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Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
 Denver, Colorado

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Articles on the subject of road building and highway development in the West are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible. Manuscripts not found available will be returned promptly.
10 CENTS A COPY. \$1.00 A YEAR.

Our Cover Picture

On the cover of this month's Colorado Highways there is a splendid view of Pikes Peak and the city of Colorado Springs as seen from the Limon Highway, or U. S. Road No. 40. This is one of the important highways of the state, and during the past few years has been greatly improved with state, federal and county funds. It is maintained the year 'round, the entire distance from Colorado Springs, through Limon to the state line.

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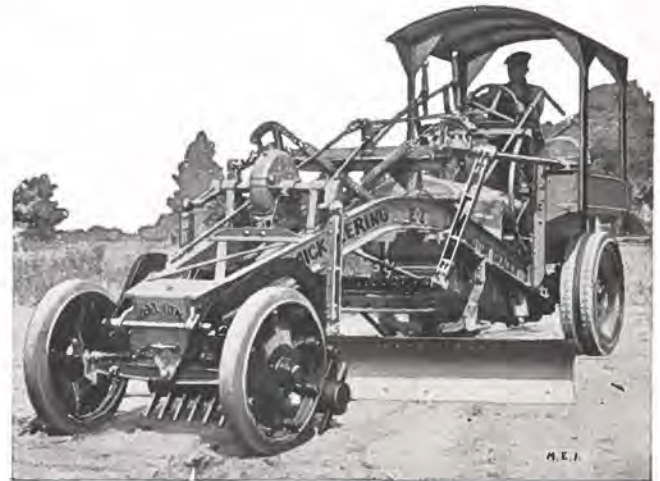
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Colorado Highways

"BETTER ROADS"

Score of Big Road Projects Completed by State in 1927

IN spite of an inauspicious start at the beginning of the year and very unfavorable weather conditions during the middle and late summer, the accomplishments of the highway department as recorded at the close of the season have been very considerable. The budget, which is usually given the department about the first of the year, was not executed until May 2, on account of legislation changing the amount of income from the gasoline tax.

The principal part of the construction work is of course covered by federal aid projects, 33 of which were completed during the past year, including the construction of a total of 34 bridges, 2 of which are over-head railroad crossings. Following is a condensed tabulation of the federal aid projects completed:

Hard surfaced.....	11 projects	40.1 miles
Surfaced	13 projects	64.4 miles
Graded	3 projects	24.1 miles
Major bridges and rail- road crossing struc- tures	6 projects	1.8 miles
Totals.....	33 projects	130.4 miles

Excellent progress has been made on improving the main north and south road. The paving has been com-

pleted on the projects north of Lafayette and north of Longmont, which makes a continuous paved highway from Fort Collins to Denver.

Two large grading projects between Castle Rock and Monument were completed and a contract let for two separate grade structures under the Santa Fe and Rio Grande roads just north of Monument. Paving has been placed on this grade between Castle Rock and Tomah, leaving but about 17 miles to complete a paved road between Denver and Colorado Springs. When this is done, thirteen grade railroad crossings between the two cities will have been eliminated.

South of Colorado Springs a project is being advertised for continuing improvements toward Pueblo, and it is contemplated that further extension of this work will be provided for in 1928.

Between Pueblo and Trinidad one paving project has been finished and contract for another has been awarded. It is proposed to continue these improvements during the coming year.

But while considerable effort has been expended on the main north and south road—a logical course where so large a proportion of the state's traffic is concerned—other sections of the state have also received their due share of consideration and funds.



Two Views Showing Improved Stretches of the Santa Fe Trail Surfaced with Gravel, Located East of Manzanola

In the northeast the heaviest work has been done along the Platte valley. Two large grading projects between Greeley and Fort Morgan, as well as a paving project were completed during the year. Between Brush and Merino good progress has been made in grading and paving. Paving on this section will be continued next year, also west of Fort Morgan and north of Greeley, as well as a surfacing project north of Nunn.

In the Arkansas valley paving work has been done near Avondale, Portland and between Las Animas and Fort Lyon, and it is expected to have projects next year near Fowler and Manzanola. At Swink an underpass with paving approaches is being constructed. At Portland a highway viaduct eliminating a dangerous railroad grade crossing has been completed with faced approaches. Other surfaced projects between Pueblo and Canon City will be continued next year.

In addition to the above, in the southeastern part of the state several state projects of considerable size have either been completed or are in progress. Among these should be mentioned 32 miles of grading and surfacing in Baca county, approximately 15 miles in Crowley county, and 16 miles in Kiowa county.

In the eastern part of the state one surfacing project between Burlington and Limon was completed, and it is anticipated that further work of this class on this road will be continued next year.

In the San Luis valley considerable surfacing has been done between Alamosa and Conejos and it is expected that a bridge on this road will be constructed during the coming season. In addition to this, work will be done on the Gunbarrel road, including both federal and state projects. One project has been completed and another is in progress and a third is contemplated for the coming year on the La Veta pass road.

In the northwestern part of the state considerable work has been done and is in progress to make U. S. Highway No. 40 a real transcontinental road, and special attention will be given to this work the coming year. There will be grading and graveling projects west of Craig, west of Milner, and north of Kremmling. The sub-structure will be erected the coming season. A bridge south of Craig was completed during the year and a surfacing project is contemplated for next year.

In the southwestern part of the state two surfacing projects between Cortez and Durango were finished during the year. East of Durango work is still in progress and it is expected that new projects will be opened up between Durango and Wolf Creek pass. One project is under way north of Silverton and this will be extended the coming year. South from Cortez two projects will be put under way the coming year. One of these is a federal aid project with state participation and the other is across the Ute Indian reservation and will be constructed entirely with federal funds.

Work on the Morrison-Baileys road is in progress and will be completed into Baileys under the present contracts. A paving project in the town of Morrison eliminating the dangerous entrance into the town, is under construction.

Considerable work has been completed, is in progress, and is contemplated during the coming year distributed all along the road from Tennessee pass, through Grand Junction, to the state line. Among the other projects this includes both grading and surfacing by the bureau of public roads on forest highway projects from Red Cliff to the summit; grading west of Minturn; surfacing in the neighborhoods of Glenwood Springs and DeBeque; and bridges between Grand Junction and Fruita.



Showing Newly Completed Concrete Pavement Crossing Lake, North of Lafayette



An Improved Stretch of Gravel Surfaced State Highway West of Pueblo

On the road from Monarch pass westward to Grand Junction via Montrose, two projects have been completed the past year and work is still in progress between Gunnison and Sapinero. Improvements are contemplated near the western approach to Monarch pass.

About \$590,000 has been expended on state projects. The number of projects either completed or in progress is about 95 or 100. It is impossible to estimate the mileage covered by this work since most of the projects are for betterments here and there along a highway between specified termini, and the improvements are not consecutive. This work involves cutting off corners, daylighting cuts, raising fills, and similar work covering improvements that are important on roads where it is impossible to bring the entire stretch of road up to high standard on account of lack of funds and where the traffic is not sufficient to demand the higher standard of work. Considerable more than half the state projects are done by county forces and equipment under agreements made with the highway department.

Among the more important state projects completed, or in progress, during the past year are the following:

Work already referred to in Baca, Crowley and Kiowa counties.

Work is in progress toward the continuation of a road over Loveland pass. A 5.6 mile contract is under way.

A 2¼ mile road involving some heavy steam shovel work to connect the town of Golden with the Coal creek road. This work is being done by state forces.

Seventeen miles of road grading has been recently contracted for between Wiggins and Roggen.

A \$40,000 contract on the spur leading to the summit of Mount Evans was completed during the past year. There remains about 1.9 miles to finish this spur to the mountain top.

Among the more important state projects contemplated for the coming year are:

Improvements on road 10 in Alamosa county; on road 16 between Granby and Grand Lake; on road 131 between Oak Creek and Sidney; continuation of work on road 175 between Golden and Coal creek; as well as a large number of others that cannot be mentioned on account of lack of space.

The construction for the year, as discussed above, amounting to \$3,120,200, together with maintenance amounting to more than \$852,000, has been accomplished with the expenditure of less than 2½ per cent for administration—an extremely low figure. The highway law allows 4 per cent for this item, but every effort is made to keep it as low as possible. It is very difficult to make a comparison with other states because of different accounting methods and variations in the gross amount of funds handled, as well as the character of the developments, which determines whether many projects are close together so that the minimum amount of administration work will handle them, as compared with other states, including our own, where the funds are necessarily distributed to projects that are very much scattered. Such comparisons as can be made indicate that Colorado is among the lowest, if not the lowest, in the item of percentage of its highway funds required for administration.

The principal source of funds for the past year is as follows:

One-half mill levy.....	\$ 762,527
Gasoline tax.....	1,740,651
Federal aid.....	1,148,156

The balance of the receipts is made up from the internal improvement fund, receipts from counties, other miscellaneous receipts, and balances carried over from last year.

County Road Officials to Hold Meet in Denver, January 17, 18, 19

THE twentieth annual convention of the Colorado State Association of County Commissioners, which opens in the Capitol Building, Denver, January 17, is expected to be the largest and most important in the history of the organization.

A heavy program of addresses and discussions, in which highway maintenance and taxes will be featured, has been arranged by association officials. Elaborate preparations have been made for the entertainment of the visiting commissioners and their wives and the three convention days will be packed with business and pleasure.

The association president, Wm. L. Rees of Pueblo, will preside at the convention sessions, which will be opened by an address of welcome by Mayor Ben Stapleton of Denver. Governor William H. Adams will deliver the principal address of the opening day's program.

Probably the most important topic of discussion from the standpoint of interest to the commissioners this year will be that of maintenance of federal aid highways. J. W. Johnson, district engineer for the United States bureau of public roads, has been selected to talk on "Federal Aid and Maintenance." Mr. Johnson is expected to explain just what the bureau requires of each state in the maintenance of its federal aid system and as to how the situation now stands in Colorado under the contract this state has with the federal bureau.

A warm discussion on the proposal of the state highway department to take over maintenance of all federal aid roads, beginning with the first of the year, is predicted following the address. It is predicted that the commissioners will go on record on that proposal. Acting on an ultimatum from the bureau of public roads to the effect that the federal aid system in Colorado must be maintained at a higher degree of perfection than in the past, the state highway advisory board in the tentative budget it submitted to Governor Adams December 15 provided for the state taking over exclusively that maintenance work.

A strong wave of protest against the proposed change has come from a number of counties, where the commissioners claim that the state would take over their prerogatives as road commissioners. However, thirty-one counties are reported to have signed up for the new system and the attitude of the association will be definitely determined at the Denver meeting. The highway advisory board felt that such a change was necessary at this time in order to bring the federal aid system up to the standards required by the bureau. In such cases where the state fails to remedy such a condition the bureau, under its contract with the states, can step in and carry on what maintenance it deems necessary with its own forces, billing the state for the cost.

It was learned that the budget submitted to the governor contains provision for the expenditure of the \$750,000 raised by the state from a half-mill levy. The budget provides that this sum be used in "matching" a like sum from the government in federal aid funds.

According to a recent opinion of the Attorney General, the suggestion was made that it was entirely proper, and he believed legal, for the governor to divert the half-mill levy voted by the people themselves for highway purposes, to the general fund to help meet the over-appropriations made by the last general assembly.

It is said that it was this opinion from the Attorney General which caused Governor Adams to inaugurate his "economy program" in all the state departments.

The governor is opposed to the diversion of the highway half-mill levy on the grounds that it was voted by the people for a specific purpose; and further that should the auditing board divert this fund, it might lead to general diversion of funds from the educational institutions and other departments, thus leaving the "door wide open" for future legislatures to over-appropriate to their hearts' content.

It is said that a majority of the members of the auditing board share the governor's opinion in regard to the highway fund.

Provision has been made by the highway advisory board in its budget submitted to the governor for the handling of maintenance on federal aid roads by state forces. The sum of \$900,000 was set aside by the board for meeting this expense.

By the end of December, Governor Adams was still holding the tentative budget of the board without having taken any action on it.

In any event, it is expected that the disagreement will be ironed out without difficulty. The association has won a creditable name for itself during its twenty years of existence for the broad-minded way it has attacked such perplexing problems and the business-like way it has decided its stand, always with a view to the state's best interests. The association and the individual commissioners have almost without exception gotten behind and helped on highway matters when needed. Bus and truck regulation and many other beneficial state laws have received their hearty support, and the association has taken the leadership in bringing about a better understanding between the counties, especially on highway matters.

Other important speakers listed on the convention program are Chief Justice Haslett P. Burke, of the Colorado supreme court; President Charles A. Lory, of the state agricultural college; Major L. D. Blauvelt, state highway engineer; State Senator David Elliott, of Colorado Springs, on taxation; State Senator John J. Tobin; Chairman Otto Bock, of the state public utilities commission; and Allen S. Peck, United States district forester. Election of new officers will come as the last order of business on the program for January 19.

As usual all Denver road machinery concerns will keep "open house" for the commissioners during the three-day convention.

It is announced that Rudd Hardesty, president of the Hardesty Mfg. Co., will be the host at an elaborate banquet to be given the commissioners and their wives

at the Albany Hotel on Wednesday evening, January 18. This banquet is an annual affair and is always one of the high-lights of the commissioner conventions.

As the convention will be held during the Denver Stock Show, one day will be taken off by the commissioners to visit the horse show and exhibits. Various other entertainments will be provided by the Denver merchants.

A luncheon will be given on Wednesday noon by the H. W. Moore Equipment Co. in their offices at Sixth and Acoma street. The luncheon will be served from Baur's restaurant. Free taxi service for the commissioners is announced by George Meffley, general manager of the Moore firm.

A special display of modern road building and maintenance equipment will be staged by the Wilson Machinery Co. at 1936 Market street, according to Harry P. Wilson, president. Like displays are being prepared by Clinton-Held Co., Liberty Trucks & Parts Co., Elton T. Fair Company, and Herbert N. Steinbarger & Co., all located on Wazee street, between Sixteenth and Seventeenth streets.

The complete program for the three-day convention follows:

TUESDAY, JANUARY 17, 1928

Morning Session

- 9:30—Called to order by president.
Registration by counties.
- 9:50—Invocation..... Rev. Benjamin D. Dagwell,
Dean, St. John's Cathedral
- 10:00—Welcome Address..... Hon. Benj. F. Stapleton,
Mayor of Denver
Response..... Herman Emperius, Vice-President
- 10:30—Address..... Hon. Wm. H. Adams,
Governor of Colorado
Report..... President Rees
Report..... Secretary Monell
- 11:00—Address, "Legislative Work".....
..... Judge V. H. Johnson, Chmn. Legislative Com.
Appointment of committees.
Adjournment for lunch.

Afternoon Session

- 1:45—Address..... Hon. Haslett P. Burke,
Chief Justice Supreme Court
Address—"Co-operation in Agricultural
Extension Work"..... Hon. Charles A. Lory,
President Agricultural College
Address—"Expenditures and Taxes".....
Hon. David Elliott, State Senator, Third Dist.
Address..... Maj. L. D. Blauvelt,
State Highway Engineer

WEDNESDAY, JANUARY 18, 1928

Convenes at 9:30 A. M.

County affairs will occupy the morning. Commissioners E. B. Hill of Boulder county and Harris Aiken of Larimer county have selected John B. Wolff to present the question of "County Poor."

Other topics will be announced from the floor. Every commissioner is expected to take an active part in the discussions, also to present county problems for discussion.

Noon—The convention members, together with the ladies, are to be the guests of H. W. Moore Equipment Company for luncheon, Sixth avenue and Acoma street. Cars will be in readiness at 12 o'clock sharp to take guests to and from the plant.

Afternoon Session

- Convenes at 2:00 P. M. sharp
Address—"Colorado Fair"..... Hon. John J. Tobin,
State Senator, Seventeenth District
Address—"Federal Aid and Maintenance".....
Hon. J. W. Johnson, Dist. Engineer, U. S. Federal
Aid Department.
Address—(Subject to be selected).....
..... Hon. Allen S. Peek, U. S. District Forester
Discussion.

Evening Session

The Hardesty Banquet at the Albany Hotel at 6:30 p. m. Please preserve the invitation sent you. Open house by John Crook and wife at their York street home.

THURSDAY, JANUARY 19, 1928

Convenes at 10 A. M.

- Address—"The Bus and Truck Law".....
Hon. Otto Bock, Chairman, Public Utilities Com-
mission, State of Colorado.
Report Auditing Committee
Report..... Necrology Committee
Report Resolution Committee
Discussion.

Afternoon Session

Election of officers.

CONVENTION NOTES

Secretary's headquarters will be the same old place, Room 171, Albany Hotel.

It is requested that each county hand in the names of those present. Write name of county, together with names of commissioners, county clerk, roadmen and others present from your county. Also ladies present as your guests so they may be adequately cared for. Hand this to the secretary immediately on arrival.

Any matters you desire discussed, write out same and hand to secretary.

Officers of the association are: Wm. L. Rees, Pueblo county, president; H. Emperius, Alamosa county, 1st vice-president; W. G. Huntley, Kit Carson county, 2nd vice-president; S. R. Rigg, Adams county, 3rd vice-president; T. W. Monell, Montrose county, secretary-treasurer. V. H. Johnson, of Cheyenne county, is chairman of the legislative committee and Harris Akin, of Larimer county, chairman of the finance and executive committee.



One of Adams County's Maintenance Crews Removing Snow East of Brighton

Gas Prices Have Wide Range

MOTORISTS in this country are paying a wide range of prices for gasoline. Depending on the locality, straight run gas costs from 10 to 27 cents a gallon and high test from 13 to 29 cents.

The price variation was disclosed by a survey conducted by 950 motor clubs affiliated with the American Automobile Association. The survey revealed that as recently as November 22, gasoline was on sale at 47 different prices.

Accuracy was obtained in the checkup by sending identical forms to every A.A.A. club throughout the United States. The local clubs checked the prices in their respective areas.

Peoria, Ill., is enjoying the lowest price, gas costing 10 cents for straight run and 13 cents for high test. The highest price was reported at Phoenix, Ariz., 27 cents for straight run and 29 cents for high test.

A feature of the survey is that prices do not vary in ratio to the distance from the source of supply. In many instances prices were higher close to the oil fields than they were in places where long hauls were necessary. As a whole, prices at the coasts were higher than at inland points.

Prices along the Atlantic seaboard averaged 22 cents a gallon, while those in the Mississippi valley averaged 19 cents and on the Pacific coast 20 cents a gallon.

The survey shows that prices change rapidly in small areas where basic conditions such as rentals, supply and demand are the same. The A.A.A. statement follows:

"In the New England states, far from the oil fields and one of the greatest consuming sections, the price of gasoline varied seven cents, ranging from 15 cents a gallon to 22 cents for straight run and from 18 cents a gallon to 25 cents for high test gas.

"Gasoline prices in the states of New York, New Jersey and Pennsylvania, comprising the North Atlantic area, varied 11 cents on both varieties of gas, the range in the straight run being from 12 cents a gallon to 23 cents and for high test from 18 cents a gallon to 29 cents.

"Price variations of 10 cents for straight run and

four cents for high test gas were shown for the Middle Atlantic states, the range being from 15 to 25 cents per gallon for straight run and from 24 to 28 cents for high test.

"The four South Atlantic states, Georgia, Florida, North and South Carolina, showed price variations of 8 cents for straight run gas and 3 cents for high test gasoline. The lowest price for the former was 16 cents and the highest 24 cents a gallon, while high test sold from 24 to 27 cents.

"In the Gulf states the price variation was 11 cents. Straight run gas sold from 13 to 24 cents a gallon and high test from 16 to 27 cents per gallon.

"The Southwest states showed a variation of 12 cents in the price of straight run and 9 cents in the price of high test gasoline. The range was from 15 to 27 cents for the former and 20 to 29 cents for the latter.

"In the East Central states, comprising Ohio, Michigan, Indiana, Illinois, Wisconsin, Kentucky and Tennessee, the price variation was 13 cents for both varieties of gasoline. The range was from 10 to 23 cents per gallon for straight run and from 15 to 26 cents for high test.

"Variations of 7 cents for both straight run and high test gas were shown for the eight West Central states, comprising Minnesota, Iowa, Missouri, Kansas, Nebraska, Arkansas, South Dakota and North Dakota. The range varied from 14 to 21 cents per gallon for the former and from 17 to 24 cents for the latter.

"Variations of 2½ cents in straight run gas and 1 cent in high test was shown for Montana and Idaho, in the Northwest. The range of prices was from 23 cents per gallon to 25½ cents for straight run and from 27½ to 28½ cents for high test gas.

"Gasoline prices varied 10 cents for both varieties in the Western states of Colorado, Wyoming, Utah and Nevada. The range was from 16 to 26 cents for straight gasoline and from 19 to 29 cents for high test gas.

"The three Pacific Coast states, Oregon, Washington and California, reported variations of 4 cents in straight run gasoline and 5½ cents in high test. The price range was from 21 to 25 cents for the former and from 23 to 28½ cents for the latter."



Showing Arapahoe County Crew Making Repairs on Denver-Littleton Pavement



State Maintenance Crew Repairing Golden Pavement, Two Miles West of Denver

Second State Highway Conference to be Held at Boulder, January 19-20

The Second Annual Highway Conference will be held at the University of Colorado in Boulder on January 19th and 20th, 1928. Representatives of the U. S. Bureau of Public Roads, the State Highway Departments of Wyoming, New Mexico and Colorado, the Colorado State Association of County Commissioners, the Colorado Municipal League, and others interested in the construction of good highways will participate.

On January 13th and 14th, 1927, the first conference was held at the University with representatives from the U. S. Bureau of Public Roads and the Colorado organizations taking active part. This year it has been possible to obtain the aid and co-operation of the Wyoming and New Mexico Highway Departments. Engineers who are connected with these highway departments are taking a prominent part in the conference and will present discussions on subjects of interest to highway engineers. The participation of Wyoming and New Mexico means that the highway meeting to be held at the University assumes an interstate aspect inasmuch as all states in District No. 3 of the U. S. Bureau of Public Roads are represented.

The program follows:

PRELIMINARY PROGRAM University of Colorado

HIGHWAY ENGINEERING CONFERENCE

January 19th and 20th, 1928

Under auspices of Department of Civil Engineering and University Extension Division at Boulder, Colorado.

Thursday, January 19th, 1928

Morning Session

Address of Welcome:

F. B. R. Hellems, Acting President of the University.

Response:

Major L. D. Blauvelt, State Highway Engineer, Colorado State Highway Department.

Treated Timber Highway Structures, Wyoming Experience:

J. F. Seiler, Engineer of Bridges, Wyoming State Highway Department.

New Mexico Experience:

E. B. Van de Greyn, Bridge Engineer, New Mexico State Highway Department.

Afternoon Session

State Owned and Operated Materials Testing Laboratories, New Mexico Experience:

L. C. Campbell, Materials Engineer, New Mexico Highway Department.

Wyoming Experience:

W. H. Norris, Engineer of Materials, Wyoming State Highway Department.

Oiled Gravel Roads:

C. H. Bowman, District Engineer Wyoming State Highway Department.

Review of the Proposed Uniform Vehicle Registration and Traffic Regulation Code Recommended by the National Conference on Highway Safety:

Warren Raeder, University of Colorado.

Friday, January 20th, 1928

Morning Session

Relation of Foundation to Type of Bridge:

Paul C. Bailey, Bridge Engineer, Colorado State Highway Department, and L. F. Copeland, Bridge Engineer, U. S. Bureau of Public Roads.

Personnel Selection and Training:

T. Warren Allen, Chief, Division of Control, U. S. Bureau of Public Roads, Washington, D. C.

Afternoon Session

The Writing of Highway Specifications from the Contractor's Viewpoint:

Henry M. Roberts, J. Fred Roberts Construction Company, Denver, Colo.

Highway Right of Way Maintenance:

J. W. Johnson, District Engineer, U. S. Bureau of Public Roads.

County Highway Problems:

E. B. Hill, Chairman, Boulder County Commissioners; Earl C. Hamilton, Road Supervisor, Weld County, Greely, Colorado.

Street Maintenance Organization and Operation in a Small City:

E. A. Lawver, City Engineer, Fort Collins, Colo.

As will be noted, this is an outstanding program. A wide range of topics will be discussed and the conference should be of great value to all who are interested in better highways.

Good Road Is One Best Suited to the Traffic It Serves

THE average person's definition of a good road is a concrete highway, smooth of surface and stretching great distances in more or less straight lines.

The road having the hardest and smoothest form generally fits the average definition. This is true for the most part, but road experts qualify the definition. To the road builder the most desirable road is the one most generally useful and the one most durable for the usage to which it is put.

The United States Bureau of Public Roads and other experts were recently asked, "What constitutes a good road?" The answers stated three factors: smoothness, ability to withstand traffic and feasibility from the economic standpoint of communities supporting the particular type of road which is selected.

A dirt road, under certain conditions, according to an expert of the bureau of public roads, if well graded and drained will make the best type of road. Such a road, when kept in good condition, may be as smooth as concrete. This official believes that it is erroneous to think that all road improvements should result in a hard-surfaced finish.

"Careful study has shown that the cost of moving a vehicle over an improved road is less than moving it over one that is in a natural state," this expert states. "By multiplying the saving in cost of operating one vehicle with the number of vehicles that use the road in a year, the resultant sum is the largest which it is proper to pay to improve the road and to maintain it in its improved state.

"To grade and drain an unimproved road costs much less than to hard-surface it, and if the vehicles using the road are comparatively few in number, an unsurfaced but graded and drained road can be maintained in satisfactory condition by dragging, at very low cost, at the same time amply satisfying the needs of the district which it serves."

This expert goes on to say that the other extreme in road building is the concrete and asphalt-surfaced types. These cost from \$30,000 to \$40,000 a mile and, if well constructed, are able to withstand the heaviest traffic.

It is entirely impracticable for the entire road mileage in the United States, amounting to more than 3,000,000 miles, to be improved, in the opinion of highway experts. Many roads merely communicate between individual farms or run along section lines.

For this reason they are plainly designed to remain in a natural state for at least several generations. On many of them, it is pointed out, traffic consists of but two or three vehicles a day. Naturally, it would be unprofitable to improve such roads, as the improvements in many instances would cost more than even the value of the property adjoining the roads.

Between these two extremes there are various types of roads which it is deemed advisable to build, under certain circumstances. If traffic on a graded dirt road becomes so heavy that it is impossible to keep it in condition by dragging, then a sand-clay or gravel surface is needed.

Careful study has revealed that any road carrying in excess of 1,000 vehicles per day should be paved with a hard surface. It has been found that a gravel road used by more than 1,000 cars per day cannot be economically kept free from heavy ruts and the wash-board effects.

Or, if the traffic becomes too heavy for this surface, a bituminous macadam may be applied. The latter type of surface, road builders say, requires a crushed rock foundation just as did the old type of water-bound macadam.

Such a road is suitable for horse-drawn and automobile traffic as well as a limited amount of heavy motor truck traffic, engineers say. For really heavy traffic, however, they prefer a highway with a so-called high-grade surface, one that will withstand almost any usage, provided the road has been properly constructed.

The concrete highway fulfills this need. It may be either of bituminous concrete or Portland cement concrete, experts state.

The bituminous concrete surface differs from a bituminous macadam road in two respects. First, the aggregate, or stone and sand particles, is carefully graded in size on the theory that when compacted there will be a minimum of space between them, and secondly, the asphaltic cement is mixed hot with the aggregate before being spread on the road, thereby assuring a thorough coating of all particles.

One highway engineer explains the difference between use of various surface materials as follows:

"When spread on the road, generally to a thickness of two inches, this mixture forms a closely-knit, weatherproof surface, capable of supporting heavy loads if adequately supported itself by a firm foundation.

"Laid on adequate bases, these surfaces may carry a very heavy volume of traffic and are extraordinarily durable. However, if the base is not heavy enough for the traffic on the road, the whole road will break down locally and the only lasting remedy is construction of a new base.

"Probably the most popular type of surface is Portland cement concrete. When well constructed, it provides as smooth a surface as may be had and will carry almost any volume of heavy traffic.

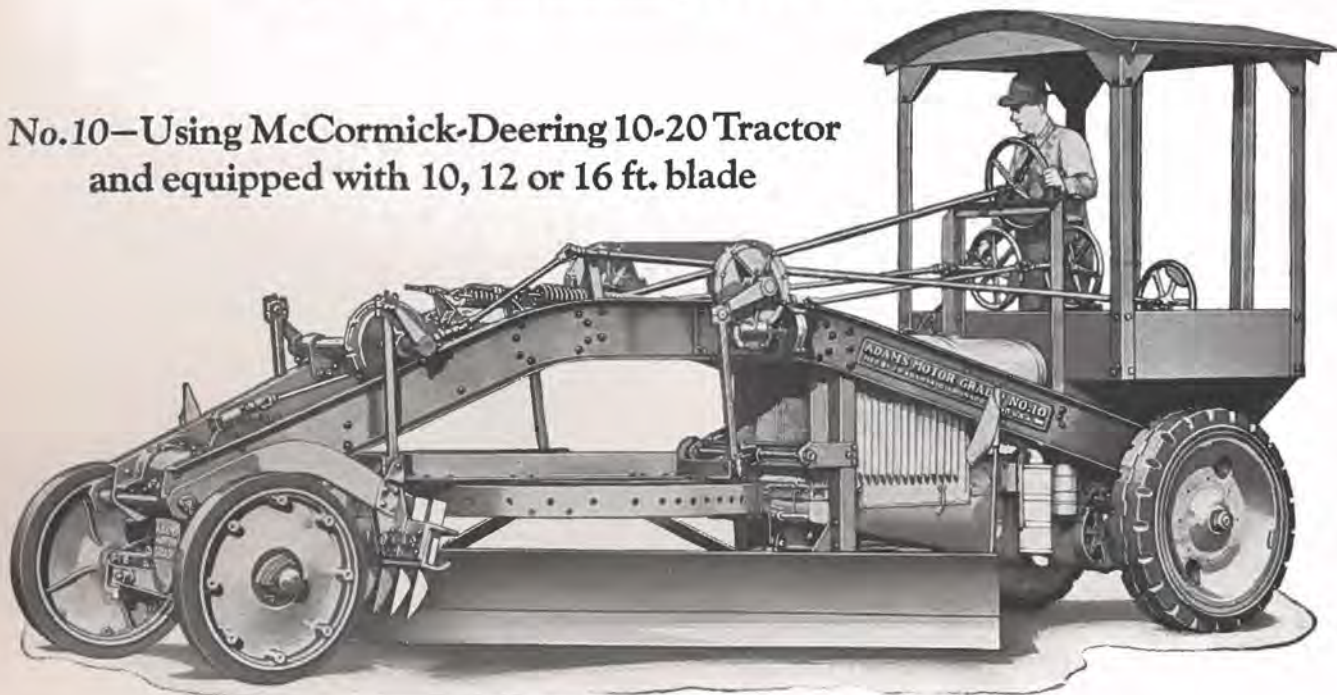
"During the last ten years there has been an appreciable advance in the construction of concrete roads. Many of the Portland cement concrete highways built in 1915, 1916 and 1917 cracked after several years, but, due to research and development of better engineering methods, the modern road ought to last 20 years or more, if properly cared for."

Another advance in engineering is making the edges of a concrete highway thicker than the center. This is due to the fact that a wheel's weight in the center of the road is distributed over a radius of 360 degrees, whereas at the edge the weight is distributed only over about 180 degrees.

Announcing the Adams Motor Grader

~ with a New Type Blade Control and
Other Exclusive ADAMS Features

No. 10—Using McCormick-Deering 10-20 Tractor
and equipped with 10, 12 or 16 ft. blade



ADAMS MOTOR GRADER No. 10 is an outstanding engineering achievement typifying the finest development of Adams ideals in high-class design and construction. It is the result of several years of painstaking development, embodying an entirely new blade control and many other exclusive Adams features.

The new blade control, a marked advance in grader design, raises the blade 50% faster than the ordinary type and with half the effort because of a continuous hand wheel motion and a leverage twice that of ordinary hand wheels.

Another outstanding feature is an exceptional strength and rigidity of construction throughout, which gives Adams Motor Grader a smooth, steady

cutting quality that is not approached by any other grader. This is brought about by an unusually strong frame and a distinctive method of bracing or stiffening which employs four large tubular steel cross members—a construction which absolutely prevents any frame twisting or weaving.

Other features of refinement which contribute to long life and ease of operation, and which positively eliminate all lost motion throughout the machine, are enclosed machine-cut gears, machined ball and socket joints, machine-finished bearings and an all-riveted construction.

Write for a copy of our special folder fully describing this new machine.

Write for illustrated
booklet giving full
details.

