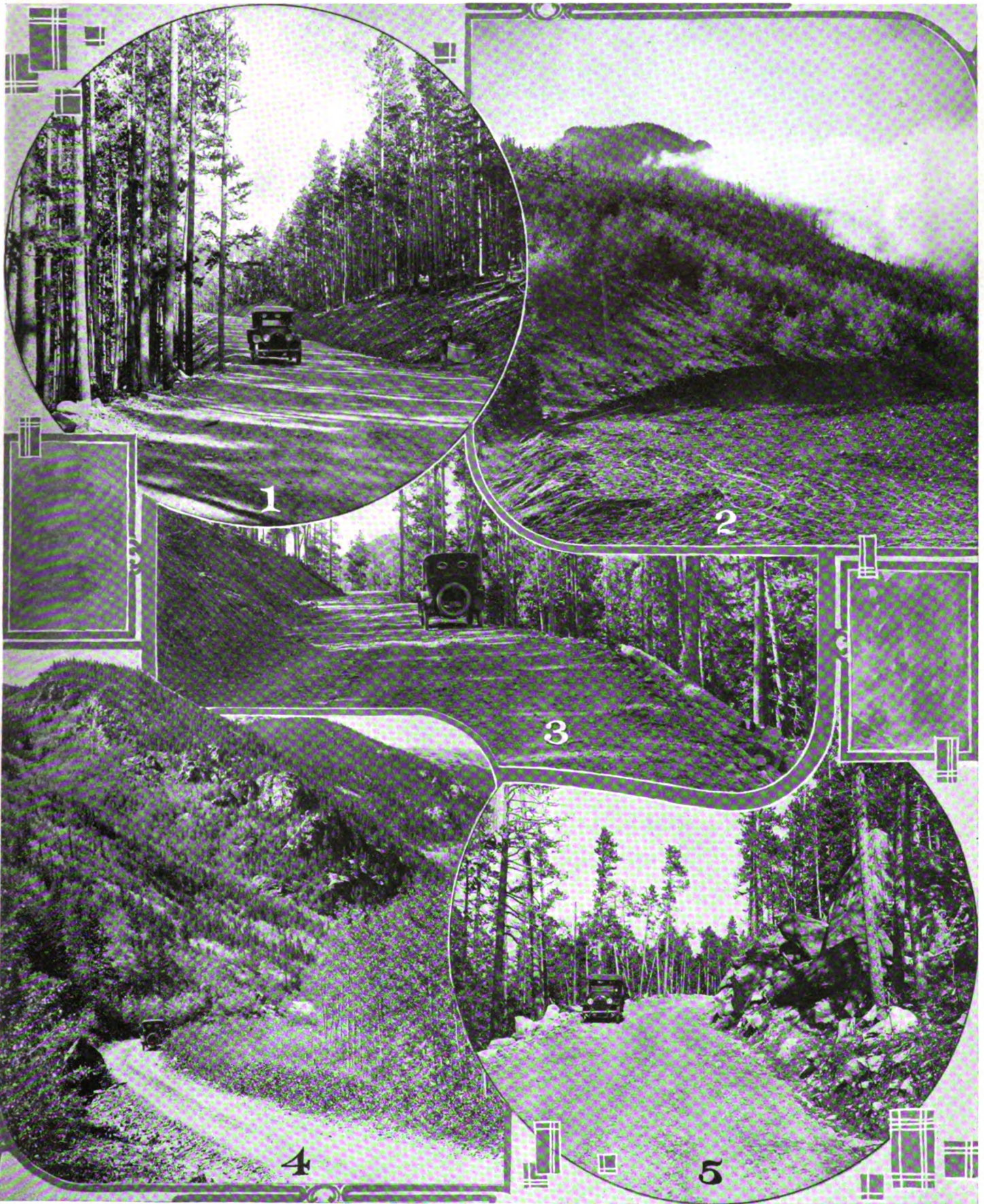
Wyoming—28,528,492 acres.

Colorado—14,908,126 acres.

New Mexico—26,338,379 acres.

Many thousands of acres are being brought under cultivation each year, adding largely to the production of wheat and forage crops.

The permanent improvement of this road will induce the settlement of millions of these acres, increasing the agricultural production proportionately, adding to the Nation's wealth and resources.



Scenes on new Government, State and City road being built from Denver to Mt. Evans. 1. Lodge Pole Pines near end of City's part of the road. 2. Where U. S. Forestry crews took up the work Oct. 15. 3. A cut through the mountain side. 4. Old road over Soda Pass to Idaho Springs, near Squaw Mountain. 5. Romantic, rocky and 9,000 feet.

State's 117 Federal Projects in Detail

Data Has Been Compiled to Show Large Amount of Work Being Done or Planned by Colorado in Connection with Bureau of Roads of National Government. Special State Projects and State's Proportion of Forestry Projects are Also Given, Making Formidable Showing.

THERE is published herewith a compilation of Federal Aid Projects as approved to date in Colorado by State and National government and also the Special State projects, much fewer in number. At the end of the table is given in addition the state's proportion of Forestry projects. This is the first publication in detail of the 117 Federal Aid projects in Colorado, and includes,

starting with the first column, the number of the State District in which the road is located, the project number as assigned by the State Highway Commission and the Federal Bureau of public roads, its number as a state road, the kind of improvement to be done, length of the road in miles, the county in which it is located, towns between which it runs and the total cost or estimate.

IMPROVEMENT				LOCATION		Total Cost or Estimate	
Dist. No.	Proj. No.	State Road	Kind	Length	County		Between
1	1	3	Concrete ..	3.95 Mi.	Arapahoe	Denver and Littleton	\$ 82,860.61
3	2	26	Grading Draining Surfacing	64	Mi. Huerfano,		
2	3	17	Grading Draining ..	10	Mi. Las Animas	South Line of Pueblo Co. to New Mex. State Line	550,000.00
5	4	42	G-D-S	21	Mi. Chaffee, Lake	Granite-Twin Falls	62,614.42
4	5	44	G-D	15,770	Ft. Rio Blanco	Rifle-Meeker. (See Addl. Proj. No. 76.)	106,507.72
3	6	34	G-D-S	3.08	Mi. San Miguel	Placerville-Norwood, Ends Specie Creek	Void
4	7	20	G-D-S	3	Mi. Prowers	Lamar South	24,689.71
5	8	42	G-D	17.5	Mi. Montrose	Norwood-Naturita-Paradox, Norwood and Dry Creek	30,879.10
1	9	51	G-D-S	20	Mi. Rio Blanco	Meeker-Craig	10,958.20
1	10	49	Concrete ..	1.8	Mi. Larimer	Big Thompson-Estes Park	120,000.00
1	11	6-S	G-D	15	Mi. Adams	Brighton Road	43,000.00
1	12	49	Concrete ..	1	Mi. Yuma	Wray to Idalia	42,000.00
1	13		Concrete ..	½	Mi. Weld	Greeley, 1 Mi. South	21,000.00
1	14	2	Concrete ..	½	Mi. Boulder	Boulder, East ½ Mi. (See Project No. 37.)	10,500.00
1	15	9	Concrete ..	½	Mi. Boulder	Longmont, South ½ Mi. (See also Proj. No. 36.)	10,500.00
1	16	24	Concrete ..	½	Mi. Logan	Sterling, South ½ Mi.	11,000.00
2	17	Or 9	G-D	3	Mi. Morgan	Ft. Morgan to Brush. (See Project No. 38.)	11,000.00
3	18	5	Concrete ..	2	Mi. El Paso	Colorado Springs, North (Near Hilsted)	31,500.00
3	19	34	G-D	30	Mi. Pueblo	Pueblo to Roselawn	60,000.00
3	20	34	G-D	15	Mi. Prowers	Lamar, South to Baca County Line	12,000.00
3	21	5	Concrete ..	½	Mi. Baca	Springfield, North to Prowers County Line	6,000.00
3	22	5	Concrete ..	½	Mi. Otero	Rocky Ford, East ½ Mi.	11,000.00
4	23	12	Concrete ..	½	Mi. Otero	La Junta, West ½ Mi.	11,000.00
4	24	19	G-D	17	Mi. Delta	Delta, South ½ Mi.	11,000.00
4	25	12	Concrete ..	½	Mi. Costilla	Ft. Garland-San Luis. (See also Proj. No. 64.)	10,200.00
4	26	G	.....	1½	Mi. Montrose	Montrose, North ½ Mi.	11,000.00
5	27	11	Concrete ..	½	Mi. Ouray	Ouray to Red Mountain on New Location. (See also Project No. 65.)	18,000.00
5	28		G-D	3½	Mi. Mesa	Grand Junction, East ½ Mi.	11,000.00
1	29	35	G-D	15	Mi. Summit	Grading and Draining	13,000.00
1	30	27	Concrete ..	3	Mi. Jefferson	Morrison to Baileys via Conifer Jct.-Turkey Creek	60,000.00
1	31	7	Concrete ..	2	Mi. Jefferson	Denver-Morrison Road	75,000.00
1	32	49	Concrete ..	10	Mi. Adams, Arapahoe	Denver to Hospital 21, 2 Mi.	44,000.00
1	33	2	Concrete ..	3	Mi. Adams	Denver-Brighton Road	230,000.00
1	34	24	Concrete ..	3	Mi. Larimer	Ft. Collins, South 3 Mi.	75,000.00
1	35	49	Concrete ..	2	Mi. Weld	Greeley, North 1 Mi., East 1 Mi., South 1 Mi.	75,000.00
1	36	2	Concrete ..	2	Mi. Weld	Platteville, South 2 Mi.	50,000.00
1	37		Concrete ..	2	Mi. Boulder	Longmont, South 2 Mi. (See Project No. 14.)	45,000.00
1	38	24	Concrete ..	2	Mi. Boulder	Boulder, East 2 Mi. (See Project No. 13.)	45,000.00
1	39	19	G-D-S	15	Mi. Morgan	Ft. Morgan-Brush Road. (See Project No. 16.)	45,000.00
1	40	19	G-D	10	Mi. Washington, Morgan	Akron-Brush Road	48,000.00
1	41	9	Bridge	Bridge	Mi. Yuma	Wray-Schram Road	30,000.00
2	42	1-S	G-D	48	Mi. Logan	Sterling-Merino Road	70,000.00
2	43	6-S	G-d	10	Mi. Douglas 3/7..	Cherry Creek to Colorado Springs Junction	35,000.00
2	44	6-S	G-D	10	Mi. El Paso	(Kit Carson) Burlington, North 10 Mi.)	29,000.00
2	45	6-S	G-D	10	Mi. (Kit Carson)	Burlington, North 10 Mi.)	10,000.00
2	46	30	G-D	10	Mi. (Kit Carson)	Burlington, North 10 Mi.)	5,000.00
2	47	22	G-D	6	Mi. Lincoln	Limon, East 10 Mi.	15,000.00
2	48	8	G-D	6	Mi. El Paso	Colorado Springs-Canon City, Dead Man's Canon Road	40,000.00
2	49	18	G-D	1	Mi. El Paso	Colorado Springs to Palmer Lake	30,000.00
					Mi. El Paso	Colorado Springs to Cripple Creek, Cheyenne Canon Road	20,000.00

2	50	8	G-D	20	Mi.	Elbert	Castle Rock to River Bend	50,000.00
2	51	32	G-D	10	Mi.	Cheyenne	Cheyenne Wells, North or West	25,000.00
2	52	18	G-D	10	Mi.	Teller	Woodland Park to Cripple Creek	25,000.00
2	53	17	G-D	26	Mi.	Chaffee	Buena Vista to Salida	75,000.00
2	54	18	G-D	12	Mi.	Chaffee	Buena Vista to Divide	40,000.00
2	55		G-D	10	Mi.	El Paso	Peyton to Ramah	17,000.00
2	56	18-S	G-D	5	Mi.	El Paso ½	Lincoln ½ Farmers Highway, Colorado Springs to Boyeno	15,000.00
3	57	5	Concrete	2	Mi.	Prowers	Lamar, North to 4 Corners	44,000.00
		34	G-D	2	Mi.	Baca	On State Road 34	6,000.00
3	59	5	G-D-S	10	Mi.	Bent	Las Animas, East	35,000.00
3	60	5	Concrete	½	Mi.	Otero	La Junta, West ½ Mi. (See Project No. 22.)	11,000.00
3	61	5	Concrete	½	Mi.	Otero	Rocky Ford, East ½ Mi. (See Project No. 21)	11,000.00
3	62	5	Concrete	1	Mi.	Otero	Manzanola, 1 Mi.	23,600.00
3	63	5	Concrete	1	Mi.	Otero	Tower, East 1 Mi.	24,000.00
4	64	19	G-D	9	Mi.	Costilla	Fort Garland to San Luis, Extension of Project No. 24	30,000.00
4	65	13	G-D	1½	Mi.	Ouray	Silverton-Ouray Road. (Addl. to Project No. 26.)	30,000.00
4	66	44	G-D	10	Mi.	Montrose	San Miguel Top of Norwood Hill to Connection with No. 7 Federal Aid Project	50,000.00
4	67	45	G-D	4	Mi.	Dolores	Rico, North	20,000.00
4	68	36	G-D	12	Mi.	Río Grande, Saguache	Monte Vista-Saguache Road	25,000.00
4	69	12	G-D	7	Mi.	Delta	Delta to Montrose	21,000.00
		& 13		10	Mi.	Montrose	To Ouray County Line	19,000.00
4	70	46	G-D	10	Mi.	Delta	Delta-Hotchkiss Road	30,000.00
4	71	14	G-D	6	Mi.	La Plata	Durango-Mancos Road	40,000.00
4	72	15	G-D	6	Mi.	La Plata	Bayfield-Dyke Road	27,000.00
5	73	43	G-D	6	Mi.	Archuleta	Walden to Rand Road	30,000.00
5	74	41	G-D	10	Mi.	Jackson	Craig, West to Maybell	75,000.00
5	75	57	G-D	30	Mi.	Moffat	Kremmling, North	30,000.00
5	76	42	G-D-S	10	Mi.	Grand	Meeker-Rifle Roar (Included in Project No. 4)	.....
5	77	11	Concrete	1¾	Mi.	Mesa	Grand Junction-Palisade Road	50,000.00
5	78	10	G-D	6	Mi.	Eagle	Battle Mountain Road Between Redcliff and Minturn	60,000.00
5	80	52	G-D	15	Mi.	Routt	Steamboat Springs, North	59,400.00
1	81		G-D	4	Mi.	Jefferson	Vernon Canon Road	35,000.00
1	82		Paved	3½	Mi.	Jefferson	Denver-Morrison	87,000.00
1	83		Paved	4	Mi.	Arapahoe	Denver-Colorado Springs, Littleton, South	110,000.00
1	84		Paved	2	Mi.	Morgan	Morgan-Brush	58,000.00
1	85		Paved	2	Mi.	Morgan	Ft. Collins-Loveland	58,000.00
1	86		Paved	2	Mi.	Larimer	Loveland-Berthoud	58,000.00
1	87		Paved	2	Mi.	Larimer	Boulder, East	58,000.00
1	88		Paved	2	Mi.	Boulder	Longmont, South	58,000.00
1	89		Paved	6½	Mi.	Adams ¼	Brighton Road	30,000.00
						Weld ½	Brighton to Ft. Lupton	146,000.00
1	90		G-D	6	Mi.	Clear Creek ½	Gilpin ½ Idaho Springs to Central City	40,000.00
3	91		G-D	11	Mi.	Las Animas	Trinidad to Hoehme	20,000.00
3	92		Bridge	Huerfano	Pueblo	Pueblo, East Huerfano Bridge	70,000.00	
3	93		G-D	16	Mi.	Crowley	Ordway, East and West, 16 Mi.	40,000.00
3	94		G-D	7	Mi.	Fremont	Canon City, East	40,000.00
3	95		G-D	10	Mi.	Kiowa	Eads, North	25,000.00
3	96		Paved	3	Mi.	Otero	La Junta, West	80,000.00
3	97		G-D	18	Mi.	Prowers	Lamar, East	90,000.00
3	98		G-D	6	Mi.	Baca	Springfield, North	20,000.00
3	99		G-D	15	Mi.	Bent	Las Animas, East to County Line, No. 5	60,000.00
4	100		G-D	6	Mi.	Río Grande ½	Saguache ½ Del Norte-Saguache Road	30,000.00
4	101		G-D	10	Mi.	La Plata	Durango	80,000.00
4	102		G-D	1½	Mi.	Ouray	Silverton-Ouray	50,000.00
4	103		G-D	6	Mi.	Montrose	Placerville-Dry Creek	30,000.00
4	104		G-D	8	Mi.	Montrose ¾	Delta ¼ Montrose-Delta	50,000.00
4	105		G-D	5	Mi.	Dolores	Rico-Lizzard Head	40,000.00
5	106		G-D	6	Mi.	Routt	Steamboat, East	30,000.00
5	107		G-D	12	Mi.	Moffat	Maybell to State Line	60,000.00
5	108		Paved	1.8	Mi.	Mesa	Grand Junction-Palisade	50,000.00
5	109		Paved	1.8	Mi.	Mesa	Grand Junction-Fruita	50,000.00
2	110		G-D	2	Mi.	Kit Carson	Burlington, South	10,000.00
2	111		G-D	6	Mi.	Lincoln	Limon, East	30,000.00
2	112		G-D	5	Mi.	Park	Divide, Towards Lake George	30,000.00
2	113		G-D	6	Mi.	Chaffee	Salida, North and South	40,000.00
2	114		G-D	4	Mi.	Elbert	Kiowa, West	20,000.00
2	115		G-D	6	Mi.	Cheyenne	Cheyenne Wells, West	30,000.00
2	116		Paved	4	Mi.	El Paso	Colorado Springs, North	100,000.00
2	117		Paved	1½	Mi.		Colorado Springs-Manitou	35,000.00

Total 882.93 Mi.

\$5,425,209.76

Concrete 84.35 Mi.

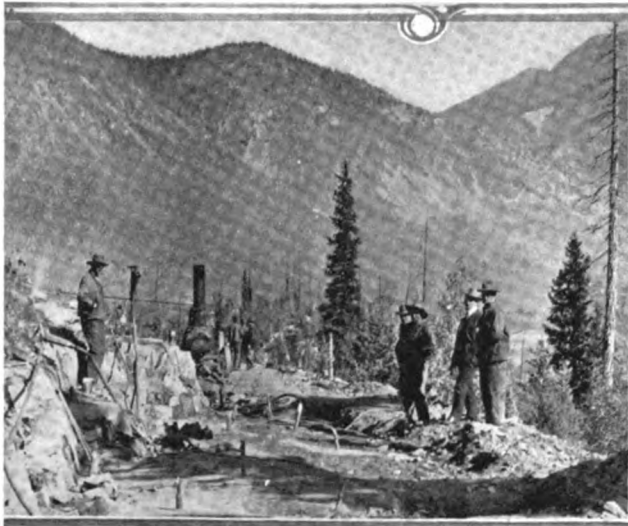
G-D-S 798.58 Mi.

Total 882.93 Mi.

(Continued to page 20)

Ten Miles of Durango-Silverton Road Built

Twelve Miles Remain To Be Built To Complete Important Road in Southwestern Colorado. Forest Service and State Highway Commission Have Combined To Complete This \$350,000 Project. Working Season Is Short, Permitting of Only Four Months Operation Each Year.



Substantial progress is being made in the construction of the Durango - Silverton road, a project of 50½ miles long connecting these two important cities in Southwestern Colorado. The road is being built by the U. S. Bureau of Public Roads, following a co-operative agreement between the State Highway Commission and the United States Forestry Service.

The Durango-Silverton road is a \$350,000 project, of the cost of which the Forestry pays \$243,000 and the State \$107,000. The State will maintain the road after its completion, which will probably be in 1921, with fair luck and no hindrance. There remain 12 miles of heavy construction of which ten miles is rock work. Two and eight-tenths miles were built last year and ten miles this year.

It is expected that crews on this project will be able to continue work until Nov. 10 or 15 before the heavy snows that occur in the passes make further progress impossible. Work began this year July 1, this being the earliest date of any year on which it is feasible to start operations, on account of climatic conditions.



Top Left: Steam drilling outfit on Silverton Road. Top Right: Town of Silverton from Durango-Silverton Road. Below: Powerful steam shovel of caterpillar or tracklayer type at work on this road.

There are on this road two unnamed passes each 10,500 feet in altitude. Four and one-half miles of the road had been built by the State before the joint arrangement was made with the Forestry Service, leaving 46 miles to be constructed. Government officials in charge of the work are J. S. Bright, district engineer for the Bureau of Public Roads; J. W. Johnson, assistant and acting District Engineer, and Smith Riley, District Forester. L. E. Smith is superintendent in charge of construction work for the Bureau.

Part of the work on the Durango-Silverton Road has been done by station contract, part by the yard and part by day labor. George Frye, one of the principal contractors, has introduced on the work

a 7½-yard Bucyrus caterpillar steam shovel which he has worked three shifts in the granite to excellent advantage, and a steam drilling outfit.

Grading completed this year included portions of the Silverton, Molas Lake and Lime Creek sections.

Empire State's Experience Is Good Lesson

New York Commissioner in Able Paper Tells Why Only Best of Roads Are Adequate for Modern Needs. Commissioner Ehrhart of Colorado Declares That It Is Time for This State To Finance by Bond Issue a Program for the Construction of Hard-Surfaced Roads.