ELTON T. FAIR CO. " "

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Write for 64
page book on
Snow Removal

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SNOW SPECIAL	• \$2100
<i>Peoria, Illinois</i>	
THIRTY	• \$3000
SNOW SPECIAL	• \$3450
<i>Peoria or San Leandro</i>	
SIXTY	• \$5000
SNOW SPECIAL	• \$5500
<i>Peoria or San Leandro</i>	

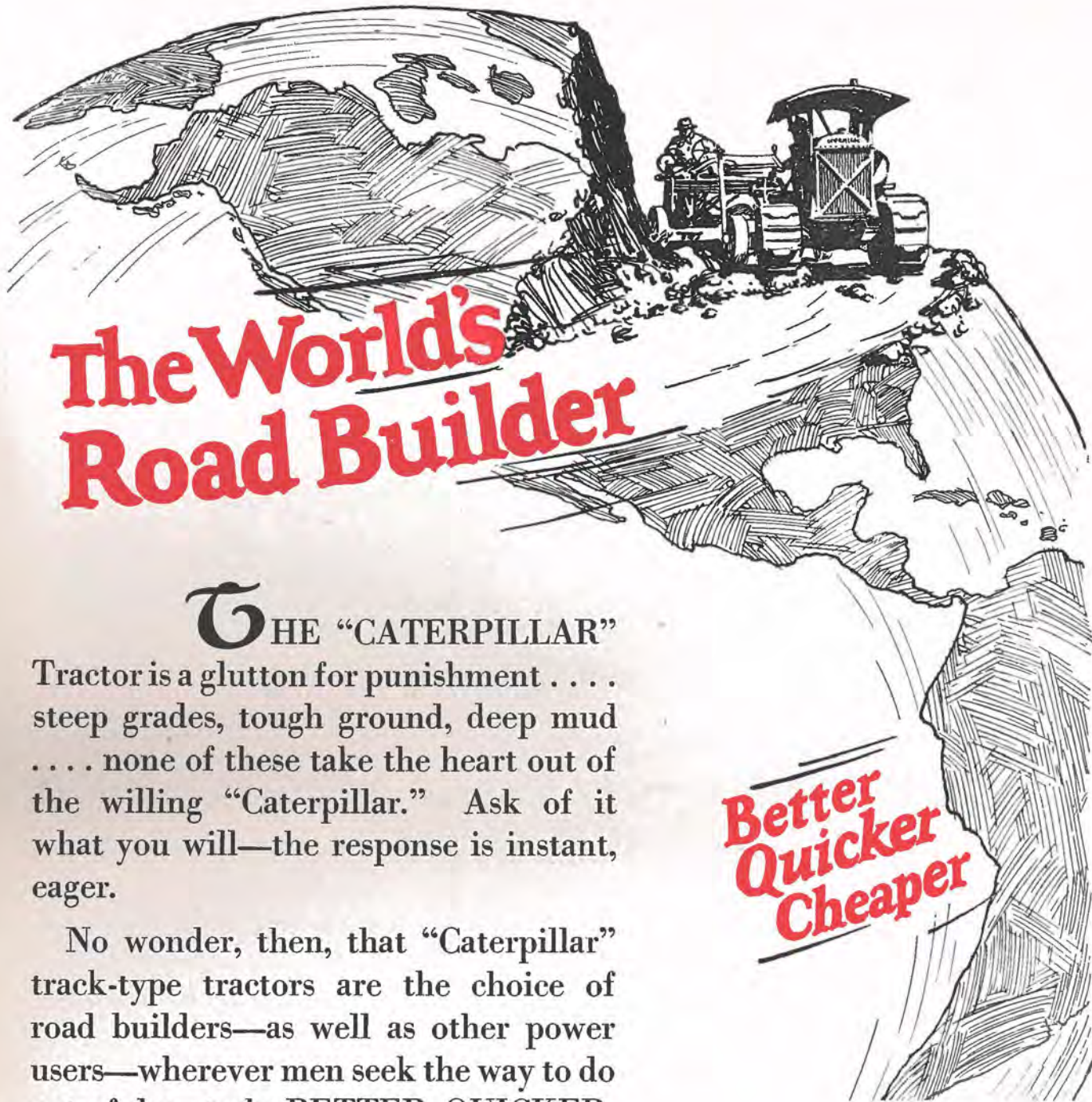


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Tractor is a glutton for punishment
steep grades, tough ground, deep mud
. . . . none of these take the heart out of
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eager.

No wonder, then, that "Caterpillar"
track-type tractors are the choice of
road builders—as well as other power
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Quicker
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Clinton & Held Co.

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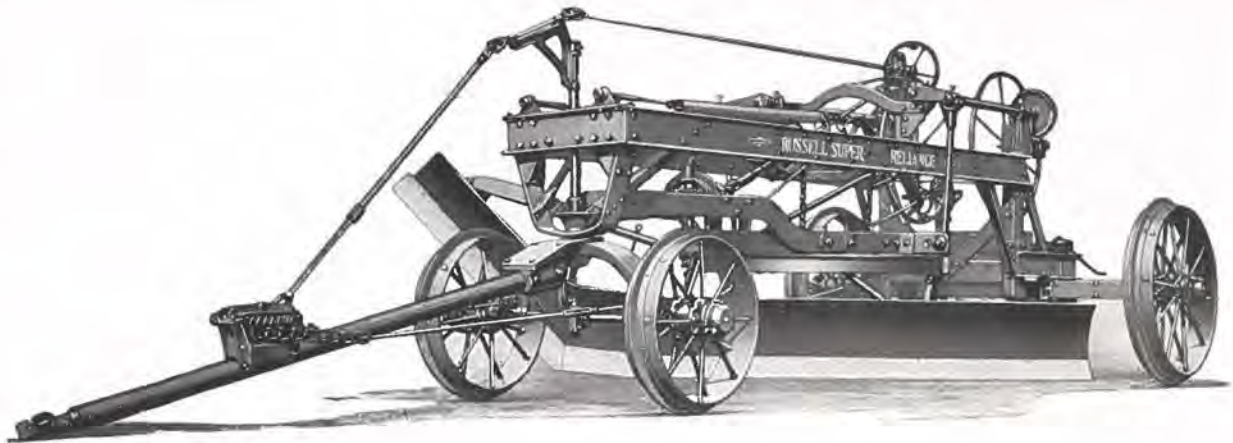
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RUSSELL

ROAD EQUIPMENT



Performance—the True Yardstick of Value

Choosing the right road equipment has an important bearing on the cost of road building.

In buying road machinery, as in buying automobiles, the cost per mile (not the first cost) determines the real value to the purchaser.

In other words, capacity, up-keep cost and operating expense are the main factors to consider.

RUSSELL ROAD EQUIPMENT will positively produce more miles of road work per dollar because it is trouble-free, low in operating cost, low in up-keep and has a surprisingly large capacity.

The complete Russell Line for Road Construction, and Road Maintenance includes—

14 Sizes Road Machines—3 Sizes Elevating Graders

Maintenance Patrol Machines for both Motor and Horse Power, Scarifiers, Road Drags and Wheel Scrapers, Drag Lines, Conveyors, Gravel Screening, Crushing and Loading Equipment, Etc.

“Russell Always Makes Good”

The Herbert N. Steinbarger Co.

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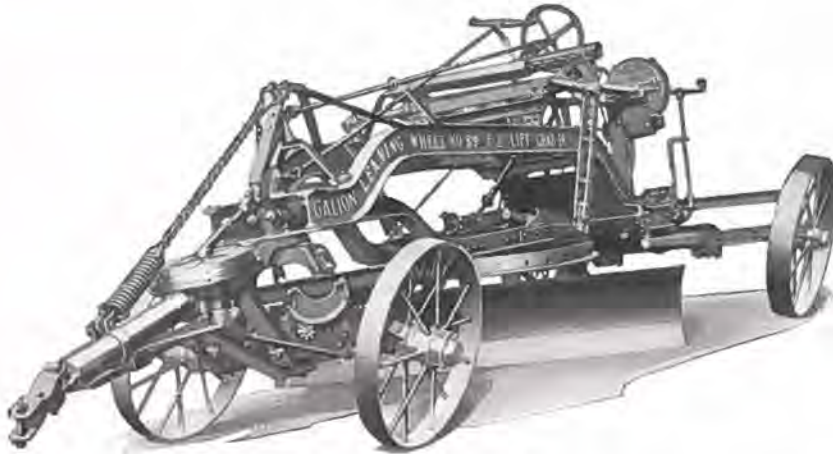
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*Predominant
in Use
Because
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Denver, Colorado — Missoula, Montana

Galion E-Z-Lift



Leaning Wheel Graders

Equipped with Timken Tapered Roller Bearing Wheels are easier to "pull."

COUNTY COMMISSIONERS—

It will pay you to visit our display of Galion Graders (both Leaning and Straight Wheel) during your Convention in Denver, January 17-18-19.

"Certainly We'll Demonstrate Graders"

H. W. MOORE EQUIPMENT CO. 120 West Sixth Avenue **DENVER**

Commissioners—Make our place your headquarters during your Convention in Denver. Free Taxi Service anywhere.

NAVY DEPARTMENT
Bureau of Yards and Docks
Washington, D. C.

April 16, 1927.

Pierce Testing Laboratories,
Denver, Colorado.
Gentlemen:

It is understood that you recently conducted some tests of the permeability of plain concrete, as well as concrete containing admixtures. If the results of your tests can be furnished this Bureau without charge we will appreciate very much receiving them, together with your comments.

P. L. REED,
Acting Chief of Bureau.

This information, of course, we gladly furnished the Navy Department. However, we cannot always serve our clients without hope of remuneration; still we have been able to invariably carry on such tests and investigations which resulted in a saving several times above the cost of our services, as is confirmed by the letter shown here from the Moffat Tunnel Commission.

MOFFAT TUNNEL COMMISSION
Club Building, 1731 Arapahoe Street
Denver, Colorado

March 15, 1927.

Mr. George Pierce,
The Pierce Testing Laboratories,
730 19th Street,
Denver, Colorado.

Dear Mr. Pierce:

The tests which you have been conducting for the Moffat Tunnel Commission under your contract have saved the Commission many times the cost of the tests. It is doubtful if the work could have been successfully carried out as cheaply as it has been without frequent tests as a guide and check on the mixes. On one part of the job, for example, a field test enabled us to detect faulty sand which might have required the tearing out and replacement of several hundred yards of concrete, and in another instance we were enabled to use a leaner mixture by virtue of your tests.

I am calling this to your attention, as I feel that thanks are due you for your willing co-operation in getting results at the Moffat Tunnel.

Very truly yours,

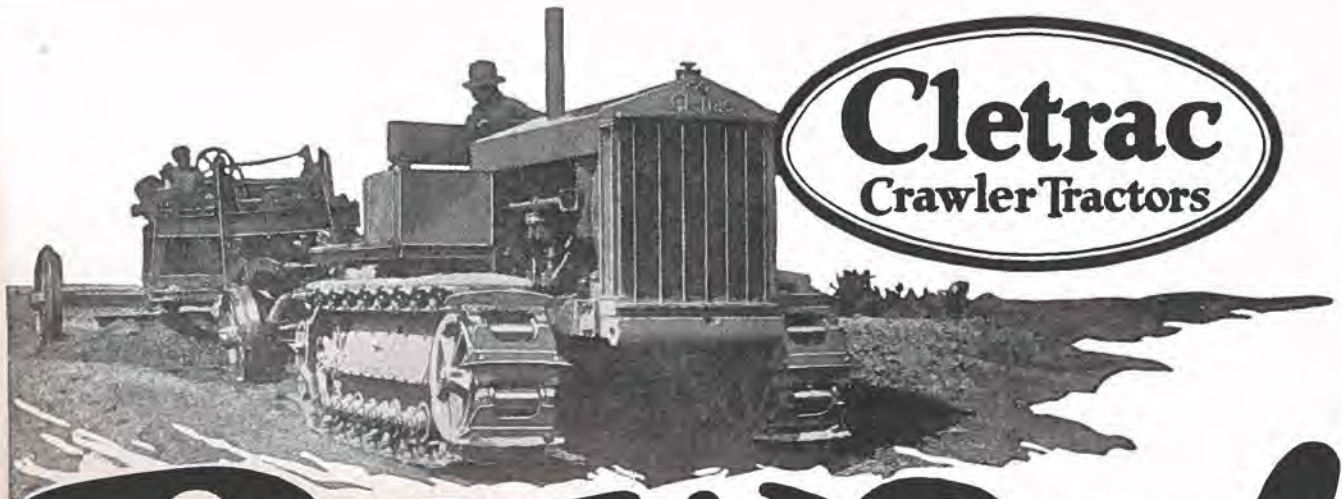
C. A. BETTS,
Office Engineer,
Moffat Tunnel Commission.

CAB-K

The Pierce Testing Laboratories, Inc.

730-734 Nineteenth St., Denver, Colorado.

Telephone Champa 7236



Cletrac
Crawler Tractors

Power!

TODAY, more than ever before, larger implements and tandem equipment are being used on big road and land development jobs everywhere. It is the one sure way to cover ground more quickly and to cut time and costs on every project. *Graders of greater capacity — dump wagon and scraper trains instead of single units — this is the modern trend!*

Such peak loads demand the power reserve and the sure-footed traction that CLETRAC delivers in fullest measure. *CLETRAC has a record of greater draw-bar pull in proportion to its weight than any other tractor built!* It has an exceptional power reserve. It has instantaneous "One-Shot" lubrication to save the time of greasing and oiling. It has speed, easy handling, short turning — *every feature* for making it the most useful and profitable power unit you can possibly purchase.

Built in a Complete Range of Sizes

There is a CLETRAC Crawler Tractor to fit the power specifications of every industrial tractor operation. The CLETRAC 20—the CLETRAC 30—and the CLETRAC 100 completely cover every power requirement you are called upon to meet.

Liberty Trucks & Parts Co. Distributors
Sugar Building, 16th and Wazee Streets, Denver, Colorado

Performance Counts and

Delays Mean Dollars

Macks from 1½ to 7½
Tons



Model AB, 1½-2 Ton Dual Reduction
Model AB, 1½-2 Ton Chain Drive
Model AB, 2½-3 Ton Dual Reduction
Model AB, 2½-3 Ton Chain Drive
Model AK, 3½-5 Ton Dual Reduction
Model AK, 3½-5 Ton Chain Drive
Model AC, 5½-7½ Ton Chain Drive

TRACTORS

5 to 15 Ton Trailer Capacity
Winches—Dump Bodies—Cranes

The Little Mack Contractors' Special—A 1½ ton short wheelbase. Turns in 39 feet. Four speed transmission, and above all, always on the job.



MACK International Motor Truck Corp.

585 SOUTH BROADWAY

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"The Best Piece of Road I've Ever Seen"

Federal and State Engineers were unanimous in acclaiming the merits of a road recently finished by the *ORD Concrete Road Finisher*. They actually said it was the best job of road finishing they had ever seen—but it was just an ordinary, every-day ORD job.

Come and see how the ORD works at our big exhibit at the Road Show, Cleveland Municipal Auditorium, West Wing, Space WW-44, Cleveland, Ohio, January 9th to 13th.



A. W. French & Co. *Manufacturers of the ORD Concrete Road Finisher*
8440 Lowe Avenue, CHICAGO, ILLINOIS

Distributed by

WILSON MACHINERY COMPANY, 1936 Market Street, DENVER, COLO.

Cedar Rapids



One Piece Outfit

This outfit is growing in favor with each succeeding road surfacing job.

The production of road surfacing material is one of the costly items entering into the building of good roads.

Every County Board of Engineers has recognized this problem as a very perplexing one.

In the Cedar Rapids "One Piece" Outfit we offer the most logical solution to this problem. It crushes, sizes and loads the finished surfacing material in *One Operation*—which means less expense. And it will successfully handle any road building material—limestone to niggerheads. Pictured here, it is being operated in Fremont County, Colorado—crushing, sizing and loading an exceptionally hard type of gravel.

This means speed, economy, elimination of delays and the assurance that the job will not only be a good one, but will be finished as per schedule.

The type of road building material in your locality can be successfully handled by the Cedar Rapids "One Piece Outfit."

It makes no difference what it is—limestone or gravel—the "One Piece Outfit" will produce the finished product more economically than is possible in any other way.

See the Cedar Rapids "One Piece" Outfit in operation at our plant January 17-18-19.

We always have a plant in stock for immediate shipment.

H. W. Moore Equipment Co.

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Commissioners—Make our place your headquarters during your Convention in Denver. Free Taxi Service anywhere.

**State Highway Department Financial Statement for the
Fiscal Year Ending November 30, 1927**

BALANCE, DECEMBER 1, 1926	
State Treasurer.....	\$1,657,784.86
County Time Warrants	15,000.05
Total Balances....	\$1,672,784.91
RECEIPTS	
Half Mill Levy.....	\$ 762,526.89
Gasoline Tax.....	1,740,651.20
Internal Improvement	70,600.00
Federal Aid.....	1,148,156.23
County Aid.....	104,486.90
Miscellaneous	4,713.29
Total Receipts....	3,831,134.51
Total Balances and Receipts.....	\$5,503,919.42

DISBURSEMENTS	
Federal Aid Projects..	\$2,522,025.84
State Projects.....	591,607.46
Maintenance	852,122.94
Federal Aid Renewals	6,559.16
Property & Equipment	24,755.65
Surveys	15,824.27
General Office Admin- istration	57,705.76
Engineering Admin- istration	43,887.37
Road Signs and Traffic Census	30,532.28
Compensation Insur- ance	19,784.30
Total Disbursements	\$4,164,805.03
BALANCES, NOVEMBER 30, 1927	
State Treasurer.....	\$1,334,675.24
County Time Warrants	4,439.15
Total Balances....	1,339,114.39
Total Disbursements and Balances.....	\$5,503,919.42

Universal Crushers

**WE ARE EXCLUSIVE DISTRIBUTORS
FOR THIS TERRITORY**

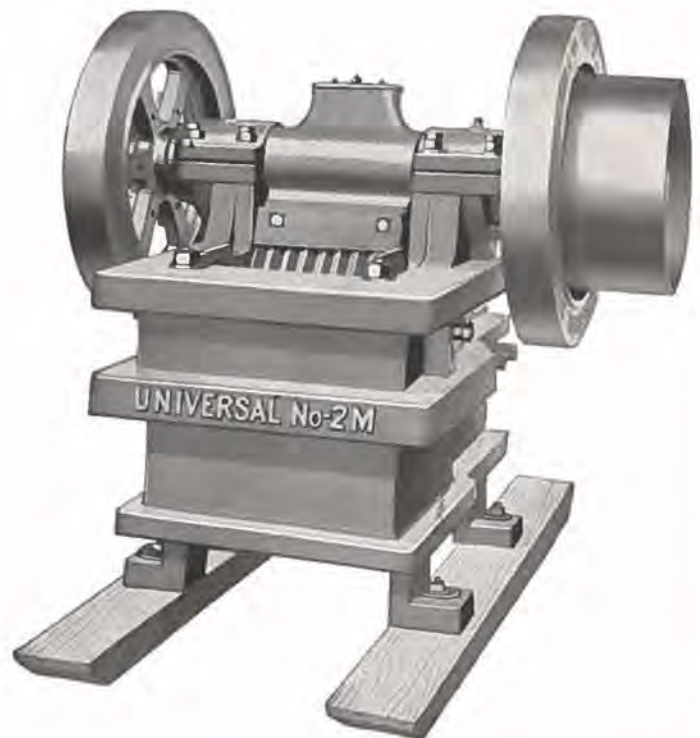
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In using cheap grades of oil. While they do fill the space in your crank case, they do not lubricate; they do not stand up under heat and strenuous conditions.

AVOID DELAY AND EXPENSE OF REPAIRS BY USING

Sommers Oils and Greases

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*You Won't
Growl at
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100% Pennsylvania Motor Oil

You haven't used the best, if you
haven't used our oils.

Sommers Oil Co.

Denver,

Colorado

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NEWS OF THE MONTH

Current Events in the Field of Highway Engineering and Transportation—State, County and Municipal Activities

Colorado received \$281,672.65 from the 3-cent gasoline tax in November, according to the report of James Duce, state oil inspector. The inspection fee amounted to \$1,253.16. Of the revenue from the tax, \$20,063.74 was paid under protest.

Since December 1, 1926, there has been \$2,944,869.04 collected through the tax and \$73,421.95 from the inspection fee. The money is used in the upkeep of state roads, 70 per cent going direct to the state highway department and the rest to the counties.

It was announced that about \$40,000 of funds previously paid by local oil companies under protest has been released to the state by the concerns paying the tax. These funds were paid under protest pending a suit brought by one of the oil companies to test the new 3-cent gas tax.

One of the points involved in the suit is the question of whether the general assembly has the right to levy a tax for the benefit of the counties.

Distance between Pueblo and Walsenburg will be shortened two miles if federal and state highway officials adopt one of two surveys relocating the highway in southern Pueblo county. The 1927 budget provides for \$120,000 to be spent on the seven-mile change in Pueblo county but work is being held up until the plan is settled.

The route which would shorten the distance would be a new road from the Hatchett ranch to the Apache school house, going east of Crow and Greenhorn. The other proposal is to build the road on a survey west of the present road, leaving it at Crow and re-entering at Greenhorn.

Either change would eliminate several steep hills and dangerous curves. The Pueblo county commissioners are said to be opposed to the plan to shorten the distance because it would necessitate maintenance of the new and old roads. Exponents of the plan point out that about \$60,000 would be saved when the route is paved as eventually planned.

A campaign of prosecution may be started in the Arkansas valley unless vandals cease defacing and destroying highway signs. During the past few months all of the main highways have been marked with warning, mileage and road number signs. Many have been removed and destroyed and others have been used for targets, it is reported by Lewis Swink, division superintendent of state highway maintenance.

Surveys and estimates for the Trinidad-San Luis valley highway are being made by E. E. Montgomery, division engineer of the state highway department. It is proposed to route the road by way of Whiskey canon on the east side of the

range and along San Francisco creek on the western slope into Costilla county. The proposal provides for a short tunnel near the summit which would shorten the distance 12 miles.

The Colorado Culvert & Flume Co. of Pueblo has entered a new trade field by shipping corrugated culverts to the Grand Canon national park during the past few weeks.

Plans are in preparation for starting a \$124,000 paving project on the Pueblo-Colorado Springs highway in El Paso county. The concrete will start from the Broadmoor paving and continue toward Fountain.

Pueblo county commissioners are planning to frame a letter received from a farmer a few days ago. The farmer offered to deed the county the necessary land and pay the county for labor in making a slight change in the county highway near his place. The officials state that most requests contain no arrangement for financing the work.

Five more miles of paving on the Denver-Colorado Springs highway have been completed and opened to traffic. The stretch connects Castle Rock and Tomah and was constructed by J. Fred Roberts & Son. All grade railroad crossings are removed from the route. The last two underpasses between Denver and Colorado Springs are now being built under the Santa Fe and Denver & Rio Grande Western tracks at Monument by Frank Hoffman of Denver.

The new underpass on the Santa Fe Trail at Swink is completed but will not be available for use for several months due to work on changing the road near it. The underpass removes one of the dangerous valley railroad crossings. Workmen are also paving the last mile of unpaved highway between Rocky Ford and La Junta.

The three-mile stretch of concrete paving east of Las Animas on the Santa Fe Trail was completed and opened to traffic in November. There is now a continuous ribbon of paving from Las Animas to within a short distance of Fort Lyon. W. A. Colt & Son paved the stretch.

Early in November work was started by W. A. Colt & Son on two miles of paving north of Trinidad. Traffic will be detoured while the work is under way.

Considerable advancement was made in trail construction in the San Isabel national forest during the past summer. The Highline trail, which leads to the summit of the range along the headwaters of the Rito Alto, was completed for a distance of 20 miles. Almost as much work was done on the Rainbow trail from Bear creek, 72 miles southeast of Mosca pass.

Shorter trails were established during the summer in other parts of the San Isabel, opening up scenic beauties not accessible to vehicular traffic.

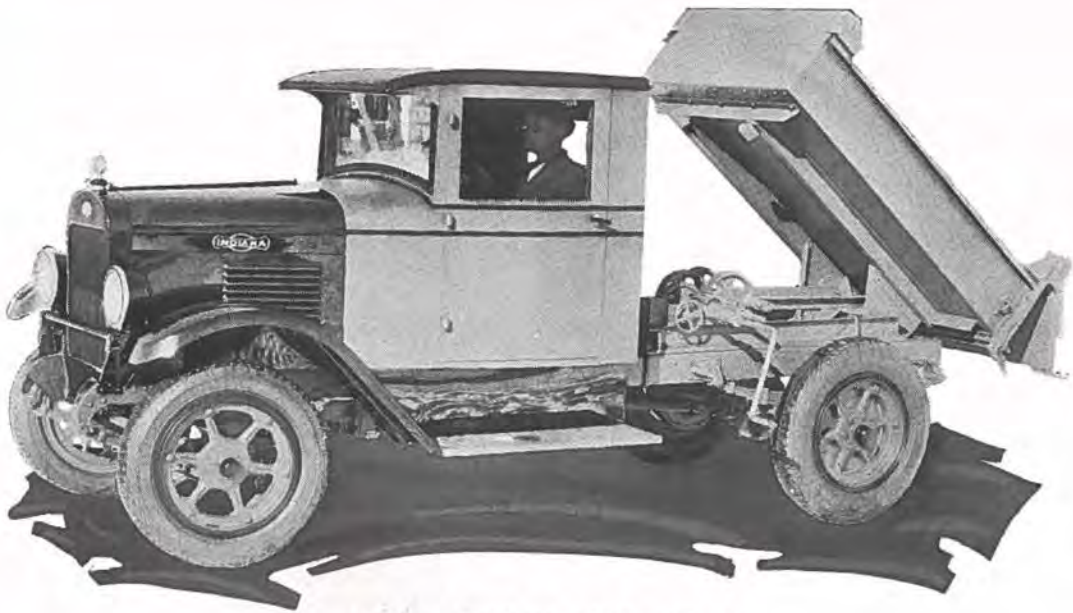
"DEATH CURVE"

on the Morrison highway where many fatal accidents have occurred, will soon be removed, that it may no longer prove a menace to motorists driving through the little foothill town. Plans are underway by the state highway department to eliminate the sharp bend in the road by diverting Bear Creek and straightening the highway at that point. The work will be undertaken with the least possible interference to fall and early spring travel.

A 600-foot channel will be dug from a point opposite the Colorado and Southern railroad bridge to the diversion dam of the ditch so that no bridges will be needed. A modern concrete road, making Morrison easily approached in a straight line, will replace the present dirt road. Bids were received up to October 10.

New Woven-Wire Fence Installed on Danger Curve on Denver-Morrison Highway





Indiana Model 111—1½-Ton Chassis
With Hand Hoist and Dump Body

for **1928**

Consider Your Truck Costs

NEXT YEAR you will need new trucks. Old ones must be replaced. More trucks must be added to take care of your increased business.

When you consider replacing your old equipment—or adding to your present fleet—check your present operating costs against those of INDIANA users. You'll find that INDIANAS will save money for you.

Then make a check on the basis of dependability. You'll find that INDIANAS now in service have a performance record far beyond your expectations.

We believe we can prove to your satisfaction that INDIANA Trucks are more dependable and more economical than your present equipment. You owe it to yourself to investigate our claims. Won't you write us for further information?

INDIANA TRUCK CORPORATION, 312 Indiana Park, MARION, INDIANA

4 and 6 Cylinder Models

INDIANA TRUCKS

1 to 7 Ton Capacities

Liberty Trucks & Parts Co., Distributors

SUGAR BUILDING, 16TH AND WAZEE STS.

DENVER

We carry a complete line of parts for all government released trucks, ready for immediate shipment.

COLORADO

A campaign to popularize Colorado and Wyoming highways is necessary if the two states are to retain their popular tourist traffic, in the belief of Clarence Werthan, manager of Rocky Mountain Motorists.

Werthan reports considerable agitation is in evidence by interests in the south-

west for a main highway through that section of the country. The group is urging that U. S. Highway No. 66 be completely paved from Chicago to Los Angeles. It would pass through Missouri, Oklahoma, Texas, New Mexico and Arizona, completely cutting off Colorado and Wyoming. Werthan states that the co-operation of all Coloradoans and Wyo-

mingites is needed to keep the transcontinental traffic from being side-tracked.

After the state had spent hundreds of thousands of dollars, raised by bond issues and otherwise, on the building of roads, the Illinois legislature has at last come to the gasoline tax, leaving only two states in the Union, New York and Massachusetts that have no gas tax.

BIDS RECEIVED FOR FOLLOWING PROJECTS

Proj. No.	Length	Type	Date Bids Opened	Low Bidder
F.A.P. 258-F	5.689 mi.	Gravel Surfacing	December 29, 1927	Hinman Bros.
F.A.P. 277-B	4.360 mi.	Concrete Paving	December 29, 1927	J. L. Busselle & Co.

PLANS SUBMITTED FOR APPROVAL TO U. S. BUREAU OF PUBLIC ROADS

Proj. No.	Length	Type	Location
F.A.P. 2-R No. 7	1.224 mi.	Pavement & R. R. Grade Separation	South of Aguilar
F.A.P. 133-A	10.916 mi.	Gravel Surfacing	North of Kremmling
F.A.P. 295-C	5.284 mi.	Gravel Surfacing	North of Antonito
F.A.P. 262-D	1.764 mi.	Gravel Surfacing	West of Walsenburg

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
F.A.P. 145-B	1 mi.	Gravel Surfacing	West of Glenwood Springs
F.A.P. 147-A	16 mi.	Gravel Surfacing	South of Cortez
F.A.P. 203-B	0.2 mi.	Gravel Surfacing and Overhead Railroad Crossing	East of Grand Junction
F.A.P. 253-C	5 mi.	Gravel Surfacing	West of Milner
F.A.P. 266-C*	3 mi.	Gravel Surfacing	South of Durango
F.A.P. 288-A3	3 mi.	Graded & R. R. Overhead Crossing	East of Brush
F.A.P. 292-B	3 mi.	Graded & R. R. Overhead Crossing	South of Minturn
F.A.P. 296-C	5 mi.	Gravel Surfacing	North of Greenhorn

* Plans finished.

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1928

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj No
2-R3	North of Trinidad	0.553 mi.	Pav. Underpass	Strange-Maguire Pav. Co.	\$ 28,882.70	100	2-R3
2-R4	North of Trinidad	6.66 mi.	Asphalt Paving	Strange-Maguire Pav. Co.	331,632.00	100	2-R4
2-R5	Bet. Trinidad and Aguilar	1,959 mi.	Paving	W. A. Colt & Son	72,122.50	18	2-R5
2-R No. 6	South of Aguilar	2.75 mi.	Paving	W. A. Colt & Son	93,000.00		2-R No. 6
134-A	Betw. Stratton and Burlington	5.861 mi.	Sand Surfacing	W. A. Colt & Son	40,438.00	100	134-A
134-A2	Stratton-Burlington	5.313 mi.	Sand Surfacing	F. Kentz	15,265.68	100	134-A2
144-A1	Near Ingleside	4.694 mi.	Gravel Surface	Orley La Nier	31,564.50	100	144-A1
144-B	Northwest of Fort Collins	3.201 mi.	Gravel Surfacing	White & LaNier	44,000.00		144-B
145-A	West of Glenwood Springs	3.807 mi.	Gravel Surfacing	Winterburn & Lumsden	58,227.90	94	145-A
157-A	North of Buena Vista	3.997 mi.	Grading	E. H. Honnen	47,546.00	100	157-A
210-B2	De Beque-Grand Valley	7.507 mi.	Gravel Surfacing	Fred Kentz	37,475.00	23	210-B2
213-D	Durango, west	3.877 mi.	Gravel Surfacing	Shields & Kyle	47,692.00	100	213-D
222-CR	South of Lafayette	0.375 mi.	Paving	J. H. Miller & Co.	12,834.75	100	222-CR
246-F	West of Avondale	1.0 mi.	Paving	Strange-Maguire Pav. Co.	37,847.00	100	246-F
247-C	Swink	0.8 mi.	Conc. Pav. & R.R. Underpass	J. Finger & Son	62,559.58	50	247-C
254-C	Div. 1 2 mi. S.W. of Hot Sulphur Springs	150 ft.	Steel Truss Bridge	Hinman Bros. Constr. Co.	12,383.00	100	254-C1
254-C2	S. W. of Hot Sulphur Springs	Superstr. of Bridge & Approaches		Northwestern Constr. Co.	48,203.50	54	254-C2
254-D	Parshall-Hot Sulphur Springs	3.013 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	37,124.18	94	254-D
258-B	S. W. of Gunnison	2.727 mi.	Gravel Surfacing	Lamble-Bate Const. Co.	65,374.00	100	258-B
258-D	Iola-Cebolla	4.426 mi.	Gravel Surfacing	H. C. Lallier Const. Co.	52,739.80	84	258-D
258-E	Cimarron-Cerro Summit	3.898 mi.	Gravel Surfacing	Strange-Maguire Pav. Co.	49,850.50	95	258-E
258-E	Dist. 2, F. A. P.	1.487 mi.	Gravel Surfacing	Hinman Bros. Const. Co.			
262-G1	Russell-La Veta Pass	5.014 mi.	Gravel Surfacing	Central Const. Co.	44,822.00	100	262-G1
262-H	Walsenburg-La Veta	3.296 mi.	Gravel Surfacing	Central Const. Co.	34,788.00	100	262-H
265-B	Durango-Bayfield	3.831 mi.	Gravel Surfacing	Engler & Teyssler	52,134.55	92	265-B
271-B	At Portland	0.778 mi.	Paving, grav., bridge	H. M. Fox	58,802.65	100	271-B
275-C	Div. 2 East of Monument	0.625 mi.	Concrete Paving and 150 ft. Bridge	W. A. Colt & Son	34,456.60	100	275-C2
275-E	North of Monument	0.926 mi.	Grading and Underpass	F. L. Hoffman	41,905.20	87	275-E
275-F1	Castle Rock-Larkspur	10.303 mi.	Grading	J. Fred Roberts & Sons	132,679.00	84	275-F1
275-F2	Castle Rock, south	5.227 mi.	Paving	J. Fred Roberts & Sons	119,027.80	100	275-F2
275-G	Larkspur-Monument	10.869 mi.	Grading	Monaghan-Cunningham Con. Co.	141,252.78	92	275-G
276	North of Colorado Springs	R. R. Overpass		J. L. Busselle & Co.	37,913.00	100	276
279-D	Morrison	0.264 mi.	Paving	M. E. Carlson	23,266.80	51	279-D
279-E	Schaffer's Crossing-Baileys	3.243 mi.	Grading	S. M. & S. J. Feely	54,305.60	83	279-E
279-F	North of Baileys	3.444 mi.	Graded	J. Fred Roberts & Sons	126,000.00		279-F
281-D1 & 251-B1	Longmont-Lafayette	5.813 mi.	Grading	F. L. Hoffman	99,631.50	100	281-D1 251-B1
251-B2 & 281-D2	Lafayette, north	5.813 mi.	Concrete Paving	J. H. Miller & Co.	146,315.00	92	251-B2 281-D2
281-E	At Lafayette	0.812 mi.	Paving	J. H. Miller & Co.	27,228.00	100	281-E
282-D	North of Meeker	2.864 mi.	Gravel Surfacing	Winterburn & Lumsden	42,155.00	92	282-D
283-C	North from Longmont	5.79 mi.	Concrete Paving	J. H. Miller & Co.	196,703.90	100	283-C
287-A2	Fort Morgan, west	4.011 mi.	Concrete Paving	H. C. Lallier Const. Co.	119,016.60	100	287-A2
287-C1-2	Greeley-Fort Morgan	16.61 mi.	Subgrade Treatment	H. C. Lallier Const. Co.	159,950.85	100	287-C1-2
287-D-1	Two mi. E. of Kersey on S. H. 2	19.447 mi.	Grading	H. C. Lallier Const. Co.			287-D-1
288-A2	Bet. Merino and Brush	0.921 mi.	Grading	White & LaNier			288-A2
290-D	East of Las Animas	9.741 mi.	Paving	Edw. Selander	245,043.50	49	290-D
292-A	North from Minturn	2.954 mi.	Concrete Paving	W. A. Colt & Son	88,979.50	80	292-A
293-B	Colona-Ridgway	6.417 mi.	Grading	H. C. Lallier Constr. & Eng. Co.	92,571.80	80	293-B
295-B	La Jara, south	80 ft.	Steel Bridge	Geo. F. Wear	21,645.25	100	295-B
296-B	South of Pueblo	6.622 mi.	Gravel Surfacing	John A. Duncan	32,316.80	100	296-B
297-AR	Northeast of Palisade	4.351 mi.	Gravel Surfacing	Cole Brothers	58,061.00	100	297-AR
297-B	Northeast of Palisade	2.848 mi.	Surfacing	O. J. Dorsey	15,043.00	83	297-B
299-A	Northeast of Palisade	2.237 mi.	Gravel Surfacing	Winterburn & Lumsden	30,581.24	100	299-A
300A	Northwest of Delta	5.888 mi.	Gravel Surfacing	Strange-Maguire Pav. Co.	61,582.65	100	300-A
300A	Bet. Chattanooga & Red Mt.	2.277 mi.	Grading	Winterburn & Lumsden	59,480.80	19	300-A

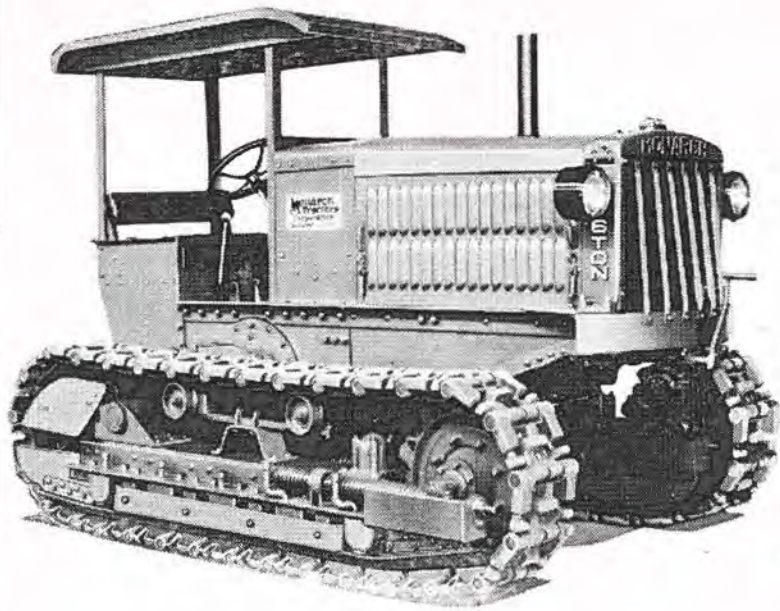
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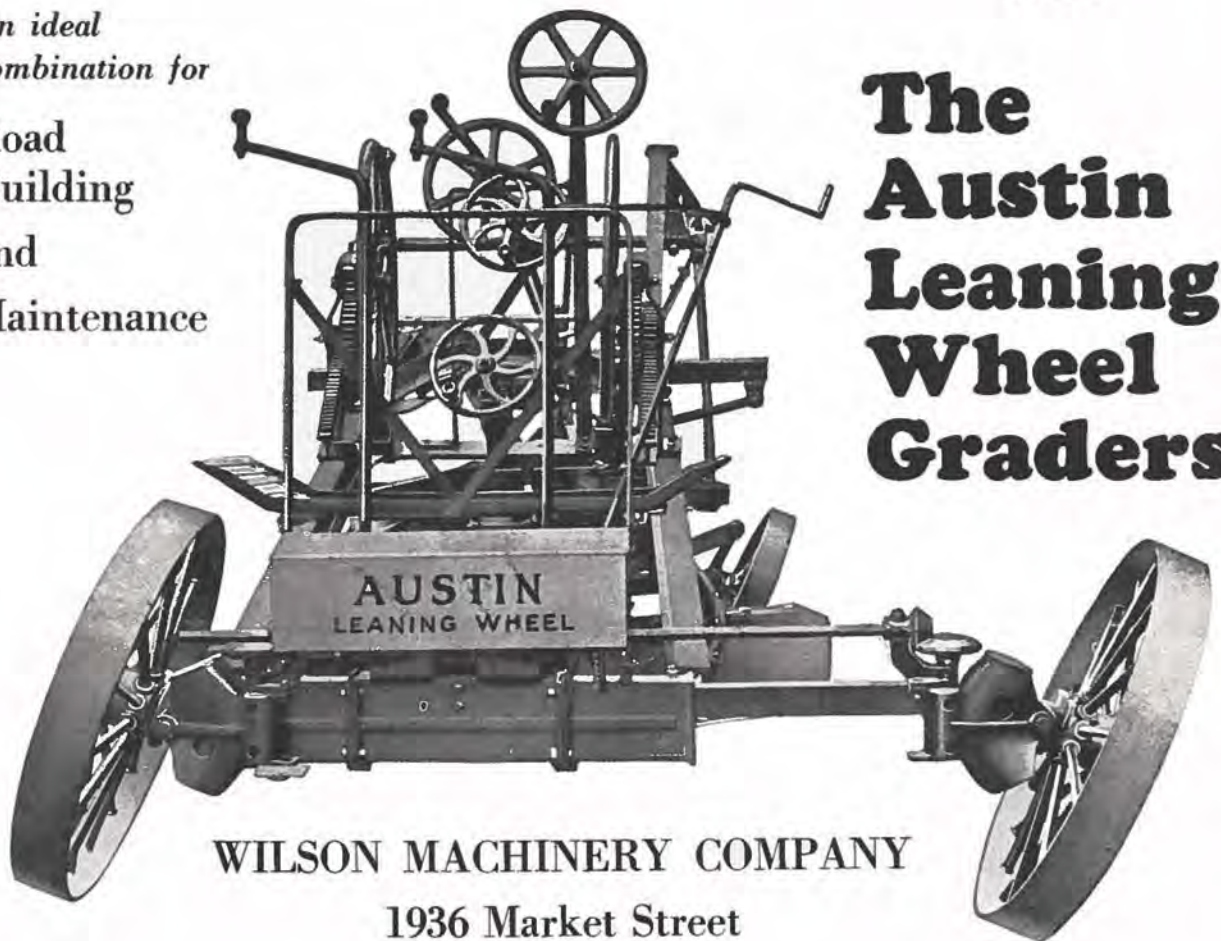
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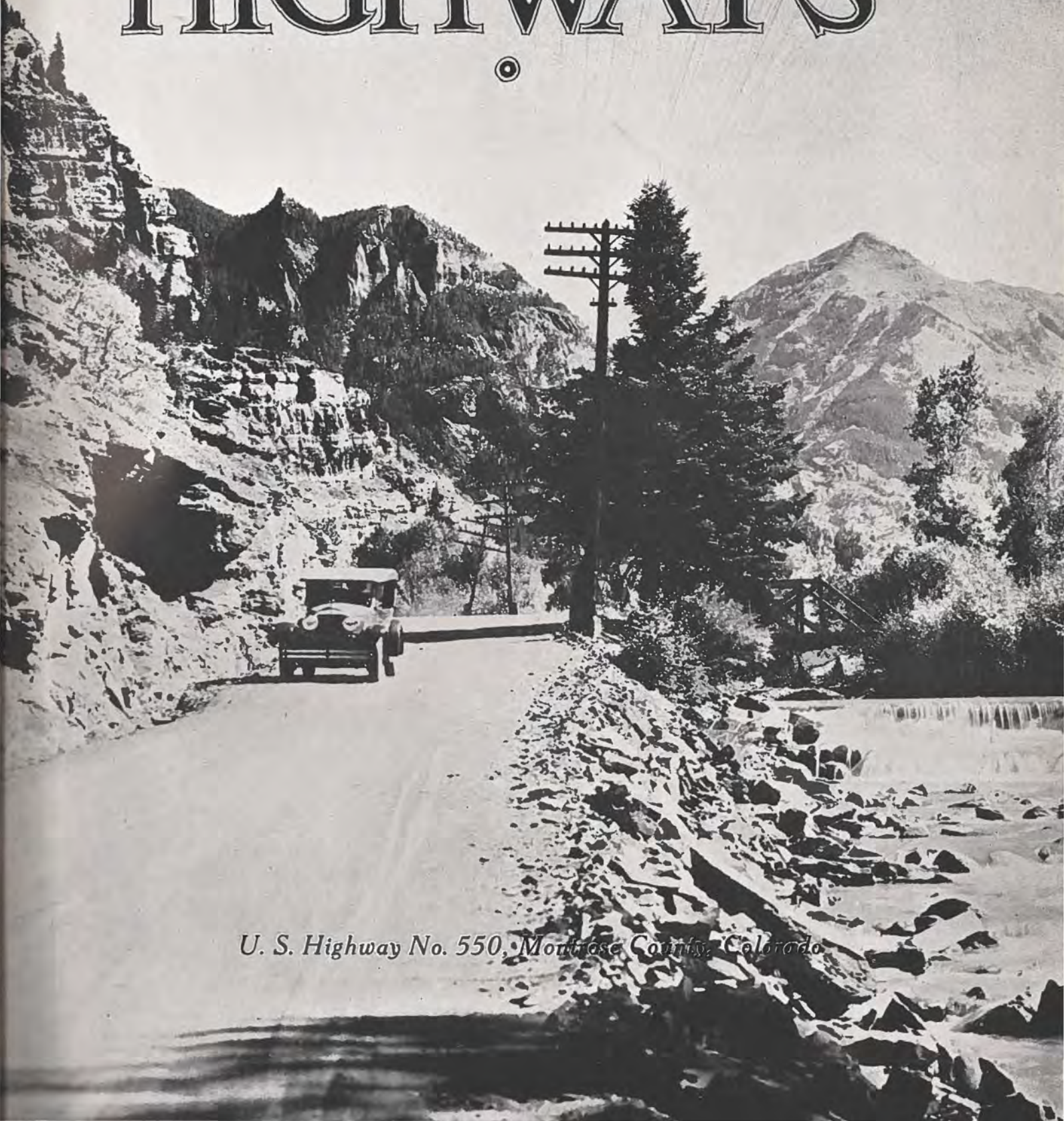
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M. W. BENNETT, Editor

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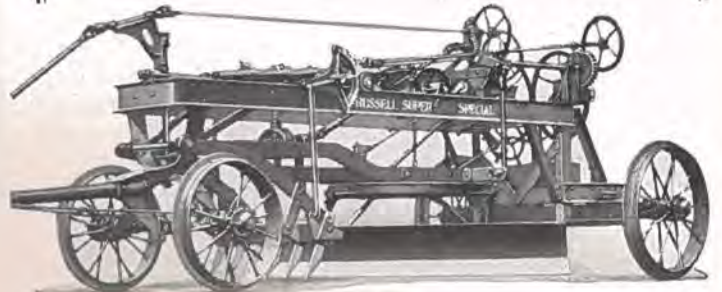
Our Cover Picture

This month's cover picture of COLORADO HIGHWAYS shows a stretch of the Montrose-Ouray highway, along the Uncompaghre river. This road leads to the "Million Dollar" highway between Ouray and Silverton, considered by road officials as the finest and most spectacular piece of modern mountain road construction in America, and unsurpassed by the roads of the Swiss Alps. During the summer months it is travelled by thousands of tourists from all parts of the country. Under the new arrangement with the counties this road will be maintained by state forces.

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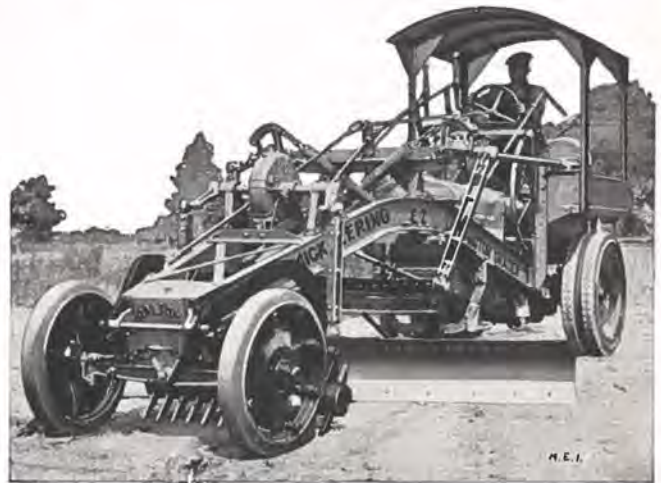
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State Forces to do Maintenance On All Federal Aid Highways

AFTER February 1st the State Highway Department will do all maintenance and reconstruction work on the federal aid or national highway system in Colorado.

The same class of work on state roads, not included in the federal system, will be under the direct supervision of the county commissioners. The latter will have direct control over all expenditures on state roads for maintenance within their respective counties.

On the federal aid system the state will have direct control of expenditures and will employ all maintenance patrols. At the same time the state will supervise the work done in ten counties having no federal aid roads and where the state will share the cost of maintenance on a "fifty-fifty" basis with the counties.

The above is the compromise reached between the county commissioners and the highway department, during the recent convention of the commissioners held in Denver. This agreement was reached following a meeting between a special committee appointed by the commissioners, members of the highway advisory board and Governor Wm. H. Adams.

Heretofore all maintenance and reconstruction work on federal aid and state roads was done by county

forces, co-operating with the state highway department, the latter paying one-half of the expense. In 1927 the expenditures of the state and counties for this work totaled \$1,600,000, the work covering the entire state system of roads.

The total state mileage of roads in Colorado is 8,900 miles. Of this total 3,360 miles are designated as federal aid highways. The 3,360 miles of roadways included in the federal aid system constitutes 7 per cent of the total road mileage of the state. The federal aid system includes all of the main roads, both east and west and north and south, and this system, according to estimates made from the traffic census, serves 85 per cent of all motor traffic in the state.

Under the terms of the Federal Aid Road Act, government funds can only be expended on what is known as the "7 per cent or federal aid system." States accepting federal aid are required to make agreements with the government whereby the states undertake to maintain all federal aid construction projects to a certain standard.

During the past two or three years considerable dissatisfaction has been expressed by officials of the U. S. Bureau of Public Roads with the maintenance work



Showing method of constructing new federal aid crushed rock surfaced highway located east of Durango in La Plata county. Photo on left shows subgrade before application of crushed rock.

done on Federal Aid roads in Colorado. Following a conference with the head of the bureau, held in Denver in October, the highway advisory board announced that it would authorize the state highway engineer to take over the maintenance of state roads in Colorado in 1928.

A resolution to this effect was passed by the board at its annual meeting held in November. Following this meeting strenuous objection to this action by the board was made by a number of the county officials. As a result Governor Adams delayed affixing his signature to the budget until after the annual meeting of the commissioners' association in January, when the compromise agreement outlined above was made.

It was said that the U. S. bureau had issued a statement which practically amounted to an ultimatum to the Colorado department that unless the maintenance work was improved government crews would be used to make the necessary repairs and all federal aid money would be withheld from the state.

With the dispute between the commissioners and the highway department settled, the way was cleared for approval of the \$4,900,000 highway budget for 1928 by Governor Adams. The budget as submitted to the governor contemplated taking over of the federal aid road maintenance work by the state. An item of \$900,000 is included in the budget covering the cost of maintenance of the 3,360 miles on the federal aid or national road system in this state. Another item contemplates the expenditure of nearly a half million dollars for the necessary equipment to carry out the maintenance program.

Under the 1928 budget there will be approximately \$232 for every one of the 3,360 miles of federal aid roads. If the county commissioner system had been continued, only \$190 a mile would have been available.

In adopting the new system of maintenance on federal roads, Colorado joins the ranks of other progressive states of the country. It was learned that only three states now follow the system of permitting the counties to carry on maintenance and reconstruction work on the national roads. Plans of the highway department call for the employment of 125 patrol crews to handle the work. Each one of these crews will look after an average of 25 miles of roadway. They will work after the fashion of railroad section crews. The patrols will consist of two men each. They will be supplied with modern equipment.

Included in Colorado's federal aid system are 260 miles of concrete or asphalt roads, 477 miles of high type gravel surfaced roads, 55 miles of sand-clay surfaced, and 248 miles of graded roads. The remaining 2,295 miles of roads are in various stages of improvement, from just plain dirt roads to gravel surfaced.

The ten counties which have no federal aid roads are as follows: Baca, Crowley, Custer, Gilpin, Hinsdale, Kiowa, Mineral, Pitkin, San Miguel and Yuma. These counties have 1,212 miles of states roads. On the maintenance of these the state will share fifty per cent of the cost with the counties. For this purpose the advisory board set aside \$100,000 in the budget. While the work on state roads in these counties will be carried out by county forces, state road men will supervise the operations.

All of the main mountain pass highways come under the supervision of the state department under the new



One of Park county's modern motor-grader maintenance outfits. Similar units will be employed by the state in maintaining the 3,300 miles of federal aid roads in Colorado.

system. These include: Berthoud, Tennessee, Monarch and La Veta passes. Likewise the new system will eliminate county lines so far as the maintenance work is concerned. Patrols will be stationed in order to obtain the best results and not according to county boundaries. By this system the old method of one county giving careful attention to a particular stretch of road and the adjoining county neglecting same, will be eliminated. Constant maintenance will be applied to all sections of the most important roads of the state.

Experience of other states has shown that the new system makes for efficiency and for economy, giving the motorists who pay the bulk of maintenance costs better road service.

Members of the special committee appointed by the commissioners' convention to confer with the governor, the state highway engineer and members of the advisory board, resulting in the compromise agreement, are as follows: W. L. Rees, Pueblo, president of the association; G. D. Roberts, Eagle county; J. T. Berry, Douglas county; S. D. Buster, Boulder county; Stanley Lee, Bent county; and W. A. Carlson, Weld county.

Officers elected to serve during 1928 were: Herman Emperius, Alamosa county, president; G. W. Huntley, Kit Carson county, first vice-president; S. R. Riggs, Adams county, second vice-president; Ray McGrath, Prowers county, third vice-president; and T. W. Monell, Montrose, secretary-treasurer.

"Safety" Signs for Grade Crossings

"Stop" signs, as a safety measure, will be erected at all railroad crossings in Colorado, according to Maj. L. D. Blauvelt, state highway engineer. The department has placed an order for 500 signs. The state will pay for the signs, but cost of erection will be borne by the railroads.

The signs will be placed at the crossings in compliance with a public utility law that requires all common carriers to come to a complete stop before crossing a railroad track.

Highway Engineers Discuss Road Problems at Boulder

THE Highway Engineering Conference held at the University of Colorado on January 19 and 20, 1928, was a desirable feature in the highway improvement program in the Rocky Mountain states. More than one hundred highway engineers and administrators, representing the U. S. Bureau of Public Roads, the State Highway Departments of Wyoming, New Mexico and Colorado, the Colorado State Association of County Commissioners, the Colorado Municipal League, contractors' organizations and others interested in good highways participated in the program and discussions.

The first morning session was devoted to treated timber highway structures. This topic was presented by J. F. Seiler and E. B. Van de Greyn, bridge engineers of the Wyoming and New Mexico Highway Departments, respectively. The savings effected by this type of construction have been expended on highway improvements and have meant the addition of several hundred miles of improved roads to the existing highway systems in Wyoming and New Mexico.

Two excellent papers presented by L. C. Campbell, Engineer of Materials, New Mexico State Highway Department, and W. A. Norris, Materials Engineer, Wyoming State Highway Department, advocated state-owned and operated materials testing laboratories. Colorado is one of three states in this country without a laboratory operated in conjunction with its highway department. Financial savings, utilization of local materials, correlation of tests so that data have research value and the personal interest of the materials engineer, who is a member of the highway staff, in the control and use of these materials in the field, thereby securing a higher quality of construction, are some of the advantages claimed for the state-owned and operated laboratory.

Mr. C. H. Bowman, District Engineer, Wyoming State Highway Department, discussed a new type of highway construction—oiled gravel roads—which seems destined to become a popular and economical type of construction for the intermediate class of highways. Asphaltic base crude oil is used as a binder. Careful grading of materials and adequate foundation are essentials in this type of construction. The economic value of this construction is evident when it is realized that a pavement having the characteristics of a more permanent type can be constructed for a fraction of the cost of the permanent types of paving.

The need of a uniform traffic code was pointed out in discussions by Warren Baeder, Instructor in Civil Engineering, University of Colorado, and Clarence Werthan, Managing Director, Rocky Mountain Motorists, Inc. The report recently presented by a committee of nationally known men working under the direction of Herbert Hoover was the basis of the discussion of this important matter.

The proper economical design of bridges according to the character of foundations and the length of the crossing was discussed by Paul S. Bailey, Bridge Engi-

neer, Colorado State Highway Department, and L. F. Copeland, Senior Highway Bridge Engineer, U. S. Bureau of Public Roads, during the morning of the second day of the conference. It was shown that definite relations exist between these factors and that the use of each of the many types of bridges should be restricted to sites which provide suitable foundation conditions.

Mr. T. Warren Allen's paper on "Personnel Selection and Training" indicated that rigid standards similar to those employed in the selection of materials for construction should be used in the selection of the personnel of an organization. Mr. Allen, who is chief of the Division of Control of the U. S. Bureau of Public Roads, discussed the objective of his division and the methods employed in selecting and training men for his organization. It may be interesting to note that Mr. Allen is selecting his men from the outstanding students in technical schools of recognized standing.

The contractor's viewpoint in the writing of highway specifications was presented by Henry M. Roberts of Denver, Colorado. Mr. Roberts advocated clearness, elimination of uncertainties by adequately diversified unit classification of quantities and a realization of the responsibility which is implied with the authority given the engineer.

Highway problems confronting the counties were presented and discussed by E. B. Hill, Chairman, Boulder County Commissioners, and Earl Hamilton, Road Supervisor of Weld County. Location, drainage, surfacing, maintenance and finances were given emphasis. Mr. Hill suggested that the distribution of the gasoline tax to the counties should be on the basis of amount

(Continued on page 16)



"Uncle Sam's mail must not be delayed." This picture shows how Winterburn & Lumsden, road contractors near Grand Junction, solved the problem of getting the rural carrier "on his way" around a rocky point.

Bids Opened for Seventeen Miles of Federal Aid Pavement

FIVE miles of paving on the Denver-Colorado Springs highway have been completed and opened to traffic. The stretch connects Castle Rock and Tomah and was constructed by J. Fred Roberts & Son.

All grade railroad crossings are removed from the route. The last two underpasses between Denver and Colorado Springs are now being built under the Santa Fe and Denver & Rio Grande Western tracks a short distance north of Monument by Frank Hoffman, Denver contractor.

With the completion of the new highway between the capital city and Colorado Springs, the state highway department has eliminated thirteen railroad grade crossings, either by relocation or the construction of underpasses.

The paving north of Colorado Springs has now reached Monument from the south, and on the north it is completed to Tomah, leaving only seventeen miles to be paved with concrete.

Grading on the latter stretch was completed by Monaghan & Cunningham, contractors, last fall. On January 27th the department opened bids for the paving of the 17-mile stretch. H. C. Lallier Const. Co. of Denver were low bidders on 13 miles of the project, while J. Fred Roberts & Son were low on 4 miles of the work. The longer stretch starts at Tomah and runs to Palmer Lake, and short stretch takes the pavement into Monument.

Neither of these contracts had been awarded to the low bidders at the time of going to press, due to the fact that both projects are included in the 1928 budget, which has not been signed by Governor Adams.

Lallier's bid was \$292,309.95 for the thirteen miles of pavement, while Robert's bid \$114,079.63 on the shorter project. The specifications call for 135,240 sq. yards of concrete pavement on the job between Tomah and Palmer Lake. This project is located in Douglas and El Paso counties, while the four-mile project is located wholly in El Paso county. The completion of these two projects will give a continuous stretch of pavement between Denver and Colorado Springs, a distance of 75 miles.

Lallier bid \$1.93 per sq. yard on the concrete on his job, while Roberts bid \$2.15 for the same class of work on the Palmer Lake-Monument project. It is specified in the bids that the work on both projects must be com-

pleted by December 1st. The plans also call for two complete concrete mixer outfits on the Tomah-Palmer Lake project.

The department recently let a contract for the construction of five miles of pavement south of Colorado Springs, being an extension of the present pavement between the Springs and Pueblo. With the completion of this project there will remain 33 miles of unpaved highway between these two points. However, plans are now being drafted for the paving of ten miles additional on this stretch as the funds become available. There is also a project to be started north of Pueblo this year, consisting of about four miles of concrete.

Plans also call for the paving of six miles between Boulder and Lafayette this year. This will complete the concrete between these two points. The 1928 plans also call for the completion of the pavement between Sterling and Fort Morgan. With the exception of about eight miles, this stretch is now paved. Edw. Selander, contractor, is now working on all but about three miles of the unpaved stretch.

The pavement is now open to traffic from Denver to Fort Collins, a distance of 56 miles. This is the second longest continuous ribbon of concrete in the United States. During the month of December the Strange-Maguire Company completed seven miles of asphalt pavement north of Trinidad, giving a continuous strip of eighteen miles of this type of pavement north of the southern Colorado city.

Snow Removal on Tennessee Pass

An effort is being made this winter by the State Highway department to keep Tennessee Pass open for traffic. A special crew of men with graders and other equipment, under the direction of Frank McQueary, has been working on the pass all winter.

This crew has been keeping data on the snow-fall and other weather conditions, with a view to making recommendations for improvement of the snow-removal service on the pass next winter. Plans are being made by the state and federal government for further improving the highway over Tennessee Pass. These plans include the construction of a new road from the Eagle county line to Leadville. Installation of snow fence to prevent drifting also is contemplated next fall.



Dotted line shows section of highway located between Castle Rock and Monument, to be paved during 1928.

Senator Oddie Urges More Federal Aid to Highways of States

SENATOR ODDIE (Republican), Nevada, speaking November 11 at the dedication of the new Market street bridge at Wilmington, Delaware, discussed federal aid of road building, and said that the government is under an obligation to continue the program mapped out in the law of 1916. This program, he said, calls for annual federal appropriations of \$75,000,000 for federal aid and an additional \$7,500,000 to be spent on roads in national forests.

Expansion Proposed

Amendments to the present Federal Highway Act were suggested by Senator Oddie in the following respects:

To provide for a higher percentage of the cost of building roads in sparsely settled areas, to be paid by the federal government.

To eliminate the present limit of \$15,000 per mile upon federal payments for roads built jointly with the states.

Increase in federal appropriations to provide connecting links in the national road system; and

Elimination of private billboards, sign boards and other roadside advertising along the national highways.

The road building program is of importance, he said, not only to the West, where there is great need for improved roads, but also to the eastern states, which, he predicted, will soon be face to face with the necessity of widening many of their principal roads and constructing many new highways to handle increasingly congested traffic.

Senator Oddie's speech, in part, was as follows:

Our modern highway system comprises approximately 3,000,000 miles, of which 450,000 miles have some form of surfacing. The value of the country's 22,000,000 motor vehicles, including the value of the highways, is \$26,500,000,000. The sum nearly equals that of our 250,000 miles of steam railroads and 50,000 miles of electric railroads, which, with their equipment, are valued at about \$27,000,000,000.

About 4,000,000 automotive vehicles were produced in the country in 1926, of a wholesale value of over \$4,000,000,000, which gave employment to 3,500,000 people. The annual operating cost of the country's highway expenditures are about \$10,000,000,000, which makes its yearly cost of motor transportation about \$11,000,000,000.

It is interesting to note that while the states built about 14,000 miles of new surfaced roads in 1926, the automobile manufacturers during the same period built 16,000 miles of automobiles, allowing 20 feet to the car.

Aid to Build Cumberland Pike

In 1803 congress planned the Cumberland pike, running from Cumberland, Md., to Vandalia, Ill. A few years later it authorized the construction of this road with federal funds, at a cost of \$8,000,000.

In 1916 the federal government declared its policy of "aiding" the states in building a system of highways of national importance, and in 1921 the Federal Aid Highway Law was enacted, which provided that federal funds be allotted to the states to aid them in the building of roads, and that the Secretary of Agriculture give preference to such state road projects as will expedite the completion of an adequate and connected system of highways, interstate in character.

Under this law the states have designated a system of highways, not exceeding 7 per cent of their total highway mileage, and all of the federal apportionments must be spent on

this system. The 7 per cent federal aid system is therefore limited to about 210,000 miles, of which 76,708 miles have been improved or are in process of improvement with federal aid, and an equal amount has been improved on this system without federal aid.

Today two-thirds of this system is in some state of improvement; the states having expended over \$2,000,000,000, while the federal government has expended about \$580,000,000, being nearly one-quarter of the cost, instead of one-half as originally contemplated in the law.

The federal government has collected in war excise taxes directly from motorists close to \$1,000,000,000. So from a bookkeeping standpoint it is nearly \$500,000,000 ahead, after deducting its expenditures on the federal aid highway system.

System Laid Out

When the Federal Aid Highway Act was passed the system of national highways was laid out, and the federal government agreed to aid the states in improving them. The states accepted the offer in good faith and sincerity and look to the federal government to continue its co-operation until all the roads on the system are improved to meet traffic needs.