(Extract from an Article appearing in Engineering News Record, N. Y.)

HIGH COST OF MAINTENANCE OF LIGHT MACADAM HIGHWAYS COMPARED WITH CONCRETE CONSTRUCTION.

(By Frederick Stuart Greene, New York State Commissioner of Highways.)

Upon taking office as Commissioner of Highways, I was astonished to find how large a sum the state is expending yearly merely to keep its improved roads in repair. When I was informed that the department had \$5,500,000 to spend during 1919 upon the maintenance of 7,400 miles of completed construction it seemed to me a large sum, but when I was told by our nine division engineers that this appropriation, which allows \$743.00 per mile for both old and new roads, gave none of them enough money to put all of their roads in first-class condition, I could hardly credit their statements. This led me to investigate, and the deeper I went into the history and records of our highways the more astonished I became. If, before I had seen these records for myself, anyone had told me what the maintenance charges totalled in a few years on some of our roads, I would not have believed the figures. That the departmental records are correct, however, no one familiar with the system of accounts as conducted by our auditor, Sefrine D. Gilbert, can doubt. Mr. Gilbert has served this department as auditor for nine years, and has witnessed the coming and going of six different administrations.

I have not been Commissioner of Highways long enough and I have been so busy since taking office, that I have not had sufficient time to make a thorough search into this matter of maintenance of the different types of pavement.

But I have discovered enough to convince me that the life of a water-bound or light bituminous-macadam pavement averages about seven years and can not be reckoned beyond 10 years. Our roads are built for the most part from 50-year bonds, and it does not require a financial genius to see that if we continue to construct and reconstruct roads five times before they are paid for such a policy will inevitably lead to financial embarrassment.

COST AND MAINTENANCE OF MACADAM ROADS IN NEW YORK STATE.

County	Road		Construction Cost	Maintenance Cost
	No.	Miles		
Genesee	5090	4.47	\$ 54,395.45	\$ 75,081.76
Montgomery	5126	2.24	31,125.53	58,680.07
Jefferson	625	5.37	65,200.70	36,892.55

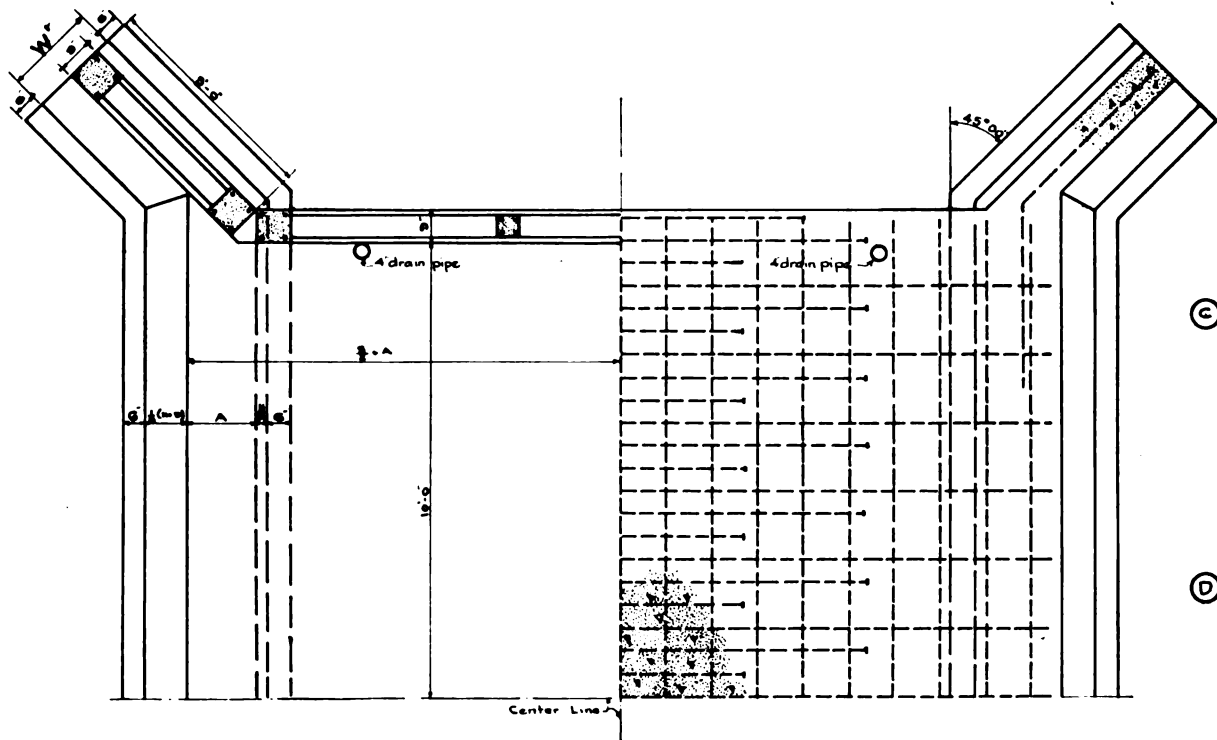
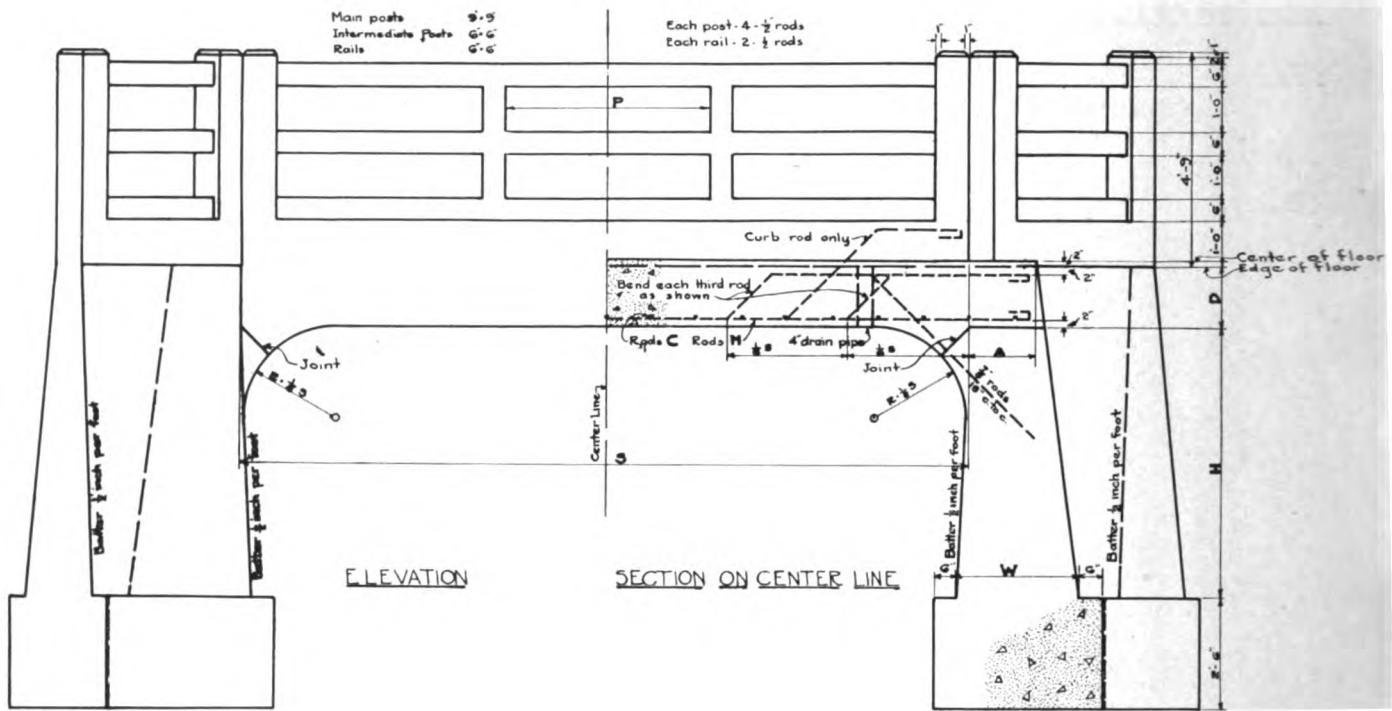
Livingston	5142	4.05	45,105.16	32,357.10
Onondaga	555	7.77	95,867.77	49,402.04
Ontario	5081	5.26	76,282.93	51,961.49
Otsego	708	4.60	54,457.48	23,440.42
Rensselaer	5107	.40	8,660.09	4,437.09
Rensselaer	680	3.92	39,211.46	21,910.29
Suffolk	5008	3.55	53,551.56	29,142.66
Suffolk	5111, 5112	10.01	100,924.06	74,888.14
Tomkins	5043	2.53	34,339.72	28,158.29
Wyoming	892	1.43	16,006.95	8,623.73
Dutchess	5092	4.15	51,792.70	41,772.67
Fulton	5096	.64	9,779.84	5,603.59
Herkimer	463	5.52	69,283.36	39,611.56
Nassau	5106	2.46	29,511.25	23,876.91
Oneida	839	1.21	13,861.58	9,764.43
Steuben	904	1.64	16,952.59	9,219.31
Steuben	907	4.13	52,156.06	30,471.08
Steuben	5130	1.16	10,891.44	9,887.63
Wayne	919	3.87	26,515.09	37,062.18
		80.48	\$955,872.76	\$702,244.99

The advent of the motor truck and its rapid growth have revolutionized traffic conditions. No one could have foreseen its remarkable growth. So I repeat that the building of these types of roads in the past was not an unpardonable error. But I do hold that a Commissioner who has witnessed this growth of motor trucks, and has not sufficient vision to know that he must build permanent roads, even though their first cost is high, is not the right man for the place. Rapid as has been the development of motor trucks, they are still but at the threshold of their usefulness. The number of these vehicles will continue to grow in the future, and will grow with greater rapidity than it has in the past. The time is here when we must build for the future, and strive by every means to construct the most permanent road that engineering knowledge can devise.

Referring again to the records of this department, they show us that during the past four years our 208 miles of first-class concrete roads have cost \$138.00 per mile per year for maintenance, and this cost is due largely to mistakes made with expansion joints, resulting in some comparatively expensive repairs, caused by sections of the pavement being destroyed by expansion. We have concrete roads, where expansion joints were placed as we now know how to place them, which cost us less than \$50 per mile per year for maintenance. We have concrete roads on main traveled routes in this state that have been down five years and show so little wear that the broom marks, left as a finish to the surface, are still on that surface.

The cheapest reconstruction we now do on macadam roads is to lay a new two-course bituminous-macadam

(Continued to page 21)



(C)

10'-0"	10'-0"
11'-0"	11'-0"
12'-0"	12'-0"
13'-0"	13'-0"
14'-0"	14'-0"
15'-0"	15'-0"
16'-0"	16'-0"
17'-0"	17'-0"
18'-0"	18'-0"
19'-0"	19'-0"
20'-0"	20'-0"

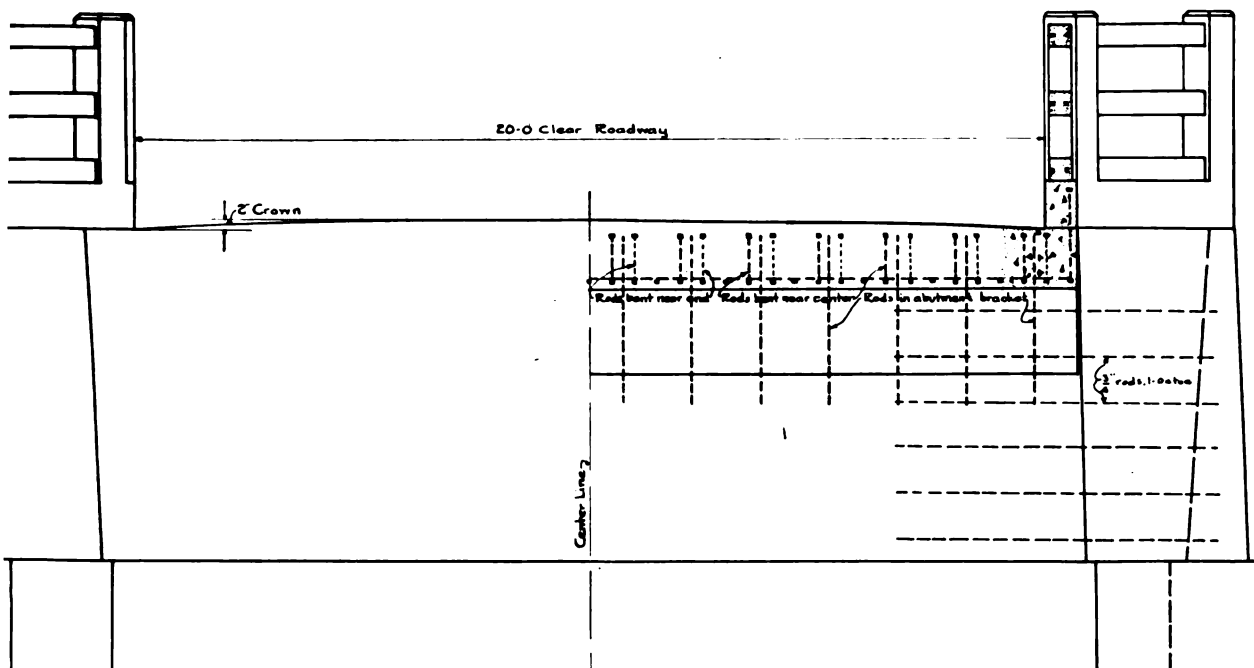
(D)

CONC	
6'-0"	6'-0"
10'-0"	10'-0"
12'-0"	12'-0"
14'-0"	14'-0"
16'-0"	16'-0"
18'-0"	18'-0"
20'-0"	20'-0"

(E)

CONC	
6'-0"	6'-0"
10'-0"	10'-0"
12'-0"	12'-0"
14'-0"	14'-0"
16'-0"	16'-0"
18'-0"	18'-0"
20'-0"	20'-0"

(See Explanation on Page 17)



END VIEW

SECTION ON CENTER LINE

P		M		C	
No	Clear	Main Rods	Cross Rods	Size	Spaced
2	3'-0"	3/4"	6"	1/2"	15'
2	4'-0"	7/8"	6"	1/2"	15'
3	3'-2"	7/8"	6"	1/2"	14'
3	4'-0"	7/8"	6"	1/2"	12'
4	3'-3 1/2"	1"	6"	1/2"	12'
4	4'-2 1/2"	1"	6"	1/2"	12'

(B) TOTAL QUANTITIES FOR SPANS WITH 5'-0" WING WALLS

Span - 5'	Height - H	4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	13'-0"	14'-0"	15'-0"
8'-0"	Concrete - CIA	10.8	10.8	10.8	10.8	10.8	10.8	10.8					
	" - CIB	31.4	31.2	42.4	48.0	54.7	60.7	69.2					
	Steel	214.3	220.4	226.6	232.7	238.8	245.0	251.1					
10'-0"	Concrete - CIA	14.2	14.2	14.2	14.2	14.2	14.2	14.2					
	" - CIB	31.8	37.4	42.8	48.5	55.2	61.3	69.6					
	Steel	284.8	290.9	297.1	303.2	309.3	315.5	321.6					
12'-0"	Concrete - CIA	18.3	18.3	18.3	18.3	18.3	18.3	18.3					
	" - CIB	32.1	38.0	43.3	48.9	55.7	61.8	70.5					
	Steel	325.1	331.2	337.4	343.5	349.6	355.8	361.9					
14'-0"	Concrete - CIA	22.3	22.3	22.3	22.3	22.3	22.3	22.3					
	" - CIB	35.7	40.7	41.8	43.1	40.7	70.5	71.2					
	Steel	313.5	319.6	325.8	331.9	338.0	344.2	350.3					
16'-0"	Concrete - CIA	26.1	26.1	26.1	26.1	26.1	26.1	26.1					
	" - CIB	36.0	40.9	48.2	53.4	61.1	71.0	77.7					
	Steel	408.5	414.6	420.8	426.9	433.0	439.2	445.3					
18'-0"	Concrete - CIA	28.7	28.7	28.7	28.7	28.7	28.7	28.7					
	" - CIB	34.2	41.1	46.4	53.4	61.3	71.2	77.9					
	Steel	520.0	526.1	532.3	538.4	544.6	550.7	556.8					
20'-0"	Concrete - CIA	34.5	34.5	34.5	34.5	34.5	34.5	34.5					
	" - CIB	34.7	41.7	48.9	54.1	61.9	71.8	78.5					
	Steel	564.9	571.0	577.2	583.3	589.4	595.5	601.6					

QUANTITIES

Span	STEEL - LBS			
	Main rods	Cross Rods	Brackets	Rail Rods
8'-0"	566	161	365	406
10'-0"	1561	178	437	427
12'-0"	1783	232	510	481
14'-0"	2064	304	620	502
16'-0"	2287	399	692	522
18'-0"	3276	315	728	576
20'-0"	3584	411	802	597

(F) QUANTITIES PER ADDITIONAL FOOT OF ABUTMENT (FOR USE ON SKEW BRIDGES)

Height - H	4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	13'-0"	14'-0"	15'-0"
Width A - 15' - Cu Yds	0.33	0.64	0.73	0.84	0.95	1.04	1.19	1.31	1.46	1.64	1.76	1.95
Width A - 18' - Cu Yds	0.61	0.72	0.83	0.93	1.07	1.23	1.34	1.48	1.64	1.76	1.95	2.16

WING WALLS - CLASS B - CU YDS

Span	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	13'-0"	14'-0"	15'-0"
54.5	60.5	69.0						
54.9	61.0	69.3	78.0					
55.3	61.4	70.1	78.6	84.6				
60.2	70.0	76.7	83.4	91.6	99.7			
60.4	70.3	77.0	83.7	92.0	100.1	109.4		
60.4	70.3	77.0	83.7	92.0	100.1	109.4	121.3	
60.8	70.7	77.4	84.0	92.4	100.5	109.7	121.9	

ADDITIONAL FOOT OF WING WALL - CLASS B - CU YDS

Span	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	13'-0"	14'-0"	15'-0"
0.17	0.21	1.28						
0.20	0.22	1.06	1.13					
0.21	0.23	1.07	1.14	1.28				
0.21	0.24	1.08	1.15	1.29	1.45			
0.22	0.25	1.09	1.15	1.29	1.45	1.56		
0.22	0.25	1.09	1.15	1.29	1.45	1.56	1.71	
0.23	0.25	1.10	1.16	1.30	1.46	1.67	1.72	

NOTE:
 Concrete Quantities in Cu Yds
 Steel Quantities in Lbs

LOADINGS
 Alternative - 100 Lbs per Sq Ft
 Live Loads - 20 Ton Road Roller
 Dead Load - Concrete - 150 Lbs per Cu Ft

Class A Concrete - 1:2:4
 Class B Concrete - 1 1/2: 5

COLORADO
STATE HIGHWAY DEPARTMENT

STANDARD
SLAB
BRIDGES

FOR VARIOUS SPANS AND ABUTMENT HEIGHTS

R.S.D. OCT 1919

1919 Crop Season Indicates Need of Roads

Cost of Marketing Over Indifferent Roads Was So High that Farmers Who "Broke Even" on Year's Work Feel Fortunate. Immigration Department Points Out Fact That Roads in Eastern Colorado, Especially, Are Potent Factors In Determining The Future Development There.--By Howard D. Sullivan

THE season just closing in Colorado affords an illustration of the need for much better roads in remote rural districts in this state. For there are many farmers in such districts who will find the cost of marketing their products this season just heavy enough to reduce their incomes below the point where there is any profit in them.

It has been a season such as the farmer in Colorado soon learns to expect occasionally, or rather, frequently. It began with great promise for good crops, but the drought began early in May in some districts, early in June in others and in some it did not come until July. But wherever in Colorado farmers count on rainfall for growing and maturing their crops they were disappointed this year, because the necessary amount of rain did not come. In the eastern and northeastern part of the state the drought was late in starting and the wheat crop matured in good shape; but it struck the corn and forage crops right in their prime and reduced their yield in many cases 50 per cent or even more. In the north-central and northwestern parts of the state there was so little moisture in May and June that the wheat crop was almost entirely ruined in some localities and severely damaged in the entire district described. In the southern part of the state conditions generally were much better, but where farmers had to depend entirely upon rainfall they suffered some damage, from Montezuma county east to Baca county and the Kansas line.

Railroads generally are far apart in the non-irrigated districts of this state. Look at the map of eastern Colorado, where farming without irrigation is most extensively followed and you will note that there are some wonderfully long hauls for getting products of farms to railway shipping stations. As extreme cases, take Baca and parts of Las Animas, Lincoln, Washington and Yuma counties.

Attention has been called often to the fact that there are approximately 15,000,000 acres of land in this eastern plains section of Colorado which might be farmed with as much success as any non-irrigated sections of eastern Colorado are now being farmed. But in this entire district not to exceed 4,000,000 acres were in cultivation last year. People sometimes complain that our state is not being settled rapidly enough—that our vacant farm lands are being permitted to lie idle too long, especially during a period when maximum production of all food and feed crops is needed. But the experience of many farmers in this section of Colorado this year goes to show that some of the lands already being farmed here are below the margin of cultivation in unfavorable seasons.