The federal government incurred this obligation and committed itself to a policy which it must carry out. It must fulfill its obligation to the states and keep faith with them on this most important work.

The federal appropriations for the years 1928 and 1929 of \$75,000,000 annually to be spent on the roads of the states in the federal aid highway system and \$7,500,000 annually on roads in our national forests are most reasonable and necessary.

At least this much must be authorized for appropriation in the coming session of congress for carrying on this work during the years 1930 and 1931. A reduction in these appropriations will seriously handicap the states in carrying out their road-building programs and destroy their confidence in the promises of the federal government.

Very briefly, the federal aid system, when completed, will include every city and town in the country, of 5,000 inhabitants, and will pass within ten miles of 90 per cent of the population of the country. It is a plan of national highway unification, with local state control.

The road projects under this system are initiated, supervised and constructed by the states, with such federal participation as will insure continuity and articulation of the system.

National Road Needs

A few of the national needs for the federal aid highway system should be mentioned briefly:

Good roads over which the postal service can carry the mails.

Good roads which promote commerce among the states.

Military highways for national defense.

To extend farm markets by improved roads and the use of motor equipment, which have enabled the farmers of the country to quadruple the economic range in their choice of markets.

To increase the efficiency and production of our country and the national wealth, and to eliminate enormous national waste.

In the public land states of the West the federal government owns from a small percentage to nearly 90 per cent of all the land in the states. The law provides that the federal government shall increase its contribution to the cost of building and improvement of the highways above one-half, in proportion to the government's ownership of lands in these states.

A brief statement regarding the roads in the national forests and the necessity for them should be of interest. They comprise 160,000,000 acres of federal-owned land in thirty-three states and in Alaska and Porto Rico, and contain about 600,000,000,000 feet of standing timber. The value of the timber, grazing and water power in these forests is estimated at about \$1,500,000,000, with other resources having a value of about \$500,000,000.

(Continued on page 16)

State Collects \$1,639,657 in Motor Vehicle License Fees

COLORADO collected \$1,639,657.92 from motor vehicle fees during the year of 1927, according to a report made by Charles M. Armstrong, secretary of state.

Of this sum owners of cars registered from Denver paid \$483,526.88, the second largest by owners in Weld county, who paid into the motor vehicle department \$110,806.

There were 245,738 passenger cars registered in the state during 1927, and 22,288 trucks, with 1,327 motor cycles.

Fees collected from the sale of motor vehicle tags are divided fifty-fifty with the state highway department and the counties. The state's share of the fees goes into a special fund for the retirement of the \$6,000,000 bond issue voted by the people for highway construction in 1921.

At the present rate these bonds will be retired in 1931. Proceeds from the sale of the bonds were used to match federal aid at the rate of \$1,500,000 per year for four years.

Secretary Armstrong reports that the motor theft division operated in conjunction with the license tag department last year recovered 125 stolen automobiles, and furnished information which resulted in the recovery of 500 others.

The files of the motor theft division contain over 100,000 cards describing cars stolen in all parts of the United States. The department also issued over 2,000 garage and dealers' licenses at \$3.00 each and sold over 700 garage and dealers' record books at \$1.00 each.

The following is a report of the license fees collected by counties:

Counties	Owners	Trucks	Fees Collected
Adams	5,101	889	\$ 37,658.81
Alamosa	1,790	185	12,246.64
Arapahoe	5,713	452	35,779.12
Archuleta	430	35	2,332.10
Baca	1,705	258	12,199.45
Bent	2,870	133	11,799.72
Boulder	9,581	256	63,818.23
Chaffee	1,561	109	9,792.82
Cheyenne	813	93	5,089.55
Clear Creek	595	42	3,913.77
Conejos	1,341	147	7,960.39
Costilla	644	59	3,863.22
Crowley	1,497	125	8,786.05
Custer	508	90	3,565.34
Delta	3,174	482	22,486.16
Denver	70,991	4,761	483,526.88
Dolores	217	31	1,250.73
Douglas	1,505	110	7,057.17
Eagle	710	92	4,321.87
Elbert	1,632	131	9,911.46
El Paso	13,560	788	90,309.50
Fremont	4,874	453	32,094.08
Garfield	2,019	197	13,825.21
Gilpin	186	1	1,601.91
Grand	581	77	3,789.44

Counties	Owners	Trucks	Fees Collected
Gunnison	988	53	5,684.02
Hinsdale	79	10	530.67
Huerfano	3,241	207	20,017.48
Jackson	397	40	2,359.78
Jefferson	5,630	610	38,361.44
Kiowa	906	130	5,992.40
Kit Carson	2,430	394	17,563.64
Lake	897	1	4,978.71
La Plata	2,258	163	14,900.96
Larimer	10,253	915	66,518.63
Las Animas	6,060	426	38,932.93
Lincoln	1,801	323	13,883.15
Logan	5,080	689	34,243.88
Mesa	5,617	536	36,311.53
Mineral	151	20	950.26
Moffat	975	104	6,274.11
Montezuma	1,350	162	8,570.12
Montrose	2,441	271	16,539.59
Morgan	4,099	648	33,923.39
Otero	5,431	414	34,013.58
Ouray	305	22	2,190.62
Park	514	63	3,350.15
Phillips	1,961	378	14,635.50
Pitkin	303	7	1,550.73
Prowers	3,091	210	19,001.33
Pueblo	13,601	929	94,435.62
Rio Blanco	566	37	3,374.99
Rio Grande	2,394	475	18,514.84
Routt	1,831	135	9,568.70
Saguache	1,188	191	7,915.70
San Juan	195	11	2,001.77
San Miguel	593	49	3,738.16
Sedgwick	1,740	312	12,572.40
Summit	341	7	1,590.66
Teller	1,040	98	6,299.65
Washington	2,031	455	15,006.78
Weld	16,600	2,187	110,808.83
Yuma	3,340	595	23,971.70
Total	245,738	22,288	\$1,639,657.92



Showing new guard fence at "Dead Man's Curve" on Denver-Morrison pavement. No accidents have occurred at this turn since installation of fence.

How Lafayette Pavement Project Was Finished in Record Time

By MAJOR JOHN P. DONOVAN, Division Engineer, Colorado State Highway Department.

IN May and June, 1927, the Colorado State Highway Department awarded to J. H. Miller & Company contracts involving a total of nearly eight miles of Colorado section concrete pavement, for paving Federal Aid Projects Nos. 222-C, Reopened, 251-B and 281-E—closely connected projects on State Highway No. 1, north of Denver, which will complete the paving between Denver and Fort Collins, and give a total length of 56.8 miles of federal aid concrete pavement between those cities.

Lafayette, being advantageously situated for shipments of material to railroad sidings, was selected by the contractor as the site for the first set up of a central mixing plant for the southern four miles of work.

Rock and cement each were shipped by rail. The rock came from the Brodie Quarries, at Lyons, Colorado, and the cement from the Colorado Portland Cement Company's plant at Ideal, Colorado.

There being use for the crusher fines as part of the sand cushion used on the projects, it was most economical to crush the rock at the plant, which was so arranged that the rock was dumped from the cars to aprons leading directly to the main crusher, which was an Austin No. 4 Gyratory. An auxiliary Cedar Rapids 9 x 16 Jaw crusher was installed for emergency use during breakdowns, but was not used, there being no breakdowns. Crusher run was elevated by a bucket line to revolving screens, and thence by a belt conveyor to the storage bins above the mixer. A secondary bucket line was installed feeding the same bins from a stock pile of crushed rock, which was kept filled by running the crusher on a night shift. Sand was hauled by dump truck from Boulder Creek to the stock pile at the base of the plant and there elevated to the bins above the mixer by a bucket line.

The proportioning boxes of the mixer were set at such an elevation that a trestle carrying a standard gauge

railroad was built to the elevation of the floor of the box cars containing cement, and the cement was loaded on a push car and went directly from the box cars to the mixer, giving a remarkably cheap cement handling cost. A reserve supply of cement was stored at the railroad end of the trestle for emergency use in case of non-arrival of cars. The cement shipment and paving operations were timed so closely that neither delay in paving nor demurrage on cement cars occurred.

The mixer itself was a Smith Tilter No. 28-S, using a seven-sack batch of approximately 1-2-3 mix. Water was closely controlled, and averaged about 5.5 gallons total per sack, with all allowances for contained water and absorption closely calculated.

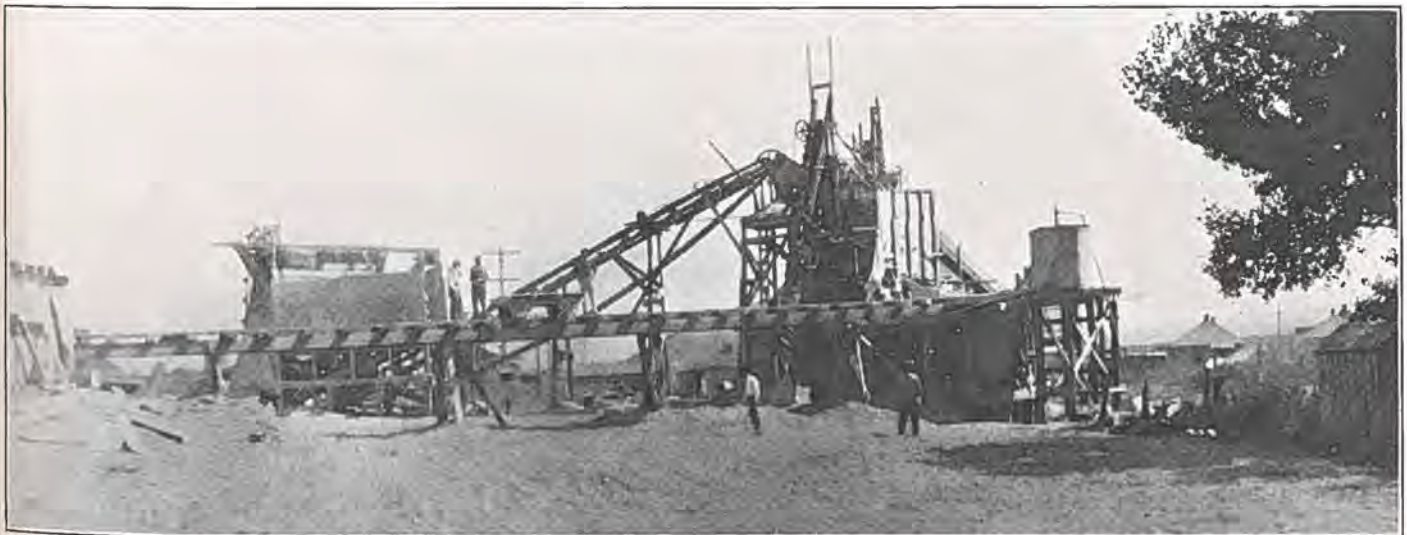
The average compressive strengths of the first forty cylinders on the job is 2,404 lbs. at seven days, and 3,229 lbs. at 14 days. Average slump two inches at the plant.

The entire plant is electrically operated and an average rate of a batch every 2 $\frac{1}{4}$ minutes is maintained, including a mixing time of 1 $\frac{1}{2}$ minutes in the drum.

The contractor maintains a fleet of International Trucks with dump bodies which handle one full mixer batch to the load. The average haul is two miles.

The entire plant is very efficient, was economically erected, is operated with a minimum of man power, and the entire job has been marked by a remarkable spirit of co-operation between the contractor and engineers.

Mr. Robert Hanes, one of the partners, is superintendent for J. H. Miller & Company, and Walter R. Douglas, another partner, is engineer, and these gentlemen were in supervision of the construction. Mr. Clyde Walters was resident engineer on these jobs for the Colorado State Highway Department, and to the cordial understanding between these three gentlemen is due the remarkably good and uniform progress of the work throughout its length.



A general view of the central concrete mixing plant used on the Lafayette project.

Congress Asked To Appropriate \$400,000,000 For State Roads

A BILL authorizing the creation of a special highway fund, providing a total of \$407,341,145, to be allotted among the states in the same proportion as the federal aid funds authorized each year, was introduced in the House January 28 by Congressman Edward E. Browne (R) of Wisconsin.

The unique feature of the measure, which is sponsored by the American Motorists Association, is that it does not add one dollar to the burden of the taxpayers of the United States. The bill providing for the utilization of this huge sum for highway construction is in addition to the \$165,000,000 federal aid bill already introduced in both the House and Senate, which is known as the federal aid bill.

The sum provided in the measure is to be obtained by the repayment of French bonds issued after the war covering an invoice of approximately \$2,000,000,000 worth of property including roadbuilding machinery which was ordered in June, 1919, by the War Department to be turned over to the Agricultural Department to be proportioned among the states for use in highway construction. Bonds totaling \$400,000,000 mature on August 1, 1929, the remainder one year later.

Before the War Department's order for the return of the equipment was received in France, negotiations had already gone too far for the sale of the property to France, at approximately 20 cents on the dollar. The intent on the part of the government, however, was that it should be used by the states in highway construction, and this intent can still be carried out by favorable action on the Browne bill.

"The bill provides that the states are not required to pay a sum to exceed 20 per cent of the cost of the roads constructed from this fund," Mr. Browne declared.

"We have placed too much of the cost of road construction upon the states and they in return upon the county unit, the counties in many instances having to pay one-third or more of the cost of roads which serve the entire nation, and this tax burden has helped to put the farmer where he is," the author declared.

The measure will have the undivided support of the motorists of the United States, in the opinion of J. Barton Weeks, President of the American Motorists Association. "The bill should pass because it is economically sound and because it does not add to the taxpayer's burden. The most colossal waste in the history of the United States is that due to the operation of the 23,480,000 automobiles of the country over roads mostly unfit for their use. This waste can be stopped by good highways. Under this measure highway construction can proceed five times as fast as it is now progressing," Mr. Weeks declares.

"Due to road conditions," says Dr. S. M. Johnson, chairman of the Good Roads Board of the American Motorists Association, "we are losing more than sixty per cent of the value of the main factor of progress—

the automobile. Railway service is about 100 per cent efficient, because the almost mechanical perfection of the rolling stock is supplemented by an almost perfect track on which to operate. Speed, safety and comfort are thus secured and men and goods are moved faster at less cost than ever before."

"The Browne bill will do the seemingly impossible. It will get good roads without increasing the taxes. The government of France owes the United States \$407,000,000 for merchandise purchased after the war and to be paid for in 1929 and 1930. This indebtedness is totally different from the War Loans, as it was a purely commercial transaction, entered into for profit. The Browne bill proposes to set apart the proceeds of this sale as a special highway fund," Dr. Johnson points out.

A tentative draft of the bill was sent by the American Motorists Association to governors, state highway department heads and representative chambers of commerce and prominent editors. The replies received indicate that it will be strongly supported throughout the country. Outstanding publications, such as the "Saturday Evening Post," have endorsed it editorially.

Following is the approximate sum which each state will get under the federal aid allotment program as proposed in the measure:

Texas	\$21,937,500	South Dakota ..\$	5,947,500
New York	17,720,000	North Dakota ..	5,825,625
Pennsylvania ..	16,160,625	New Mexico.....	5,786,625
Illinois	15,356,250	Oregon	5,762,250
Ohio	13,464,750	Washington	5,513,500
California	12,102,675	Massachusetts..	5,308,875
Missouri	11,724,375	Arizona	5,152,875
Michigan	10,718,250	South Carolina.	5,143,125
Minnesota	10,335,000	Louisiana	4,938,375
Kansas	10,081,500	Nevada.....	4,626,375
Iowa	9,964,500	Idaho	4,558,125
Georgia	9,652,500	New Jersey.....	4,553,250
Indiana	9,394,125	Wyoming	4,553,250
Wisconsin	9,116,250	Florida	4,387,500
Oklahoma	8,443,500	West Virginia..	3,870,750
North Carolina	8,350,875	Maine	3,312,875
Tennessee	7,873,125	Utah	3,153,125
Nebraska	7,726,875	Maryland	3,095,625
Montana	7,566,000	Connecticut	2,305,875
Alabama	7,541,625	New Hampshire	1,784,250
Virginia	7,134,625	Vermont	1,784,250
Kentucky	6,892,500	Rhode Island...	1,784,250
Colorado	6,708,000	Delaware	1,784,250
Mississippi	6,376,500	Hawaii	1,784,250
Arkansas	6,230,250		

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In line with the fixed policy of the Caterpillar Tractor Company to build even better tractors and to sell them at lowest prices, we are pleased to announce these very substantial price reductions which are made possible by increased production and efficiency in manufacturing operations.

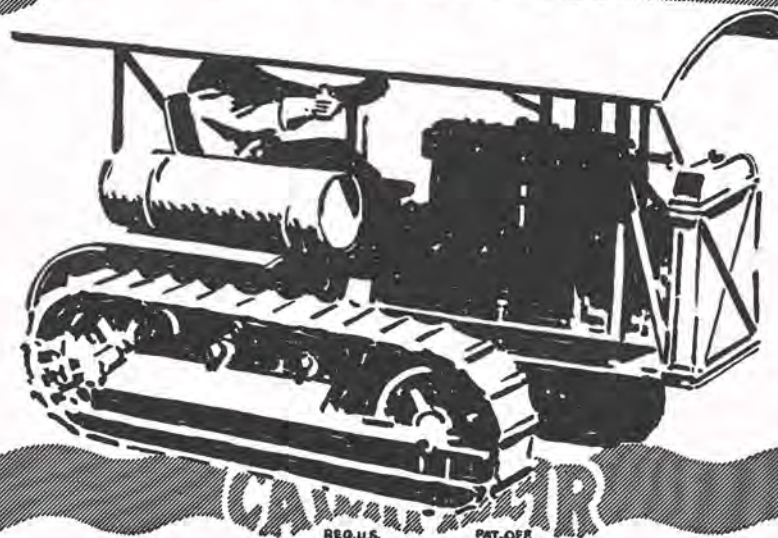
There is but one Caterpillar Tractor. It has the reputation for dependable performance, for economy of operation, and low cost of upkeep. Past the stage of experimentation. Be sure your track type tractor is a Caterpillar.

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When writing advertisers, please mention Colorado Highways.

Highway Map of Colorado

showing the 3,360 miles of federal aid or national roads on which all maintenance supervision and control is being taken over by the state highway department.

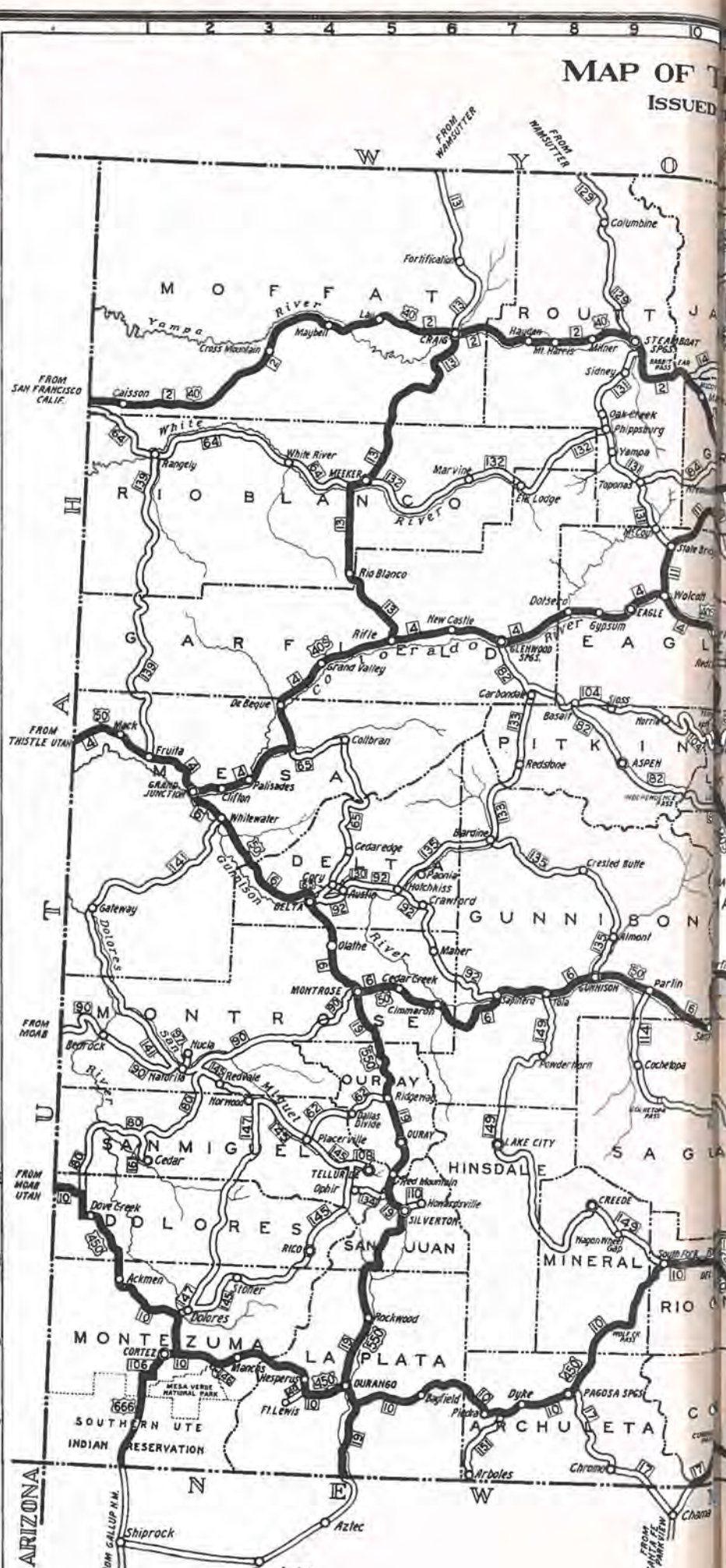
The roads marked with the heavy black lines constitute the federal aid system, on which the state will inaugurate the new continuous patrol system of maintenance.

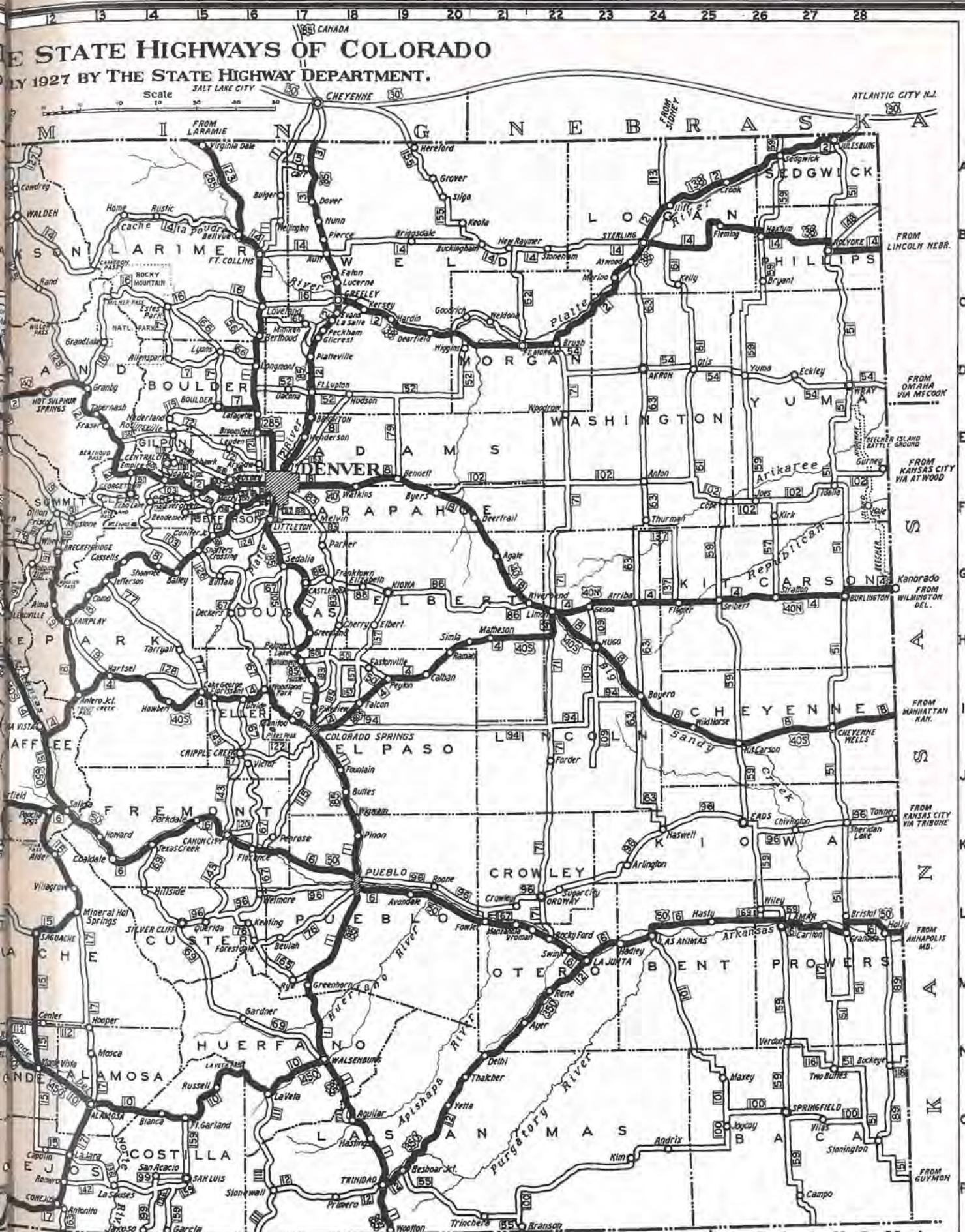
The light, double-lined roads are the state highways, on which supervision of maintenance will be retained by the county commissioners in each county.

The federal aid system of roads in Colorado is considered the backbone of the state's motor transportation system, connecting, as it does, virtually every important city and town. It is estimated that 85 per cent of the highway traffic passes over the federal aid roads, indicating the necessity of constant patrol maintenance.

About April 1st the highway department will start an intensive campaign to put the federal aid system in first-class shape. In order to assure steady, consistent maintenance, a system of 125 patrols is being organized to cover the 3,360 miles of highways, paved, graveled, graded and dirt. Each patrol will consist of two men with equipment for the type of road to patrol. The beats of the patrols will average twenty-five miles each. They will be on duty continuously.

Under the old system of county supervision, each maintenance crew stopped at its county line; there were different standards of maintenance between the counties and in a good many instances the crews were on duty only part of the time.





THE STATE HIGHWAYS OF COLORADO

BY THE STATE HIGHWAY DEPARTMENT.

Scale
SALT LAKE CITY

LEGEND.

State Highways on the Federal Aid System. State Highway Numbers State Highway Numbers
 State Highways Not on the Federal Aid System. U.S. Highway Numbers
 Highway Numbers as per Resolution of The Highway Advisory Board, May 1923.

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WICHITA ROAD SCHOOL AND EXHIBIT TO BE ENLARGED

Considerable attention is being given at this time to the coming Third Annual Road Show and School to be held at Wichita, Kansas, February 21-22-23-24, 1928. This attention is in part due to the fact that the Federal government has announced its intention of sending to this attraction the intensive Good Roads Exhibit that was arranged for the Cleveland National Road Show and also to the high calibre of the men who are to assist in making this year's event the greatest yet held in the Southwest.

Last year the government exhibit was a revelation to many and it is promised that this year's exhibit will be still more elaborate and educational. This feature of the road show alone will occupy some 1,000 feet of floor space and will include a huge illuminated sign representing U. S. Highway No. 40 along its route from Atlantic City to the Golden Gate. Text in large letters explain the display, taking those watching it from coast to coast upon this model highway.

The program as arranged will include participation by the following engineers and authorities upon roads and road building:

FIRST DAY—Gov. Ben. S. Paulen, "A State Road Program for Kansas"; John W. Gardiner, Director Kansas Highway Commission, "State System Progress."

SECOND DAY—W. H. Lynch, District Engineer, Fifth District Bureau of Public Roads, Omaha, Nebraska, "Bureau of Public Roads"; Prof. T. E. Agg, Highway Engineer, Iowa State College, Ames, Iowa, "Economics of Grades and Surfaces"; Prof. O. L. Waller, Washington State College, Pullman, Washington, "Automobiles, Tire and Operation Cost"; R. L. Cochran, Nebraska State Engineer, Lincoln, Nebraska, "The Nebraska State Road Program."

THIRD DAY—John Malang, Joplin Special Road District, "The Public and a State Highway System"; Prof. C. H. Scholer, Kansas State Agricultural College, Manhattan, Kansas, "Investigation on Concrete"; Charles M. Kerr, Field Engineer, American Wood Preservers Association, Chicago, "Wood Preservation"; R. O. McBurney, President County Com-

missioners Association, Kingman, Kansas, "Counties and the State System"; High Stephens, Vice Chairman Missouri State Highway Commission, Jefferson City, Mo., "State and Federal Court Decisions"; Pyke Johnson, National Automobile Chamber of Commerce, Washington, D. C., "Regulations of Interstate Traffic".

FOURTH DAY—Prof. J. H. Kessnar, Department of Civil Engineering, University of Nebraska, "Bridges of the United States"; C. I. Felphs, Construction Engineer, Kansas State Highway Department, "Kansas Road Construction—Specifications".

With the above array of speakers arranged for, indications point to the most successful show and school yet held. Preparations are fast going forward in Wichita's two and one-half million dollar Municipal Coliseum to house the exhibits. More than 30,000 square feet of choice floor space has been allotted to the Good Roads School exhibit alone. Auxiliary accommodations have been arranged in two large theaters, one seating 5,000 and the other 2,000. Manufacturers and distributors will have at this show and school the largest array of exhibits of this nature ever shown in the Southwest. These exhibits will include machinery and equipment for construction, road building, road maintenance, trucks, accessories, materials, etc. Only with this up-to-date modern equipment can present highway traffic be economically served and an excellent opportunity presents itself here for the study of the most suitable methods by personal observation.

BUCYRUS AND ERIE STEAM SHOVEL CONCERNS MERGED

Announcement of the merger of the Bucyrus and Erie shovel factories was announced last month. The merger went into effect on January 1.

The Erie account was handled in Denver by the Hendrie & Bolthoff Co. With the merger the Erie account went to the H. N. Steinbarger Co. agents in Denver for several years for the Bucyrus line of shovels.

The new merged concern will henceforth be known as the Bucyrus-Erie Company. Three plants will be operated by

the new company, located at Milwaukee, Evansville and Erie, Pa. Manufacture of the Erie gas-plus air shovel will be continued, according to the announcement. The Bucyrus Company was organized in 1880 and the Erie Company in 1883. The former concern has been prominently identified in the manufacture of large draglines and shovels, while the Erie Company has produced more than 4,200 steam Eries.

Recently the Colorado highway department purchased one of the Erie gas-air shovels, which is now at work on a stretch of heavy excavation located between Pine Grove and Shaefer's Crossing.

ELKINS JOINS SALES FORCE OF THE WILSON MACHINERY CO.

Thomas R. Elkins, better known to his many friends among contractors and county road officials of Colorado as just plain Tommy, became identified with the sales force of the Wilson Machinery Co. on February 1. Elkins was formerly purchasing agent for the Colorado State Highway department. In this position he became acquainted with those engaged in the construction of roads in this state. He has been allotted a number of counties in which he will have the exclusive sales rights on road building equipment handled by the Wilson concern.

Harry P. Wilson, president of the Wilson Company, announced that his firm has taken over the sales in this territory for the well known line of Insley contractors' construction equipment. This includes excavators of various sizes, and also concrete placement equipment, elevators, chutes, etc. This line was formerly handled by the Lindrooth-Shubarte company in Denver.

To the eyes of a woman the shortcomings of her children are invisible, but the faults of her husband stick out like the warts on a pickle.

The price of experience has always been high, even when the cost of living was low.



Group of operators who attended the tractor school conducted by the Clinton & Held Co. in Denver January 17.

Cedar Rapids



One Piece Outfit

This outfit is growing in favor with each succeeding road surfacing job.

The production of road surfacing material is one of the costly items entering into the building of good roads.

Every County Board of Engineers has recognized this problem as a very perplexing one.

In the Cedar Rapids "One Piece" Outfit we offer the most logical solution to this problem. It crushes, sizes and loads the finished surfacing material in *One Operation*—which means less expense. And it will successfully handle any road building material—limestone to niggerheads. Pictured here, it is being operated in Fremont County, Colorado—crushing, sizing and loading an exceptionally hard type of gravel.

This means speed, economy, elimination of delays and the assurance that the job will not only be a good one, but will be finished as per schedule.

The type of road building material in your locality can be successfully handled by the Cedar Rapids "One Piece Outfit."

It makes no difference what it is—limestone or gravel—the "One Piece Outfit" will produce the finished product more economically than is possible in any other way.

Fremont County thinks so much of the first Colorado Special One Piece Outfit that they duplicated their order for another machine February 1, 1928, just eight months after first machine was installed.

Boulder County purchased their second Cedar Rapids One Piece Outfit 4½ years after the first machine was installed. "There must be a reason."

We always have a plant in stock for immediate shipment.

H. W. Moore Equipment Co.

120 West Sixth Avenue, Denver

Phone South 9000

Highway Engineers Discuss Road Problems at Boulder

(Continued from page 5)

and kind of traffic and not on the total miles of state highways.

Street maintenance in a small city was discussed by Mr. E. A. Lawver, City Engineer of Fort Collins, Colorado. Lack of finances to adequately equip the city street department seems to be a serious handicap. Machinery designed for sprinkling and flushing is sometimes worn out in dragging and grading operations when much less expensive equipment would have served the purpose to better advantage.

Mr. J. W. Johnson, District Engineer, U. S. Bureau of Public Roads, gave a brief discussion of "Maintenance of Right of Way."

It is felt that the conference was very much worth while and of considerable value to those who were able to attend. Engineers connected with the great road building agencies in this region, i. e., U. S. Bureau of Public Roads and the highway departments of the states of New Mexico, Wyoming and Colorado, were given an opportunity to discuss their common problems. Students in the Civil Engineering Department of the University also obtained a great deal of value from the conference.

Senator Oddie Urges More Federal Aid to Highways of States

(Continued from page 7)

An adequate system of roads and trails is absolutely essential for the proper administration, protection and utilization of the federal land and resources within the national forests, for fire protection especially, and also for the protection of the nation's watersheds.

Eastern Roads Improved

In the wealthier, more populous East, road improvement is much farther advanced, and easterners mistakenly suppose highway expenditures may shortly be reduced. The day of such reduction is as remote as the elusive saturation point in motor vehicle production and registration.

The growing traffic demands the constant improvement of highway facilities, the replacement of outworn surfaces, widening and strengthening of pavements and rights of way, the reduction of grades established according to less exacting standards of a few years ago, the elimination of railroad grade crossings, and the separation of grades at important highway intersections, the installation of traffic signals, and the construction of additional highways as entrances to the large cities. The last is a problem that will shortly have to be faced in the environs of practically all large cities.

Our highways, laid out in the days of horse-drawn traffic of low density, converge as they approach most of the cities and discharge their heavy burdens of modern traffic collected from wide areas into a few already congested city streets. Modern traffic conditions demand a separation of these old-fashioned converging city approaches.

Instead of merging the highways as they draw near the cities, their number should be multiplied in order to distribute the traffic over a greater number of streets and to permit it to enter the city at points as near as possible to the destinations of the vehicles.

These are a few of the problems that will occupy eastern road builders and call for continued expenditures indefinitely in the east.

Performance Counts and

Delays Mean Dollars

Macks from 1½ to 7½ Tons



The Little Mack Contractors' Special—A 1½ ton short wheelbase. Turns in 39 feet. Four speed transmission, and above all, always on the job.

Model AB, 1½-2 Ton Dual Reduction
Model AB, 1½-2 Ton Chain Drive
Model AB, 2½-3 Ton Dual Reduction
Model AB, 2½-3 Ton Chain Drive
Model AK, 3½-5 Ton Dual Reduction
Model AK, 3½-5 Ton Chain Drive
Model AC, 5½-7½ Ton Chain Drive

TRACTORS

5 to 15 Ton Trailer Capacity
Winches—Dump Bodies—Cranes

MACK International Motor Truck Corp.

585 SOUTH BROADWAY

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Power, Traction and Speed!

POWER, traction and speed are foremost considerations in a tractor for road construction and maintenance. They are *indispensable to efficient, profitable handling* of any contract.

Cletrac has **POWER** to spare for peak load requirements. It has sure-gripping **TRACTION** to pull through mud and hard going. It has **SPEED** to wade through jobs in record time. Whatever the job or whatever the difficulties, Cletrac is one tractor you can depend on to "see you through."

Note these Cletrac features that make for convenience, time-saving and efficiency:—"*One-Shot*" lubrication that oils the tractor instantly at the push of a plunger; *full rated horse power when turning*; the ability to *turn practically in its own length*; remarkable economy because of *low gas and oil consumption*. Add to these the many other distinctive Cletrac advantages and you have *the greatest tractor value on the market for all road work!*

Write today for full details of the four Cletrac road-builders—the "20"—the "30"—the "40"—and the super-powered "100."

The Cleveland Tractor Co.
Cleveland, Ohio

Cletrac

Crawler Tractors

Distributors

Liberty Trucks & Parts Co.

Use Four Crops to Pay Dirt Road Cost

It takes Iowa's entire corn, oats, wheat and barley crops to pay her dirt road transportation bill, according to figures compiled by the highway commission of that state. The cost of operating the 699,000 motor vehicles registered in 1926 is estimated at \$314,608,000, while the value of the four principal crops that year was \$313,367,000.

As a means of reducing the transportation bill, the commission advocates paving all the main highways and graveling roads with light traffic. To prove this claim, figures are quoted showing the saving on the three principal items, new cars, gasoline and tires, between dirt, gravel and paved roads.

Iowa spends \$120,000,000 annually for new automobiles, it is stated. The average life of a motor vehicle on dirt roads is given as five years, on gravel six years and on pavement seven years.

The annual bill for gasoline in the Hawkeye state is estimated at \$50,000,000. Most of it is used in propelling vehicles on dirt roads, and tests made by the Iowa agricultural college show that a gallon of gas will carry the average car 14 miles on a dirt road, 21 miles on a gravel road and 31 miles on pavement.

The annual expenditure for tires is figured at \$30,000,000. The annual cost of tires for an average motor vehicle is figured at \$31.65 on concrete pavement, \$63.30 on gravel and \$158.25 on average macadam.

Apparently the people of Iowa have

come to the conclusion that the cost of riding on dirt is too high, for fifty-three counties have to date voted to authorize a total of \$60,085,650 in highway bonds. From January 1 to August 31, 200 miles of paving had been completed and considerable more will be finished before freezing weather comes. Contracts for 186 miles of paving were let during July, August and September. More contracts will be let later, and it is quite apparent that Iowa will be some distance ahead of Minnesota in paved road mileage by the end of 1928.

NEW 27-E PAVER FEATURE T. L. SMITH COMPANY'S EXHIBIT

Among the interesting exhibits at the Road Show in Cleveland was that of the T. L. Smith Company. The new Smith 27-E paver was displayed for the first time. Improvements and refinements are many and the perfected water tank comes in for a lot of attention on the part of contractors.

This measuring tank follows the design of devices used to measure liquids for sale, such as gasoline dispensers. It is claimed to be accurate to the ounce and practically trouble proof.

This new Smith 27-E includes a 57 h. p., six cylinder motor as standard equipment. Timken and Hyatt roller bearings and SKF ball bearings are used liberally. Band type clutches, long a feature of Smith equipment, are again used. Heavier parts are used all the way through and the new machine is 6,000 pounds heavier than last year's model. The Smith organization is particularly proud, also, of

the new boom swing which can be turned with only the thumb and finger yet is very fast. Other refinements have been carried out, even to enclosing the bevel gear reverse on the tractions in an oil bath.

The mixer line, which includes eleven sizes of tilters and six non-tilters, were represented in the Smith exhibit by their 7-S model mounted on crosswise trucks, as it is preferred for conduit, sidewalk and alley work.

The T. L. Smith Company of Milwaukee, manufacturers of concrete mixers and pavers, have appointed Mr. James H. Smith as field sales representative to agents. Mr. Smith was formerly located in the South for the Novo Engine Company and will now have his headquarters in Milwaukee.

Analysis of Accidents at Grade Crossings Is Made by Railroad Board

An analysis of grade crossing accidents occurring on twenty-four railroads in California from January 1, 1925, to May 10, 1927, has been made by the state railroad commission. The 2,251 accidents analyzed were as follows: On crossings protected by crossing signs, 946; by wigwags, 654; by human flagmen, 290; by overhead crossing signs, 293; by gates, 34; by crossing bells, 34. These 2,251 accidents resulted in 297 persons being killed and 1,054 injured. Property damage only occurred in 1,360 accidents.

TWO BIGGEST EVENTS OF 1928

Four Day Good Road School

Federal Government Road Exhibit. American Association of State Highway Exhibits. Central and Southwest State College and University Exhibits.

Authorities of national reputation will speak each day at the Road School meetings.

Seating capacity at Road School, 2,500.

Third Annual Southwest Road Show

Largest Exposition in the Central and Southwestern States.

Biggest display of road building and contracting equipment ever shown in this territory.

Both at Wichita, Kansas,
February 21, 22, 23, 24, 1928

State, County, Township, Municipal Officers, Contractors, Engineers and all others interested are invited.

ADMITTANCE FREE

REDUCED RATES on all railroads. Certificate Plan. Get certificates when purchasing railroad tickets from your station agent.

SOUTHWEST ROAD SHOW AND SCHOOL
The Forum, Wichita, Kansas

1908

1928

Twenty Years of Service—

For twenty years we have been testing the concrete materials used in the construction of all the important structures built in the Rocky Mountain district, starting with the largest concrete dam in Colorado, located near Nederland, and on through the years, testing for practically every mile of concrete paving in Colorado; also materials for concrete in the Moffat tunnel.

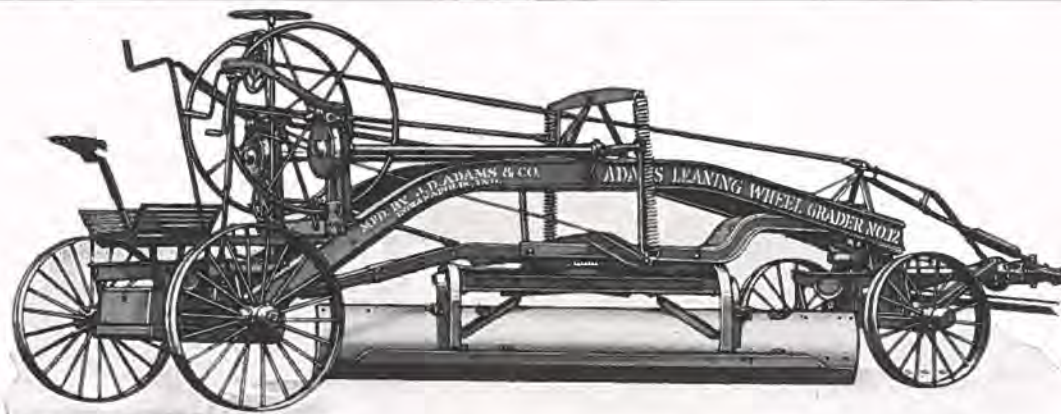
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THE PIERCE TESTING LABORATORIES, INC.

Established 1908

730 Nineteenth Street

Denver, Colo.



Important Improvements in New Adams Graders

DURING the past year improvements have been made in Adams Graders which add considerably to their efficiency, easy operation, and long life. Most important of these are:

Machine cut, enclosed lift-gears on all models with special adjustable end thrust bearings for lift worms (an exclusive Adams feature).

Machine-finished lift-arm bearings, ball and socket lift-links, and ball and socket connections at the mold-

board (an exclusive Adams feature). Alemite lubrication is used wherever practicable. All joints are adjustable for wear and at no place in the blade control is there any place for lost motion.

Other popular features of Adams Graders in addition to the Adjustable Leaning Wheels are the Adams Patented "One-piece" Rear Axle, Equalizing Lift Springs, Spring Platforms, etc. All models are furnished with machine-finished plain bearings or Hyatt Roller Bearings as desired.

Get our new catalog describing all of these features before you buy

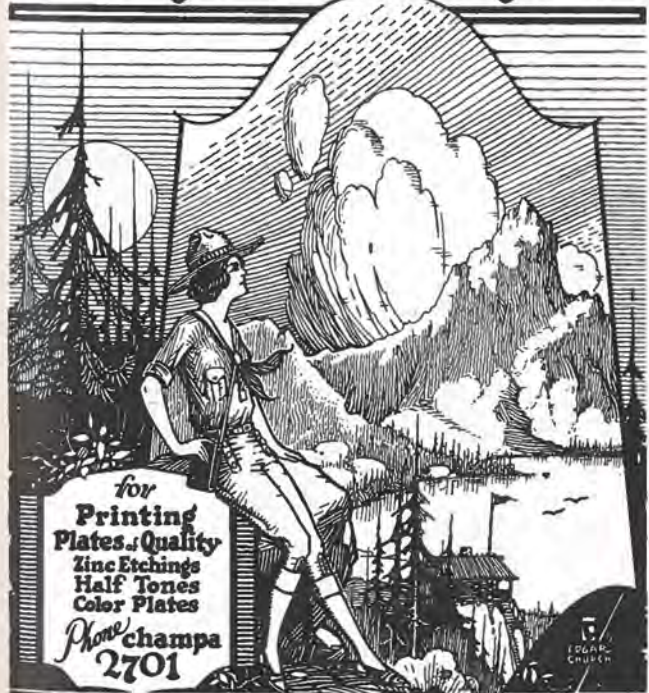
ELTON T. FAIR CO., 1611 WAZEE ST., DENVER, COLO.

Complete Stock Carried for Immediate Shipment

ADAMS ADJUSTABLE LEANING WHEEL GRADERS

"The Original - A Proved Success Since 1885"

ENGRAVING SERVICE



for
**Printing
 Plates, Quality
 Zinc Etchings
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Photo Engravings

Road Builders and Engineers use the pages of **COLORADO HIGHWAYS** each month as a guide in placing orders for supplies.

Your sales message will reach these active buyers through this medium.

Rates upon application

News From Other States

ARIZONA—The Arizona highway commission has approved the budget for the highway department for the fiscal year ending June 30, 1928, calling for a \$5,200,000 program.

State Engineer W. C. Lefebvre and W. W. Lane, chief engineer, will commence at once to prepare plans and specifications for the project to be taken up at once under the budget, and to advertise for bids for those projects scheduled to be started first.

The first work to be done will be the completion of the two miles of the Apache Trail necessary to reopen it.

KENTUCKY—The eighth biennial report of the highway commission of Kentucky states that:

"The total receipts from all sources, federal, state and county, for the two fiscal years, 1925-26 and 1926-27, covered by this report were \$26,773,989.68. The total disbursements for the same biennium \$21,288,983.09. Of the latter amount \$7,666,766.48 was for construction and reconstruction work done under contracts made prior to the period, but completed in whole or in part during this period. The sum of \$6,113,120.70 was for construction and reconstruction contracted for within the period and finished in whole or in part during such period—a total for construction \$13,779,887.18. The total for maintenance, additions and betterments to roads and bridges, not including all re-

construction done under the head of maintenance, nor the expenditures of the division of equipment, was \$4,253,006.

"Construction has been so distributed that the principal gaps on all through routes have been closed, leaving only a scattered few yet to be let to contract for constructive improvement of a high standard. Much of the work of the past year and that of 1925-26 has been the surfacing of projects graded and drained in years previous."

NEW YORK—The New York Assembly at its last session defeated a measure providing for the collection of a 2-cent gasoline tax. In a recent trade paper an official of the New York Automobile Merchants' Association explains why his organization persistently fought the measure. He states that raising funds for highway construction and maintenance by means of registration fees and gasoline tax, set at a figure proportionate to the highway budget, is fair and reasonable. The objection his association had to the New York program was that only half of the funds raised were to be spent for highway improvement, the balance to be used for other purposes.

OHIO—Motor trucks handle more freight than railroads from Columbus to cities within 40 miles, revealed the recent state-wide transportation survey. Highways bore 84.5 per cent of all freight traffic to destinations less than 20 miles distance, 54.7 per cent up to 40 miles, and 32, 24.2 and 2.3 per cent, respectively, to destinations in succeeding 20-mile zones.

UTAH—More than \$500,000 will accrue to the Utah state highway department

from general property tax levied for state road purposes during 1927, according to official reports. This revenue will be available to supplement other sources of revenue in the construction and maintenance of the state road system. Its use principally will be to match federal aid in large construction projects and match state aid in some few instances in minor improvements. Under policies laid down by the department none of the money raised from state road taxes levied against general property may be used for maintenance purposes and under the state law the money must be expended in the counties wherein raised. The taxes are levied by the county commissions but are expended by the state department.

If you work for a man, in Heaven's name work for him. If he pays you wages that supply your bread and butter, work for him, speak well of him, and stand by him and the institution he represents. I think if I worked for a man, I would work for him. I would not work for him part of his time, but all of his time. I would give my undivided service or none. If put to the pinch, an ounce of loyalty is worth a pound of cleverness.

If you must villify, condemn, and eternally disparage, why resign your position, and when you are outside damn to your heart's content.

But, I pray you, so long as you are a part of an institution, do not condemn it. Not that you will injure the institution—not that—but when you disparage the concern of which you are a part, you disparage yourself.—Elbert Hubbard.



100 ft. Riveted Low Truss Span, Dillon, Colo.

Bridges and Structural Steel

For every purpose

Plans and specifications gladly sent upon application

Minneapolis Steel & Machinery Co.
Denver Office, 15th & Wazee
Denver, Colorado

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SUPPLIES
WELL
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RIVETED
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PIPE



THOMPSON CORRUGATED CULVERTS are made of the highest quality rust-resisting steels obtainable and are guaranteed to meet all Federal, State and County specifications. **WEIGELE RIVETED STEEL PIPE** has been the standard for Irrigation, Power, Mining and Municipal Water Works for more than forty years.

FOR LOW INITIAL COST, long life, low maintenance and continuous operation under severe working conditions, specify our products.

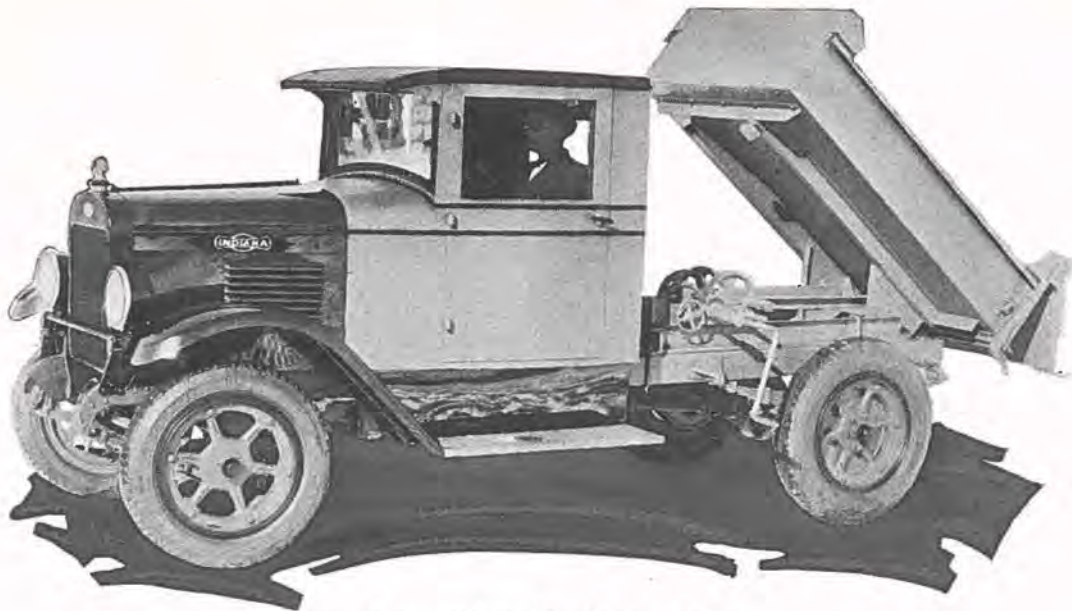
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DENVER, COLO.



Indiana Model 111—1½-Ton Chassis
With Hand Hoist and Dump Body

for **1928**

Consider Your Truck Costs

NEXT YEAR you will need new trucks. Old ones must be replaced. More trucks must be added to take care of your increased business.

When you consider replacing your old equipment—or adding to your present fleet—check your present operating costs against those of INDIANA users. You'll find that INDIANAS will save money for you.

Then make a check on the basis of dependability. You'll find that INDIANAS now in service have a performance record far beyond your expectations.

We believe we can prove to your satisfaction that INDIANA Trucks are more dependable and more economical than your present equipment. You owe it to yourself to investigate our claims. Won't you write us for further information?

INDIANA TRUCK CORPORATION, 312 Indiana Park, MARION, INDIANA

4 and 6 Cylinder Models

INDIANA TRUCKS

1 to 7 Ton Capacities

Liberty Trucks & Parts Co., Distributors

SUGAR BUILDING, 16TH AND WAZEE STS.

DENVER

We carry a complete line of parts for all government released trucks, ready for immediate shipment.

COLORADO

New Highway Equipment and Materials

A Section Devoted to What the Manufacturer Is Doing for the Engineer and Contractor

ROAD SHOW AT CLEVELAND BREAKS ALL CROWD RECORDS

Cleveland, Ohio—With an attendance of nearly 40,000 highway engineers, public officials and contractors from all over the western world, and an exhibit of road construction and maintenance machinery covering a space of over four acres, the 25th Convention and Road Show of the American Road Builders' Association, held in this city from January 9 to 13, inclusive, broke all previous records for attendance and interest in this great annual gathering of the national organization.

The road building industry demanded a convention at which the latest equipment and most up-to-date methods might be fully demonstrated, and in response to the deluge of requests for space from all over the country, the committee found it necessary not only to lease the Central Armory, but also to have a new section of the great Public Auditorium of Cleveland rushed to completion in order to house more than 300 carloads of equipment and display materials sent in by exhibitors.

The program opened with a general meeting, after which special sessions were held for engineers, contractors and state and county highway officials, each with a program adapted to its own special problems. On Pan-American day a comprehensive survey of the progress of road-building in Central and South America, Cuba and Alaska aroused the interest of all in the demand for modern highways, even in seemingly remote portions of these countries.

James H. MacDonald, treasurer of the association, and one of its founders, was accorded the position of honorary chairman in recognition of long and faithful service to the organization and his untiring efforts to promote the cause of good roads, not only in the United States, but abroad as well.

H. K. Bishop, chief of the division of construction, U. S. Bureau of Public Roads, was general chairman of the convention.

NEW HOME OF CATERPILLAR TRACTOR IN DENVER

The Clinton & Held Co., Colorado distributors of Caterpillar Tractors, are now located in their own home at 1637 Wazee Street, where they have two floors and a basement for housing of tractors, replacement parts and repairs.

With the moving of the company to their new quarters, General Manager Louis Clinton announced the appointment of two new salesmen and service men in Colorado. They are C. E. Maddox, who has been allotted the Western Slope territory with headquarters at Grand Junction, and Lloyd Terrill, in the San Luis valley with headquarters at Alamosa. Maddox was formerly parts manager at Denver.

With the addition of these men, the Clinton-Held concern have seven salesmen and service men in their territory.

Lester Rein is now in charge of the parts department.

During the week of January 17, the company conducted a tractor school in their new quarters for the benefit of operators of Caterpillar tractors in the Colorado and Wyoming territory. Paul Weeks, of San Leandro, Calif., general service manager of the Caterpillar Tractor Co., was in charge of the classes. Over a hundred operators attended the school.

The Clinton-Held company now have on display in Denver one of the new Caterpillar "20" type tractors, which was recently brought out for the purpose of serving a need for an all-round road maintenance tractor. This makes four sizes in the Caterpillar line.

ADAMS MOTOR GRADER NO. 10 ANNOUNCED

J. D. Adams & Company of Indianapolis announce Adams motor grader No. 10, which was shown for the first time at the Cleveland Road Show, January 9-13. This new grader, anticipated by road builders, contractors and officials the country over, is an outstanding engineering achievement, the result of several years of painstaking development.

An entirely new type of blade control makes it possible to raise the blade 50 per cent faster than with the ordinary type and with half the energy. This is made possible by a continuous handwheel motion and by a leverage, given through reduction gears, that is twice that of ordinary hand wheels.

Lost motion through the machine has been entirely eliminated. All gears—blade lift, scarifier control and steering—are machine cut to a perfect fit, are closely housed and run in oil. The worms of all controls are fitted with adjustable end thrust bearings—an exclusive Adams feature that makes it possible to eliminate all lost motion in the gears and hand

wheels. The lift arms are drop forged steel and machined at the bearing points.

J. D. Adams & Company have prepared a special folder, illustrating the machine, which will be sent to anyone interested.

OREGON WILL OIL 347 MILES OF ROAD

Portland, Ore.—The State of Oregon in 1928 will oil 347 miles of new road, making a total of oiled macadam in Oregon of 1,325 miles before the tourist season opens, shows a report received by the tourist committee of the Seattle chamber of commerce, which has urged the oiling of important arterial roads until such time as they can be paved.

Information reaching the tourist committee shows that by the time the tourist season opens in 1928, Oregon will have approximately 50 per cent of her roads dustless.

DENVER BUYS FIVE GRADERS

At a recent bidding on graders the city of Denver purchased five graders from local dealers. Those selected were the Russell, the Adams, Austin-Western, Stockland and Galion.

The Chain Belt Company also announce a line of complete concrete mixing plants for any purpose and any size or capacity. This line is designed to meet the requirements of the large or small contractor, and includes vertical, high lift and handling elevators, inclined and belt elevators, complete central mixing plants and material yard equipment, reciprocating feeders, as well as Rex bin and tunnel gates. This new line of contractors equipment is put out following the consolidation of the Stearns Conveyor Co. with the Chain Belt Co. The H. N. Steinbarger Co. will handle this new line with the Rex mixer in the Denver trade territory.

New Home
of the
Caterpillar
in Denver.



*You Won't
Growl at
Our Service*



"Cinders"

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THE MOST
ECONOMICAL OIL
FOR ANY CAR

Quaker State Motor Oil

Costs a little more by the gallon than ordinary oils, but measured by miles run, it is the cheapest oil you can buy.

THERE'S AN EXTRA QUART OF LUBRICANT IN EVERY GALLON

QUAKER STATE is free from the non-viscous content that makes up 25%, or more, of the volume of ordinary oils. This undesirable matter is removed at the refinery by a special exclusive SUPER-REFINING process—it doesn't leave it for your engine to struggle with.

FOR ANY CAR QUAKER STATE WILL PROVE AN ECONOMY NOT ONLY IN YOUR YEARLY EXPENDITURE FOR OIL, BUT EVEN MORE IN IMPROVED RUNNING AND FREEDOM FROM WEAR AND REPAIRS.

We are Colorado and Wyoming Distributors

Sommers Oil Co.

DENVER, COLORADO

New State Speed Law Ruling

Cities of Colorado with a population of less than 2,000 have no right to reduce the speed limit of 35 miles per hour on state highways running through their corporate limits.

This was the decision of Judge Dunn in the Littleton district court in deciding a case appealed to that court by George E. Cranmer of Denver. Cranmer had been fined for driving more than 15 miles per hour through the town of Sheridan, located on the Denver-Colorado Springs highway.

It was further brought out in the hearing on Cranmer's appeal that it is a violation of the Constitution of the United States to try an alleged offender in a court where the judge is paid for his services from the fees collected by the court.

This decision is of far-reaching effect in Colorado, and it will probably be appealed to the state supreme court for a final adjudication.

In appealing the case to the district court of Arapahoe county, Mr. Cranmer had the support of the Rocky Mountain Motorists, Inc.

Big Thompson Road Will Be Improved

Visitors to Estes Park this summer will note many road improvements over previous years. Plans for improving the Big Thompson canon highway are now under way. The road up Rapids Hill, the only formidable grade in the canon route to the park, is to be moved to the north side of the canon.

Two river crossings will be abandoned by this change and the grade will be equalized and reduced. The work is to be done under the supervision of the Larimer county commissioners. Under the new agreement with the state the maintenance of this road will be under the direct charge of the Larimer county officials.

Road crews are at present widening the highway running south out of the village of Estes Park towards Longs Peak Inn. Plans also are being made by the Park Service to make improvements on the roadways in the park proper. During the past three years a new road has been constructed from the South St. Vrain canon to Copeland Lake Lodge. Further improvements of this road are contemplated in 1928.

BIDS RECEIVED FOR FOLLOWING PROJECTS

Proj. No.	Length	Type	Date Bids Opened	Low Bidder
F.A.P. 145-B	1.051 mi.	Gravel Surfacing	January 27, 1928	Winterburn & Lumsden
F.A.P. 275-F3 & 275-G2	12.894 mi.	Concrete Paving	January 27, 1928	H. C. Lallier C. & E. Co.
F.A.P. 275-G3, 275-E2 & 275-C3	4.602 mi.	Concrete Paving	January 27, 1928	J. Fred Roberts & Sons
F.A.P. 293				
F.A.P. 277-B	4.860 mi.	Concrete Paving	December 29, 1927	J. L. Busselle & Co.
F.A.P. 295-C	5.284 mi.	Gravel Surfacing	January 27, 1928	Pofe Bros. Const. Co.

PLANS SUBMITTED FOR APPROVAL TO U. S. BUREAU OF PUBLIC ROADS

Proj. No.	Length	Type	Location
F.A.P. 2-R No. 7	1.224 mi.	Pav't & R. R. Grade Separation	South of Aguilar
F.A.P. 138	10.957 mi.	Gravel Surfacing	North of Kremmling
F.A.P. 262-D	1.764 mi.	Gravel Surfacing	West of Walsenburg
F.A.P. 266-C*	2.401 mi.	Gravel Surfacing	South of Durango

*Bids to be opened February 23, 1928.

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
F.A.P. 147-A	15.9 mi.	Gravel Surfacing	South of Cortez
F.A.P. 208-B	0.5 mi.	Grav. Surf. & Overhead R. R. Crossing	East of Grand Junction
F.A.P. 282-F	5 mi.	Gravel Surfacing	South of Craig
F.A.P. 388-A3	3 mi.	Graded & Overhead R. R. Crossing	East of Brush
F.A.P. 292-B	3 mi.	Graded & Overhead R. R. Crossing	South of Minturn
F.A.P. 296-C	8 mi.	Gravel Surfacing	South of Pueblo
F.A.P. 253-C*	4.502 mi.	Gravel Surfacing	West of Minturn

* Plans finished.

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1928

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R5	Bet. Trinidad and Aguilar	1.959 mi.	Paving	W. A. Colt & Son	\$ 72,122.50	26	2-R5
2-R	No. 6 South of Aguilar	2.75 mi.	Pavement	W. A. Colt & Son	93,000.00	1	2-R No. 6
144-B	Northwest of Fort Collins	3.201 mi.	Gravel Surfacing	White & LaNier	44,000.00	2	144-B
145-A	West of Glenwood Springs	3.807 mi.	Gravel Surfacing	Winterburn & Lumsden	53,227.90	94	145-A
210-B2	De Beque-Grand Valley	7.507 mi.	Gravel Surfacing	Fred Kentz	37,475.00	29	210-B2
247-C	Swink	0.8 mi.	Conc. Pav. & R.R. Underpass	J. Finger & Son	62,559.58	50	247-C
254-C2	S. W. of Hot Sulphur Springs	Superstr. of Bridge & Approaches		Northwestern Constr. Co.	48,203.50	57	254-C2
254-D	Parshall-Hot Sulphur Springs	3.013 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	37,124.18	54	254-D
258-D	Iola-Cebolla	4.426 mi.	Gravel Surfacing	H. C. Lallier Const. Co.	52,739.80	99	258-D
258-E	Cimarron-Cerro Summit	3.898 mi.	Gravel Surfacing	Strange-Maguire Pav. Co.	49,850.50	100	258-E
258-E	Div. 2, F. A. P.	1.487 mi.	Gravel Surfacing	Hinman Bros. Const. Co.			
265-B	Durango-Bayfield	3.831 mi.	Gravel Surfacing	Engler & Teysstler	52,134.55	100	265-B
275-E	North of Monument	0.926 mi.	Grading and Underpass	F. L. Hoffman	41,905.20	87	275-E
275-F1	Castle Rock-Larkspur	10.303 mi.	Grading	J. Fred Roberts & Sons	132,679.00	84	275-F1
275-G	Larkspur-Monument	10.869 mi.	Grading	Monaghan-Cunningham Con. Co.	141,252.78	100	275-G
279-D	Morrison	0.264 mi.	Paving	M. E. Carlson	23,266.80	76	279-D
279-E	Schaffer's Crossing-Baileys	3.243 mi.	Grading	S. M. & S. J. Feely	54,305.60	100	279-E
279-F	North of Baileys	3.444 mi.	Graded	J. Fred Roberts & Sons	126,000.00	1	279-F
251-B2 & 281-D2	Lafayette, north	5.813 mi.	Concrete Paving	J. H. Miller & Co.	146,315.00	100	251-B2 281-D2
282-D	North of Meeker	2.864 mi.	Gravel Surfacing	Winterburn & Lumsden	42,155.00	95	282-D
287-D1	Two mi. E. of Kersey on S. H. 2	0.921 mi.	Grading	White & LaNier	14,046.40	0	287-D1
288-A2	Bet. Merino and Brush	9.741 mi.	Paving	Edw. Selander	245,043.50	50	288-A2
290-D	East of Las Animas	2.954 mi.	Concrete Paving	W. A. Colt & Son	88,979.50	100	290-D
292-A	North from Minturn	6.417 mi.	Grading	H. C. Lallier Constr. & Eng. Co.	92,571.80	80	292-A
297AR	Northeast of Palisade	2.848 mi.	Surfacing	O. J. Dorsey	15,043.00	83	297-AR
300A	Bet. Chattanooga & Red Mt.	2.277 mi.	Grading	Winterburn & Lumsden	59,480.80	20	300-A



The DURABILITY of
KEYSTONE CULVERTS
IS NEVER QUESTIONED

Road-building records, extending from 1911 right down to the present day, offer irrefutable proof of their durability--justifies the statement

BUILT TO SERVE, SATISFY AND SURVIVE

Colorado Culvert & Flume Co.
PUEBLO

KOEHRING



BECAUSE boom can be raised or lowered at command of the control levers, and no adjustment of crowding cables is needed, the Koehring adapts itself instantly to new conditions and situations.