Cost of transportation to railroad is one of the items in the cost of producing and marketing farm products that might be reduced in the case of a great many farmers in the non-irrigated districts of eastern Colorado. In many cases it might be reduced without the building of additional railroads sufficiently to make farming profitable on lands that can not be farmed at a profit now. In most cases where farming in eastern Colorado has been found wholly unprofitable it might be made profitable by two changes—first, the construction of better highways and the better maintenance of highways already constructed; and second, the introduction of better farming methods, whether better cultivation of the soil, better crop selection, the introduction of more dairy stock and poultry or some other improvement.

Of course it is not here argued that highway improvement is the principal need of this section of Colorado in order that its agricultural possibilities might be realized to their fullest extent. Indeed I desire to make it clear that in my opinion the first and most important need is for better farming methods, which means primarily such cultivation of the soil as will better meet the problems of absorbing and retaining moisture peculiar to this district and selection of crops especially adapted to the district. Reports of the county assessors show that wheat is the principal crop from the standpoint of acreage in all the counties in northeastern Colorado, from Weld county east and from Arapahoe county north, and that corn is the principal crop in the counties farther south that lie east of the range. Grain sorghums is the principal crop in one county in Colorado—Baca. But the experience of the best farmers has shown that wheat is not a reliable crop in much of the territory where it is now being very extensively raised in Colorado. The same thing is true to a less marked extent with reference to corn grown for grain. Sorghums and certain drought-resistant grasses, which ultimately may be expected to become the great feed crops of this section, are as yet enjoying only a moderate popularity, though the acreage devoted to them is increasing steadily each year.

But in conclusion I want again to call attention to the fact that better highways are among the essentials toward the settling up of the undeveloped farming areas of Colorado. There are fully 5,000,000 acres of agricultural land in the state now below the margin of cultivation because the cost of marketing farm products is too high. The first and perhaps the most important factor toward reducing this marketing cost is the construction of better highways.

Engineer's Report Details Important Work

THAT appropriations for state highways to be built by Federal aid be concentrated, as far as possible, in large projects on main lines of traffic, in order to meet government requirements, is a recommendation made by State Chief Engineer J. E. Maloney in a report of progress that he has made to the State Highway Commission.

Chief Engineer Maloney's report details work of interesting character in all sections of the state, and is as follows:

Denver, Colorado, October 14, 1919.

Mr. T. J. Ehrhart,
State Highway Commissioner.
Denver, Colorado.

Dear Sir:

I desire to report that up to date, surveys, cross-sections, plans and specifications have been drawn, estimates made, Federal agreements drawn and contracts entered into for the following Federal Aid Projects:

Nos. 1, 2, 3, 4, 6, 7, 9, 10, 12, 13, 14, 16, 17, 18, 24, 57, making 10½ miles of concrete pavement, 64 miles of Macadam surfaced road, 20 miles of crushed shale road, 3 miles of Graveled surfaced road, 42 miles of Graded and drained roads, including all bridges and culverts.

To the above must be added Projects Nos. 21, 22, 60, 61, 62, and 63, which are now waiting decision of the Commission as to award. These six comprise four more miles of concrete pavement.

The 22 Projects represent a total expenditure of \$1,309,000.00, and work is in progress on all except the last four.

Surveys have been finished, and plans are now completed or under way for Projects Nos. 8, 11, 19, 20, 23, 25,

26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 43, 44, 50, 51, 58, 59, 64, 65, 66, 67, 68, 69, 71, 74, 77, 78, 80, 82, 84, 91, 92, 95, 96, 98, 100, 101, 102, 106.

These Projects comprise a total improvement of 258 miles of which 38 miles will be paved surfacing and the balance graded and drained with all incidental structures.

Projects 11, 43, 44, 45 are now awaiting Federal approval. Eight of the other 44 are about ready for submission, and the others are in progress of completion of plans.

The foregoing 70 Projects represent 402½ miles of road work surveyed, with the office work well under way.

Surveys were also made for the Silver Plume-Georgetown Road, The Independence Pass Road and the Fall River Road.

On the first 22 Projects the cost of all surveys, plans, specifications, supervision, inspection and overhead will total about 3¼ per cent of the total cost of the work at this time, and will not exceed 8 per cent when the work is completed on the Projects.

The surveys and plans on the 48 Projects have averaged \$130.00 per mile for mountain and plain, varying from \$90.00 per mile to \$400.00 per mile, depending on the location and the extent of the work. The cost for the smaller Projects being very much higher per mile and in per cent of cost of Project than the larger Projects. For this reason, and also to meet the Federal requirements, I would recommend that the appropriations be concentrated in larger projects on the main lines of traffic.

I have placed these figures before you so that you would be informed of these approximate costs.

(Signed) J. E. MALONEY,
Chief Engineer.

Good Roads Benefit All

That the general public is a beneficiary of good roads is not a debatable subject; it is universally conceded. But Jasper T. Kincaid, state tax commissioner in Kansas, has contributed a new idea along this line which is worthy of repetition. Here's what Mr. Kincaid has to say in a recent number of Kansas Highways:

"Then, aside from the benefits to the general public by the employment of labor, labor itself will be a beneficiary of improved roads in a personal way—one of the chief beneficiaries—and labor should make its contribution—not in excessive taxation, not in donations, but by manifesting a willingness to do honest, intelligent and efficient work. In letting contracts and employing labor, labor must be dealt with fairly and liberally, but labor has its obligations which it must honestly meet.

"Then the landowners whose lands are enhanced in value, the efficiency of whose farms are many fold increased by improved roads, are beneficiaries and should contribute in exact proportion as benefits are received."

New Jersey Pays Price

BOTH money and enterprise are required to build good roads. New Jersey is evidently well supplied with either commodity, for the "Mosquito State" has undertaken to spend the tidy sum of \$66,500 per mile for a stretch of seventeen and one-half miles, totalling for this short stretch, \$1,157,264.

Colorado has built her concrete roads to date for from \$25,000 to \$30,000 per mile, so it would appear that construction in this state to date has been pretty well managed. New Jersey is building 30-foot roads, of which but 18 feet are macadam, with bituminous macadam shoulder three feet wide on either side. The concrete is eight inches thick at the sides and 10½ inches in the center.

New Jersey is doubtless building a good road, but its high cost would indicate that Colorado's paved roads, costing less than half as much per mile to date, have not been too expensive.



The Finance Problem

COLORADO needs more and better roads; that is undeniable. Not only is the tourist in need of proper highways to permit him to get to and through the state, but the settler, the homesteader, the farmer—the real developer of the commonwealth—must have highways to get to market.

Chambers of Commerce and kindred public institutions are not blind to the need of good roads. In several sections of the state have commercial and good roads clubs adopted resolutions recently favoring the financing on a big scale of new or improved roads for Colorado. Now comes the State Immigration Department and declares that the year 1919 agriculturally in Colorado is an excellent example of the manner in which the settling up of the undeveloped farming areas of Colorado is being retarded by the lack of good roads.

So it is a fact which is becoming more and more recognized and admitted that the state needs the roads. The only questions remaining, apparently, are how to finance new roads and how and where to build first. As to getting the money, several commercial clubs have recently gone on record as favoring a respectable-sized bond issue, one commensurate with the needs and dignity of the state. There was published in the October number of this magazine a table showing the tremendous good roads bond issues that have been voted in certain other states. It is an extremely formidable table, one which makes Colorado look somewhat unenterprising, for every other state is well aware that this is a tourist state which should have better roads than almost any other.

There are various ways of raising sufficient money for new roads. There is taxation and there is a bond issue, which mean much the same; the people have to pay. But the people receive immediate benefits from good roads which they can't ignore. The blessings that come from good roads are widely distributed. Nearly every citizen gets part of the ensuing revenues. It's not only the hotel man, but the storekeeper and auto-repair man and the man who has real estate to sell and the person who has houses or rooms to rent. The tourist business will always be one of Colorado's greatest industries. This state is of a truth the playground of the world.

Consideration of a bond issue which will solve Colorado's difficulties is engaging the minds of good roads and commercial organization throughout the state as never before. Whether a bond issue will be decided upon can-

not be foretold, but it appears the best solution. And said bonds should be in sufficient quantity to carry out without fail the comprehensive program of State and Federal co-operation which is already in embryo. There are 117 desirable road-building projects now approved and ready for survey and construction in Colorado and these are so distributed as to be the nuclei of a great system, such a program as will call the attention of the entire pleasure-seeking and home-loving world to Colorado. There should be no more such lack of interest as that of the last state legislature, which failed to appropriate even enough funds to meet Federal Aid requirements.

Let not Minnesota and Texas, with \$75,000,000 bond issues; Pennsylvania and Michigan with \$50,000,000 each, or California with \$40,000,000 (her third large issue), be the only commonwealths to exhibit enterprise of commendable nature along good roads lines.

The California bill passed July 1 last providing \$40,000,000 for good roads in addition to her two former large issues is reproduced in this issue. It was passed by a vote of 8 to 1. Let Colorado learn the lesson.

Our Monthly Map

THE map on the back cover of this magazine is worthy of study by layman, commissioner and road contractor alike. It depicts graphically the nature of the working agreement between State and Government in the pretentious roads-building program now being carried out.

In the fall of 1916 the first issue of "Rules and Regulations" of the Secretary of Agriculture for carrying out of the Federal Aid Road Act was published. This was followed in the Spring of 1917 by the Bulletin "Standards covering the form and arrangement of plans, specifications and estimates for all Federal Aid Projects." These standards have been revised and amended later as it has been necessary to do so.

This article will be confined to an outline of the form and arrangement of the plans. It is taken in large part from the Bulletin previously referred to, and such amendments thereto as have been received to date.

The sheets making up the plans of a Project are bound in the following order:

First: Title Page.

Second: Typical Cross-section of Improvement and Summary of Quantities.

Third: Structural Plans, etc.

Fourth: Plan and Profile Sheets.

Fifth: Cross-section Sheets.

"All plans or drawings will be on flat sheets 22x36 inches outside dimensions. Border lines are to be so placed as to provide a binding margin two inches wide at the left hand end and a margin of one-half inch width on the remaining three edges of all plans. In cross-section sheets the border lines are omitted, but space should be allowed for the two-inch binding edge at the left hand edge of the sheets;"

"The title page for the set of plans shall have conveniently arranged the title, scale and lay-out map, an index of the drawings and key to the conventional sizes used, the number of the Project in the upper right hand corner, and in the lower right hand corner a sufficient number of blank spaces for the dates and signatures of two approving State Officials, and blank spaces for the dates and signatures of three approving Federal Aid officials, with their titles."

A cut of the title page of one of the Colorado Federal Aid Projects was printed in the September number of the Colorado Highways Bulletin. The style, the lettering and general make-up of this sheet is typical of the form in which the title of the Colorado Projects has been submitted.

"A typical cross-section of the improvement shall be placed on the first sheet directly following the title page. This section on a suitable scale should show the various slopes for cut and fill, the width or graded section in cut and on embankment, the crown or shape of the finished surface, shoulders, gutters, etc., between slopes, the width and thickness of the various courses of pavement or surfacing, and the position of the previously graded line relative to the typical cross-section, together with any desired additional details.

"When more than one typical cross-section is used, the proposed location for each should be indicated."

On this sheet we have shown any special information such as summary of quantities, the typical headwalls for culverts, and where space is sufficient, plans for box culverts, etc., are sometimes shown.

The cut of a sample second page is shown in this issue. In following issues will be published cuts of the plan and profile sheets and the cross-section sheets and an explanation of them.

Oregon Sees The Light

OREGON, with a population considerably less than that of Colorado and from 1,000 to 1,500 miles farther isolated geographically from Eastern tourist travel by train or automobile, has a Highway program, duly budgeted and approved, calling for the expenditure of \$15,437,211.02.

Oregon realizes the need of good roads, if it is to attract the Easterner who seeks pleasure or a home. Practically every county in the state is represented in the Highway program, the magnitude of which is shown by

the fact that the state highway work under contract up to July 20, including all post and forest road projects on 19 Highways totaled 352 miles of hard paving, 146 miles of macadam and 430.2 miles of grading.

In hard paving the Pacific highway led with 114.7 miles. The Columbia River highway was next with 94.8 miles and was first as to macadam, 63.1 miles, and grading, 111.7 miles. The West Side Pacific highway stood third—49.8 miles of hard paving, 14.6 miles of macadam and 40.2 miles of grading. The total of all contracts was \$12,864,342.52; grand total, including 10 per cent for contingencies and 10 per cent for engineering, \$15,437,211.02.

Standard Bridge Plans

Notes by J. E. Maloney, State Chief Engineer

(The following notes by the State Chief Engineer have been prepared in explanation of the double page cut in the center of this magazine. Editor.)

REINFORCED concrete Slab type for spans from 8 to 20 ft. inclusive. The form work for this type is simple in construction; the reinforcement of square twisted steel. The steel is generally available from stock material.

Abutments, wing-walls and piers should be carefully considered and laid out by the Engineer, as local conditions will generally require changes from any stock plan.

In the abutments, wing-walls and piers the concrete is of a mixture of cement 1, sand 2½, gravel or stone 5, while for the floor, curb and railing the mixture is Cement 1, sand 2, gravel or stone 4.

Bank or pit run gravel is not to be used. In connection with these bridges, the Standard specifications of the State Highway Commission are to be used.

These slabs are computed for a concentrated load of 20 tons.

This plate will be followed by one of eye-beam, reinforced concrete girders, riveted low truss and concrete arch.

The plate is complete so that quantities per foot, and total for any span or height of abutment within the limit stated can be taken from the table both for concrete and steel.

It is intended that these plates should be useful to the County Commissioners and County Engineers of the State in their work, but they should be used under the supervision and direction of the Engineer. Any question as to the use of these tables that may come up may be taken up with the Department, and any advice or assistance that we can give, will be furnished.

To Improve Berthoud

The State Highway Commission, at its meeting of October 14, appropriated \$4,000 for the improvement of Berthoud Pass, that important gateway to the Western Slope, 60 miles west of Denver on the Midland Trail. The Forestry Service will build a road up both sides of the Pass in 1920, according to present plans.



A sunset between Craig and Hayden, Colo., caught by Photographer Howe en tour with Highway Commission, Aug. 28, 1919.

Two Roads Completed, One Makes Progress

Nederland-Ward and Sedalia-Deckers Roads, Being Built by Joint Cooperation of State Highway Commission with the Forestry Service Under Supervision of Bureau of Public Roads, Are Finished and City Completes Its Share of Road Up Mount Evans.

THE City of Denver has completed its portion of the road up Mt. Evans from the municipal Mountain Parks system at Bergen Park, and the U. S. Forestry Service, which has agreed to carry the construction of the road on westward from Soda Pass, the terminus of the City's section, to Echo Lake, an additional distance of nine and one-half miles, has made camp and begun work.

The Bureau of Public Roads, which is doing the construction work for the Forestry Service, has given the grading work for the first half-mile to Contractor Flick, and it is thought likely that between three and four miles of the right of way will be cleared this fall, so that next spring's work will be comparatively easy. Superintendent Fred C. Capes is in charge of the work for the Bureau.

Another important road which is now complete is that from Nederland to Ward in Boulder County, which has been built by co-operation of the Forestry Service and the State Highway Commission through the Bureau of Public Roads.

In the Nederland-Ward road were $10\frac{1}{3}$ miles of actual construction, all done this year and costing \$52,000. It is a valuable link in the Boulder-Estes Park road by

way of Allen's Park, and also in the road from Idaho Springs to Estes Park by way of Central City, Rollinsville, Nederland, Ward and Allen's Park.

The Sedalia-Deckers road up Jarre Canon is also complete, this road affording a useful link between the Denver-Colorado Springs road and Platte Canon resorts. The road was built by an arrangement of the Forestry Service with the State Highway Commission.

Important Contracts

The Levy Construction Company has been awarded the contracts on Federal Aid Projects No. 21, 22, 60, 61, 62 and 63, nearly all concrete roads, in the neighborhood of La Junta and Las Animas. The amounts of these contracts are as follows:

No. 21,	\$16,016.28.
No. 22,	\$17,586.75.
No. 60,	\$17,581.74.
No. 61,	\$16,109.78.
No. 62,	\$28,979.28.
No. 63,	\$27,872.90.

The sum of \$35,000 was appropriated to meet the final estimated cost of these projects, which will be combined.



Scene just below Kremmling, Colo., on Pike's Peak Route, where road from Rabbit Ear diverges to Kremmling and Walden.

California Bond Issue Carries by 8 to 1 Majority

THE bill for the \$40,000,000 bond issue voted by the people of California, July 1, by a majority of 8 to 1, was short, concise and to the point.

It is reproduced herewith, for doubtless in the near future, Colorado will be called upon to vote a large issue and it is none too early to become familiar with the ambitions and programs of other leading states. The California measure was as follows:

Resolved by the Senate, the Assembly concurring, That the Legislature of the State of California at its regular session, commencing on the sixth day of January, 1919, two-thirds of the members elected to each of the two houses of the said legislature voting therefor, hereby proposes to the people of the State of California that the constitution of said state be amended by adding to article sixteen thereof a new section to be numbered two, reading as follows:

Section 2. Immediately upon the adoption of this section the state treasurer shall prepare forty thousand suitable bonds of the State of California in the denomination of one thousand dollars each, to be numbered from one to forty thousand inclusive, to bear a date not later than thirty days after said adoption and to bear interest at the rate of four and one-half per cent per annum from the date of said bonds, said interest to be payable on the third day of January and the third day of July of each and every year after the sale of said bonds, and said bonds to become

due and payable in annual parcels of one thousand bonds, commencing July 3, 1926, and ending July 3, 1965.

The provisions of the act of the legislature approved May 20, 1915, known as the "state highways act of 1915," relative to the signing, countersigning, endorsing and sealing of the bonds therein provided for and the interest coupons thereon, the place and method of payment of principal and interest thereon, the procedure for initiating, advertising and holding sales thereof, and the performance by the several state boards and officers of their respective duties in connection therewith as therein stated, and all other provisions, terms and conditions in said last-named act relating to the bonds therein mentioned, so far as the same shall be pertinent, shall be applicable to the preparation, issuance and sale of the bonds herein provided for, as herein contemplated.

Funds corresponding to those provided for in said act are hereby created, and payments into and out of the same shall be made as in said act provided, said funds to be designated respectively, "third state highway fund," "third state highway interest and sinking fund," "third state highway revolving fund" and "third state highway sinking fund"; and the state treasurer shall on the first day of January, 1920, and on the first day of each July and the first day of each January thereafter transfer from the general fund to the "third state highway interest and

sinking fund," and on the first day of July, 1926, and on the first day of July of each year thereafter, from the general fund to the "third state highway sinking fund," the required moneys as provided in section five of said act for the purposes therein stated but as applicable only to the bonds herein provided for and the interest thereon.

The moneys in said "third state highway fund" shall be used by the state department of engineering for the acquisition of rights of way for and the acquisition, construction and improvement of uncompleted portions of the system of state highways prescribed by the act of the legislature approved May 22, 1909, known as the "state highways act," and the act of the legislature approved May 20, 1915, and known as the "state highways act of 1915," and certain extensions thereof described in said last-named act, and also for the acquisition of the rights of way for the acquisition, construction and improvement of the following additional highways as state highways: Barstow to Needles; Oxnard to San Juan Capistrano; Barstow to Mojave; Santa Maria to Bakersfield; Skyline Boulevard, San Francisco, to Santa Cruz; Rio Vista to Fairfield; Auburn to Verdi; Ukiah to Tahoe City; Crescent City to Oregon line; Santa Rosa to Shellville; Big Pine to Oasis; Placerville to Sportsman's Hall; Feather River route, Oroville to Quincy; General Grant National Park to Kings River Canyon; Calistoga to Lower Lake; Mecca to Blythe; Rumsey to Lower Lake; Azusa to Pine Flats in San Gabriel Canyon; La Canada via Arroyo Seco to Mount Wilson Road; Lancaster to Bailey's; Bakersfield via Walker's pass to Freeman; McDonald's to the mouth of the Navarro River; Carmel to San Simeon; Klamath River state highway bridge to coast state highway; Susanville to Nevada state line; Pacheco Pass Road into Hollister; Visalia to Sequoia Park line; Deep Creek easterly via Bear Valley dam to the county road at Metcalf Creek in the Angeles National Forest; Orland to Chico; Tiburon to Alto, and county line near Michigan Bar via Huot's Ranch to Drytown. Said additional highway to be located on the most direct and practical routes; *provided, however*, that twenty million dollars of the moneys in said "third state highway fund," or so much of said twenty million dollars as shall be necessary, shall be used for the completion of all of the system of state highways contemplated and provided for in said "state highway act" and in said "state highways act of

1915," and the extensions thereof specified in said last-named act.

The cost of acquisition and construction of the several extensions described in said "state highways act of 1915" shall hereafter be entirely borne by the State of California, it being the intention hereof to relieve the several counties from any further co-operation as contemplated by said "state highways act of 1915," but nothing herein shall prevent any county from contributing towards the cost of said extensions or of any other state highways at its option to such extent as it may desire under the provisions of any existing laws.

All provisions of section eight of said "state highways act of 1915," and of any amendment thereof, and any provisions of said act or of any amendment thereof, relating to the selection of routes, character of construction of highways, manner of conducting work thereon, powers and duties of officers in connection therewith, adoption of public highways as state highways, payment of principal and interest on any bonds and appropriation of money for payment thereof, and the keeping of records and making of statements and reports, and all provisions of section eight of the "state highways act," as amended May 19, 1915, and of section eight of the "state highways act of 1915," and of any amendment of either thereof, relating to the payment by counties of money for interest upon any bonds and the relief of counties from such payment, shall, so far as applicable, apply to the bonds herein authorized and all highways constructed hereunder.

All provisions of this section shall be self-executing and shall not require any legislative action in furtherance thereof, but this shall not prevent such legislative action, and all expenses that shall be incurred by the state treasurer in the preparation of bonds herein provided for and in the advertising and sale thereof and all expenses incurred by any officer in reference thereto shall be paid from the general fund of the state. Nothing in this constitution contained shall be a limitation upon the provisions of this section.

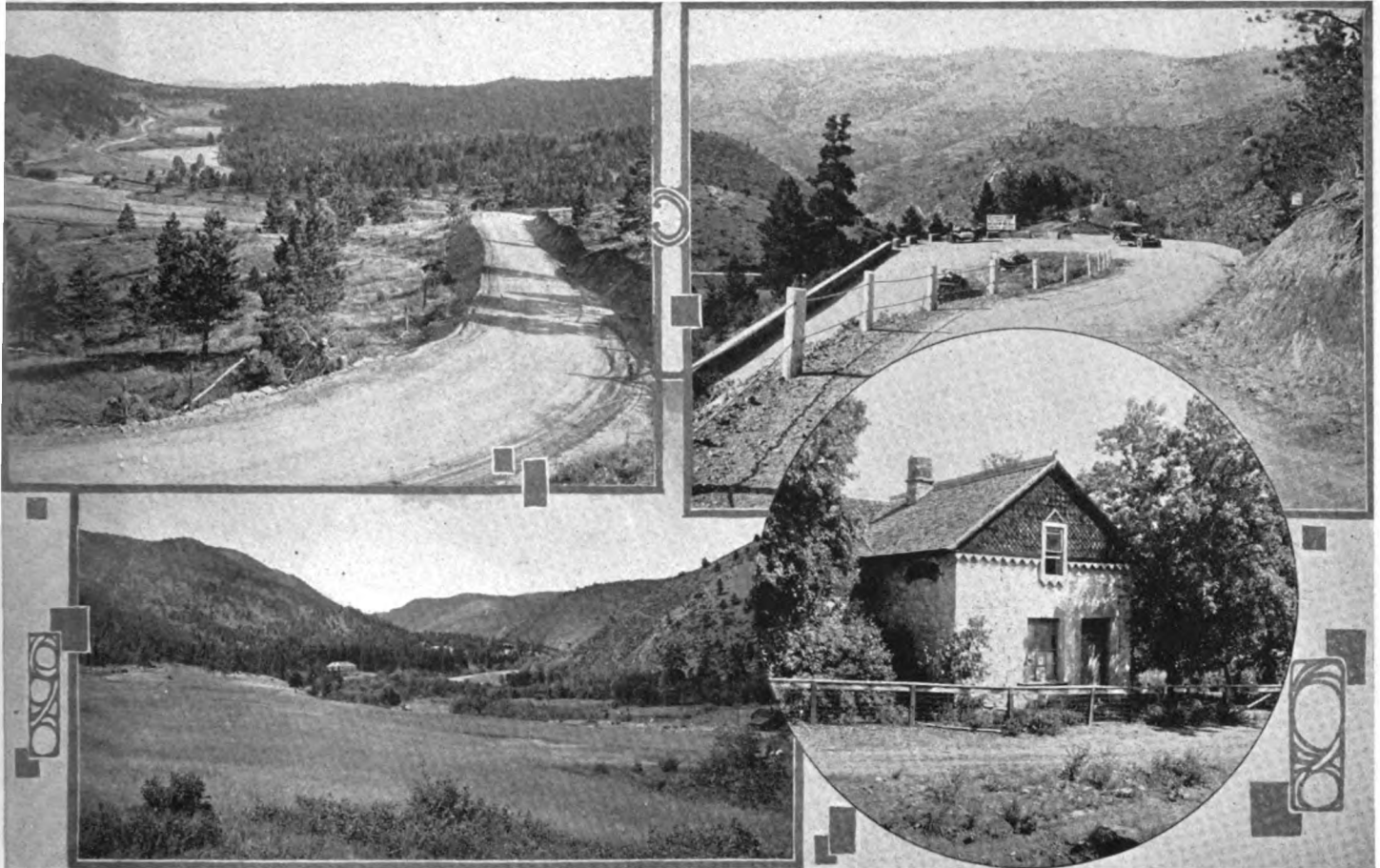
STATE PROPORTION OF FORESTRY PROJECTS.

(Continued from Page 9.)

Durango-Silverton	\$140,380.00
Monarch Pass	41,725.00
Sedalia-Decker Springs	15,209.00
Total	\$197,314.00

**SPECIAL STATE PROJECTS
STATE FUNDS**

State Road No.	Klnd	LOCATION		IMPROVEMENT	Total Cost or Estimate
		Length	County		
51	G-D-S	6	Grand, Larimer	Fall River Road (High Line)	\$ 114,000.00
		6	Lake,		
25	G-D-S	4	Pitkin	Independence Pass Road	25,027.02
62	Concrete	8.6	Jefferson	South Golden Road, Pavement	104,940.80
49	Concrete	2	Adams	Brighton Road, Pavement	43,295.94
27	Bridges	Bridges	Jefferson	Bear Creek Bridges, 42,000 Denver; 21,000 State	4,807.46
7			Adams, Arapahoe, Elbert,		
& 31	G-D-S		Lincoln	Denver-Limon Road	13,554.01
21	G-D-S	1	Jefferson	Golden Approach to Lookout	1,600.00
Total					\$ 307,225.23



Roads scenes near Denver. Top right: Curve and embankment on Floyd Hill. Top left: Just west of Bergen Park on Floyd Hill. Lower left: Cassell's Resort in Platt Canon from distance. Lower right: 1858 house in Vernon Canon.

Empire State's Experience is Good Lesson

(Continued from page 11)

pavement over the old road. At present prices this costs an average of \$16,700 per mile for a 16-foot pavement. In Wayne County, Michigan, an old concrete road has been successfully surfaced by placing a new reinforced-concrete top of 3-inch thickness. Let us suppose that we would wish to resurface with a 4-inch reinforced top, then a mile of 16-ft. pavement, requiring 1,043 cubic yards of concrete for such resurfacing at \$16.00 per cubic yard (which is not a low price) would cost \$16,688. If these figures and premises are correct they show that the resurfacing of a concrete road at the end of 14 or 15 years is half the cost of the double resurfacing of a macadam road apparently necessary during the same period.

Maintenance records in this department show that to keep pavements in first-class condition, the waterbound macadam roads have cost approximately \$600.00 and concrete roads of modern construction are costing less than \$100.00 per mile per year.

Remembering that road history shows that the average life of a waterbound or a bituminous-macadam pavement is seven years in this state, that after seven years of present traffic conditions these types of pavements

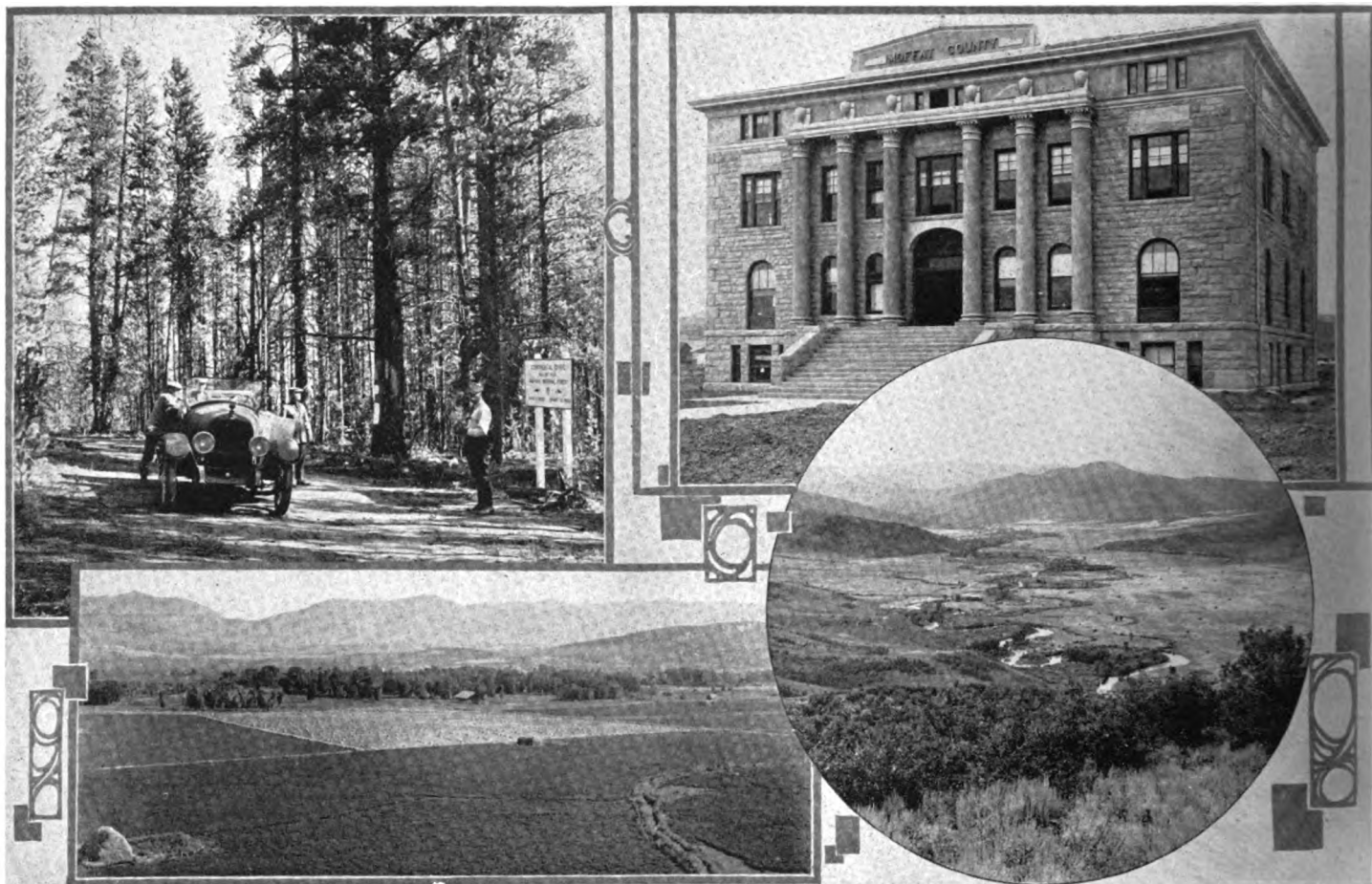
have to be reconstructed, we will, therefore, consider the total cost of the different pavements for that period.

	First Cost	4% Interest 7 yrs.	Main tenance 7 yrs.	Total Cost
Water-bound macadam..	\$17,500 per mile	\$4,900	\$6,650	\$29,050
Bituminous-macadam ...	18,900 per mile	5,292	4,200	28,392
Concrete	25,812 per mile	7,227	700	33,739

These figures show that by the time the two types of macadam pavements are worked out and in need of reconstruction, at a cost of approximately \$16,000 per mile, the concrete pavement, which should be good for at least seven additional years, has cost only \$4,700 more than the cheapest type of highway that any state should now build.

From all available data there is no doubt that at the end of 8 or 10 years of service, depending upon the amount of traffic, the concrete pavement is the most economical one that can be constructed.

These are but some of the reasons why I advocate a more permanent road than we have been building in the past, and it is now my belief that, considering the new problems of traffic that we have to solve, the most practical pavement for a highway to build today is the one built of concrete.



Upper right: Court House at Craig, Colo. Upper left: Arapahoe Pass on Continental Divide as viewed by Highway officials. Lower right: Bear on Yampa River just east of Steamboat Springs. Lower left: Farm in fertile Yampa Valley.

The above article should be interesting to the good roads advocates and the tax paying public of Colorado. Coming from an authority such as Highway Commissioner Greene of the State of New York, where experiments with every type of road construction have been going on for many years, with large sums available for highway work and no doubt with the very best engineering advice, so that the conclusions of Mr. Greene should receive the most careful consideration in planning highway construction, at least, as far as heavy traffic roads are concerned in Colorado.

The small experience we have had in highway work has convinced me that it is absolutely necessary to construct the very highest type of road in order to withstand the traffic we now have on the principal routes of the State, and especially so in the vicinity of cities and towns where the traffic is concentrated from the surrounding country. In my opinion, it is time for Colorado to finance, by a bond issue, a program for the construction of hard surfaced roads, and in order to do this, it will require, to take care of the heavy traffic sections of highway and continue the development of our system of state highways throughout the state, an initial issue of bonds of at least \$25,000,000. Colorado can better afford to do this for several reasons than the majority of states, because substantial road improvement means additional value to the

adjoining lands. And increasing the facilities for the transportation of our products, and decreasing materially the expense of the operation of vehicle, and greatest of all, our tourist traffic, which will be attracted in large degree by the improvement and extension of roads throughout the State.

A conservative estimate of tourist automobile visitors to Colorado for 1919 and the amount expended by them, convinces me that at least \$3,600,000 has been left in Colorado as a net profit to the business interests of the state by these visitors—a net profit more than sufficient to pay the annual interest on such a bond issue, without considering the advantages of improved roads to our own local people in the operation of vehicles by reducing the wear and tear, gasoline consumption, and general depreciation through improvement of road surfacing and the reduction of grades.

T. J. EHRHART,
State Highway Commissioner.

Aiding Saguache

The sum of \$4,000 has been appropriated by the State Highway Commission to Saguache County on a 50-50 basis for the construction of Road 20, a connection from Sargent to Bridge 40, on the Monarch Pass road.



Willows at foot of beautiful Willow Pass, ninety miles west of Denver, are wearing their best fall clothes.

Virginia is Determined

THE State of Virginia has provided itself with a State Highway Commission of five men, appointed by the governor, with a per diem compensation when in session. This commission will aid the State Highway Commissioner in administration work and will act in advisory capacity. The salary of the Commissioner is increased to not less than \$5,000 and he is authorized to select two assistant engineer commissioners and to employ necessary engineering and clerical force.

Virginia's automobile licenses are increased from 40 cents per horsepower to 60 cents and from the increase it is estimated that nearly \$450,000 will be raised annually to construct state highways. A property tax of 7 cents on each \$100 will be levied and it is estimated that this will produce \$1,000,000 annually. Virginia is determined to have roads.

Wisdom in Maine

THE State of Maine has the right idea when it plans its highway system on the principle of serving the largest number of people with the smallest mileage. In the Pine Tree State state highways comprise but 5½ per cent of the roads of the state, or 1,400 miles of a total of 25,530.

State Highways serve cities and towns including 73.7 per cent of the population and 73 per cent of the valua-

tion. In the past five years Maine has built 390.8 miles of State highways at a cost of \$3,200,000, and in addition to this, 1,393 miles of State aid roads in the past ten years, costing \$6,000,000.

Navy Will Build Road

The State Highway Department has granted permission to Geo. H. Barker, Rear Admiral in the U. S. Navy, acting for the Federal Government, for a right of way over the public highway known as the Santa Fe Trail whereon to build an 18-foot concrete road for one mile connecting with the road from the Naval Hospital at Las Animas.


Building Road North of Lamar

An appropriation of \$11,000 has been made by the State Highway Department to cover additional estimated cost of Federal Aid Project No. 57, north from the town of Lamar.

Leadville Gets Bridge

A badly needed bridge over a small creek between Leadville and Arkansas Pass, on the Pike's Peak Route, will be built as the result of an appropriation of \$4,500 which was made for that purpose by the State Highway Commission at its October meeting.

JAN 8 1919



COLORADO HIGHWAYS BULLETIN

December, 1919

Engineering Department Number

President's Message on Roads, Agriculture,
Forestry and Schools

Standard I-Beam Bridge Design

French Roads

Western Slope Problems

Federal Aid in Eastern Colorado

Before Construction

Military and State Maps

Work on Some Federal Aid Projects

Section Line Locations

Maintenance Work

Issued by the
State Highway Department

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STATE HIGHWAY COMMISSION

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FRED J. RADFORD, District No. 3, Trinidad.

FREDERICK GOBLE, Vice-Chairman, District No. 4, Silverton.

E. E. NICHOLS, District No. 2, Manitou.

ROBERT E. NORVELL, District No. 5, Hayden.

N. A. BALLOU, Secretary.

ROBERT H. HIGGINS, Federal Aid Deputy.

T. J. EHRHART, Commissioner.

J. E. MALONEY, Chief Engineer.

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FREMONT—Jonathan Seaman, Canon City; James Bunten, Canon City; J. V. McCandless, Florence; G. V. Hodgkin, Canon City; Jas. Belknap, Hillside.

NOTE—In the appended list of county officials the first name in each county is that of the county clerk, the second name is that of the county surveyor, and the last three names are those of county commissioners.

GARFIELD—Carleton L. Hubbard, Glenwood Springs; P. C. Thurmond, Glenwood Springs; L. F. Grace, Glenwood Springs; R. P. Coulter, New Castle; Geo. Newton, De Beque.

GILPIN—Frank G. Moody, Central City; S. A. Rank, Central City; Joseph Borzago, Black Hawk; Neil McKay, Central City; R. I. Hughes, Russell Gulch.

GRAND—H. J. Harrison, Hot Sulphur Springs; F. I. Huntington, Hot Sulphur Springs; Simon Olson, Parshall; J. H. Cather, Kremmling; J. B. Stevens, Fraser.

GUNNISON—C. C. McWilliams, Gunnison; J. H. Robinson, Gunnison; W. H. Whalen, Crested Butte; Geo. L. Miller, Gunnison; C. L. McDonald, Gunnison.

HINSDALE—L. E. Shull, Lake City; E. L. Defenbaugh, Lake City; Jno. C. Gavin, Lake City; E. W. Wiley, Lake City; E. W. Soderholm, Lake City.

HUERFANO—J. G. Archuleta, Red Wing; J. O. Francisco, La Veta; Walter Hamilton, La Veta; J. T. Trujillo, Red Wing; Chas. E. Furphy, Walsenburg.

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JEFFERSON—Frank N. Felch, Golden; Chester A. Lytle, Critchell; J. R. Cruse, Mt. Morrison; Gus A. Johnson, Golden; R. L. Downes, Evergreen.

KIOWA—Ed. M. Low, Eads; C. E. Bell, Eads; C. C. Wolever, Eads; Wurt Bailey, Townner; Ed. Houston, Arlington.

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LA PLATA—Helen Galloway, Durango; W. H. Wigglesworth, Durango; Ole M. Lee, Durango; Geo. Olbert, Oxford; Jacob Fritz, Durango.

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SAN MIGUEL—Lillian C. Kenyon, Telluride; Ben W. Purdy, Telluride; T. B. McMahon, Telluride; A. T. Woods, Placerville; J. R. Galloway, Norwood.

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SUMMIT—Geo. F. Forman, Breckenridge; James D. Galloway, Breckenridge; A. Lindstrom, Dillon; W. H. Hampton, Frawley; Eli Fletcher, Breckenridge.

TELLER—J. H. White, Victor; E. P. Arthur, Jr., Cripple Creek; T. J. Wicks, Cripple Creek; Tom Foster, Woodland Park; I. N. Riley, Victor.

WASHINGTON—L. Roy Cummings, Akron; Elbert Lewis, Akron; Homer Evans, Akron; R. M. Buckmaster, Abbott; E. A. Lewis, Burdett.

WELD—Chas. E. Littell, Greeley; L. L. Stimson, Greeley; A. F. Peters, Mead; T. Elmer Rowe, Greeley; J. W. Birkle, Platteville.

YUMA—John Adcock, Wray; A. C. Cary, Wray; Harry F. Strangways, Wray; H. W. Jackson, Yuma; Alex. Shaw, Wray.



TREASURE MOUNTAIN

From Summit of Wolf Creek Pass on the "Spanish Trail" Legends of Buried Treasure by the Early French and Spanish Adventurers Are Associated With This Mountain.