The pitch of the dipper is easily adjusted for ditching!

Bucket has no interfering bail, this construction making it possible to lift big boulders!

The Koehring dipper bites deep! Because there's full, undivided driving power behind it! Cuts out time-wasting nibbling!

Ready instantly for anything—high bank work, level shallow stripping, deep close-in digging, high dumping!

— the shovel of fingertip ease of control!
— of speed in every function! Know the Koehring!

Shovel Capacities

Line-of-plate struck measure.
Quickly convertible to crane or dragline.

No. 301—19'-6" Boom. $\frac{5}{8}$ Yd. Dipper on 19' Dipper Sticks; $\frac{3}{4}$ Yd. Dipper on 16' Dipper Sticks; 1 Yd. Dipper on 13' Dipper Sticks.
Shock absorber on boom. Wisconsin four cylinder gasoline engine, $5\frac{1}{4}$ " x $6\frac{1}{2}$ ", 1,000 R. P. M.

No. 501—24' Boom. 1 Yd. Dipper on 19' Dipper Sticks; $1\frac{1}{4}$ Yd. Dipper on 16' Dipper Sticks; $1\frac{1}{2}$ Yd. Dipper on 13' Dipper Sticks.
Shock absorber on boom. Wisconsin four cylinder gasoline engine, 6 " x 7 ", 925 R. P. M.

Write for Shovel Bulletin

Sales Agents

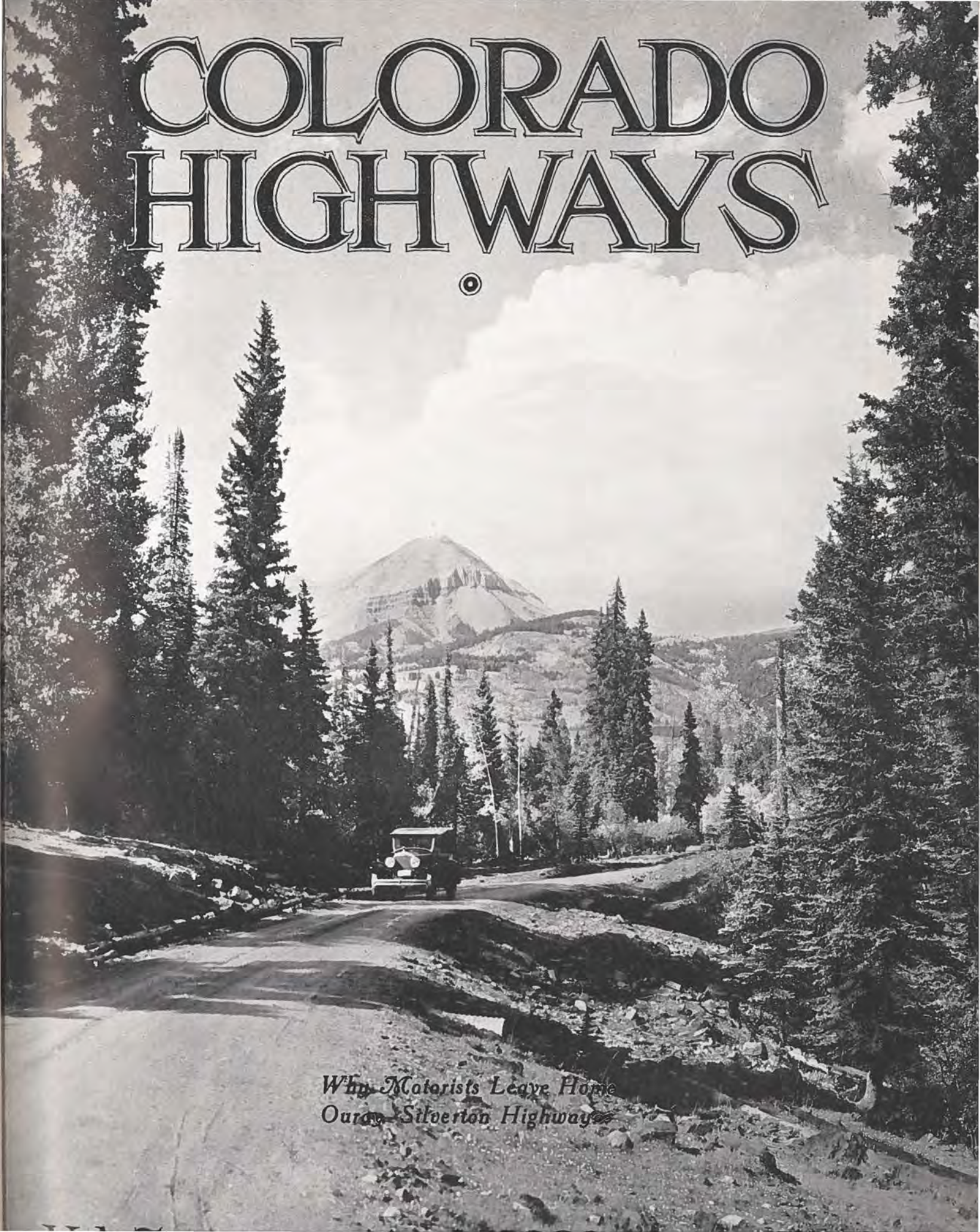
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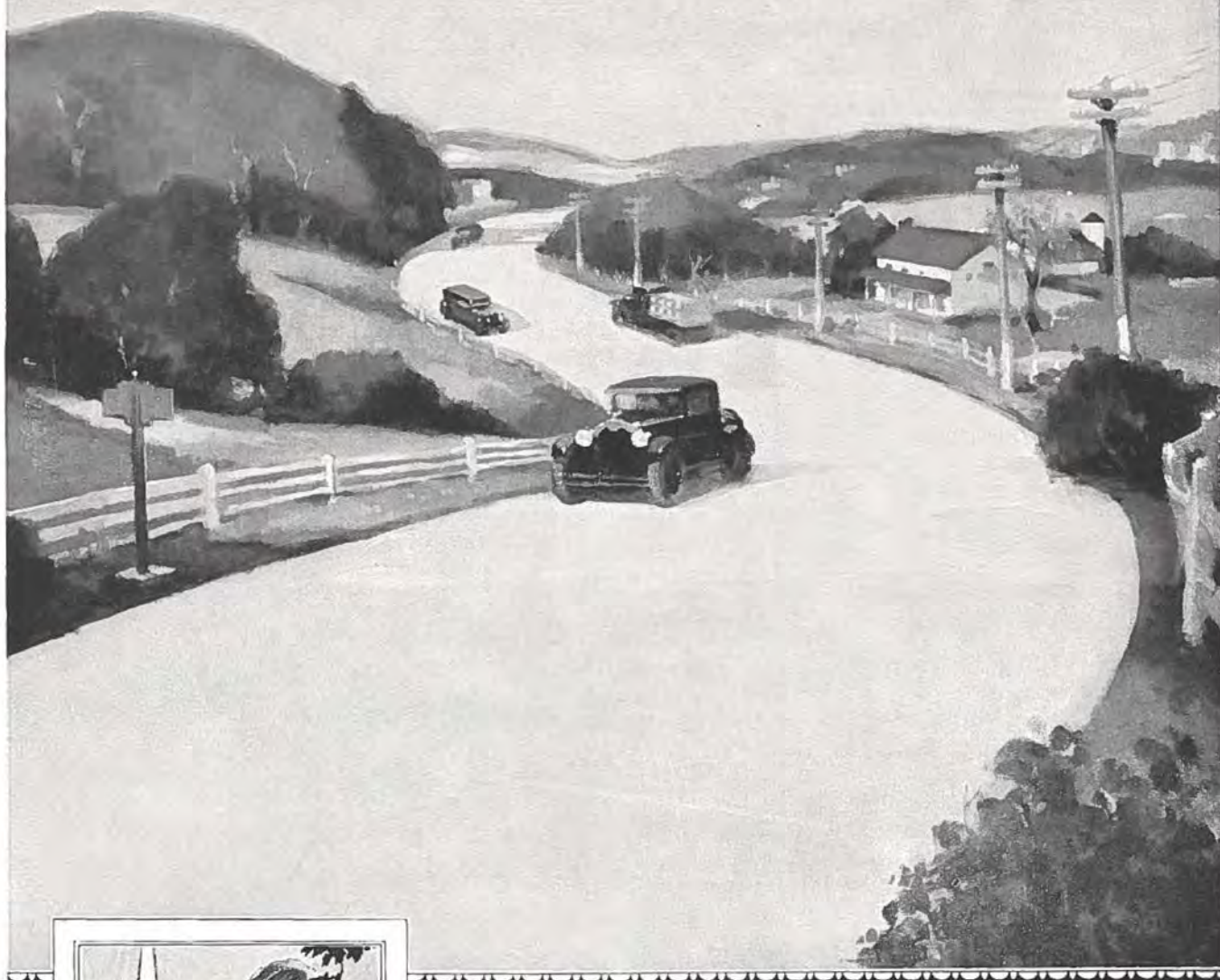


COLORADO HIGHWAYS

A black and white photograph of a vintage car driving on a winding road through a forest towards a mountain peak. The road is paved and curves through a dense forest of tall evergreen trees. In the background, a large, rounded mountain peak rises above the treeline under a cloudy sky. The overall scene is scenic and evocative of a mountain road trip.

*Why Motorists Leave Home
Ours - Silverton Highway*

For City Streets *also* † †



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† † *for permanence*



Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
 Denver, Colorado

GOVERNOR WILLIAM H. ADAMS, Chief Executive

L. D. BLAUVELT,
 State Highway Engineer.

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Articles on the subject of road building and highway development in Colorado are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible.
10 CENTS A COPY. \$1.00 A YEAR.

Our Cover Picture

Why Motorists Leave Home—that's the title of this month's picture on the cover of Colorado Highways. Giants in fable must have used Cone Mountain on the Ouray-Silverton road as a sand pile in the play-time, but today this sentinel guides the motorist down the wondrous slopes of the Rockies in Southwestern Colorado. Picture courtesy the Denver Tourist Bureau.

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Colorado Highways

"BETTER ROADS"

VOLUME VII.

MARCH, 1928

NUMBER 3

State to Spend \$5,058,000.00 on Highways During 1928

COLORADO will spend \$5,058,000 on the maintenance and construction of highways in 1928, under the revised highway department budget for the work, approved by Governor Adams.

The budget, as approved, increases the original budget submitted by the advisory board December 15, by \$158,000. This amount is provided for by the estimated increases in the revenue from the half mill levy, the 3-cent gas tax and the federal aid apportionment.

Governor Adams approved the expenditure of \$400,000 for the purchase of highway equipment for the maintenance of federal aid roads made necessary by the state assuming the upkeep of these highways.

Before affixing his signature, the governor made a number of changes in the tentative draft of the budget as originally submitted to him by the state highway advisory board in December. The chief executive increased by \$158,000 the estimated revenue of the highway department for the year, placing that money on several projects that had not been included by the

board. This increase was based on data furnished the governor indicating that receipts from the 3-cent gasoline tax and the one-half mill levy would exceed original estimates.

Of the expenditures, a total of \$3,066,000 will be spent on federal aid projects, the state and the federal bureau of roads bearing an equal share of the costs. State projects will receive \$292,000, while \$1,300,000 was provided for maintenance work. The contingent fund was increased from \$100,000 to \$200,000 by Governor Adams.

The maintenance money will be used in carrying out the new program under which the state highway department will have exclusive control of maintenance of all federal aid highways with the counties maintaining all purely state roads. This maintenance work was formerly under control of the various boards of county commissioners with the state paying one-half the cost. Of the maintenance item, \$756,050 will be used to keep up the 3,167 miles of federal aid roads,



An all-weather Federal Aid highway near Steamboat Springs constructed by the State Highway Department during the last year

\$43,200 on the 193 miles of forest service roads the state must maintain, and \$100,000 will be used to help eleven counties that have no federal roads in maintaining their state highways.

This latter item includes \$19,000 to assist Denver in maintenance of seventy-four miles of mountain park roads. The rest of the maintenance funds, \$400,000 will be used to buy maintenance equipment. The board had provided one-half million dollars for that purpose.

In his final draft of the budget, Governor Adams gave particular attention to the needs of the smaller feeder roads that connect the more strictly farming districts with the main trunk highways. This was in accordance with the policy announced in his inaugural address last year.

Some of the more important construction items provided in the budget are:

Completion of paving on the Denver-Colorado Springs road, \$437,500. Bids already have been received on this work and the contracts are ready to be let.

For paving between Pueblo and Colorado Springs, \$215,063.

For paving between Trinidad and Pueblo, through Aguilar, \$90,000.

For paving north from Greeley toward Cheyenne, \$175,000.

For paving west of Fort Morgan, \$112,226.

For paving east from Brush, \$85,000.

For improvements on the Victory highway along its length in Colorado, including a number of individual projects, \$435,000.

For completion of the paving between Lafayette and Boulder, \$173,648.

Mesa Verde Projects Are Included

Special projects were included for improving the roads leading to the Mesa Verde National Park. Special attention was given to needed improvements on the roads leading over several of the principal passes, including Wolf Creek, Monarch, Tennessee and Cochetopa. A \$40,000 item was added by the governor for a road over Mosca pass.

The highway budget, with estimated receipts, total disbursements and expenditures by districts, follows:

ESTIMATED RECEIPTS

One-half mill property tax.....	\$ 775,000
70% of 3-cent gasoline tax.....	2,700,000
Internal improvement.....	50,000
Federal aid.....	1,533,000
Total.....	\$5,058,000

DISBURSEMENTS

Federal aid projects.....	\$3,066,000
State projects.....	292,000
Maintenance.....	1,300,000
Advance surveys.....	7,500
Traffic signs and census.....	7,500
Property and equipment.....	20,000
Compensation insurance.....	15,000
Contingent fund.....	200,000
Administration.....	150,000
Total.....	\$5,058,000

HIGHWAY DISTRICT NO. 5

Federal Aid Projects

Road 1—Paving, Tomah to Palmer Lake.....	\$ 437,500
Road 1—Paving south of Colorado Springs.....	50,000
Road 4—Grading and surfacing near Burlington.....	25,000
Road 8—West from Baileys.....	50,000
Road 8—West from Limon.....	35,000
Total.....	\$ 597,500

State Projects

Cheyenne County—	
Road 59—General improvements.....	\$ 3,141
Road 8—West of Limon.....	5,000
Road 86—Bridge at Kiowa.....	6,000
El Paso County—	
Road 4—East of Colorado Springs.....	2,500
Road 4—Ute Pass.....	2,500
Lake County—	
Road 4—Tennessee Pass (forest service participation).....	7,000
Park County—	
Road 9—Bridge at Garo.....	6,000
Teller County—	
Road 4—Crystala to Park county line.....	3,000
Road 67—Between Cripple Creek and Victor.....	2,000
Total.....	\$ 37,141
District total.....	\$ 634,641

HIGHWAY DISTRICT NO. 6

Federal Aid Projects

Road 2—West from Craig.....	\$ 60,000
Road 2—West from Milner.....	100,000
Road 2—North from Kremmling.....	100,000
Road 2—Between Granby and Coulter.....	60,000
Road 7—Complete paving Boulder to Lafayette.....	173,648
Road 13—Bridge improvements.....	10,000
Road 123—Fort Collins toward Tie Siding.....	60,000
Total.....	\$ 563,648

State Projects

Clear Creek County—	
Road 2—Improve Floyd Hill.....	\$ 1,000
Road 91—North from Georgetown.....	2,500
Road 98—Near Bendemeer.....	5,000
Road 103—Echo Lake to Chicago Creek.....	10,000
Gilpin County—	
Road 119—Near Blackhawk.....	2,500
Grand County—	
Road 16—North from Granby.....	10,000
Jackson County—	
Road 114—Muddy Pass eastward.....	5,000
Jefferson County—	
Road 2—Oiling west from Rock Rest.....	6,000
Road 175—Between Golden and Coal Creek.....	20,743
Routt County—	
Road 131—Between Oak Creek and Sidney.....	15,500
Total.....	\$ 78,243
District total.....	\$ 641,891

HIGHWAY DISTRICT NO. 7

Federal Aid Projects

Road 2—Grading and paving east of Brush.....	\$ 85,000
Road 2—Paving west from Fort Morgan.....	112,226
Road 3—Paving north from Greeley.....	175,000
Road 3—Gravel surfacing north from Nunn.....	90,000
Total.....	\$ 462,226

State Projects

Arapahoe County—	
Road 75—Surfacing Federal blvd. south from Denver limits.....	\$ 2,500
Road 75—Surfacing South University blvd. south from Denver limits.....	2,500
Logan County—	
Road 2—Gravel surfacing east from Sterling... ..	4,500
Road 14—Surfacing west from Sterling.....	2,700
Morgan County—	
Road 52—East from Wiggins.....	1,500
Phillips County—	
West from Holyoke (no road number).....	4,448
Washington County—	
Road 54—Surfacing east from Otis.....	3,500
Road 61—Surfacing north from Otis.....	1,500
Yuma County—	
Road 51—Surfacing north of Wray.....	1,500
Road 54—Surfacing east of Wray.....	1,500
Road 59—Surfacing south from Yuma.....	1,000
Total.....	\$ 29,148
District total.....	\$ 491,374

HIGHWAY DISTRICT NO. 1
(Denver County, No State Highways)

HIGHWAY DISTRICT NO. 2

Federal Aid Projects

Road 4—Improvements west from Glenwood Springs	\$ 20,000
Road 4—Between Fruita and Mack	90,000
Road 4—West from Minturn	40,000
Road 6—Surfacing between Delta and Grand Junction	70,000
Road 6—Westward from Saguache-Gunnison county line	52,121
Road 6—West side of Cerro Summit Pass	60,000
Road 13—North from Rifle	60,000
Road 13—Between Meeker and Craig	45,000
Road 19—North from Ouray	70,000
Total	\$ 507,121

State Projects

Garfield County—	
Road 82—Improvements	\$ 2,141
Road 139—South from Rangley	3,000
Gunnison County—	
Road 6—Halfway House to Pine Creek	7,000
Mesa County—	
Road 4—Plateau Creek	6,000
Montrose County—	
Road 141—Bridges	1,000
San Miguel County—	
Road 62—Dallas divide	9,000
Summit County—	
Road 9—Hoosier Pass	2,000
Total	\$ 30,141
District total	\$ 537,262

HIGHWAY DISTRICT NO. 3

Federal Aid Projects

Road 1—Paving between Trinidad and Aguilar	\$ 90,000
Road 6—West side of Monarch Pass	60,000
Road 10—West from Wolf Creek Pass	100,000
Road 10—West from La Veta Pass	50,000
Road 15—North from Alamosa on Gunbarrel route	15,000
Road 17—Bridge and approaches north of Antonito	35,000
Road 19—South from Bondad	60,000
Road 19—North from Silverton toward Ouray	40,000
Road 106—South from Cortez toward Mesa Verde	66,606
Total	\$ 516,606

State Projects

Alamosa County—	
Road 10—East and west through Alamosa	\$ 10,000
Conejos County—	
Road 142—Between Romero and La Sausas	2,000
Dolores County—	
Road 145—Between Rico and Telluride	6,000
Hinsdale County—	
Road 149—Between Lake City and Creede	2,000
Huerfano County—	
West from Gardner toward Mosca Pass (no road number)	40,000
Las Animas County—	
Road 12—Between Trinidad and Stonewall	15,000
Mineral County—	
Road 149—Between Lake City and Creede	4,000
Saguache County—	
Road 15—General improvements	1,440
Road 114—North from Cochetopa Pass	15,000
Total	\$ 95,440
District total	\$ 612,046

HIGHWAY DISTRICT NO. 4

Federal Aid Projects

Road 1—Grading and paving north from Pueblo	\$ 165,063
Road 4 and 15—Chaffee County, Buena Vista, west	30,000
Road 6—Clay Creek bridge	15,000
Road 6—Bridge at Lamar	70,000
Road 6—Paving east from Manzanola	78,036
Road 6—Grading and bridge west from Portland	60,000
Total	\$ 418,899

State Projects

Baca County—	
Road 100—Grading east of Springfield	\$ 7,000
Crowley County—	
Road 71—North from Rocky Ford	2,200
Road 96—West from Ordway	3,380
Custer County—	
Road 69—South from Silver Cliff	1,757
Kiowa County—	
Road 59—North from Eads	5,550
Road 96—Near Haswell	2,000
Total	\$ 21,887
District total	\$ 440,786

MAINTENANCE

(Counties Having no Federal Aid Roads on 50-50 Basis, State and County Sharing Expense)

County	Miles	State's Share
Denver (mountain parks)	74	\$ 19,000
Baca	226	9,000
Crowley	64	5,000
Custer	96	6,000
Gilpin	36	5,000
Hinsdale	49	3,000
Kiowa	146	6,500
Mineral	39	6,000
Pitkin	88	9,000
San Miguel	144	13,250
Yuma	252	19,000
Total	1,214	\$100,000

3,167 miles federal aid roads to be maintained by state

193 miles forest service roads to be maintained by state

Total maintenance work

Maintenance equipment to be purchased

Total maintenance expense

Other items—

 Advance surveys

 Traffic signs and traffic census

 Property and equipment

 Compensation insurance

 Contingent fund for emergencies

 Administration expense

Grand total budget



One of Montrose County's maintenance crews working on State Road No. 6

Colorado Built 136 Miles of Federal Roads in 1927

A TOTAL of 136 miles of Federal Aid standard roads of all types were constructed in Colorado during the year of 1927, according to a report of the engineering division of the State Highway department. The total cost was \$2,715,400. With this road mileage the department constructed 37 major bridge and drainage structures.

The mileage of the various types of roads completed during the last year under Federal Aid is as follows: 27.331 miles of concrete pavement; 7.216 miles of asphalt pavement; 69.402 miles of gravel or crushed rock surfacing; 29.882 miles of grading, and 1.642 miles of bridge structures.

The roads constructed in Colorado to date under government aid totals 1,107.32 miles of all types as follows: 248 miles of concrete pavement; 13.14 miles of asphalt pavement; 501.91 miles of gravel or crushed rock surfacing; 98.43 miles of sand clay surfacing, and 245 miles of grading.

There were 61 projects in hand during 1927. Of these, 35 were carried over from 1926. The listed carry-over of contracted and uncontracted projects to be carried into the 1928 construction schedule total \$2,932,800, of which \$1,166,640 is cash on hand by the State, and \$1,316,160 is Federal Aid participation.

During the past season low bids on Federal Aid contracts were 93.83% of the engineers' estimates, and the average of all bids received was 99.44% of the engineers' estimates.

The department improved 305 miles of state roads during 1927. These improvements included grading and surfacing on 52 projects. These projects ranged in cost from \$43 to \$50,000 in cost. A list of the jobs may be found on page 8. In addition, the department completed 18 bridge and drainage structures under the heading of "State Projects." There was no Federal Aid used on the 305 miles of improvements made on the State roads.

There were 30 State projects carried over into the 1927 season. The 1927 budget contained 110 State projects, and there were six additional from the contingent fund during the past season, making 146 in all. Forty-nine of the 1927 projects were for \$3,000 or less, making the engineering supervision costly of keeping records of these expenditures.

Work was in progress upon the following forestry projects during 1927: Echo Lake-Chicago Creek, Tennessee Pass, Independence Pass, and Dolores-Rico. The State and counties co-operated with the Forestry Department in the construction of these projects, the construction work being under the supervision of the Bureau of Public Roads. The State, under the supervision of the State Maintenance Division, also carried out steam shovel projects on Wolf Creek Pass and the Blue Mesa roads.

Plans and specifications were made by the Bridge Department for structures of various spans, including concrete culverts and siphons, the total estimated cost of which was \$427,000. The total salaries and expenses for this work was \$9,070.

Three important grade separations were handled during 1927 as follows: Underpass north of Trinidad



Looking up Peaceful Valley in Boulder County—a new mountain boulevard

completed; underpass at Swink, contract let and work in progress; underpass at Monument, completed. Four railroad crossings between Tomah and Palmer Lake were eliminated by relocation of the new road between these two points.

Since 1918 the Highway Department has eliminated 58 railroad crossings. Ten of these crossings have been eliminated by underpasses; five by overhead structures and forty-three by relocation of roads.

Twenty-three Federal Aid project contracts were under construction at the close of the fiscal year, which include the construction of a total of 23 major structures of over 20-foot span, four of which are railroad underpasses. These projects are classified as follows:

Concrete pavement, seven project contracts, length 27.625 miles, estimated complete 18.490 miles. Surfaced projects, nine project contracts, length 33.678 miles, estimated complete 21.757 miles. Graded projects, six project contracts, length 28.804 miles, estimated complete 24.765 miles. Structural project, one contract, length 0.295 miles, estimated complete 0.141. Total length projects under contract, 91.179; estimated complete, 65.153 miles.

On page 7 is shown a table giving details of the Federal Aid projects completed during 1927, while on page 8 the State projects are given in detail.

FEDERAL AID PROJECT CONTRACTS COMPLETED DURING FISCAL YEAR 1927

Project No.	Location	County	Length in Miles	Cost of Projects to Nov. 30, 1927	Major Structures
Concrete Pavement:					
222-C (Reop.)	Between Lafayette and Broomfield.....	Boulder	0.375	\$ 13,208.15	0
246-F	Avondale, West	Pueblo	1.239	40,634.75	0
271-B*	West from Portland.....	Fremont	0.649	68,906.90	1
275-B	Between Sedalia and Castle Rock.....	Douglas	5.334	235,402.67	4
275-C	Husted, North	El Paso.....	4.795	203,844.76	2
276	North of Colorado Springs over C. R. I. R. R.....	El Paso.....	0.132	52,369.25	1
281-E	Lafayette-Boulder	Boulder	0.812	31,476.16	0
283-B	West thence South from Berthoud.....	Larimer	4.194	190,425.37	2
283-C	Between Longmont and Larimer County line.....	Boulder	5.790	222,826.44	2
287-A-2*	West from Fort Morgan.....	Morgan	4.011	97,082.12	0
			27.331	\$1,156,176.57	12
Bituminous Pavement:					
2-R-3	North of Trinidad.....	Las Animas.....	0.554	\$ 32,242.72	1
2-R-4	North of Trinidad.....	Las Animas.....	6.662	295,101.61	4
			7.216	\$ 327,344.33	5
Surfacing:					
134-A	Burlington-Limon	Kit Carson.....	11.174	\$ 47,517.92	1
144-A-1	Junction Road 14 N. via No. 123.....	Larimer	4.694	42,530.71	1
213-D	Between Mancos and Hesperus.....	La Plata.....	3.877	62,768.81	0
258-B	Gunnison-Sapinero	Gunnison	2.727	85,553.36	2
262-G-1	Walsenburg-Alamosa	Costilla	5.041	51,624.27	2
262-H	Walsenburg-La Veta	Huerfano	3.296	45,690.88	0
271-B*	Portland, West	Fremont	0.129	3,599.20	0
271-E	Between Pueblo and Canon City.....	Fremont	1.303	41,725.00	0
287-A-2*	West from Fort Morgan.....	Morgan and Weld.....	16.610	28,737.11	0
294-B	Mancos-Cortez	Montezuma	1.476	24,315.02	0
295-B	Between La Jara and Antonito.....	Conejos	6.622	42,476.92	0
296-B	Pueblo-Walsenburg	Pueblo	4.351	65,619.34	0
297-B	Between Grand Junction and Plateau Creek.....	Mesa	2.241	45,710.17	0
299-A	Delta-Grand Junction	Delta	5.888	72,655.04	1
			69.402	\$ 660,523.76	7
Grading:					
157-A	Buena Vista-Leadville.....	Chaffee	3.997	\$ 65,727.24	0
275-C-2	East of Monument.....	El Paso.....	0.625	37,941.19	1
281-D	Lafayette, North	Boulder	5.813	125,609.01	4
287-C	Kersey, East	Weld	19.447	170,051.65	3
			29.882	\$ 399,329.09	8
Structural:					
79-A	Between Colorado Springs and Limon.....	Elbert	0.246	\$ 11,175.43	1
242-A-R-1	Between Grand Junction and Fruita.....	Mesa	0.023	22,149.01	1
254-C	Byers Canon (substructure).....	Grand	0.295	22,696.96	1
282-A	South of Craig over Yampa River.....	Moffat	0.852	91,592.40	1
293-B	Over Uncompahgre River.....	Ouray	0.227	24,413.08	1
			1.643	\$ 172,026.88	5
	TOTAL, 33 Projects.....		135.474	\$2,715,400.63	37

* Combined Paving and Surfacing Project.