CONTENTS

President's Message on Roads.....	5
The Road, Its Paramount Importance.....	5
Standard I-Beam Bridges.....	6
Roads and Things.....	6
The Ease of Travel in France.....	8
Section Line Roads.....	9
Military and State Map Work.....	10
Some French Roads.....	11
Quick Construction of Army Camps.....	15
Big Thompson Canon Project.....	15
Maintenance Work Accomplished.....	16
Road Problems on the Western Slope.....	17
Before Construction.....	17
Federal Aid Project, Greeley Road.....	18
Federal Aid Project, Brighton Road.....	20
Federal Aid Projects in Eastern Colorado.....	22

**COLORADO HIGHWAYS
BULLETIN**

Published Monthly
by the

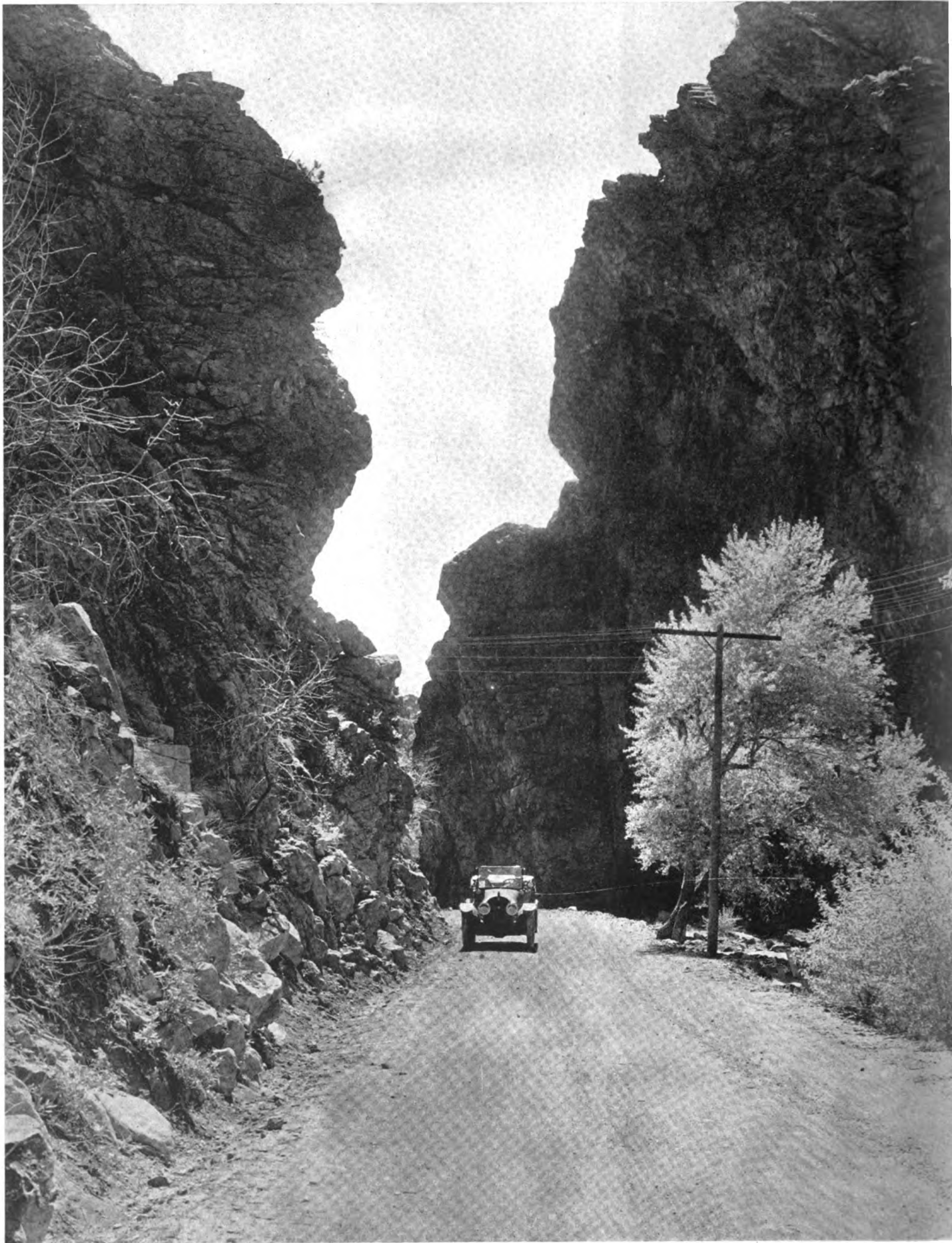


Colorado Highway
Department

Denver, Colorado.

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Bear Creek Canon



COLORADO HIGHWAYS BULLETIN

VOL. II

DECEMBER, 1919

NO. 12

President Wilson

Links Four Very Important Subjects Together in His Message to Congress

President Wilson's Message on Agriculture, Good Roads,
Forestry, Schools.

“The need of doing everything possible to promote production along economical lines, to improve marketing and to make rural life more attractive and healthful, is obvious. I would urge approval of the plans already proposed to the Congress by the Secretary of Agriculture, to secure the essential facts required for the study of this question, through the proposed enlarged programs for farm management studies and crop and estimates.

“I would urge, also, continuance of federal participation in the building of good roads, under the terms of existing law and under the direction of present agencies; the need of further action on the part of the states and the federal government to preserve and develop our forest reservoirs, and supply through the practice of better forestry methods on private holdings and the extension of the publicly owned forests; better support for country schools and the more definite direction of their courses of study along the lines related to rural problems; and fuller provision for sanitation in rural districts and the building up of needed hospital and medical facilities in these localities.”

The Road

Its Paramount Importance

(Reprinted from Chambers's Journal, London, England.)

By the Right Honorable Sir J. H. A. MacDonald,
K.C.B., LL.D.

“What we want, my Lords, is roads, roads, roads.”
Duke of Wellington.

“It may now be laid down without risk of intelligent contradiction that if the country is to be well served by its roads, these must be capable of carrying a very different traffic, both in bulk and character, from that of the latter half of the last century, when the use of the road was comparatively trifling, because all distance locomotion by heavy vehicles had been diverted from the road to the railway. In consequence of this old roads deteriorated, and were repaired on the cheap plan, and new roads were flimsily constructed. It is now practically admitted on all hands that road construction and maintenance, neglected for half a century, are once more of paramount importance, and that it is a matter of public necessity that the roads shall be made fit to bear the traffic which passes over them, traffic which tends every day to increase in volume as regards all classes of vehicles, and in mileage as regards the distance per day which each vehicle accomplishes.”

Editor's Note: It is evident from this article that, after centuries of road building, England still has to solve the present day traffic problem.—J. E. M.

Standard I-Beam Bridges

(Notes to accompany the plate on pages 12 and 13.)

By Robert DuBois, Field Engineer.

This plate is to be followed by others showing standard concrete girders, steel truss bridges and reinforced concrete arches. Last month was published that on concrete slab bridges. This plate is now being revised, the height of the railing being decreased by the omission of the bottom railing, while the widths of the footings of the abutments and wing walls are being increased sufficiently to make of them independent gravity retaining walls. Until this revision has been completed and the plate republished, care should be used to avoid the use of the plate on standard slab bridges without the change of these items in general accordance with those shown on the plate here published.

In order to provide for slight variations in unit prices, and, in cases, to suit special conditions, there is a slight overlapping of the allowable clear spans of one type of bridge over those of another type. Thus a bridge with a clear span of eighteen feet has been designed both as a slab bridge and as an I-beam bridge, while one of thirty-two feet clear span will be included among the concrete girder bridges as well as among the concrete encased I-beam bridges.

In every case, certain data must be secured by examination of the location in the field, before the plate can be advantageously referred to. These data should include the desirable length of clear span, the height from the bed of stream to the under clearance line of the old bridge, or, if the location is new, to some flood-water mark, so that the area of clear waterway may be made sufficient, the elevation of the roadway at each end of the bridge, and in case cut or fill be anticipated, a line of levels, and the corresponding cross sections. Soundings should be made to give an idea of the foundation conditions which may be encountered, such as the depth to bed rock, or as to the necessity for piling.

For the clear span determined upon there will be in general but one type of bridge given in the standards. In case the span selected should happen to fall within the overlapping of two types, a comparative cost estimate should be prepared. From the table of quantities given on each plate, the quantities for each span and abutment may be chosen. These, together with the estimated unit prices of the materials of construction, will give the approximate costs.

For simplicity of construction, the number of dimensions which vary with the span or height have been reduced as much as possible. These variable dimensions are indicated upon the drawing by letters, and their appropriate values given in the table of dimensions.

Two auxiliary tables have been given, containing the quantities per running foot of wing wall, and of abutment, respectively. The former of these is necessary, because of the wide range of wing wall lengths, to suit particular

local conditions. It should be noted that the quantities given are for but one foot increase of length of but one wing wall, and not for a general increase in length of each of the four, in which case four times the quantities given should be used. It is expected that the second auxiliary table will permit a wide extension of the usefulness of the standards through their application to skew bridges. A skew bridge has but slightly different quantities from the normal bridge of the same clear span. When the increase in the length of an abutment has been figured from the known angle of skew, the increase in volume of each abutment can easily be derived from the second auxiliary table, and the total quantities in the bridge be estimated fairly closely.

It is further expected that these plates will be of assistance in estimating the quantities and costs of multiple span valley crossings when it is desired to establish what length of span gives the most economical construction.

Roads and Things

By N. A. Ballou, Secretary State Highway Commission.

During the past few years much has been written, more said, about road conditions in Colorado. From some of the articles written it is evident that the writer was not fully informed as to the laws under which the counties, State Highway Commission, U. S. Bureau of Public Roads and U. S. Forestry Department were operating.

This is intended to be a brief outline of the co-operative methods now employed by the aforesaid county, state and U. S. departments, also explaining in detail the jurisdiction and working plan of the State Highway Commission.

The State Highway Commission was created by an act of the legislature in 1917, and is one of the executive departments of the state. The Commission is composed of five commissioners, each representing one of five districts into which the state is divided. Also one Highway Commissioner, who is the executive officer of the Commission. All commissioners are appointed by the governor and subject to removal for cause.

The legislature classified all state roads into two classes: First—State roads which within the meaning of the act, include rights of way or location—either actually used as a highway or not—designated for the construction of a state highway upon it. State routes are in nearly every instance supervised, constructed and maintained by the counties in which they are located, the State Highway Commission contributing to the county some amount agreed upon for construction or maintenance.

Second—State highways are such parts of state routes as are designated and accepted as such by the State Highway Commission. No highway or part of same shall be declared a state highway that has not heretofore been designated as a state route. Any part of a state route designated and accepted as a state highway shall be maintained jointly by the state and county in which same is located.

but in no case shall the county be required to pay more than one-half of the maintenance expense.

Federal Aid Projects are construction projects in which the U. S. Government and State Highway Commission enter into agreement to construct. These projects must be on a declared state highway over a major portion of which mail is carried, either rural or star route.

The State Highway Commission is required to furnish the Agricultural Department, through its Bureau of Public Roads, a complete survey, including plats, plans and specifications of proposed project, for their rejection or approval. No part of the preliminary expense for this work is reimbursed to the state; the government steps in only after the project agreement has been entered into and the expense is then divided between the government and state when actual work begins, upon some agreed basis, usually 50 per cent each.

Forestry Projects are those laid out and constructed by the U. S. Forestry Department, under the supervision of the U. S. Bureau of Public Roads. In case the State Highway Department enters into an agreement with the Forestry Department for the construction of a road through or entering into a U. S. forestry, the State Highway Department is required to pay its agreed upon proportion of the preliminary expense of engineering, including plats, plans and specifications, as well as the actual construction.

The State Highway Commission prepares at its regular meeting in December of each year a budget showing the estimated receipts for the coming year, also the amount of funds set aside for the use of each county, each Federal Aid Project, Forestry Project, projects coming under the direct supervision of the State Highway Department. Also appropriations for administration of the department, which includes salaries for employes, office supplies, road building equipment, engineering supplies and other items too numerous to detail. In cases of emergency the Commission may make appropriations at other times. All appropriations are submitted to the governor for his approval.

The State Highway Commissioner, or his deputy only, can sign vouchers authorizing payment (except in the case of the absence or disability of both, then the chairman of the board can act) of accounts, and then only where an appropriation has heretofore been authorized by the Highway Commission.

The Engineering Department makes all surveys, prepares plans and specifications for all proposed work, and after contracts are let, a representative from this department is at all times on the ground to see that specifications are adhered to and prepare monthly estimates. He also makes weekly or oftener, if necessary, reports to the Chief Engineer, detailing progress of work, weather conditions, etc.

Field parties on location or survey work are in charge of a field engineer. He assumes all responsibility for his crew, makes arrangements for transportation, hotel or camp accommodations, approves all bills for expense incurred by him as well as all items of expenses incurred by members of his party. In regard to automobile expense, the State

Auditing Board has prescribed that the mileage charge for a Ford car shall be 8c per mile, larger cars 10c per mile traveled; in case car is owned by the employe using same. Statements should show in detail mileage traveled, places reached, dates, etc.; in cases where cars are rented by the day, statements should give the same information. The Highway Department has at present for use of inspectors, superintendents and field engineers, only six cars, necessitating the hire of numerous cars for transportation in this department.

The expense items of the party must be covered by receipts, showing purpose, amount and where same was incurred; these receipts are listed and attached to an employe's expense form, showing to what project same is to be charged. These statements are made in duplicate and approved by field engineer before forwarding to the office. After being audited and found correct they are submitted to the chief engineer for his approval. A voucher on state auditor is then prepared; after same receives the approval signature of the State Highway Commissioner it is forwarded to the State Auditing Board for their approval.

The State Auditing Board meets Wednesday of each week, and consists of the governor, secretary of state, treasurer, auditor and attorney general. From there it goes to the auditor and after account is again audited, a warrant is issued if voucher and accounts are found correct. All vouchers issued by this department are handled in this manner, except salary vouchers for employes within the Civil Service classification. These vouchers go direct to the state auditor, and warrants issued only on certification from Civil Service Commission.

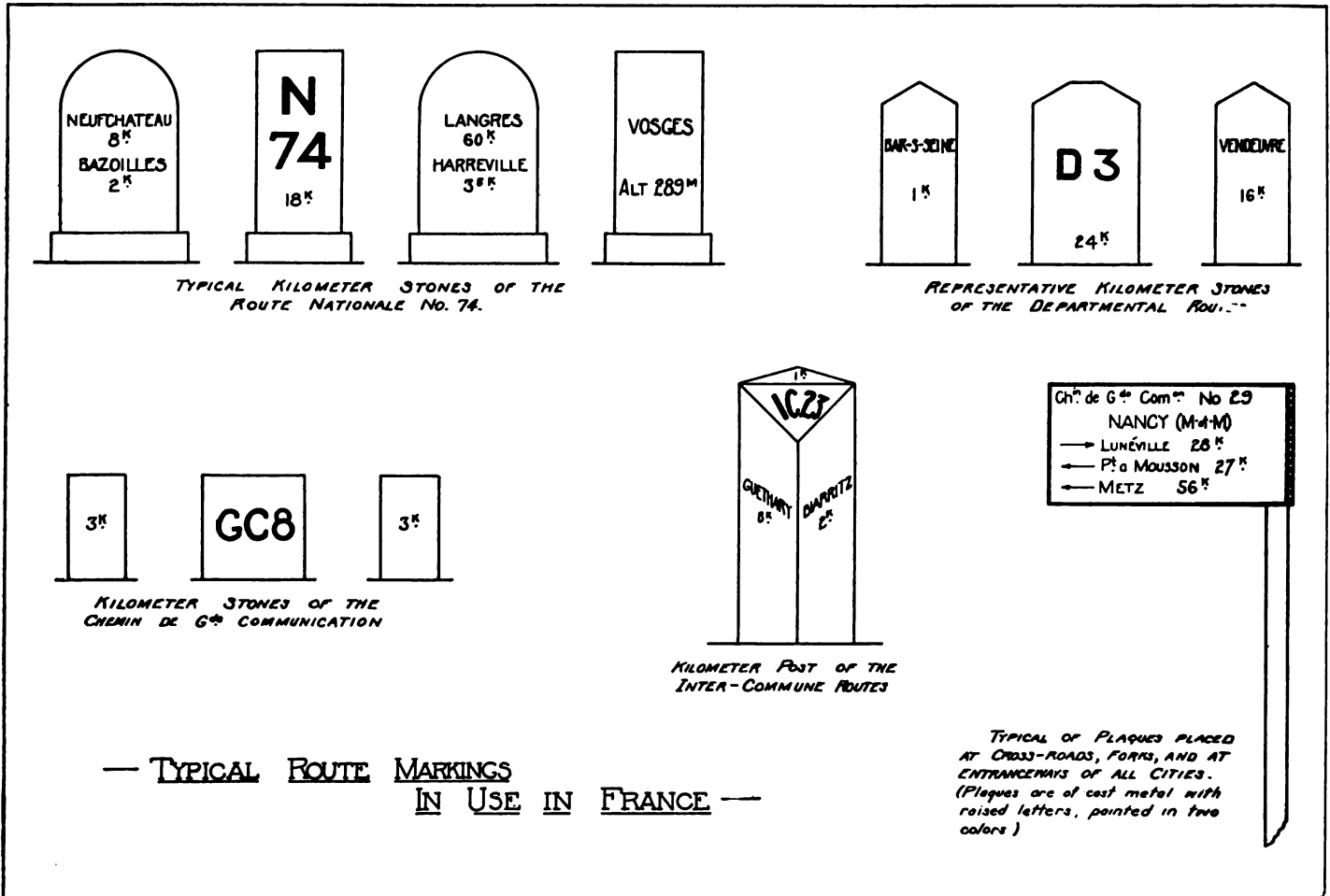
Under the present constitutional amendment the Civil Service Commission cannot place on its roster any person who is not an elector of the State of Colorado. All state employes come within the classified service, with the exception of those classed as day laborers.

Reimbursement of funds expended by counties on state highways are made on statements, certified to this office by the county clerk. Statement shows county warrant number, to whom warrants were issued, for what purpose, and on what highway the expense was incurred, and on these certified statements our voucher is issued for the state's portion of the expense, the ratio between county and state having been determined on each highway by the county commissioners and the State Highway Commission at the time the annual budget was prepared.

The State Highway Commission has received to date from the War Department through the U. S. Department of Agriculture 178 trucks for use on Federal Aid Projects and state highways. The trucks are distributed to the counties by the Highway Commission—the commissioner from each district making the assignment for the counties in their respective districts.

The Commission contracted for steel dump body and hoist equipment, and as fast as the trucks are equipped they are delivered to the counties, the counties reimbursing the state for the freight and equipment charge.

The foregoing is intended to answer in a general way inquiries regarding the subjects mentioned.



The Ease of Travel in France

By John S. Means, Field Engineer, Formerly Captain Engineers, A. E. F.

Traveling in France, aside from the delight incident to gliding over a smooth and well surfaced roadway, maintained always in excellent condition, through aisles of gigantic trees, over graceful arch bridges, and with the enjoyment augmented by the splendid natural beauties of this picturesque country, is rendered many times more pleasurable by the ease with which the tourist is able to find his way. With the facilities afforded him in this land of wonderful highways, the traveler needs spend but very little, if any, of his time in planning and following routes. This result is due to the thorough and liberal placing of kilometer stones and sign posts along all the routes.

A more detailed description of the types of roads and the way in which they are marked might be of interest. In the first place, the road system of the country has been divided into several distinct classifications, chief among which are the principal thoroughfares or Routes Nationale, the secondary or Departmental Routes, and lastly the Inter-Communal Routes. The first of these, the Routes Na-

tionale, are the broad main highways connecting the larger cities all over the country. They are marked from end to end, at intervals of one kilometer, with stone monuments, each of which has carved upon it the route number and the distance in each direction to the next town. The route number is maintained through the entire length, making it possible to travel across a great portion of the country on the same road, necessitating no other care than an occasional glance at the passing monuments, and a due observance of the ever-present plaque or sign post at forks and cross roads. Even this latter precaution is superfluous, as the width of the road alone distinguishes it clearly from the routes of lesser importance.

The secondary, or Inter-Departmental Routes, form the lines of communication between the towns of average size, and differ only from the Nationale Routes in their narrower width. They, too, are clearly marked, with monuments distinctive of this type of road.

The Inter-Communal roads are, as the name implies, connecting links between the small country towns and villages, and are but narrow ribbons of macadam, often only of sufficient width for a single vehicle. In spite of their narrow width, which is, however, sufficient for the traffic they are called upon to carry, these small roads are as firm and substantial as the more important trunk lines, and can be relied upon by the traveler to carry him to his destination just as surely, though not so directly, and perhaps with an added increment of pleasure derived in following

these small country lanes through their many windings, touching here and there.

In keeping with this comprehensive system of road marking, which includes the kilometer and intermediate posts and cross road plaques, which are all well designed and of pleasing appearance, there is published a guide book, similar to the automobilists' Blue Book of this country, but which, due to the smaller size of France and its more highly developed road system, is more simple, compact and complete. This small volume, through careful editing and selection of subject matter, is made to contain all the important items of interest to the traveler. It includes a brief description of all the interesting tours which can be made in the various sections of the country, together with an alphabetically arranged list of every city, town and village of over a hundred population, with pertinent facts about each concerning hotels, their whereabouts and prices, telephone and telegraph offices, altitude, and distances to adjacent cities. For each city of over 2,000 population a small map is included, placed in position with the description of the city to which it pertains. These small maps, showing, as they do, the connection of the city streets with all the country roads, enable the tourist to pass through even the largest cities without delaying to inquire his way.

A system such as above so briefly described can only be obtained in many years of effort, by the expenditure of considerable money, and lastly but pre-eminently a unifying of effort by centralizing under a single head the direction of all the roads of the entire country. Through a central bureau such as this, the plans of many states and districts of our own country could be so co-ordinated, improved and regulated as to establish a comprehensive and far-sighted road system, which could be worked out gradually; one which would make it impossible for the obscure county surveyor or road supervisor to install bridges of hideous design, road markings of widely varying shapes, sizes and materials; conglomerate and often ineffective road surfacing, and endless types of culverts; a plan which would progress towards a glorious system of permanent highways, efficient and practicable methods of maintenance, and the attendant increased prosperity, national compactness and healthy growth of a unified nation.

Rapid strides in the direction of permanent roads are at present being made all over the United States, and here in Colorado many miles of concrete highways are already in place, with others soon to follow. Here, too, various standard designs for bridges and culverts are being prepared with a view toward gradually replacing the unsightly and inadequate structures with strong yet pleasing ones, which will harmonize with the surrounding landscape. So, it would appear that the coveted goal, that of making the roads of the United States superior to those of every other nation in the world, will in due course be attained.