A view of Long's Peak as seen from the newly completed forest highway, connecting the South St. Vrain and Estes Park in the Rocky Mountain National Park

Project No.	Location	County	Length in Miles	Cost (To Nov. 30, 1927)
State Projects Completed During Fiscal Year 1927				
Surfaced Projects:				
504-D	Montrose County line, East.....	Gunnison	3.	\$ 7,875.78
512-B	Norwood, North to County line.....	San Miguel	1.5	3,500.00
519	South end of F. A. P. 214 toward Wilson Gulch.....	La Plata	0.8	3,441.35
524	North and South of Springfield.....	Baca	16.	23,623.17
526	North and South of Ouray.....	Crowley	6.0	25,000.00
527-B	Kiowa County line, West.....	Crowley	15.	18,077.00
538	Agate East toward Limon.....	Elbert	9.	35,000.00
538	Agate East and West and East of Buick.....	Elbert	5.	*21,621.43
544-B	West of Hartsel and West of Howbert.....	Park	7.5	1,849.44
545-E	North and South of Fairplay, Trout Creek, Antero Junction, Red Hill, Twin Bridges.....	Park	7.	1,873.96
579-B	Between Ault and East County line.....	Weid	15.	6,000.75
580-B	Between Hudson and Fort Lupton.....	Weld	9.	6,993.93
606	Alamosa, South.....	Alamosa	8.	21,999.64
614-B	Parkdale-Salida.....	Fremont	11.5	30,666.93
627	Between Tabernash and Granby.....	Grand	0.423	9,952.74
627-B	East of Hot Sulphur Springs between Granby and Tabernash.....	Grand	3.7	45.51
628	Between Grand Lake and Granby.....	Grand	6.	10,000.21
635-636	Washington-Adams-Arapahoe County line, West.....	Adams and Arapahoe	12.	26,924.82
639	Greeley West to Larimer County line.....	Weld	11.	18,000.00
648	East of Stonewall.....	Las Animas	32.3	4,956.10
648	East of Stonewall.....	Las Animas	10.0	16,045.34
659	Between Redvale and San Miguel County line.....	Montrose	4.	3,672.51
667	Frijole Hill toward Trincheras.....	Las Animas	1.0	2,952.23
670	Between La Junta and Delhi.....	Otero	4.0	4,000.80
671	Cheyenne Wells South to Kiowa County line.....	Cheyenne	14.	2,995.23
674-A	South and East of Elbert.....	Elbert	3.	1,499.86
675	Between Colorado Springs and Pueblo.....	El Paso	3.	500.00
678	East of Highway Junction to Lincoln County line.....	El Paso	7.	2,447.90
683	From top of Hoosier Pass toward Alma.....	Park	2.	2,250.00
686-A	Between Walden and Cameron Pass.....	Jackson	1.800	1,906.41
693	North of Otis and South of Akron.....	Washington	17.7	5,000.00
694	North of Wray.....	Yuma	.....	2,995.76
			TOTAL, 32 Projects.....	247,223
Graded Projects:				
502-C	Midland grade, Catherine-Glenwood.....	Garfield	1.631	\$ 1,974.85
503-E	Between Grand Junction and Rangely.....	Rio Blanco	0.500	2,473.96
513-B	Between Hoosier Pass and Breckenridge.....	Summit	0.500	5,000.00
518-B	Between High Bridge and Lake City.....	Hinsdale	0.5	2,927.53
522	West side of Cochetopa Pass.....	Saguache	8.	21,466.04
529	Wetmore, East (Jackson Hill).....	Custer	1.558	5,150.00
545-D	Between Baileys and Jefferson.....	Park	6.	12,900.00
551-A	Mt. Evans.....	Clear Creek	3.606	42,979.78
552-C	At Blackhawk.....	Gilpin	0.299	2,147.37
558	Northwest of Golden (Guy Hill).....	Jefferson	4.	49,934.57
566-D	South from F. A. P. 106 toward Rabbit Ear Pass.....	Routt	0.969	4,999.06
584-C	Between Manitou and Cascade.....	El Paso	3.	838.17
626	Coal Creek Road, East of Pine Cliff.....	Gilpin	0.738	11,055.99
632	Pine Grove Gulch.....	Jefferson	3.	4,339.87
672	Between Jarre Canon and Platte River.....	Douglas	2.	1,000.00
682	East from El Paso County line.....	Lincoln	10.	623.32
684	Pisgah Hill.....	Teller	2.	4,233.01
686-B	Between Walden and Rabbit Ear Canon.....	Jackson	1.439	5,750.00
697	Between Hooper and Mineral Hot Springs.....	Saguache	.....	4,000.00
860	South of Butte Creek.....	Baca	3.	15,704.65
			TOTAL, 20 Projects.....	58,240
Structural Projects:				
509-B	Roaring Fork River at Aspen, Bridge.....	Pitkin	.....	\$ 2,667.78
513-C	Over Blue River and over Black Creek, Bridges.....	Summit	.....	6,000.80
526-A	Over Duck Creek, Bridge.....	Crowley	.....	25,000.00
526-B	Bridge over Bob Creek, 3 miles South of Ouray.....	Crowley	.....	30.09
531-B	Bridge over canal connecting the Nee-No-She and Nee Gronda Reservoirs.....	Kiowa	.....	4,937.06
536	Bridge over Dry Creek, Southeast of Franktown.....	Douglas	.....	7,894.91
546-A	Bridge Reconstruction between Divide and Florissant.....	Teller	.....	28,976.41
552-B	Bridge over South Boulder Creek at Rollinsville.....	Gilpin	.....	7,141.69
562-A	Four 80-foot Steel Bridges, Big Thompson Canon.....	Larimer	.....	27,878.84
584	Bridge and Channel Change at Cascade.....	El Paso	.....	10,416.71
584-B	Bridge East of Calhan.....	El Paso	.....	4,113.97
584-D	5 Culverts East and West of Falcon.....	El Paso	.....	2,375.00
614-A	Bridge East of Parkdale, Bumback Canon.....	Fremont	.....	30,725.44
623	Bridge over Wild Horse Creek.....	Lincoln	.....	6,789.98
642	Bridge East of Lamar.....	Prowers	.....	3,124.32
656	Cement Rubble Masonry Guard Fence North of Gilman.....	Bagle	.....	3,091.80
673	Bridge 7 miles South of Sedalla.....	Douglas	.....	1,250.00
695	Bridge over Spring Creek, North of Stratton.....	Kit Carson	.....	1,500.00
			TOTAL, 18 Projects.....	\$ 173,914.80

Wales Engineer Praises Colorado Road Work

Mr. N. E. Vaughan, engineer member of the Main Roads Board of New South Wales, visited the Colorado highway department on February 4, and accompanied Maj. John P. Donovan, on a trip over the concrete pavement through Morrison, thence over State Highway No. 8 to Baileys and return to Conifer, thence to Evergreen, Bergen Park and back to Denver via Lookout Mountain.

Mr. Vaughan has just completed an eight months' tour inspecting road work in the United States and Canada, and expressed himself as tremendously impressed with Colorado's mountain work.

"The trip through your mountain parks was of particular interest to me in the way of location work, some difficult tasks having been overcome in that rugged country," said Mr. Vaughan. "Your department certainly has had some outstanding tasks. I assure you, it was all a vast revelation to me, and I was introduced to dimensions I had previously unheard of. It is all a wonder of gigantic proportions."

Mr. Vaughan further said that nowhere else during his long trip had he seen construction work and location in mountain roads that nearly approached the standard of excellence reached by the Colorado state highway department on State Road No. 8.

The Uses of Highway Funds

By A. J. BROUSSEAU,
President Mack Trucks, Incorporated, and a Director of
the Highway Research Board.

THE American public has an investment of \$10,000,000,000 in rural highways.

Annual expenditures for the last few years have been at the rate of \$1,000,000,000 a year, and there are reasons for believing that annual expenditures will soon be at the rate of \$1,250,000,000 and probably become stabilized at that figure.

Authorities agree that 60 per cent of the amount expended is for construction and the balance is devoted to maintenance.

I speak of this at the beginning of my address because there is very general misunderstanding of the terms "expenditure" and "expense." Expenditures to pay for income producing facilities charged to capital account are one thing. Expenditures for maintenance expense are another thing.

We are, therefore, faced with a situation of having a \$10,000,000,000 investment in highway facilities to which we will add \$750,000,000 a year, and an annual expense of \$500,000,000 for maintenance.

Is the capital structure of this transportation system sound? Who has paid and who will continue to pay for these facilities? Are dividends paid? If so, who receives them?

Uses of Taxes Overlooked in Demand for Economy

These questions are asked because of the demand for economy in our federal, state and local governments. Because there is a tendency to look upon all taxes as expense, one should remember that in the case of highway expenditures a very large amount is not expense, but is an investment in income producing facilities.

No one, I take it, will disagree with the statement that every possible economy should be practiced in the expenditure of public funds. Nor will anyone say that taxes would be levied at random, but rather only after careful and thorough consideration of the uses to which the money is to be put.

The spending habit is one easily acquired, so we must make sure all expenditures are for those things which have justifiable earning powers.

Taxes Essential to Expansion of Facilities

But, these facts admitted, and with constant vigilance in our public expenditures, it still remains true that the government, like business enterprises, must have funds for the expansion of its capital facilities if it is to fulfill its function of providing for the needs of its citizens.

While this discussion is directed chiefly toward highway finance, it is necessary to analyze the general activities of government in order that we may have a proper conception of the relation which highway expenditures bear to the total.

First, let me point out that all government expenditures can no more be classified as expenses than can the entire budget of any business. Both must provide funds for capital structures. Both must provide money for expenses incidental to the maintenance of the poli-

cies of the stockholders. In the case of the government these stockholders are its taxpayers.

Expenses Versus Expenditures

Government is a great community enterprise which must cover a wider range of activities than any private business.

If we examine the structure of our federal government we find that its functions can be grouped into two classes.

Into the first come legislative, executive, judicial, national defense, payments on war debts, pensions and related activities.

In the second will be found all classes of property, such as national forests, public parks, reclamation and public buildings.

All of the items in these two divisions are not comparable for federal and state, but there is a great similarity between them, and the classification of expenditures of the Federal Government will apply to many of the operations of state, county and municipal governments.

I desire to emphasize that while expenditures in the first group are necessary expenses, expenditures in the second group cannot be properly charged as expenses. They must be considered as capital expenditures and the amounts must be justified by the returns which they give to the public. Mere amount is not the issue.

Uses of Highway Finances and Returns

This brings us, then, directly to the question of the uses to which highway finances are put and the returns which they give.



Type of unit which will be used by the Highway Department in maintenance of Federal Aid roads in Colorado

If we view the question as an administrative one it will be found that rural highway expenditures fall into two groups, state and local, since federal funds are expended by the states.

Each of these groups divides its appropriations into two classes—construction and maintenance, with the former constituting about 60 per cent of the total amount.

Through the construction fund, year after year, roads are built which are kept in service through the maintenance account. Each mile so constructed and maintained adds to the capital facilities of the nation or the community, and by doing so contributes in some way to the well being of every citizen.

Every Citizen a Stockholder

As for the capital structure of our highway system, there are no federal bonds, only common stock (one might say) held by more than 115,000,000 citizens.

The total state bonded indebtedness for highway purposes at the beginning of 1927 was about \$835,000,000, with interest payments approximating \$34,000,000, and principal payments another \$22,000,000.

Unfortunately, accurate figures as to county and local indebtedness are not yet available, but the fixed charges appear to constitute a very small portion of the total expenditures.

Since 1916 only twenty-five states have issued bonds for highway purposes. The fact is, of course, inconclusive as to the advisability or inadvisability of the use of bonds for highway building, since each state must gauge its need independently.

In many cases, however, the proud boast of the state that it is "paying for its roads as it goes" is attained at the expense of counties overburdened with highway bonds issued to build main roads which were the logical obligations of the state as a whole.

In the past, long term bonds were quite generally issued, but lately the tendency has been toward serial bonds, to be retired within the life of the original construction. There does not seem to be any justification for the fear that roads will "wear out" or be "destroyed" before the bonds are paid for. To illustrate, New York State issued some \$100,000,000 in bonds more than a decade ago to build a highway system. The unexpected increase in motor use soon rendered the narrow, light surfaces obsolete. New York did not scrap these roads, but used them as a base for wider, stronger roads, thus modernizing the system at a com-

paratively small additional cost. I am informed that the "present value" of these roads, at the time they were rebuilt, was more than the original cost.

Who Pays for the Roads Today?

Who pays for the roads? To illustrate, let us call the citizens of our country the stockholders who operate through their board of directors, the members of congress. They have long since recognized the need of a national system of highways and are co-operating with their subsidiaries—the states—in the construction of such a system, and with them are sharing the cost. The federal contribution is something like 8 per cent of the total annual rural highway bill.

The motor user is paying in taxes very nearly 50 per cent of the total, exclusive of federal aid. Bonds and general taxes are resorted to for the balance, although the bonds are in many instances being retired from motor taxes.

So, our source of revenue is well spread and on a wide base. I doubt if anyone today can successfully challenge the statement that the motorist is paying for highways in the ratio of the benefits he receives.

Is the Highway System Paying Dividends? Who Receives Them?

We learn from the U. S. Census Bureau that the cost of highways is fully reflected in enhanced real estate values, and so adds tremendously to taxable property. And from the Federal Trade Commission study of national wealth, we learn that the definite valuations placed upon our highway facilities show a handsome return on cost.

The beneficial results upon our primary education through school consolidation, made possible by the improved road and the bus, is another of the many dividends paid by roads.

Our unequalled rail transportation system would not function without our present highway facilities.

Motorist Receives Special Returns

The motorist, while contributing largely, receives a dividend in lower operating costs, to the extent of two or three cents per mile.

Add the recreational benefits; consider, even partially, the economic returns, and I think that no one can return other than an affirmative answer to the questions propounded.

Our highway finance structure is sound. It is necessary. And it is paying everybody.



Showing construction crew taking a "kink" out of State Road No. 8 near the town of Morrison, preparatory to paving with cement concrete



The world-famous Skyline Drive at Canon City—another reason why motorists leave home

Canon City Mountain Playgrounds

THE number of beautiful one-day trips out of Canon City is really surprising. Situated at the very entrance of the Royal Gorge, and being close to the mountains, there are hundreds of interesting spots in the vicinity that give the vacation seeker something to see and to remember. And the business men of that city are so desirous that the motorist have the opportunity to see all of these things that volunteer labor in many instances has opened up to the public scenic attractions that would be impossible except by horse back trips or hikes or else by a large expenditure of state or county money. Quite often the citizens have banded together on certain days, armed themselves with picks and shovels and teams and graders and gone after the obstacles that kept the motorist from being able to wander along without difficulty.

Each year sees more work of this sort done and gradually all of the natural wonders of the region are being opened up for inspection.

To see the Royal Gorge from a railroad train as you are whisked rapidly around the curves in this wonderful canon is indeed a thrilling sensation, but to see the Gorge with any degree of satisfaction you must stop off at Canon City and see it from the top. A splendid automobile highway, ten miles in length, leads from Canon City through a veritable wonderland of canons, and mountains and plateaus to the picnic grounds at the top of the gorge. Here, if you desire, you may sit on the rocky rim and dangle your feet out over what seems to be an almost bottomless chasm and toss stones in the turbulent Arkansas river nearly a half mile below. From this vantage the river looks like a tiny thread, and the railroad train like a little toy. The region at the top of the gorge is in reality a gentle undulating plateau with plenty of room for camping and hiking and driving. The Royal Gorge with the exception of railroad right of way belongs to

Canon City and is included in a grant of eight square miles made by congress to this city for a park—a park which for stupendous grandeur no other city ever owned.

Connected with the Royal Gorge road is the Sky Line Drive, unique among the roadways of America for it extends for two miles right along the crest of a sandstone ridge over six hundred feet in height. In former years this crest was so narrow and sharp that a man could scarcely walk along it. This rocky crest has been cut off by convicts from the penitentiary nearby and widened out into a twenty-foot roadway over which automobiles pass with perfect safety. Cars or horses or pedestrians passing over this drive can be seen by people for miles away silhouetted against the sky and hence the name "Sky Line Drive". The view from the Sky Line Drive is wonderful. Canon City spreads out like a checker board in the valley below, while round about the city spread out the orchards and gardens of Lincoln Park, Fruitmere and other fruit growing environs. The coal fields for Fremont county spread out in plain view with their twenty or more shafts; while the oil fields of Florence only seven miles away can be seen.

Another and newer recreational resort known as the Red Canons Park is becoming one of the favorite playgrounds for Canon City and her visitors. This park embraces some 600 acres of deep red sandstone canons, cliffs and pillars and has also been ceded to Canon City for a public park. The Red Canons are easily accessible by means of a splendid automobile road extending from Canon City through Park Center, the Oil Creek Canon and Garden Park. The Red Canons present one of the most picturesque and remarkable examples of erosion found anywhere. There are more

(Continued on page 24)

Highway Legislation in Many States

IT WILL be interesting to note the following highway legislative changes made throughout the country in 1927:

ALABAMA

The legislature of Alabama has assigned to the State Highway Department proceeds from a 2-cent tax on gasoline for the purpose of paying interest and retiring a \$25,000,000 bond issue, which was voted by the people of the State on April 12 of this year. Heretofore the gasoline tax has all gone to the counties and the original 2-cent gasoline tax will continue to go to the counties. This makes the total gasoline tax 4 cents.

ARKANSAS

The legislature of Arkansas authorized an issue of \$13,000,000 of highway notes annually for the next four years, making a total of \$52,000,000.

The gasoline tax was increased from 4 to 5 cents and a tax of 10 cents per gallon on motor oil eliminated. A law was passed giving the State Highway Commission much more authority in regulating traffic on state highways.

CALIFORNIA

The state legislature of California increased the gasoline tax from 2 to 3 cents per gallon. The present 2-cent tax is divided equally between the state and the counties, the state's share being reserved for maintenance and reconstruction. The additional 1 cent tax goes to the state for financing new construction.

The highways of the state are divided into primary and secondary and the funds for new construction are appropriated 75% to the primary roads and 25% to the secondary roads.

Another act provides for the creation of special assessment districts to finance grade crossing elimination. A bond issue of \$10,000,000 for grade crossing separation is to be submitted to the people in November, 1928.

COLORADO

The state legislature of Colorado increased the gasoline tax from 2 to 3 cents and allotted 70% to the state highway fund, the balance going to the counties for road expenditures. Formerly the gasoline tax was divided equally between the State Highway Department and the counties.

The legislature passed a common carrier bus and truck law. The tax on these, which is 1 mill per passenger mile and 2 mills per freight ton mile, to be distributed equally between the State Highway Department and the counties.

FLORIDA

The Florida legislature repealed a former mill tax ad valorem for roads to meet Federal aid and appropriated the funds for this purpose out of the gasoline tax.

IOWA

Under a new law passed by the legislature the counties are authorized to issue bonds for roads and both principal and interest shall be paid from the primary road fund of the state—except that not more than the county's pro rata share by area may be set aside for this purpose. This law has already brought much activity among the counties and 24 counties have prepared to

call bond elections. All of this county work is under the approval and supervision of the State Highway Commission. The primary road fund, which consists of motor vehicle fees, Federal aid and a 1 2/3 cent gasoline tax, is now under the complete supervision of the State Highway Commission and is not allocated to the various counties as heretofore.

The gasoline tax was increased from 2 to 3 cents; all of the additional 1-cent increase goes to the primary road fund.

MARYLAND

The legislature of Maryland authorized a bond issue of \$2,125,000 for road construction and a bond issue of \$1,000,000 for the construction of highway bridges. These bond issues to cover the years 1927 and 1928.

MONTANA

The state legislature of Montana, following a vote of the people of the state, passed a law increasing the gasoline tax from 2 to 3 cents, and the entire fund derived from this tax will be used by the State Highway Department for the specific purpose of co-operating with the Federal funds in the construction of the Federal Aid highway system.

Previously the 2-cent gasoline tax was split three ways, 15% going to the State Highway Department, 55% to the counties, and 30% to the general fund of the state.

MICHIGAN

The Michigan legislature increased the gasoline tax from 2 to 3 cents. However, one-half of this increase is returned to the counties and cities.

The speed limit of 35 miles per hour was removed entirely, but the law provides that the driver of a car that causes an accident due to excessive speed is liable for prosecution.

The maximum of 10,000 pounds axle load on all state roads of gravel construction and 13,500 pounds on concrete roads was passed.

WASHINGTON

The state legislature of Washington in session appropriated \$23,362,360, all of which is to be expended under the direction of the State Highway Commission.

The legislature declared that the highway policy of the state shall be that all public highways within the state shall be free and open for public travel and that the state shall hereafter regulate all tolls collected for the use of any toll bridge on any state highway.

NEW JERSEY

A \$30,000,000 bond issue, a 2-cent gasoline tax and a greatly enlarged and changed state highway system are in brief the highway accomplishments of the state legislature this year. The act providing for the \$30,000,000 bond issue provides that the "moneys realized under the act, or so much thereof as shall be necessary, shall first be devoted to the building of bridges, tunnels and viaducts and the acquisition of rights of way."

In order to provide finances for a five-year construction program the legislature voted for the \$30,000,000 bond issue, which must be submitted to a referendum vote at the general election in November. The 2-cent gasoline tax went into effect July 1.



Transformation of new road near Colorado Springs—showing underbrush before clearing, clearing operation and finished highway.

The personal property tax on motor vehicles was abolished.

Strenuous efforts were made to allot motor vehicle fees to counties and municipalities, but every effort along this line was defeated.

NEW MEXICO

The state legislature of New Mexico increased the gasoline tax from 3 to 5 cents. Under the present law the gasoline tax was limited to state roads for maintenance. Under the new law the gasoline tax may be used for both construction and maintenance.

The legislature repealed the law of a poll tax road fund and also passed a bill authorizing the State Highway Commission to insure the employes of the highway department engaged in hazardous occupation, the premium for such policies to be paid out of the state road fund.

WEST VIRGINIA

The legislature of West Virginia authorized the reissue of road bonds to the extent of \$15,000,000. The present constitution provides that not over \$50,000,000 of state road bonds may be outstanding at one time, and there being \$35,000,000 now outstanding \$15,000,000 is all that could be authorized.

Gasoline tax was increased from 3½ to 4 cents; all of the gasoline money goes to state roads.

A joint resolution was passed submitting to the people of the state a constitutional amendment authorizing an additional state road bond issue of \$35,000,000.

TENNESSEE

The state legislature of Tennessee authorized the State Highway Department to borrow \$11,500,000 during the next two years in the form of short-term notes for the purpose of constructing new bridges, \$9,500,000

of this amount will be retired by the collection of tolls on eight specified bridges.

The State Highway Department was authorized to provide for reimbursement to the counties for highway bonds issued in the construction of state road projects.

MISSOURI

The Missouri state legislature enacted several bills affecting the work of the state in its highway improvement. The regular appropriation to pay interest on outstanding bonds and the issue of \$5,000,000 additional bonds was passed. A bus bill, making busses common carriers subject to regulation by the Public Service Commission as to rates, load, etc., and levying a tax for the purpose, was passed.

A bill was passed authorizing the construction of a state highway office building in Jefferson City, the cost not to exceed \$350,000.

A law was passed providing for a county highway commission to provide roads to connect with the state system.

Appropriations were made from the road fund for the relief of men permanently injured and of families of men killed in the performance of duties as employes of the highway department.

NORTH CAROLINA

The state assembly of North Carolina authorized an additional bond issue for highway construction of \$30,000,000.

The authorization now given the counties to loan money to the state for road building purposes has been suspended.

The Highway Commission was given definite and clear authority in the location of highways.

The State Highway Commission was authorized to operate ferries and toll bridges where desirable.

State Highway News and Comment

A total of \$58,000 will be expended on Loveland Pass during 1928. While this project does not show in the 1928 budget, there is a balance of the above sum to the credit of the project on the books of the highway department. Luke Smith, contractor, will resume work on the pass about June 1. It is estimated that the new road will be completed to the summit of the pass by the end of the construction season in October. Smith's contract calls for the building of four miles of new standard roadway. The new road is being constructed on a survey which calls for a maximum of 6 per cent grade.

With the completion of the Smith contract there will remain about nine miles of new road to build on the west side of the pass, down to a connection with the end of the old road leading up the pass from Dillon.

The construction of the Loveland Pass road is considered by engineers as one of the most important projects in the state. This will give a short-cut from Denver to western slope points during the summer months. In the early days the stage coaches used Loveland Pass on regular trips to Breckenridge, Dillon and Leadville.

At the present time there is a beautiful highway leading from Dillon over Fremont Pass, constructed by the Forest Service. This road connects with the Tennessee Pass highway, which will see further improvements during the coming construction season.

"There is \$58,000 available for the continuation of the Loveland Pass project," said Major Blauvelt, "and the work will be done by the same contractor who has built the road three miles beyond Silver Plume. This work will start as soon as the weather permits; that is, when the weather is warmer and the road crew can work without being in snow.

To Reach Summit in 1928

"It is confidently expected that the work this year will carry the road to the summit of Loveland Pass and that early next year it can be extended into Dillon, which will mean the virtual completion of the highway."

The \$58,000 available for this year's work has accumulated, there being no appropriation for this work in the 1928 budget. Rumors have spread over Colorado that the Loveland Pass project had "died," but this is emphatically denied by Major Blauvelt, who cites the proposal for continuing the work this year.

Mileage to West Reduced

The construction of this road will materially reduce the mileage between Denver and Leadville and a corresponding reduction in mileage to the western slope and southwestern Colorado.

Loveland Pass has figured in transportation schemes for many years. Originally it was suggested that the Union Pacific in constructing a railroad

across the country should come via Denver and cross the range by this pass. W. H. A. Loveland, pioneer railroad builder who gave the pass his name, had it figured in numerous railroad projects, including the present Colorado & Southern line up Clear Creek canon crossing here to reach Leadville and other points on the other side of the Continental Divide.

Scenic Grandeur Opened

The route follows the old stage and freighting road from Denver into Leadville, traversed in the early days by many thousands of persons. One of the old stage stations still stands, and there are abandoned mining towns and abandoned mines, each with its own romance, to intrigue the motorist. There is the Brick Pomeroy tunnel which that famous promoter of the pioneer days started with the intention of having a railroad built through the mountains and the cost of construction of the tunnel would be borne by the gold and silver taken out in drilling the great bore.

Plans are now being formulated for the use of the present Moffat railroad right-of-way for a highway route over Rollins Pass, as soon as the Denver & Salt Lake Railroad abandon the roadbed, through use of the Moffat tunnel. The route over Rollins Pass will be shorter than the Berthoud Pass road to the Middle Park area. The proposed road will be 300 feet higher than Berthoud, and is said to surpass the latter road in scenic beauty, because it reaches above timberline. It is said that a national hotel company is now negotiating for sites along the new route.

In the 1928 budget as approved by Governor W. H. Adams there will be expended \$292,000 on state projects. On

these projects the state stands 100% of the cost.

State highway field engineers are now working on surveys for the new road over Mosca Pass under the direction of P. C. Thurmond. He estimates that the new road will shorten the distance between Pueblo and the San Luis Valley approximately 40 miles. The new route will run in an easterly direction from a point near Mosca in the San Luis Valley over the pass to Gardner in the Wet Mountain valley, where it will connect with a splendid road to Rye and thence to Pueblo.

The new highway budget contains an item of \$40,000 for the construction of the road to the summit of the pass from Gardner, west. The plans of the department call for the participation of the Forest Service in the construction of 12 miles of road across the summit of the pass. There will remain about 20 miles of new road to construct on the west side of the pass. This will be carried to a conclusion in 1929, according to present plans.

In the early days Mosca Pass was the main artery of travel from the Pueblo district to the San Luis Valley. Gov. Adams made his first time into the valley over this road. It is said to be a nearly all-year route over the Sangre de Cristo range to the valley, besides shortening the distance between the valley and eastern Colorado.

The actual survey now being made by field engineers is 15 miles, extending from the edge of the San Isabel national forest to Gardner. A prior survey made by the government from the pass to where the present survey started may be used in the new construction program.

Work will be started on the first project as soon as plans can be approved by the Denver office. It will probably be by contract.



Concrete paved road through fruit-growing section near Palisade, in Mesa county, constructed with Federal aid.

The department also will make surveys this summer of a new road to be constructed between Stonewall and San Luis. This road will also cross the range. The new route which was dedicated by the advisory board at their November meeting, will connect with state road No. 12, which runs from Stonewall, through Primero to Trinidad on the eastern slope. It will connect with state road No. 159, at San Luis in Costilla County on the west slope.

Both of these projects will be constructed without Federal Aid funds, except where they touch the national forests, when the government is expected to participate through the Forest Service department.

A contract has been awarded to Pople Bros. for the gravel surfacing of five and one-half miles of State Road No. 17 between Antonito and La Jara. Their bid was \$29,000.

J. Fred Roberts & Sons have been given the contract for the paving of four miles between Palmer Lake and Monument on State Road No. 1. Their bid was \$114,000.

H. C. Lallier Const. Co. was low bidder on fourteen miles of paving between Tomah and Palmer Lake on the Denver-Colorado Springs highway. The Lallier bid was \$292,000.

A contract has been given to Winterburn & Lumsden for one mile of grading west of Glenwood Springs, on a bid of \$42,000.

There is one stretch of road to be finished this summer in which Denver motorists are especially interested. This is the highway into Baileys. This route takes the car driver through Turkey Creek canon via Conifer and Shaffer's Crossing and is a real boulevard. It is one of the favorite one-day motor trips out of Denver. J. Fred Roberts & Sons are now completing the road into Baileys, eliminating one of the worst stretches of the road from Denver into the South Park country. From Baileys the road leads over Kenosha Pass to Buena Vista, one of the scenic routes of the Rockies.

The largest bridge building program of several years will be carried out in Fremont County this year. The bridge near the county farm over Four Mile Creek will be rebuilt so that it is on a straight line with the road, eliminating the sharp curves at both ends. The county's longest bridge, 294 feet, will be re-floored. It spans the Arkansas River at the MacKenzie crossing. New bridges will be built at Brush Hollow dam on the Canon City-Colorado Springs highway and in the Hardscrabble district on the Canon City-Siloam road.

Pueblo and Colorado Springs may be brought two or three miles closer together with the paving of the main highway between the two cities. The route will be straightened to conform to new surveys, eliminating grade crossings and dangerous curves.

Approximately ten miles of the highway between the two southern Colorado cities will be paved this year, five miles north of Pueblo and five miles between Fountain and Colorado Springs. By 1930



Dotted lines show proposed new road over Mosca Pass and route from Stonewall to San Luis. Construction work on these new routes will start this summer.

it is planned to have the entire distance paved.

Travelers over the Victory Highway during the coming season will note two big improvements under way. Provision has been made in the 1928 budget for the construction of projects west of Kremmling and Craig. The state will construct 12 miles of road on a new location on Muddy Pass, connecting with projects previously completed west of Kremmling. For a ten mile project west of Craig the department will expend approximately \$60,000. As funds become available the eighty-mile stretch from Craig to the Utah line will be improved. It is said that this piece of road is now the least improved of the Victory Highway from Washington to the Pacific coast. On the two projects mentioned above the state will expend \$160,000. Engineers are now drafting the plans for the two projects and contracts will be let as quickly as possible.

Colorado's pleasure car license plates for 1929 will have white figures on a maroon background, it has been decided. They will be made at the Canon City penitentiary during the next few months.

Otero County recently joined with other southern Colorado counties in dispensing with its traffic officer. W. H. Harris, who

has patrolled Otero County roads for several years, was retired March 1. The county commissioners announced that with the state taking over control of federal highways they do not desire to patrol the federal roads at the county's expense.

A new highway into the Beulah Valley is being considered by the Pueblo county commissioners. A decrease in the grade and the construction of a new bridge over the north St. Charles are principal changes in the road. The work will cost about \$30,000.

Surfacing of the scenic mountain highway through the San Isabel national forest between Beulah and Rye will be completed this year by the Forest Service and Pueblo County. The Forest Service will surface 12 miles and the county will take care of five additional miles. During the past four years the road has been entirely rebuilt, with easy grades predominating.

Douglas Stewart has taken over supervision of state maintenance work in District 4, succeeding Lewis Swink of Rocky Ford. The revised district includes Las Animas, Huerfano, Custer, Baca, Bent, Crowley, Prowers, Otero, Kiowa, Pueblo and Fremont Counties.

REVISION OF FEDERAL AID LAW HELD NECESSARY TO COMPLETE ROAD SYSTEM

THE United States government should bear a reasonable portion of construction costs on necessarily expensive highways in the Federal Aid system, declare officials of the American Road Builders Association.

This association is advocating the passage of H. R. 5518 introduced by Congressman Colton of Utah, which provides for the elimination of the limitation of Federal participation per mile of highway under certain specified conditions. This measure seems to have the unanimous approval of all the states and undoubtedly will receive favorable consideration.

At the present time the government is required to limit its aid to fifty per cent of the total cost, not in excess of \$15,000 per mile. State road officials declare this allowance is entirely inadequate where topographical or drainage conditions are unfavorable to cheap construction. The Federal Aid law should be revised to permit the Bureau of Roads to share equally with the states the expense of construction under these conditions.

"There are certain sections of the United States where the construction of vitally needed highways may not be carried out under the \$15,000 limitation," say American Road Builders Association officials. "One of the most important stretches of highway in the United States, the Durango-Silverton-Urday, a forest road in Colorado, cost more than \$17,000 per mile for grading alone.

"This road serves as an entrance to the San Juan basin, and the Mesa Verde National Park.

"The legal clause forbidding the Bureau of Public Roads to bear more than \$15,000 of the cost of road construction is unfair. The Federal government should bear fifty per cent of the costs where traffic or topographical conditions make the \$15,000 limitation inapplicable."

Congressman Colton also has introduced a measure providing for a 100 per cent participation on the part of the government in certain cases where it is difficult, if not impossible, to secure local funds. This bill does not provide for an increased allocation to the state, but makes provision that in the case of a 100 per cent Federal participation additional funds shall be spent by the state on some other project.

A number of the western states have objected to the latter clause. It is argued that in many cases the lands through which the roads in the West must pass are not taxable by the state and are virtually uninhabited; and in such cases it is only fair that the entire cost of the roads constructed in such cases be borne entirely by the government.

Congress is urged to immediately revise this legislation to permit construction of roads by its Bureau of Public Roads entirely at government expense.

Millions of acres of valuable agricultural lands may be reclaimed by the construction of these roads by the national government.

It has also been recommended to congress that the appropriations for highway construction in the National Forest areas



Congress has been asked to pass a law requiring the government to pay the full cost of roads through isolated sections such as pictured above in Colorado.

be increased from \$7,500,000 to \$12,500,000 per year.

These measures have the unanimous support of every motorist organization in the west, such as Rocky Mountain Motorists, Inc., Motor Club of Colorado, the California State Automobile Association, who have sent delegates to Washington to advocate their passage.

There is no doubt but that Federal Aid will be continued. Every person appearing before the House Committee on Roads not only urged the continuance of these appropriations, but many suggested that they be materially increased.