Editor's Note: Captain Donovan's article on page 11 gives impressions of some other French roads used during the war.—J. E. M.

Section Line Roads

By Roy J. Randall, Office Engineer.

The first hardy adventurers who made the voyage in the prairie schooner across the vast empire lying west of the Mississippi River found no roads to guide them. The region being traversed has often been termed a "trackless waste"—and such it was except for the deep cut buffalo trails and Indian paths. In fact, the greater part of Western Kansas and Nebraska was a desert and the travelers were compelled to advance along the rivers so that they might have water. Thus, the first roads across this region ran parallel to the Platte, the Big Sandy, the Arkansas, the Canadian and the other rivers running eastward.

As civilization advanced, and travel increased over these roads, fortifications were built at suitable places along the routes to furnish the travelers protection from the Indians, and to enable them to obtain supplies.

These forts and supply stations grew to be towns and were inter-connected with roads, and then mining camps appeared in the mountain districts, and roads were built to haul the ore.

Up to this point the location of the roads was accomplished by a process of selection, with possibly some assistance from a few of the pioneers who possessed engineering ability. A teamster found by experience which of several tracks between two points was the best to use, and then constant travel wore this track into a road.

Later the country was sectionized, and in time we find these old roads being fenced up and the traveler forced to go around the section, over hills and through valleys, packing back and forth to get to his destination.

It was a gross mistake for the road authorities to have allowed the old roads to be fenced off. The titles to the rights-of-way occupied by these old roads could have easily been made a matter of record, and since the old roads were being traveled years before the land was settled up, these rights-of-way could not have been included in the title to the homesteads.

Individuals had no legal right to fence them off.

This evil existed largely through the laxity of the county commissioners, who, fearing the ill will of a few constituents, allowed them to fence up the roads, on which money had already been spent in improving.

Unless the character of the country is particularly favorable, it is quite improbable that a road on a section line will follow the best location. The rise and fall is excessive, and the road is liable to traverse bad ground, such as wet, swampy spots, slides, steep grades, etc.

From time to time the state and county road authorities attempted to correct these conditions by grading and building structures, and we know places where comparatively large sums of money have been spent in cutting and filling to improve a grade. If a careful job of locating had been done in the first place, following the most economical lines of grades, the right-of-way could have been purchased, grading done and the road surfaced, and the total cost would have been less than the amount spent on

the section line road, and a much better road would have been obtained.

The injury done by having a road traverse a farm is probably a matter of perspective and imagination to a certain extent. Many farms are crossed by roads, and the owners do not notice a great inconvenience because of it. They have become accustomed to it and have adapted themselves so that the thing that at first annoyed them, they later turned into an asset.

A comprehensive program for building state routes should include an outline of the location of intra-state roads between the principal centers. Many of these roads should follow the course parallel to the railroads instead of the zig-zag route. Through the farming districts where beets are raised, the dumps are necessarily along the railroads, and yet the farmers must turn off the main highways and haul over secondary roads to get their beets from the dump because the main road follows a section line instead of running as close to the railroad as the nature of the ground will allow. This is only one example of the many advantages, others of which will suggest themselves to the readers, to be obtained by selecting the most natural engineering location following the desired general route and avoiding artificial restrictions such as section line locations.

The Military and State Map Work

By A. M. Haynes, State Highway Engineering Department.

The large amount of road work now under way is supplemented and preceded, as much as possible, by these military maps, containing the condensed information from all maps, made under orders of the War Department and in which roads are the principal feature.

Mapping is little appreciated, except by the few who are responsible for results, and has been sadly neglected in Colorado.

It is discouraging work in this rough country, where surveys are generally approximate and many fraudulent. Only in smooth irrigated districts are maps accurate, and even then many show no contours.

The Geological Survey in recent years has done some excellent work, but this covers a small portion of the state.

The Geodetic Survey is of value, but least appreciated, and the work is about starved out for lack of appropriations. This survey should be continued and sufficient funds provided by Congress.

In preparing these maps we have collected all land surveys, telephone, railroad, irrigation and national forest

maps, and now is the first time that many corporation right of way maps have been accessible.

These maps will save a great deal of surveying and are useful in planning the detail surveys. From them fair estimates can be made of cost of construction and of the grades and elevations to be overcome on different routes that come up for consideration.

For example, between Alamosa and Durango there is at the present time debate on the question of which is the best of three proposed routes. The military maps can furnish profiles for comparison. They assist in settling county lines which are indefinite and poorly described. They will probably aid in preventing such litigation as has been in progress between Summit and Lake counties over their boundary, which is wholly on account of erroneous maps.

There are many places where no one can tell just where the county boundary is. To illustrate the difficulties of county boundaries, the west line of Archuleta County is made six miles west of the mouth of Lost Trail Creek. This mouth is now under a reservoir. Is it any wonder that maps disagree a mile and a half on this line? At Ratoon Pass we have just built a mile and a half of road which New Mexico threatens to take away from us. That is, she has started suit for a boundary line which would take said road. But these maps are a safe defense on all sides, as we are assailed on the east, west and south.

We can show mistakes of at least some of our accusers as far as we have pursued our investigations. So far as the work has progressed and for purposes of land lines it may be considered 75 per cent complete, though, of course, much of it should be redrawn and corrected as new data is found and new surveys are made in unexplored districts.

It is the intention to complete the work except regarding contours, and copyright it in the name of the state to prevent others from doing so in their own name and restricting its use. That law should be changed. By the letter of that law, we have found ourselves warned not to copy our own work. We could furnish blue prints to the public for actual cost when proper regulations are established.

This work promotes the operation of air routes and the defense of the country. Airplane landings are located and the maps are reconstructed for use of pilots. The maps are made to match when put together and make a map of Colorado 24 feet by 30 feet, which is reduced (and for some purposes enlarged) by photography to meet the different uses of the government.

I believe these maps will contribute materially to the opening up of the state and be of great assistance in many ways.

Editor's Note: It is hoped that counties and private corporations will realize the benefit of these maps, and will give the Department all possible assistance in getting correct data upon which to base the sheets.—J. E. M.

Some French Roads

Experiences and Opinions

By John P. Donovan, Field Engineer, Formerly Captain Engineers, A. E. F.

Personal observation during the tour of duty described below is the sole base on which the comments and opinions expressed in this article are founded, and the statements of fact, causes and effects are given for what they are worth as the experiences and opinions of an individual whose part in the recent activity "somewhere in France" was but a very small one.

The present road system of the republic of France was founded by Napoleon I and consists of highways of three principal characters: the national highways, the departmental highways and the communal highways, alike in purpose and differing only in sizes of sections and means of control and maintenance. Practically all of the roads observed were macadam, a few telford, some of the communal roads were merely graveled and one stretch of asphaltic or tar concrete was observed running south from Paris. Normally the tremendous amount of maintenance work necessary is done by groups of one or two road menders, men or women, who clatter about in their wooden shoes, wielding picks, shovels, forks, tamps and wheelbarrows of medieval pattern, doing little at a time, but by dint of long hours and perseverance accomplishing much. Practically all of the roads observed had been without maintenance work for four years, except the infinitesimal amount accomplished here and there by a few superannuated men and women who thus improved their short periods of respite from labor in the farm fields.

Without the highway system of France the lines of communication of the Allies would have broken down—rather they could never have been established—and the Boche would have been an early and detestable victor. As an instance of the importance of highway traffic, and of its magnitude, the following illustration is condensed from official figures: During the defense of the Verdun sector by Petain in 1916, the railroads were quickly cut by shell fire and it became necessary to keep up the supplies of Verdun by means of trucks alone. The French service of supply organized a fleet of trucks for this purpose and for months this fleet numbered forty thousand trucks and the number of men required to operate them and to maintain the roads was over three hundred thousand. The main highway of communication ran through the center of the salient from Bar le Due to Verdun, only about thirty miles, and a continuous procession of trucks hurried over this short road every minute of the night and during every daylight minute when the operations of the enemy permitted traffic over the road.

As Division Engineer of the Fortieth Division it was one of my duties to closely observe the roads in the divisional areas and to supervise their repair by the labor of

American soldiers and Boche prisoners. Seven months of this tour of duty were spent in France in the zone of the advance, in the intermediate and in the base section of the American line of communications. In addition to this it was my fortune to make an automobile trip from Souilly, headquarters First American Army, to Le Mans, headquarters of the Brest and St. Nazaire embarkation area, and return, a distance of some two hundred and forty-five miles. This trip took me along some of the great traffic routes that supplied the Verdun sector for four years, as well as along some other highways that were used little by the French but very extensively by the A. E. F.

The conditions that were observed as to wear of road surfaces under heavy truck traffic were the same everywhere and a few typical instances will be cited.

In August, 1918, the Fortieth Division arrived in an area in the intermediate zone where the roads had escaped all the war time traffic and, in fact, all the material ravages of war up to that time. To the American eye the long stretches of wonderfully macadamized roads, carefully drained, protected from winds by double rows of sturdy plane trees, and having heaps of crushed rock for repairs scattered along side at intervals of but a few yards, were a wonderful example of highway construction. Actually, developments proved that, while they were wonderful for light traffic, a few days' heavy traffic caused marked and serious deterioration. This is evidenced by the fact that just twenty-six days after the arrival of the division the division commander issued an order containing the following words:

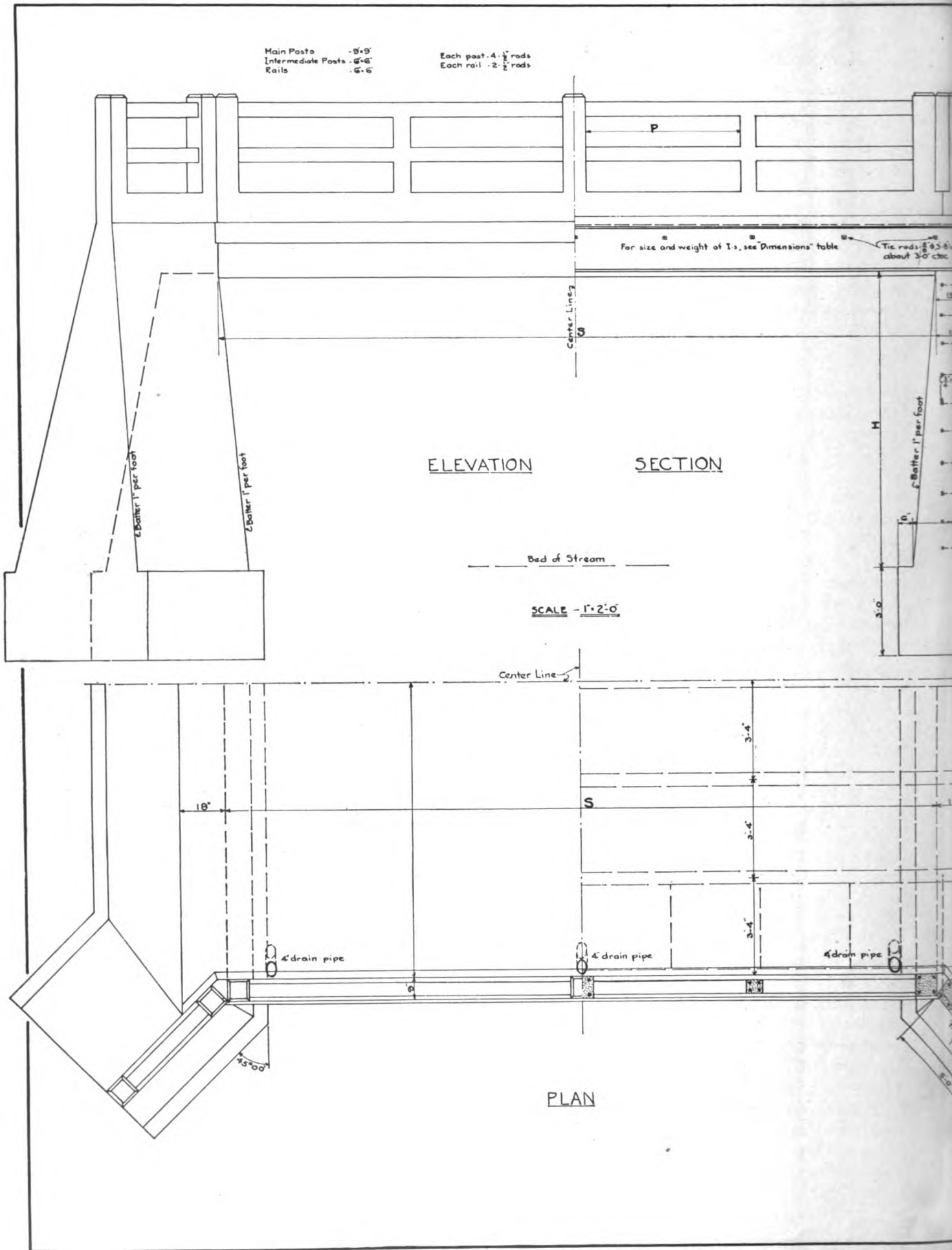
"The roads in the divisional area, over which heavy truck traffic is being carried, are becoming full of holes, which, if not soon repaired, will render them almost impassable."

And this order was issued after the roads of heavy macadam had been subjected to the truck of less than two divisions during perhaps twenty typical rainy French days.

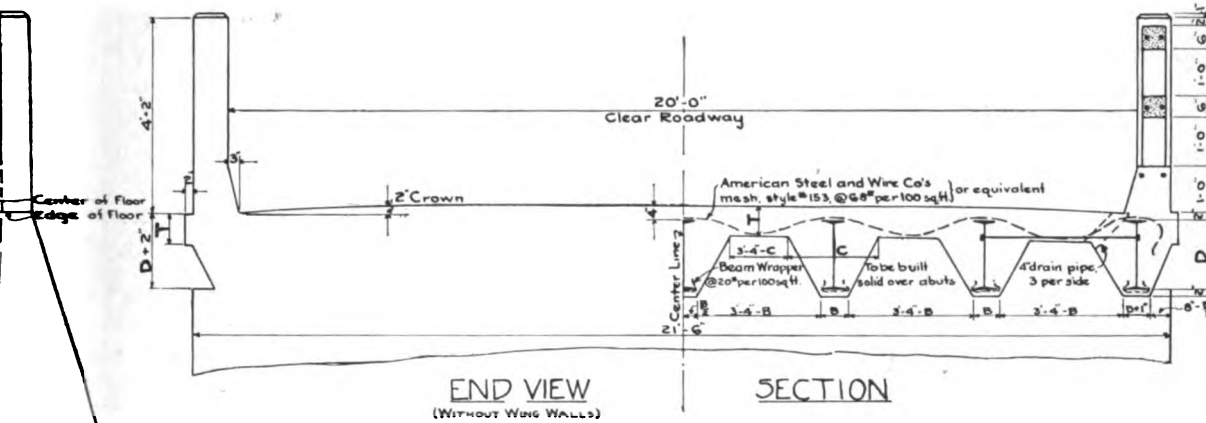
Around every area occupied by American troops that came under my observation, all the roads rapidly deteriorated under heavy truck traffic until they became only a series of chuck holes, tremendously hard on passenger cars as well as on trucks. One macadamized road near Le Mans, having had light traffic and no maintenance for four years, developed into an excellent imitation of a corduroy road that was practically impassable at the very time when it was suddenly called upon to handle a tremendous volume of truck traffic.

Around the camps of embarkation and in the zone of the advance, where the volume of traffic was alike enormous, the evils resulting were the same except that they were magnified and speeded up by the volume of traffic. But for the presence of American road-making troops and American machinery, crushers, rollers, scarifiers and even the humble "Number Two" that were kept constantly at work even under heavy traffic, long-range shelling, continual rain and other difficulties, men and munitions could never have been moved over the impermanent, macadamized highways in sufficient quantities to meet the pressing

(Continued to page 14)



See Article on



(A) DIMENSIONS

S Clear Span	T Beams			T Floor			P		Concrete around Beams		
	No.	Depth D	Weight per Ft	Thickness	No.	Clear Length	B Width at Bottom	C Width at Top			
16'-0"	7	12"	40"	8"	3	4'-6"	6 1/2"	1'-4"			
18'-0"	7	12"	40"	8"	3	5'-2"	6 1/2"	1'-4"			
20'-0"	7	15"	42"	8"	4	4'-2 1/2"	6 1/2"	1'-8"			
22'-0"	7	18"	55"	8"	4	4'-8 1/2"	7"	2'-0"			
24'-0"	7	18"	55"	8"	4	5'-2 1/2"	7"	2'-0"			
26'-0"	7	18"	55"	8"	4	5'-8 1/2"	7 1/2"	2'-0"			
28'-0"	7	20"	65"	8"	6	5'-1 1/2"	7 1/2"	2'-2"			
30'-0"	7	20"	65"	8"	6	4'-7 1/2"	8"	2'-8"			
32'-0"	7	24"	80"	8"	6	4'-7 1/2"	8"	2'-8"			
34'-0"	7	24"	80"	8"	6	4'-1 1/2"	8"	2'-8"			
36'-0"	7	24"	80"	8"	6	5'-3 1/2"	8"	2'-8"			

The rods are 3/4" diameter, 3'-8" long, and about 5' o'c. Abutments are to be 18" wide on top, for all spans. Floor reinforcing to be American Steel and Wire Co's mesh, style #153, weight, 68 lbs per 100 sq ft, or its equivalent. Beam wrapper to weigh about 20 lbs per 100 sq ft. Where Rail has 4 or 6 panels, center post is to be 9" x 9". All rods to be square and twisted, except the rods.

(B) TOTAL QUANTITIES FOR SPANS WITH 5'-0" WING WALLS

Span - S	Height - H	4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	12'-0"	14'-0"	16'-0"	18'-0"	20'-0"
16'-0"	Concrete - C.I.A.	17.90	17.98	18.04	18.08	18.08	18.11	18.14	18.15	18.19	18.20	18.22	18.22
	- C.I.B.	38.03	48.23	59.42	71.56	82.01	95.92	110.68	138.51	173.70	207.17	248.38	288.60
	I-Beams	51.80	51.80	51.80	51.80	51.80	51.80	51.80	51.80	51.80	51.80	51.80	51.80
	Other Steel	111.9	116.0	124.1	130.2	136.4	142.5	148.6	160.9	173.1	185.4	197.6	209.8

(C) QUANTITIES PER ADDITIONAL FOOT OF WING WALL

HEIGHT - H	CONCRETE - CLASS B - Cu. Yds.												
	4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	12'-0"	14'-0"	16'-0"	18'-0"	20'-0"	
16'-0" span	0.700	0.873	1.064	1.274	1.502	1.749	2.015	2.512	3.154	3.783	4.512	5.434	
18'-0"	0.700	0.873	1.064	1.274	1.502	1.749	2.015	2.512	3.154	3.783	4.512	5.434	
20'-0"	0.784	0.967	1.166	1.363	1.598	1.852	2.124	2.635	3.300	3.912	4.735	5.613	
22'-0"	0.784	0.966	1.161	1.366	1.623	1.880	2.154	2.668	3.338	3.954	4.781	5.660	
24'-0"	0.784	0.966	1.161	1.366	1.623	1.880	2.154	2.668	3.338	3.954	4.781	5.660	
26'-0"	0.850	1.038	1.245	1.470	1.715	1.976	2.257	2.745	3.464	4.110	4.935	5.803	
28'-0"	0.878	1.066	1.274	1.502	1.749	2.015	2.299	2.792	3.517	4.167	4.993	5.896	
30'-0"	0.878	1.066	1.274	1.502	1.749	2.015	2.299	2.792	3.517	4.167	4.993	5.896	
32'-0"	0.878	1.066	1.274	1.502	1.749	2.015	2.299	2.792	3.517	4.167	4.993	5.896	
34'-0"	0.878	1.066	1.274	1.502	1.749	2.015	2.299	2.792	3.517	4.167	4.993	5.896	
36'-0"	0.878	1.066	1.274	1.502	1.749	2.015	2.299	2.792	3.517	4.167	4.993	5.896	

Additional Class A Concrete in Curb and Rail - 0.0463 Cu. Yds.
Additional Steel in Curb and Rail - 5.10 Lbs.
In abutments and wing walls, use 10' rods with 6' wing, and 12' rods, 6' o'c. for over.

(D) QUANTITIES PER ADDITIONAL FOOT OF ABUTMENT (FOR USE ON SKEW BRIDGES)

HEIGHT - H	CONCRETE - CLASS B - Cu. Yds.												
	4'-0"	5'-0"	6'-0"	7'-0"	8'-0"	9'-0"	10'-0"	12'-0"	14'-0"	16'-0"	18'-0"	20'-0"	
16'-0" span	0.60	0.78	0.97	1.19	1.35	1.60	1.86	2.36	3.01	3.63	4.42	5.16	
18'-0"	0.60	0.78	0.97	1.19	1.35	1.60	1.86	2.36	3.01	3.63	4.42	5.16	
20'-0"	0.60	0.78	0.98	1.19	1.36	1.61	1.87	2.38	3.03	3.66	4.45	5.19	
22'-0"	0.60	0.78	0.98	1.20	1.37	1.62	1.89	2.39	3.05	3.68	4.48	5.22	
24'-0"	0.60	0.78	0.98	1.20	1.37	1.62	1.89	2.39	3.05	3.69	4.49	5.22	
26'-0"	0.60	0.78	0.98	1.20	1.37	1.62	1.89	2.39	3.05	3.69	4.49	5.22	
28'-0"	0.60	0.78	0.98	1.20	1.37	1.62	1.89	2.39	3.05	3.69	4.49	5.22	
30'-0"	0.60	0.78	0.98	1.20	1.37	1.62	1.89	2.39	3.05	3.69	4.49	5.22	
32'-0"	0.60	0.78	0.98	1.20	1.37	1.62	1.89	2.39	3.05	3.69	4.49	5.22	
34'-0"	0.61	0.79	0.99	1.21	1.38	1.63	1.91	2.42	3.08	3.72	4.52	5.28	
36'-0"	0.61	0.79	0.99	1.21	1.38	1.63	1.91	2.42	3.08	3.72	4.52	5.28	

NOTE.
Concrete Quantities in Cu. Yds.
Steel Quantities in Lbs.
Loads -
Alternative 100 Lbs per Sq. Ft.
Live Load 1 20 Ton Road Roller
Dead Load (Concrete - 150 Lbs per Cu. Ft.
Class A Concrete - 1:2:4
Class B Concrete - 1:2 1/2:5

COLORADO
STATE HIGHWAY DEPARTMENT

STANDARD
I-BEAM
BRIDGES

FOR VARIOUS SPANS AND ABUTMENT HEIGHTS

R.S.D. NOV 1922

Some French Roads

(Continued from page 11)

demands of battle. It is no exaggeration to state that the number of road makers, American engineer troops, prisoners of war and labor battalions of all nationalities—including the "heathen Chinese"—constantly employed in road repair work reached hundreds of thousands. And ninety-nine per cent of this tremendous effort was incidental to keeping the macadamized roads in merely passable condition for heavy truck traffic.

Instances of road deterioration or destruction like those cited above could be recited to redundancy. It is reiterated that the macadamized roads of France saved that country from destruction by a ferocious enemy, but that salvation would have been impossible had it not been for a most tremendous expenditure on the repair of macadamized roads of men, machinery and munitions that could have been better employed at the front. Macadamized roads did unquestionably do the work, but that work could better have been done had the roads been of concrete surface on a heavy foundation, substantial enough to carry heavy truck traffic, or of some other type—if such there be—of permanent road of low maintenance requirements.

Of by far the greater part of the roads observed the alignment and grades are ideal. Occasionally as a road goes through a village a section narrowed to fit the streets and a series of short curves and angles, blinded by ancient buildings, slows up traffic, causes accidents and makes the weak link in the highway chain.

It is quite certain that the bridge designers of France during the past century never dreamed of the possibility of carrying the tremendous weights of present-day wheeled traffic, and much trouble is caused by bridges of insufficient carrying capacity. Every bridge is a limiting factor in the value of a highway. The fortunes of war or of business may raise a highway of mediocre importance ordinarily to one of maximum importance over night, and this occurred in France, not once, but many times. Bridges of light load capacities on such highways immediately—in time of heavy traffic demand—reduce the potentially high value of the highway of which they are links to practically nothing. Perhaps bridges of short span can ordinarily easily be strengthened to carry safely heavy traffic during emergencies, but the strengthening of long-span bridges presents a very serious problem. The following cases are typical:

Two adjacent highways are carried across a large river and its tributary by suspension bridges—my recollection is that the maximum suspension span is about two hundred and fifty feet. These highways suddenly became of great importance as links in the line of communications. Each bridge was nearly a century old and one had a total capacity vehicle and load together of four tons; the other capacity was the stupendous amount of three thousand pounds. Three to five trucks, empty, to say nothing of loaded light trucks and touring cars, were obliged to make detours of from twelve to twenty miles around both of these bridges to another but substantial bridge of stone

arch type. By the customary perverseness of events, this bridge was the only entrance from the south to a city of some 30,000 people, and on the city side the approach to the bridge was by way of a heavy grade on a hairpin turn. There were several accidents on this hairpin because of the serious congestion of traffic over the bridge, which was obliged to carry all of the traffic of four heavily traveled highways. Progress was further greatly impeded by the fact that in order to regain the proper route it was necessary for huge truck trains to proceed at a snail's pace for a mile and a half through the narrow, tortuous streets of a busy, crowded city.

In another locality the approaches to an important bridge were so low that in time of flood they were inundated under two feet of water, requiring traffic to detour nearly eighteen miles to reach another bridge, reached, of course, only by traveling through the very center of another large city.

Every cross roads and junction in France is furnished with an iron pipe sign post bearing cast iron signs showing distances, directions and names of towns reached by each road. The signs are usually painted dark blue with letters and arrows cast in high relief and painted white. These signs saved untold hours of aimless wandering and were of great benefit to us who were unfamiliar with the country and its language. A person of moderate intelligence can take a French road map and find his way to any part of France without asking a question if he will read his map and follow the omnipresent signs. They are an important part of any road system, but are to be found nowhere within my own knowledge except on the highways of France.

The sum of the deductions made from sorry months of experience, and watching millions expended in maintenance of macadamized roads, is as follows:

1. Macadam requires too much maintenance work to make it a satisfactory road surface under heavy traffic. Use gravel, sand or nothing until money is available to build real concrete roads.
2. Blind curves and sharp angles are elements of danger and slow up traffic, thus causing congestion at bad places.
3. Sections should not be narrowed to conform to city streets. Money spent in condemnation of property for this purpose is money well spent.
4. Every bridge must be strong enough to carry maximum loads, and the approaches are as important as the structures.
5. Highways are chains carrying traffic and as strong only as the weakest link.

The roads of France are marvelous and certainly contributed a tremendous amount to the defeat of the Boche, but they are not ideal. Unbounded admiration of French roads by automobile tourists who are metamorphosed into road experts overnight should not delude American highway planners into building roads solely on the French system. It is by criticism, not by admiration, that we learn.

Editor's Note: It is evident that in some portions of France the road surfacing for modern heavy traffic will have to be of some type other than water bound macadam.—J. E. M.

Quick Construction of Army Camps

By G. S. Lawrence, State Highway Department.

While stationed at Camp Kearney, California, I was appointed executive officer for a new camp, with orders to select a camp site adjoining Camp Kearney, suitable for a recruit depot. It was my duty to see that the work was properly done and completed in the time allotted. Work was started January 2nd, 1918. There were 1,000 recruits sent to this camp and arrived January 10, 1918, from Camp Lewis, American Lake, Washington.

The survey was made by a detail from the Colorado Engineers. The water system was installed just as soon as the survey was completed.

The mess halls, kitchens, tent floors, frames, etc., were built by civilian contractors. The mess halls and kitchens were all in one building 22x38x12 after a plan adopted by the camp quartermaster at Camp Kearney. Tables and seats were constructed of 2x4 and 1x8, two tables to a mess hall to accommodate 100 men. Kitchens with earthen floors were partitioned off from the mess halls.

There were twenty tents to a company, 10 on each side of the company street, and five men to a tent. The floors of the pyramidal tents were 16x16 and built one foot off the ground, of 2x16 and 1x12. Tent frames were built of 4x4 for the corner posts, 3 feet in length, and 4 pieces of 2x4x9. One 4x4 3 feet long was used for the center pole with a tent pin for the center ring and hood to rest on. These were braced by 1x6. The floors and tent frames were built in Camp Kearney and hauled about one-half mile to the new camp in trucks. As fast as they were hauled over there were enough soldiers to unload them and put them in place. The canvas was hauled from the quartermaster depot and distributed at the head of each company street; a detail of soldiers would carry them over and adjust them on the tent frames.

The signal corps installed the electric light system.

As this was only a temporary camp, the buildings for the latrines were not connected with a sewerage system; they were 8x20-ft. front, 8-ft. back. Roof covered with tar paper.

A trough was built on the front of these buildings for washing mess outfits. All the buildings were roughly constructed, but very practicable. Seventeen officers were detailed from Camp Kearney to receive and train the recruits. A canteen was established from Camp Kearney, also a Y. M. C. A. tent was erected, fitted up with everything to entertain the men.

One hour after the last section arrived with the 1,000 recruits they were comfortably in their tents.

The tents contained a new iron spring cot, mattress, pillow and two blankets for each man; all the recruits had were their barrack bags with their personal effects. It was quite a surprise for them to arrive at night and find a new home all complete.

It only required eight days to pick out a camp site, put in water and gas and construct all the buildings, etc., with provision made for everything in record time.

Big Thompson Canon Project

By P. J. Becker, Field Engineer.

A very interesting feature to the highway engineer in constructing highways in the mountains is surfacing. It hasn't been long ago since a teamster hauling ore down a steep grade from the mine to the mill would feel perfectly safe if he could get his wheels in the ruts of the road; if his brakes were working it made very little difference to him how deep the ruts were, he would get the ore to the mill without any trouble. This kind of a road, however, didn't satisfy the milkman, the man hauling timbers to the mines, or drivers of any light vehicles.

There always have been various opinions as to how roads should be built. What would be desirable for one class of wagons would be entirely unsatisfactory to others. However, since the advent of the automobile and motor trucks the ideas about highways have changed, and instead of the drivers of the lighter class of vehicles building a road a little wider than the ordinary, calling it a boulevard and prohibiting its use to heavy traffic, and owners of the heavier wagons building roads to suit their purpose, which the lighter vehicles could not go over, the traveling public is getting together on the road question, building roads which all can use and calling them highways.

Roads formerly consisted of series of cuts and fills. After these were built to grade the road was thrown open to traffic and often in a short time it was in a very poor condition, but a highway is constructed differently. A modern highway is not any more complete without surfacing than a railroad would be without cross ties and rails. So it is being realized more and more that surfacing is as important as road building itself. Surfacing then being essential to a good highway, the question of material for surfacing naturally arises, and it is difficult to decide just what surface to use for any particular district, as conditions, experience proves, govern to a great extent. However, in building mountain highways it is the common practice to supply the surfacing from the material available at different places along the proposed line.

It has been very noticeable during the process of widening the road in the Big Thompson Canyon (Federal Aid Project No. 9) that short stretches of the highway after having been subjected to every condition the road is expected to meet, with the possible exception of a water-spout, were in good shape, while perhaps adjoining stretches would, after a heavy rain or snow, be almost impassable. In examining these stretches it is seen that, for instance, some earth when it was first turned over would be black, resembling rich agricultural soil, but would contain enough sand and gravel to produce a natural surface, while another stretch that looked good, after being placed would not hold up under traffic and storm conditions.

Now the question arises if one piece of highway has a natural surface and adjoining stretches have not, could not the latter be brought up to similar surface conditions by combinations of the material which compose these sections?



Notes by J. E. Maloney, Chief Engineer

Temporary Editor

TO ALL, we wish a peaceful, productive, prosperous New Year.

The Highway Commission consenting, the Engineering Department assumed the task of getting out this number of the Bulletin, and the matters covered and discussed are presented for your thoughtful consideration.

So much has been printed about the French roads that the articles herewith on that subject should prove interesting.

There is room for all types of road surfacing, and there is a place for each particular type.

In considering the state road problem, remember you are dealing with 8,000 miles of state road, and that there are over 40,000 miles of county roads also to be kept up.

You properly demand that the roads be kept up.

You know it takes money to do the work.

The money now provided is sufficient for a good maintenance fund.

Don't you expect to pay for the construction work, necessary for improved conditions?

If you expect to provide the necessary funds, two ways are open—by direct levy, or by a loan. Treat the road improvement financing as you would your own business.

Is the improvement worth the cost?

If it is, then why not make the loan? Do the work and get the return from the investment.

The returns are tangible. The tourists spend their money. Transportation costs of all kinds are reduced.

On a traffic of 100,000 ton miles per mile, per year, the saving on transportation will pay the interest and sinking fund for a paved road compared with an earth road.

Considered from this view point, a loan for road improvement will pay for itself, without considering the other arguments.

THINK IT OVER.

Additional forces were added to the Engineering Department within the past few weeks.

Messrs. Randall, Walters, Strauss and Bertholf are the happy dads.

Plans and specifications provided.

Maintenance Work Accomplished by State Outfit Under Chief Inspector C. T. Brock

Highway No. 2, Adams County. Operated crusher plant near Westminster, Colo., with three trucks hauling in March, 1919. We crushed, hauled and placed 2,416.9 cubic yards of rock on 2½ miles of road bed 16 feet wide. Also for 350 feet in length, 16 feet wide, at north and south approach of Clear Creek bridge. Surfaced same with gravel, using 598.7 cubic yards of gravel. Average haul, round trip 5 miles, cost \$4,165.71.

Filled in washout at end of concrete bridge on Clear Creek with crushed rock. Used 76¼ cubic yards, cost \$90.70.

On Highway No. 2, Tarvia road. Operated crushing plant near Westminster, Colo. Hauled with three trucks from June 2, 1919, to September 28, 1919. Operated 76½ days. Crushed, hauled and placed 6,264.9 cubic yards rock. Average haul 4 miles, cost \$7,955.06. Truck and blade operated four days, traveled 72 miles, cost \$40.80.

On Highway No. 7, east of Aurora, hauling from gravel pit east of Aurora, May 9, 1919, to June 2, 1919. Also, September 29, 1919, to November 30, 1919. Operated 56 days, hauled with three trucks 25 days and with four trucks 31 days. Surfaced 2 8/10 miles road 16 feet wide with 6,483.2 cubic yards gravel. Average haul, round trip 10 miles, cost \$5,078.47.

On Highway No. 31, Elbert County near Agate, Colo. Hauled gravel with three trucks from gravel pit near Agate. Hauled and placed 3,931 cubic yards gravel. Surfaced four miles road bed 18 feet wide. Average haul 10 miles, cost \$3,723.30.

On Highway No. 31, Elbert County near Buick, Colo., month of November, 1919. Operated with three trucks 15 days, hauled 1,220 cubic yards rock from our pit near Buick, placed and rolled same on 1½ miles road 18 feet wide. Average haul four miles, cost \$1,404.15. This material is first class for surfacing. I recommend its use for surfacing on as many miles as possible.

On Highway No. 31, Elbert County. Grading road May 21 to 31, 1919, from five miles east of Deer Trail to one mile north of Agate. Filled in road approximately 1,635 cubic yards of earth, put in three new pipe culverts, bladed roads three days with teams, October 1, 1919, to November 7, 1919. Cost \$390.

Grading near Buick, on fills, approximately 9,120 cubic yards earth. Cost \$1,904.60.

(Continued on page 23)

Road Problems on the Western Slope

John J. Vandemoer, Field Engineer, Formerly Captain Engineers, A. E. F.

The great necessity for adequate highway facilities on this side of the range is one of the most important problems concerning the development of this section, and it is a problem which must be solved if we are going to keep pace with other communities in the state.

A certain definite plan of action has been agreed upon by the State Highway Commission in regard to what highways are to be improved first. Just when these improvements can be made and how long it will take to complete them depends to a large extent upon what local financial arrangements can be made in each county.

In Mesa County the proposed program includes the improvement of the Midland Trail, east and west from Grand Junction, and the Rainbow Route as far as the county line. These improvements will consist of a great many different types of construction, depending upon the existing local conditions. It is proposed to begin the improvement by constructing concrete pavement, and the first contract has already been let.

Through a large section of the Grand Valley the slope of the land is quite uniform and the natural drainage is defective, making it quite difficult to obtain adequate road drainage, which is the first essential for successful road construction. This principle is borne out very strongly in France, when one studies the careful methods of road drainage and the expense entailed in the thorough way in which the water is led off the road bed. France has learned by hard years of experience that in order to overcome the natural climatic and soil conditions, it is very imperative to provide adequate drainage.

Although France has to combat her excessive rainfall and boggy valley lands, she is exceedingly fortunate in possessing in large quantities a very satisfactory grade of limestone, which is easily quarried and produces a very satisfactory road bed, which is readily repaired by the same material.

I saw no concrete roads in France, and there seemed to be no great necessity for them as long as the macadam road was satisfactory. In fact, I believe if the Western Slope, through its valley sections, could obtain a limestone as well adapted for road building as is found in portions of France, it would solve the road problem in a great many localities.

Another very important problem we are confronted with through our broad, flat, irrigated sections, is the building of substantial bridges across "washes." While I was employed in the drainage department of the U. S. Reclamation Service we used every possible means to lower the grade of these washes, in order to afford more adequate drainage to the adjacent lands. The difficulty which now presents itself on these same "washes" is to prevent these "washes" from cutting any deeper. I have in mind one "wash" in particular, across which we were building a reinforced concrete bridge, and the day following the com-

(Continued on page 21)

Before Construction

H. L. Jenness, Field Engineer, Formerly With 109th Engineers, A. E. F.

Did you ever stop to think just how much time is spent and work done when an improvement is planned for one of the roads which form the network of the state highways?

The engineering end of the location and construction of highways is probably the least known and understood by highway users and the public in general of any branch of highway work. Especially is this true in mountainous districts where the engineering work forms the most important part of the improvement.

Therefore the purpose of this article is to familiarize highway users and the public in general with the underground work which is necessary before any visible results are accomplished.

As a typical example for the purpose of this article we will take the Battle Mountain Road or Federal Aid Project No. 78, a part of State Highway No. 10 between Red Cliff and Minturn.

First comes the question of why make any change in the present road?

In this case the present road from Red Cliff through Gilman to the bridge across Eagle River four miles south of the town of Minturn has steep hills at each end with heavy grades running as high as sixteen and eighteen per cent, and is narrow with many sharp curves and a dangerous switchback. This road being one of the main trans-continental highways, known as the Pike's Peak Ocean-to-Ocean Highway, with very heavy traffic amounting to 18,000 ton miles per mile for the year 1918, and this portion being the worst stretch between Leadville and Grand Junction, it was decided by the State Highway Commission to improve the section from Red Cliff to the bridge across Eagle River, a distance of six miles north of Red Cliff.

After making the decision to improve the highway the Commission made an appropriation to cover the probable cost of construction, the County of Eagle also making an appropriation to be used with the state appropriation.

As this road is used as a post road and comes within the scope of the Federal Aid Road Act, in which the federal government pays one-half the cost of construction of improvements costing \$40,000 or under per mile, this improvement was made a Federal Aid Project and as such will be constructed under the supervision of the State Highway Department, subject to the inspection of the U. S. Bureau of Public Roads.

The decision to improve the highway and the appropriation made, the next step is the reconnaissance and preliminary survey to determine the approximate location of the new road, which will conform to the state and government requirements in regard to grade and curvature, which are: A six per cent maximum grade and a one hundred foot minimum radius for curvature. The country between Red Cliff and the end of the project being a very steep hillside with many cliffs and portions of slide rock, the first

(Continued on page 23)



No. 1. Leveling Sub-Grade, Greeley Road.

Federal Aid Project --- Greeley Road

By W. A. Lewis, Field Engineer, Formerly With 109th Engineers, A. E. F.

Starting at the city limits of Greeley on Eighth Avenue and running south 2,500 feet on tangent, then a 10 degree curve to the left and a 7 degree curve to the right, thence south to within 500 feet of the city limits of Evans, a total distance of 4,700 feet, the new road is raised with a good drainage ditch on each side. From Station 33 to 47, where the old road ran along the bottom, then up a 7 per cent grade for 400 feet, the new grade cuts down the hill, fills up the low places and has a grade of 2 per cent.

At the small draw west of Station 40-50, which has a drainage of four square miles, upon which several small reservoirs are located, heavy rains would cause a flood which would cover the road and flood the adjoining lands and fill most of the cellars in Evans. The water generally stood from one to two feet deep on the road after these storms, the road being the lowest place. All this trouble is now eliminated by a 9x5-foot culvert placed across the road with an earth dam on the west side to divert the water into a six-foot ditch on the east side. Another place which gave considerable trouble was where the road crosses the old D. L. & N. W. R. R. grade. Owing to poor drainage at this point the water would overflow the road, always

leaving a pile of sand and sometimes doing considerable damage. This was eliminated by constructing a six-foot drain ditch west along the old railroad grade, leading into the spillway of the Bartelds reservoir 500 feet west of the road.

Methods of Construction—Construction was started August 18 by the Engineer Construction Company of Greeley, Mr. Clark president, starting at the lower and cutting down the hill and making the fill from Station 38 to 47. This fill was made in one-foot lifts, bladed off and rolled with a 10-ton roller, making the embankment very compact, with very little chance for shrinkage.

Very little change was made in the profile of the old road from Station 34 back to Station 0.0. However, the old surface was gone over with a scarifier, bladed, and rolled to give a good subgrade for the concrete. The work of putting on the concrete surface was started Oct. 2. This work also was started from the south end and worked north towards Greeley, as the gravel and cement was delivered from that point.

Finishing the Concrete—The strike board, a template for such graded work and belts for finishing the work were made and proved valuable and gave very satisfactory results.

In the construction of the strike board for the concrete two pieces of three-inch by eight-inch lumber 20 feet long, were used, each sawed to the exact curve of the road



No. 2. Placing the Concrete, Greeley Road.

and spaced six feet apart in the clear, being held apart by cleats on the middle and ends, which also held them rigid. Strap iron runners were nailed on the bottom to prevent wearing and working. The extra foot on each end gave plenty of room for sliding back and forth. Constructed in this manner the strike board appeared heavy and bungle-some. However, it could be carried back and forth by two men. The extra weight with the two edges gave a true form to the road besides compacting the concrete better than the single board.

Of the two belts used for surface finish the first belt was a heavy fibre belt one-half inch by ten inches and was used by see-sawing it back and forth, using about an 18-inch pull and going ahead about eight to ten inches each pull. This heavy belt was only used once. The finish belt was made of $\frac{1}{4}$ -inch by 7-inch rubber covered and with a soft finish. It was used three times, twice by see-sawing and finally by a straight drag for the length of the part being finished. This operation gave a very smooth finish. After the finish belt had passed over a stone there were no connections, float marks or waves which are common to most concrete roads. The template used for checking sub-grade and forms just ahead of the concrete was made of 2x6-inch lumber one-half inch shorter than the width of

the concrete. Cleats were nailed on the edges to project out over the forms. A small piece of iron nailed on each cleat to prevent wearing where it would slide on the forms; a strap iron was also nailed on the bottom.

As the board was moved along sliding on the forms the sub-grade could be observed for the width of the road and any high places removed or low ones filled up, always giving an exact check on the subgrade.

Picture No. 1 shows method of leveling subgrade before the final rolling. All the gravel and cement was hauled over the road grade, cutting it up considerably. It was found desirable to level up and roll the subgrade just before the gravel was dumped, in order to prevent a lot of delay for the mixer. Rolling just ahead of the gravel left a hard surface to dump on, making the gravel easier to pick up and wheel to the mixer. At the same time it only took a few moments for one man to keep the sub-grade around the mixer in shape, the main idea being to keep the mixer going without any stops.

Picture No. 2 shows the concrete coming out of the mixer going down the chute and dumping on the ground. The consistency of the concrete can be noted by the way it stands up after leaving the chute. The mix was made dry enough so that it would hardly run and had to be helped down the chute with a hoe or shovel. After being dumped it was spread with shovels and then struck to a crown



No. 4. Reverse Curve on Greeley Road.

with the strike board, after the second time over, keeping a slight ridge ahead of the board each time. The wooden floats were used and then the strike board used again. The concrete was then allowed to dry from twenty minutes to one hour, just long enough for the water on top to start drying; then the roller was used. The roller was constructed out of an old water heater and pulled back and forth with ropes, going ahead about two feet each time across. The pull across was slow so as not to drag off any water or fine mixture from the top of the concrete. After the rolling was completed the heavy belt was used. After the concrete had set about twelve hours it was covered with 2-inch soft dirt. This covering was wet down every day for ten days—after ten days the dirt was removed and the joint filler cut off about one-quarter inch above the joint.

Picture 4 shows the pavement after the dirt had been removed and the joints cut off. Also shows the reverse curve and super-elevation set about the center of the project.

Editor's Note: The above, and the article following by A. B. Collins on the Brighton Road, are typical of the paving work now under way in various sections of the state. The work at Pueblo by the Orman Construction Co. is completed, and work is under way at Lamar, Longmont and Boulder, and contracted for at Grand Junction, La Junta, Rocky Ford, Manzanola and Fowler.—J. E. M.

Federal Aid Project No. 10—Brighton Road

Station 89+68.2, End of 1918 Paving, to Station 189.

By A. B. Collins, Field Engineer.

The contract for this project was let to Mr. M. J. Kenney of Denver on August 12, 1919, and calls for the completion of 1.78 miles of concrete roadway, eighteen feet wide, 7½ inches at center, six inches thick at edge, with a one and one-half inch crown.

Immediately on award of contract, orders were placed for the necessary equipment with which to complete the work, but unforeseen factory and shipping conditions delayed the arrival of the mixer until October 27. In the meantime a mile of finished grade had been prepared, fifteen hundred feet of forms placed and sand and gravel distributed for the length of the placed forms. Three by sixes, surfaced four sides and thoroughly oiled, were used for form material and were found to be sufficiently heavy to retain excellent alignment under the conditions imposed by the distribution of sand and gravel. The forms are held in place by fifteen-inch iron pins, driven at necessary intervals, bent on the upper end to lock over the top of lateral braces.

Sand and gravel is obtained from a pit located along the main highway at the upper end of the project and is

hauled and distributed by end dump trucks, of three yards capacity. The material is exceptionally well graded by means of a rotary screen, covered with three-foot sections of one-eighth and one-half inch screen, producing three classifications, sand, pea gravel and coarse aggregate. The sand and coarse gravel thus obtained passes all specifications; the pea gravel is placed in stock piles to be used for shoulders on the completion of the paving.

The mixer used is a Foote Paver, of twenty-seven foot dry capacity, self-propelled, with a forty-horse power boiler, and geared to sixteen revolutions per minute. Discharge is through a circular spout, twelve feet long, with removable sections, permitting the distribution of material over about eight feet of roadway, without the necessity of a forward move. The discharge spout has a slope of approximately 30 degrees and the effort is made to keep the mixture, which is a one, two, three mix, at such consistency that it will not discharge of its own weight, but may be readily forced through the spout with shovels.

While the mixer has a capacity of twenty-seven feet, it has been found advisable to use eighteen-foot batches, as the width of the roadway, with the material scattered for its length, does not permit the use of a sufficient number of gravel barrows to charge without too great a delay.

The time also necessary to secure a thorough mix is appreciably lowered by using the smaller batch. The placing of both sand and gravel within the forms has been found impracticable, as it results in a congestion that causes much loss of time. It is suggested as a means of eliminating this difficulty, that the necessary gravel only be placed in the center of the roadway, which will permit of wheeling to the charger from both sides of the pile. If the shoulders are brought to grade, at the beginning of the work, at least on one side, the sand may be dumped at proper intervals on them and as it is removed a sufficient amount may be left to complete the shoulder, eliminating the extra hauling and placing of shoulder material.

The water supply for the mixer is obtained from a deep well and pumped directly into a storage tank, from where it is distributed along the work, through a two-inch pipe line.

As the concrete is placed in the forms it is thoroughly tamped and brought to grade and crowned by means of a screed board, steel-edged, and weighing approximately ninety pounds. The finishers follow immediately with a two-section galvanized iron roller, weighing thirty pounds and about five feet in width. After the free water has been rolled off the stone is finished with a twelve-inch belt. Expansion joints are placed every thirty feet, Elastite strips being used as a filler. A little difficulty has been encountered in keeping these strips in a true perpendicular position. On removal of the form board it has been found that if care is used at the joints and the mixture kept as dry as possible the tendency to throw the strips out of perpendicular is, to a great extent, eliminated.

In finishing, a split float has been used to keep the stone on either side of the joint at the same elevation. An uneven settlement of the concrete in places, however, even

with the greatest of care, will result in a difference in elevation between the two sides of sometimes as much as one-eighth of an inch. As a means of eliminating this difference it has been suggested that the joint filler be cut to absolute form and that the surface be finished straight across the joint, letting the surface crack develop afterward. Two or three joints have been finished as submerged joints and the effect will be noted in the future. If this form of joint does not result in uneven surface cracks the writer is firmly of the opinion that it will offer the most satisfactory form of joint and will permit of a more uniform road surface.

Road Problems on the Western Slope

(Continued from page 17)

pletion of the structure a flood came down and lowered the grade below the bridge about two feet in elevation. Fortunately we had constructed a good floor and a fairly deep cut of wall, and before the "wash" had a chance to cut any deeper we built a grade-protection structure considerably down stream, which seems to be holding up the grade of the "wash" in good shape. Our foundations are largely in quicksand, which necessitates a generous use of well selected and well placed piling, driven to refusal. Our sand and gravel for concrete are of a fair grade, although the sand is fairly fine and predominates over the gravel in the pit-run material.

There is one other feature in regard to the stability of the French roads, some of which were built in the time of Caesar and Napoleon, and that is this: the thickness of the foundation varies from two to six feet, and it is very seldom that the "bottom drops out" of any of the old roads of France. We in America can learn a lesson in this connection, and that is, not to skimp our foundation, either in bridge building or road building. One more fact which stands out very prominently in regard to the French bridges is their massiveness and absolute stability. In fact, the official A. E. F. engineer information was to the effect that "you need not fear the collapse of French bridges, regardless of your wheel-loads."

The mountain roads of Mesa County are, as a rule, well constructed and the natural road materials are much better than through its valley sections. There are a great many grade eliminations necessary and the roads as a rule are rather narrow. The cross drainage is an expensive problem and oftentimes quite difficult to solve, but as time goes on and the communities get stronger, more money can be consistently spent in mountain road improvement.

Mesa County has one mountain project which she wants the world to know about, and that is the Whitewater-Gateway road. With the first ten miles of this road improved and eventually the ten miles through the Dolores River Canon built, the road system of Mesa County would connect up with the road system of Montrose County, and the Paradox Valley would have a water grade route to a standard gauge railroad and it would have an outlet which is open all winter and does not exceed an elevation of more than 7,100 feet at any point.

Federal Aid Projects in Eastern Colorado

By L. E. Edwards, Field Engineer.

Eastern Colorado, or what is more commonly known as the dry section of Colorado, comprises the following counties: Logan, Sedgwick, Phillips, Washington, Yuma, Lincoln, Kit Carson, Cheyenne, Crowley, Kiowa, Otero, Bent, Prowers, Las Animas and Baca.

Only a few years ago a large part of Eastern Colorado was devoted entirely to stock raising and ranching, but by the employment of modern methods of farming it has been developed into one of the most productive portions of the state, producing enormous quantities of wheat, corn and other grains in addition to its stock.

This is a prairie country proper, being very level in some parts and other parts rolling, the greater part, however, being quite rolling.

There are two classes of soil in this section, namely, that which is classed as "hard land" and "sandy land." The former, constituting the level land, has two very peculiar qualities: first, that of becoming very hard when dry; and second, that of becoming very soft and very sticky and heavy when wet. The latter forms the rolling land and also the sand hills, and when it is wet it is quite firm, but when it becomes dry, which is about ninety per cent of the time, it becomes very loose and blows badly in the winds, which are very prevalent in this part of the state.

The main roads in this part of the state are divided into two groups—those running north and south, and those running east and west.

These two groups, with their feeders, form a very good system of roads, and carry a great amount of traffic, both of a transient and also local type, the transient consisting mostly of tourists, while the local is mostly heavy hauling of grain and supplies.

The task of improving these roads is a very difficult one, as the traffic on all roads except the Lincoln Highway and the Santa Fe Trail is not sufficient to demand paving, nor is the financial condition of this section such as to be able to pay for such construction, which is the only sure method to insure roads absolutely good for all conditions of weather.

These roads are, as has been mentioned before, of two kinds of material—hard soil and sandy soil, neither one of which makes a good road of itself, but by surfacing the hard soil with sand or gravel, and the sandy soil with clay or adobe, either one becomes a very good road and will carry a very heavy traffic in all kinds of weather.

This is the only substitute for paving or hard surface roads and by bringing the roads to a permanent grade and providing the proper drainage, which is in itself the secret of road construction in any soil, they become a first-class road.

The State Highway Commission, in its program for 1919 and 1920, has laid out a number of Federal Aid Projects for these roads which, when completed, will make a

marked change in the condition of the roads, as they are planned to improve the worst places and those subject to heavy traffic first and then the less important ones next.

Among the projects for this section are eight projects for paving on the Santa Fe Trail, totaling an approximate mileage of six miles at an estimated cost of \$33,000.00 per mile. Contracts for all of these projects have been let and approximately two miles are complete and more is under construction. This is on perhaps one of the most heavily traveled roads in the state, and is only a beginning of what is to follow in this line of work.

There are, besides these, eleven other projects for grading, drainage and surfacing—and just a few words here in regard to drainage: No matter how well a surface may be constructed, if the subgrade is not built up so as to be at all times properly drained, the work is all for nothing. Take for example the railroad grades through the country; they are all raised above the surrounding country, no matter what their condition may be, and this is the secret of their being able to keep them in repair at a minimum cost for maintenance. This principle holds equally true in road construction of any class.

Of the projects mentioned, surveys and plans for practically all paving jobs have been made and contracts let, and the balance will be completed the coming season. Of the grading and surfacing projects, surveys have been made on Projects Nos. 11, 39, 40, 43, 50 and 95. The plans for Nos. 11 and 43 have been completed and approved by the Bureau of Public Roads and bids called for. Bids were received on Nov. 21, 1920, on Project No. 43 and construction will be started soon if weather permits.

Making the survey and preparing the plans for one of these projects calls for a large amount of work, both in the field and in the office. The field work consists of obtaining the alignment, taking of profile, locating of drainage structures, such as bridges and culverts, and securing the cross sections of the location, which are used in calculating the yardage necessary to make the cuts and fills required to bring the road to a permanent grade and for determining the amount of surfacing required.

Obtaining the proper alignment and location for some of these roads is a problem in itself, as the counties in laying out the roads originally have followed the ancient custom of following section lines regardless of conditions. From this arises a number of obstacles which must be overcome, such as going over hills where the grade cannot be brought to the maximum established without causing cuts, which is the most objectionable feature in this country, as the wind blows almost constantly, especially in the winter, and these cuts fill with snow, making the roads impassable during this part of the year. This can only be overcome by a new location of the line, making detours around the hills, thus avoiding the cuts and at the same time reducing the per cent of grade.

The field work requires a party of unusually fine men, consisting of engineer in charge, an instrument man, two chainmen and a rodman, together with the equipment, which consists of transit, level, chain, rod, stakes, etc. In

(Continued on page 23)

Before Construction

(Continued from page 17)

difficulties encountered in making the survey were the keeping of one's footing and finding a place to set up an instrument.

After running the preliminary line from Red Cliff to the mining camp of Gilman (owned by the Empire Zinc Co.), gathering all available information in regard to possible grades and natural features favorable to the new location, the survey was then carried on through Gilman for a distance of three miles to the end of the project. This section of the present road being in need of improvement more than the three-mile section from Red Cliff to Gilman, it was also the more difficult to survey, there being places along the face of cliffs where the new road will have to be blasted out of the solid rock for a distance of several hundred feet.

The next step is the location survey in which the details of the final location of the highway are worked out on the ground. The located line is run by the transit party, composed of transitman, two chainmen, axemen, stakeman and back flagman, with the same precision and care that is used in locating a railroad line, and the methods used are similar.

The curves are traced, setting stakes at various distances, but usually twenty-five feet apart, and on this project it was with difficulty the stakes were set at all, due to the abundance of rock, and where it was impossible to drive a stake, crosses were chiseled in the rock to hold the points. Data for the profile of the line is also gathered at this time, the transit party being closely followed by the level party, composed of a levelman and rodman, who ascertain the elevation of the ground at the foot of each stake. The location of the center line of the new road being finished, there follows the important step of measuring the quantities of material to be moved. This operation is called cross-sectioning.

As can be readily seen from the above picture, the character of the country from Gilman to the end of the project is such that this was one of the most difficult and laborious parts of the field work, where a pair of wings would have been far more useful than feet.

The field work being finished after a period of six weeks, the scene of operations was shifted from Gilman to the office of the engineering department of the Highway Commission, where the information gathered in the field was used in making the map, profile and estimate of the cost of the project. This being a Federal Aid Project, it is necessary that the map, profile, estimate and specifications conform to the regulations of the Bureau of Public Roads, which are in brief: The map is composed of sheets 22 by 36 inches platted to a scale of one inch equal one hundred feet, the alignment placed at the top of the sheet with the corresponding profile directly below.

A sample of one of the Battle Mountain sheets is shown elsewhere in this issue of the Bulletin.

The cross sections were platted on sheets similar to those of the alignment and plan, and when completed the areas and cubic yards were calculated and summarized. This part of the work occupied a period of six weeks.

The project statement, which is an approximate estimate of the cost of the project, was then submitted to the Bureau of Public Roads and after being approved by the district engineer at the Denver office was then sent to Washington, D. C., and after being approved by the director of the Bureau of Public Roads in November, 1919, the State Highway Department was at liberty to advertise for bids from contractors.

There then remains the submission of the maps, specifications and detail estimates, which, after being approved by the district engineer, are sent to Washington to be approved by the director of the Bureau of Public Roads and Secretary of Agriculture.

The detail estimate covers all construction items such as cubic yards of material moved, concrete, clearing and culverts.

The next step is the letting of the contract and the actual construction work, which on this project will be done during the season of 1920 at a cost of approximately \$40,000 per mile.

Federal Aid Projects in Eastern Colorado

(Continued from page 22)

level country an average of four miles of line per day can be run, and about four miles of profile and cross sections, depending, of course, entirely upon the lay of the country in which the work is being done.

The office work consists of platting the alignment and profile, laying out of grades, which, according to the standards of the State Highway Commission, must not exceed a maximum of six per cent; the platting of the cross sections and calculating the yardage, designing bridges and culverts and preparing the detailed estimates upon which cost of project is to be based.

No. 43 is a typical project of the work in Eastern Colorado, except that it calls for no surfacing at present, but the grade has been designed with this in mind and surfacing will be added as soon as funds are available. The surfacing will make an additional cost of approximately \$3,000.00 per mile.

Maintenance Work

(Continued from page 16)

On Highways No. 8 and No. 3, near Palmer Lake, Colo. Grading and surfacing approximately five miles of highway and one new concrete bridge. Cost \$10,535.75. 1,625 feet snow guards constructed to protect cuts on highway No. 8, north of Palmer Lake. Cost \$1,167.40.

DRAGGING AND BLADE WORK ON ROADS.

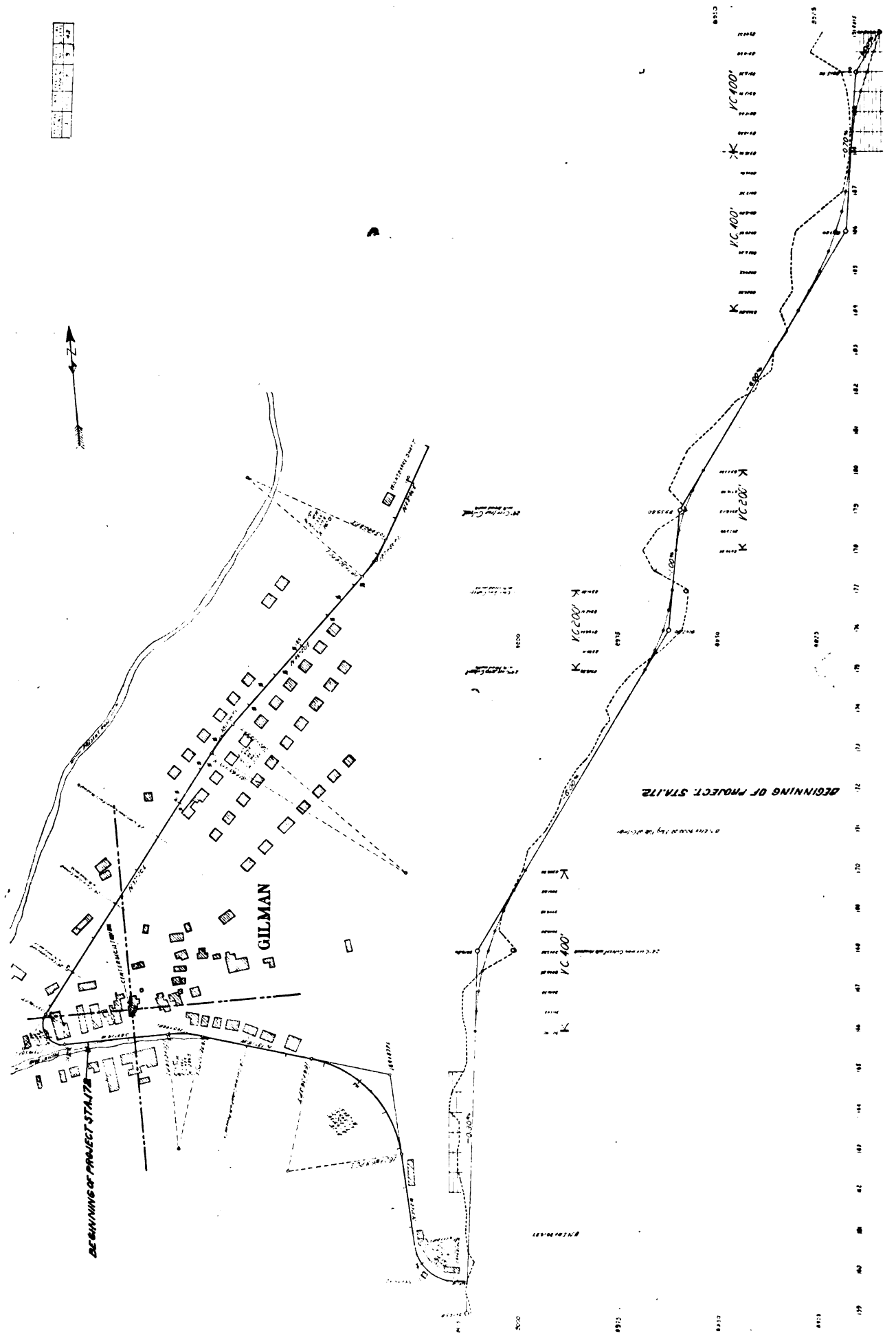
From March 11, 1919, to November 30, 1919, on Highway No. 49, Adams County (Brighton Road). Truck and blade operated 15½ days, traveled 241 miles, cost \$128.62.

On Highway No. 2, Adams County. Truck and blade operated 26½ days, traveled 539 miles, cost \$318.43.

On Highway No. 7, east of Aurora. Truck and drag operated 53 days, traveled 1,343 miles, cost \$710.50.

On Highway No. 31, Arapahoe County. Truck and drag operated 18½ days, traveled 431 miles, cost \$244.47.

On Highway No. 31, Elbert County. Truck and drag operated 48 days, traveled 1,169 miles, cost \$615.75.



Battle Mt. Project. See Article by H. L. Jenness on Page 17.