A new oiling process which has never been used in Colorado, is to be used by the state and federal road departments in improving more than five miles of highway between Antonito and Alamosa. The new road will form a shorter route between Alamosa and Antonito, connecting with the federal highway over Cumbres Pass, the main route to New Mexico.

Completion in 1927 of the 90-mile hard surfaced highway between Gallup, N. M., and Shiprock, N. M., known as the million dollar highway of Navajo land, is heralded by southwestern Colorado towns as the greatest achievement since railroad facilities were provided. The road was built by federal aid across the Navajo reservation. The road has opened markets to the south for southwestern Colorado. It represents the improvement of the longest stretch of dirt road between Los Angeles and Denver. The road will stimulate tourist travel into Colorado for diversion over the Silverton-Urday road to Mesa Verde and other scenic attractions.

El Paso County highways will be improved this year by the Colorado Springs Automobile Club which will plant 12,000 young trees along the roads. The trees will be planted where farmers can care for them until they are safely started.

Colorado is improving four miles of the main state highway south from Durango to the Colorado-New Mexico state line by surfacing it with gravel at the cost of about \$32,500. The road is the main road between Durango and Gallup, N. M., and is the only outlet of the San Juan basin of Colorado during the winter months.

Only two railroad grade crossings will remain between Salida and Leadville after the 1928 road building season in Chaffee County. The new road will follow the survey made two years ago between Buena Vista, McCune and Nathrop. It will follow the abandoned Colorado & Southern railroad right-of-way.

The rebuilt road will eliminate two obsolete bridges with dangerous approaches, one grade railroad crossing and what is known as Switzer lane, which is frequently difficult from Trout Creek overflows.

BAD ROADS, NOT GOOD ROADS, MEAN HIGH TAXES

Benjamin Franklin is credited with saying, "We are taxed twice as much by our idleness, three times as much by our pride, and four times as much by our folly as we are by our government." He must have been thinking of the folly committed by the poor fellow who votes against good roads to avoid a little increase in taxes. The loss we suffer as a direct result of bad roads is a tax fully four times as great as the tax necessary to build good roads.

PAVING SWELLS, BLOCKS POP OUT

Wooden paving blocks on Boylston Street at Arlington Street swelled up during the heavy rain and formed numerous pyramids in the paving, some of them rising to two feet. In several places the pressure was so great that blocks were "popped out" of the street, making a loud report. Police placed lanterns at the dangerous points.—Boston Post.

The
CLETRAC
"40"

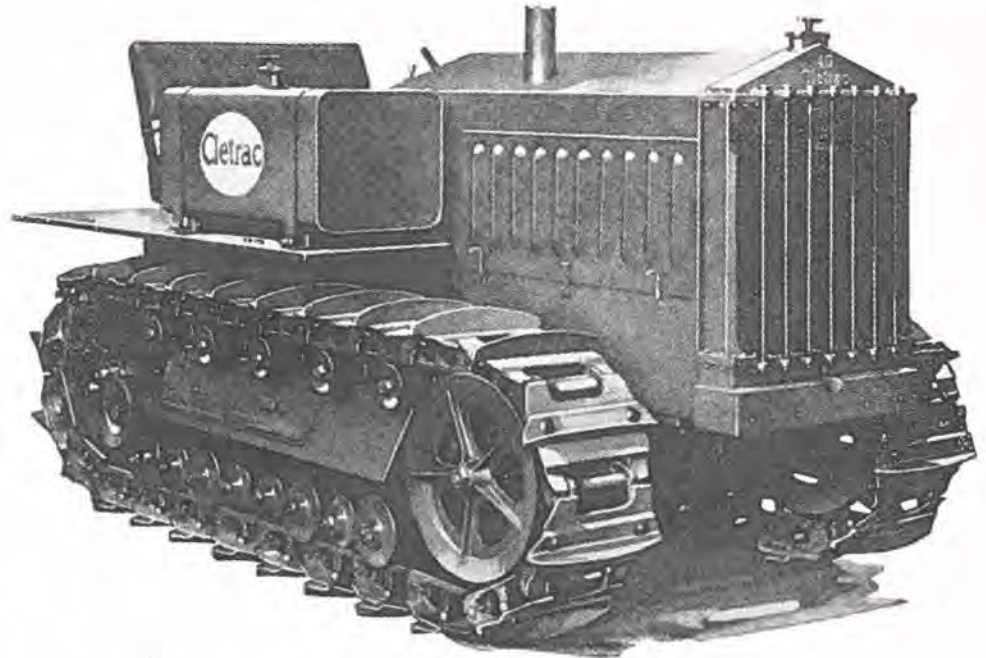
Another CLETRAC Achievement!

The enthusiastic response to the introduction of CLETRAC 40 shows clearly that this new CLETRAC achievement is destined to be another great CLETRAC success!

A heavy-duty job with a wide margin of reserve power beyond its standard rating, this new CLETRAC is certain to interest every user of road-building, road-maintenance, earth-moving and general industrial equipment.

It's a beauty to look at—and a marvel in action!

Price, \$3985 f. o. b. factory.



WITH the advent of the "40", the Cletrac line now embraces the entire scope of power requirements for building and maintaining roads and for municipal and industrial service. Here—in a single line—you are assured of finding the proper tractor model for most efficient and economic handling of every specific power job.

In this latest model, as in all others, there is the characteristic quality, ruggedness and advanced engineering that has placed Cletrac in the first rank in the industry. Notable power capacity, positive traction, speed, "One-Shot" oiling, fuel and oil economy, long life—these and a score of other features give it a value comparable only to other Cletracs.

*The Complete-Line
Catalog Now
Ready for You!*

This attractive, new book gives you full information on the entire line of CLETRAC CRAWLER TRACTORS. It contains full specifications on all models—the "20", "30", "40" and the super-powered Cletrac "100". For up-to-the-minute facts regarding these record-making crawler tractors, get this book without delay.

Liberty Trucks & Parts Co.
Sugar Building, 16th and Wazee Streets •• Denver, Colorado

The Inspector at the Mixer

Mixing the concrete and placing it on the subgrade is, perhaps, the most important item in the construction of a concrete pavement and is the activity which requires the most careful attention of the inspectors. There are numberless items to watch. Some are listed here:

The subgrade must be low enough to give the full thickness of the slab at all points.

All ruts made by the mixer or the trucks must be smoothed out.

Earth used to bring low spots to grade must be tamped carefully until it is as firm as other parts of the subgrade.

Forms must be in good alignment and set at the proper grade with enough bearing to hold them rigid while the concrete is being placed and finished. It is well to watch the forms behind the mixer and, if even the slightest displacement is observed, to insist that they be set more securely in the future.

It is better to have the subgrade thoroughly wet a day ahead, rather than just before placing concrete. If sprinkling is done immediately ahead of the mixer, care must be taken that the stream of water does not throw earth on the edge of the concrete. Even a slight covering of dirt or dust will cause a plane of weakness which will result in a ragged crack.

When the batch is placed on the subgrade, shovelers must be careful not to get earth mixed with the concrete.

Workmen must not walk on the soft concrete after it has been struck off. Boot tracks are usually filled with "soup" which will shrink when setting and cause

a soft spot which will readily develop a hole.

The surface of the concrete must be watched constantly for high and low places. Low spots are often filled with water and are, therefore, hard to detect.

It is important that concrete which is shovelled against the forms is not deficient in mortar to prevent the edges from being pitted with voids. If workmen will work the concrete with the back of the shovel toward the forms, it will help in getting mortar at the edge of the slab.

The steel must be covered sufficiently.

If the mixer is stopped for a period too short to require a construction joint, the old and new concrete should be worked together when the mixer is started again.

Too much mixing water reduces the strength of the concrete. It is important that slump tests be made often enough to insure a uniform consistency, dry enough to meet the requirements of the specifications.

The mixing time must be adhered to rigidly.

Constant vigilance is the price of a good job and it is at the mixer that the inspector has the best opportunity to demonstrate his worth. No detail is unimportant for it is the successful accomplishment of each operation that results in a creditable pavement.—Concrete Highway Magazine.

Work has been started on rebuilding the south span of the steel bridge over the Arkansas River, near Fowler. The

work will be carried out so that light traffic can be continued. The community has been served by a temporary span of the bridge since heavy rains and high waters swept the bridge away last summer.

GOOD ROADS

When a man pays a good road tax he is buying something with his money.

Good roads decrease the cost of hauling everything.

Good roads permit the choice of time for marketing products so as to get the best price.

Good road building furnishes a useful and profitable market for large quantities of materials that would otherwise be without value.

Good roads allow the hauling to be done when other farm work is impossible.

Good roads assist co-operative buying and selling.

Good roads make possible a rural mail delivery.

Good roads make for better churches and better schools.

Good roads promote better living conditions in the country.

Good roads tend to unify our population by taking the town people to the country and the country people to the town.

Good roads make for a broader outlook and better citizenship in every phase of life.—Pacific Street and Road Builder.



New home of the MACK in Denver, built for the sole purpose of rendering service to MACK owners.

Performance Counts—

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SOME OF OUR CONTRACTOR OWNERS

- Blanchard Bros. Const. Co..... Denver
- Builders Brick & Fuel Co..... Butte
- M. E. Carlson, Gen. Contr..... Denver
- F. E. Collison..... Billings
- C. & F. Teaming Co..... Butte
- Gordon Const. Co..... Denver
- Ed. Honnen..... Colorado Springs
- Hagen Fuel & Feed Co... Colorado Springs
- Robert Kehrwald..... Billings
- H. C. Lallier Const. Co..... Denver
- Lambie-Bate Const. Co..... Denver
- George O'Brien..... Butte
- Pople Bros. Const. Co..... Trinidad
- Platt Rogers Inc..... Pueblo
- Tobin & Maloney..... Gallup
- R. G. Woodward..... Billings

MACK International Motor Truck Corp.

585 SOUTH BROADWAY

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THE MOST
ECONOMICAL OIL
FOR ANY CAR

Quaker State Motor Oil

Costs a little more by the gallon than ordinary oils, but measured by miles run, it is the cheapest oil you can buy.

THERE'S AN EXTRA QUART OF LUBRICANT IN EVERY GALLON

QUAKER STATE is free from the non-viscous content that makes up 25%, or more, of the volume of ordinary oils. This undesirable matter is removed at the refinery by a special exclusive SUPER-REFINING process—it doesn't leave it for your engine to struggle with.

FOR ANY CAR QUAKER STATE WILL PROVE AN ECONOMY NOT ONLY IN YOUR YEARLY EXPENDITURE FOR OIL, BUT EVEN MORE IN IMPROVED RUNNING AND FREEDOM FROM WEAR AND REPAIRS.

We are Colorado and Wyoming Distributors

Sommers Oil Co.

DENVER, COLORADO

State Highway Department Financial Statement, February 29, 1928

BALANCE, DECEMBER 1, 1927

State Treasurer	\$1,334,675.24
County Time Warrants	4,439.15
Total Balances ..	\$1,339,114.39

RECEIPTS

Half Mill Levy	\$ 84,697.81
Internal Improvement	28,600.00
Gasoline Tax	593,354.93
U. S. Government	224,492.45
Highway Receipts ..	18,206.33
Total Receipts ..	\$ 949,351.52
Total Balance and Receipts	\$2,288,465.91

DISBURSEMENTS

Federal Aid Projects	\$ 228,808.00
State Projects	74,564.11
Maintenance	14,518.65
Maintenance Equipment and Repairs	4,438.41
Property and Equipment	1,911.23
Surveys	929.12
Administration	25,335.81
Road Signs and Traffic Census	1,270.60
Total Disbursements	\$ 351,775.93

BALANCE, FEBRUARY 29, 1928

State Treasurer	\$1,916,575.83
County Time Warrants	20,114.15
Total Balances ..	\$1,936,689.98
Total Disbursements and Balances	\$2,288,465.91



100 ft. Riveted Low Truss Span, Dillon, Colo.

Bridges and Structural Steel

For every purpose

Plans and specifications gladly sent upon application

Minneapolis Steel & Machinery Co.
 Denver Office, 15th & Wazee
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SUPPLIES
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RIVETED
STEEL
PIPE

THOMPSON CORRUGATED CULVERTS are made of the highest quality rust-resisting steels obtainable and are guaranteed to meet all Federal, State and County specifications.

WEIGELE RIVETED STEEL PIPE has been the standard for Irrigation, Power, Mining and Municipal Water Works for more than forty years.

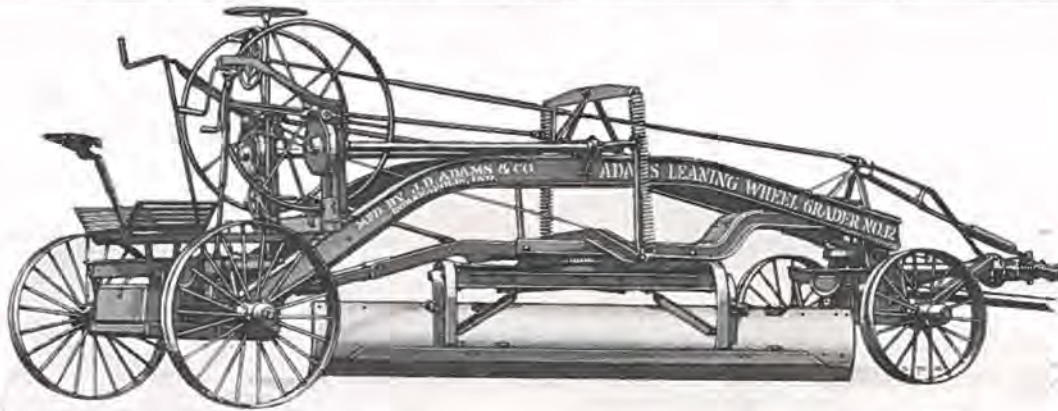
FOR LOW INITIAL COST, long life, low maintenance and continuous operation under severe working conditions, specify our products.

Write today for prices on your specifications.

THE THOMPSON

▲ **MANUFACTURING CO.** ▲

3019 LARIMER ST. DENVER, COLO.



Outstanding Improvements in ADAMS Graders

IMPORTANT improvements have been made in Adams Graders which add to their efficiency, easy operation, and long life. Most important of these are:

Machine-cut, enclosed lift gears on all models. Machine-finished lift-arm bearings, ball and socket lift-links, and ball and socket connections at the moldboard. Alemite lubrication. All joints adjustable for wear, eliminating lost motion in the blade control.

Other popular features of Adams Graders are adjustable leaning wheels, patented "one-piece" rear axle, equalizing lift springs, spring platforms, etc. All models furnished with machine-finished plain bearings or Hyatt roller bearings as desired. Write for the new Adams catalog No. 28—just issued.

Get our new catalog describing all of these features before you buy

ELTON T. FAIR CO., 1611 WAZEE ST., DENVER, COLO.

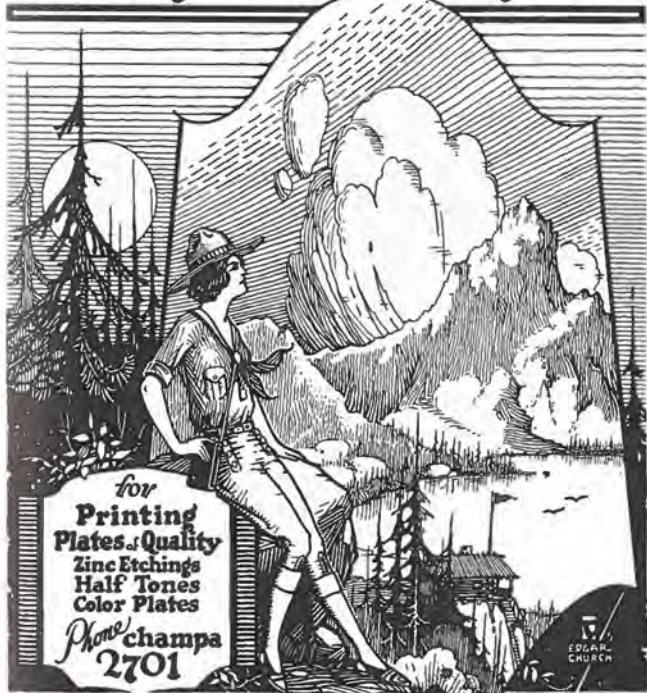
Complete Stock Carried for Immediate Shipment

ADAMS ADJUSTABLE LEANING WHEEL GRADERS

"The Original - A Proved Success Since 1885"

R-100

ENGRAVING SERVICE



Seeleman-Ehret

1908

1928

Twenty Years of Testing Service—

Since 1908 this concern has been engaged in the testing of materials on the largest construction projects in this territory. These projects include the Pueblo Conservancy District; Nederland dam; Moffat tunnel, and all concrete roads in Colorado, as well as nearly every large building constructed in Denver during the last 20 years.

We make a specialty of concrete mixture designs and testing of structural building materials.

If you have a concrete problem consult us.



THE PIERCE TESTING LABORATORIES, INC.

Established 1908

730 Nineteenth Street

Denver, Colo.

New Highway Equipment and Materials

The year of 1928 started right for the Wilson Machinery Co., according to Harry P. Wilson, president. The following is a summary of the sales of equipment made by the firm during the month of February: One No. 501 Koehring dragline; one 10-ton Monarch tractor; type O Buckeye crane; Ord finishing machine; one No. 11 C. H. & E. triplex pump; one 10-20 Austin motor grader; one 12-ft. and one 10-ft. Mammoth Austin leaning wheel graders; two Bay City truck winches; four Heil bodies and hoists; Sullivan portable air compressor; one Little Western grader; five dragline buckets; one clam shell bucket; two Western-Athey steel crawler tread dump wagons; one Ensley concrete tower outfit; one No. 5 Koehring mixer and an order of Blaw-Knox steel houses.

The Allis-Chalmers Mfg. Co. of Milwaukee, Wis., one of the largest manufacturing and engineering organizations in the world, has purchased the Monarch Tractors Corp. of Springfield, Ill. Announcement of the merger was made by Gen. Otto H. Falk, president of the Allis-Chalmers Company. He stated that the Monarch business has been purchased in its entirety, and the tractors will continue to be built in Springfield.

The Allis-Chalmers is a 100-million dollar corporation. The Monarch company will be operated just the same as at present under the same management, as a subsidiary concern to Allis-Chalmers. The Wilson Machinery Co. are Colorado agents for Monarch tractors. W. G. Schaeffer of the latter firm, has just returned from a three months' stay at the Monarch factory, and is prepared to see that the Monarch owners in this territory receive the service that they require.

A new catalog of the Russell line of road equipment is now being distributed by the Herbert N. Steinbarger Co. of Denver. A feature of the 1928 Russell line is a newly designed portable one-unit crushing and screening plant designed for county and state gravel surfacing projects. Numerous important improvements also are noted on the Russell grader line, including enclosed gears and heavier frames. Road officials interested may have one of the catalogs for the asking from the Steinbarger Co.

Seven tractors the first seven days in March—that was the record of the Liberty Trucks and Parts Co. on Cletrac Crawler tractors this month, according to Richard Carlson, general sales manager. The sales included the entire Cletrac line—starting with the "W," one "twenty", one "thirty", one of the new "forties" and a "100".

The "100" was purchased by A. R. Mackey, Greeley contractor, and will be used to pull an elevating grader, on a 16-mile project which Mackey is constructing for the state between Roggen and Wiggins.

J. D. Adams & Company have just issued a new catalog on their 1928 line of Adams Adjustable Leaning Wheel Graders and other road building and maintenance machinery.

This new catalog should be of particular interest to road builders because it not only details some important improvements made in Adams Graders but introduces several new machines brought out the first of this year. One of the most important improvements which has been applied to the entire line of Adams Leaning Wheel Graders, is the use of machine-cut, enclosed lift gears which run in oil. An exclusive feature of this refinement is the use of adjustable end thrust bearings in connection with the lift worms which keep all lost motion out of the gears throughout the life of the machine. Another feature is the use of machine finished ball and socket joints throughout the blade control, including moldboard connections and pitch adjusting links, all of which are adjustable for wear so that there need be no lost motion any place in the blade control throughout the life of the machine.

The new machines introduced are an Adams Motor Grader with McCormick-Deering 10-20 Tractor, a new 7-foot blade scarifier-grader, weighing 3,340 pounds, and a new 2-horse patrol or maintainer with 8-foot blade and weighing about 1,400 pounds.

In addition to the Adams line of Leaning Wheel Graders running from 6½ to 12-foot blade lengths, the catalog includes the Adams Road Maintainer No. 6 with 40 feet of blades, a line of horse patrols, elevating graders, dump wagons, drags, plows, drag scrapers, fresnos, wheeled scrapers, etc. A copy will be sent free and post paid to anyone interested in road work. Address Elton T. Fair Company, Denver, Colorado, distributors.

H. F. Knox, district sales manager of the Austin-Western Road Machinery Co., was a Denver visitor the first two weeks in March. He was the guest of the Wilson Machinery Co., local agents for the Austin-Western line.

"We are getting away to a great start in 1928," said George Meffley, general sales manager of the H. W. Moore Equipment Co. "Our sales during the month included four Cedar Rapids one-piece crushing and screening units to county road organizations. On the Galion line of graders we shipped out a car load and a half. In fact our sales were brisk all along down the line to fresnos. It looks like a great year in road construction and maintenance."

A glance over the Galion catalog reveals a lot of new improvements on the Galion line of graders and maintainers. These catalogs are now being distributed to road officials by the Moore concern.

The Speeder Machinery Corporation, of Cedar Rapids, Iowa, manufacturers of the Speeder one-half yard convertible shovel, have issued a new 32-page catalog showing many cases in which this machine has been used as a power shovel, crane, dragline, skimmer, or trench pull-shovel, handling all types of digging. Not only are these installation pictures worth examination, but the catalog contains full data and specifications of the machine as well, and such information is assembled in a way that should prove helpful to the prospective purchaser.

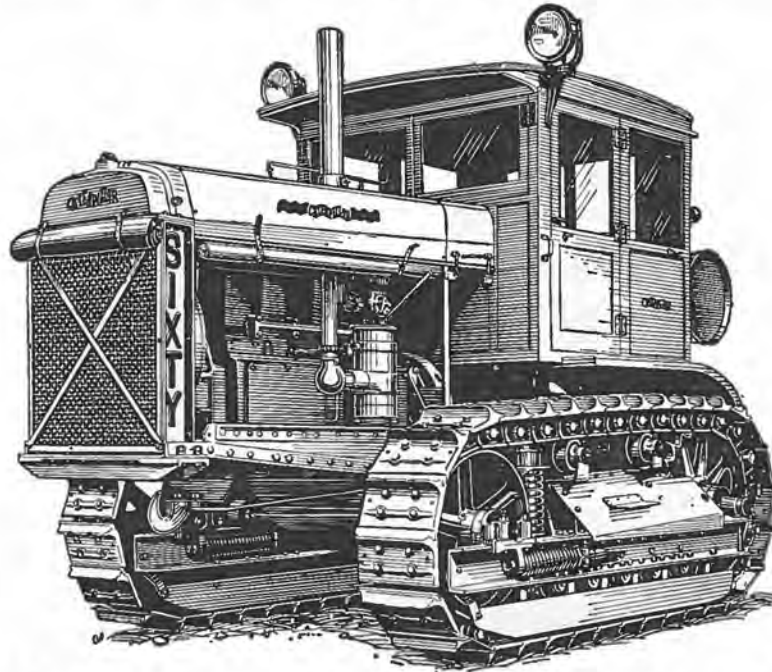
Chain-Belt Co., Milwaukee, Wis., devotes its latest catalogue No. 148 mainly to a description of its 27-E paver stressing the speed and accuracy of this machine. Illustrations are given of the machine details, such as the control lever, the power plant, cooling tank, chains, the bearings, countershafts, the rollers, etc. Specification tables are included as well as operating and dimensional diagrams.

Indiana Truck Corp., Marion, Ind., has issued a booklet containing a list of the individual concerns, corporations, state highway departments and municipalities owning fleets of trucks. Several pages of illustrations of these trucks are given.



A new portable oil drilling machine recently introduced in Colorado oil fields by the Mack Truck Corp.

CATERPILLAR
REG. U.S. PAT. OFF.



“Caterpillar” Tractors Have Made a Record for Highway Construction and Road Maintenance

Every Road Man and every Road Contractor that has used “CATERPILLAR” Tractors has a story of “CATERPILLAR” dependable performance and can produce figures showing economical operation and low cost of maintenance.

In the Denver territory there are 322 “CATERPILLAR” Tractors used for road construction and road maintenance.

This does not include the many “CATERPILLARS” used for agriculture, for logging, for mining, and in the oil fields.

**THE “CATERPILLAR” HAS NO SUBSTITUTE
IT IS AN ACCOMPLISHMENT**

In every field of activity where tractive power can be used it has been profitably employed.

**USE A “CATERPILLAR” FOR BETTER, QUICKER, CHEAPER
ROAD WORK**

Clinton & Held Co.

1637-1643 Wazee Street

DENVER, COLORADO

Canon City Mountain Playgrounds

(Continued from page 11)

than eight miles of these canons whose walls rise on either side to a height of from 100 to 300 feet. The Giant Monolith, over 100 feet in height, is one of the most remarkable pillars of the kind known. Roads, camp sites and trails have been built by voluntary labor and will be still further improved until this park will be one of the best and most accessible mountain parks in the state.

The Phantom Canon highway connecting Canon City with Cripple Creek brings the world's greatest gold camp within a few hours' drive from Canon City. This highway is sometimes called the "Million Dollar Highway," for it is built along the old railroad grade of the Florence and Cripple Creek railroad which company spent that sum in constructing the grade. The scenery through the Phantom Canon is surpassingly beautiful and in the summer time is a favorite resort for motorists and for picnic parties.

There are enough one-day scenic drives out of Canon City to please and entertain the visiting motorist for many weeks. The old Ute Indian burying ground in the Greenhorn mountains only a few miles away is full of interest and mystery. Temple Canon, a wonderful grotto, branching off from Grape Creek Canon, is a weird and interesting place. It is a natural amphitheater and can be entered only through a narrow and somewhat difficult passage. Temple Canon is the scene of some interesting and fantastic Indian legends. It was visited once by the novelist Helen Hunt Jackson.

The canons of Canon City have been the Mecca of geologists from all parts of the country. Every summer groups of college students from various educational institutions visit these formations and carry on extended observations. The formations in Grape Creek Canon and the Royal Gorge are especially attractive to the student of geology. These canons having been at one time the border of an inland sea, they are rich in fossil remains. In Garden Park are the famous fossil beds from which have been dug the fossilized bones of prehistoric monsters by the train load.

PLANS SUBMITTED FOR APPROVAL TO U. S. BUREAU OF PUBLIC ROADS

Proj. No.	Length	Type	Location
F.A.P. 2-R #7	1.224 mi.	Pav't & R. R. Grade Separation	South of Aguilar
F.A.P. 147-A	15.896 mi.	Gravel Surfacing	South of Cortez
F.A.P. 253-C	4.502 mi.	Gravel Surfacing	West of Milner
F.A.P. 262-D	1.764 mi.	Gravel Surfacing	West of Walsenburg
F.A.P. 296-C	6.606 mi.	Gravel Surfacing	South of Pueblo

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
F.A.P. 2-R #8	1.5 mi.	Pavement	Aguilar
F.A.P. 144-C	4.0 mi.	Gravel Surfacing	Northwest of Fort Collins
F.A.P. 154-A	2.0 mi.	Gravel Surfacing	South of Buena Vista
F.A.P. 208-B	0.5 mi.	{ Gravel Surfacing & Overhead } { R. R. Crossing }	Clifton
F.A.P. 266-D	5.0 mi.	Gravel Surfacing	South of Bondad
F.A.P. 271-C	3.0 mi.	Gravel Surfacing	West of Portland
F.A.P. 272-D	1.0 mi.	Pav't & R. R. Grade Separation	Manzanola
F.A.P. 275-A #2	0.2 mi.	Pavement	Sedalia Connection
F.A.P. 282-E	6.0 mi.	Gravel Surfacing	North of Meeker
F.A.P. 282-F	3.0 mi.	Gravel Surfacing	South of Craig
F.A.P. 282-H	5.0 mi.	Gravel Surfacing	North of Rifle
F.A.P. 286-C	5.0 mi.	Pavement	North of Greeley
F.A.P. 287-A3	4.0 mi.	Pavement	West of Fort Morgan
F.A.P. 288-A3	4.0 mi.	Pav't & Overhead Crossing	Northeast of Brush
F.A.P. 277-C	5.0 mi.	Pavement	North of Pueblo
F.A.P. 290-C	0.5 mi.	Bridge	North of Lamar
F.A.P. 292-B	3.5 mi.	Graded & R. R. Grade Separation	South of Minturn
F.A.P. 295-D	2.5 mi.	Gravel Surfacing	North of Antonito
F.A.P. 298-B	4.0 mi.	Gravel Surfacing	North of Pagosa Springs

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1928

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj No
2-R5	Bet. Trinidad and Aguilar	1.959 mi.	Paving	W. A. Colt & Son	\$ 72,122.50	30	2-R5
2-R No. 6	South of Aguilar	2.75 mi.	Pavement	W. A. Colt & Son	93,000.00	9	2-R No. 6
144-B	Northwest of Fort Collins	3.201 mi.	Gravel Surfacing	White & LaNier	44,000.00	10	144-B
145-A	West of Glenwood Springs	3.807 mi.	Gravel Surfacing	Winterburn & Lumsden	53,227.90	94	145-A
145-B	West of Glenwood Springs	1.051 mi.	Surfacing	Winterburn & Lumsden	42,389.72	0	145-B
210-B2	De Beque-Grand Valley	7.507 mi.	Gravel Surfacing	Fred Kentz	37,475.00	31	210-B2
247-C	Swink	0.8 mi.	Conc. Pav. & R.R. Underpass	J. Finger & Son	62,559.58	54	247-C
254-C2	S. W. of Hot Sulphur Springs	Superstr. of Bridge & Approaches	Northwestern Constr. Co.	48,203.50	66	254-C2	
254-D	Parshall-Hot Sulphur Springs	3.013 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	37,124.18	94	254-D
258-D	Iola-Cebolla	4.426 mi.	Gravel Surfacing	H. C. Lallier Const. Co.	52,739.80	99	258-D
258-E2	Cimarron-Cerro Summit	1.487 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	32,877.70	0	258-E2
258-F	Gunnison-Sapineto	5.689 mi.	Surfacing	Hinman Bros. Const. Co.	100,968.50	0	258-F
266-C	Durango and N. Mex. State Line	2.401 mi.	Surfacing	Salle Const. Co.	32,499.80	0	266-C
275-C3 E2 G3	Palmer Lake-Pring	4.602 mi.	Concrete Paving	J. Fred Roberts & Sons C.C.	114,079.65	0	275-C3 E2 G3
275-E	North of Monument	0.925 mi.	Grading and Underpass	F. L. Hoffman	41,905.20	87	275-E
275-F1	Castle Rock-Larkspur	10.303 mi.	Grading	J. Fred Roberts & Sons	132,679.00	100	275-F1
275-F3 G2	Temah-Palmer Lake	12.894 mi.	Concrete Paving	H. C. Lallier C. & E. Co.	292,309.95	1	275-F3 G2
279-D	Morrison	0.264 mi.	Paving	M. E. Carlson	23,266.80	76	279-D
279-E	Schaffer's Crossing-Baileys	3.243 mi.	Grading	S. M. & S. J. Feely	54,305.60	100	279-E
279-F	North of Baileys	3.444 mi.	Graded	J. Fred Roberts & Sons	126,000.00	6	279-F
282-D	North of Meeker	2.864 mi.	Gravel Surfacing	Winterburn & Lumsden	42,155.00	95	282-D
287-D1	Two mi. E. of Kersey on S. H. 2	0.921 mi.	Grading	White & LaNier	14,046.40	0	287-D1
288-A2	Bet. Merino and Brush	9.741 mi.	Paving	Edw. Selander	245,043.50	50	288-A2
292-A	North from Minturn	6.417 mi.	Grading	H. C. Lallier Constr. & Eng. Co.	92,571.80	80	292-A
295-C	La Jara-Antonito	5.284 mi.	Surfacing	Pople Bros. C. C.	29,414.60	0	295-C
297AR	Northeast of Palisade	2.848 mi.	Surfacing	O. J. Dorsy	15,043.00	99	297-AR
300A	Bet. Chattanooga & Red Mt.	2.277 mi.	Grading	Winterburn & Lumsden	59,480.80	20	300-A



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Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
 Denver, Colorado

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 State Highway Engineer.

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10 CENTS A COPY. \$1.00 A YEAR.

Our Cover Picture

Yes, we have roads that reach the highest peaks: also some that pierce the deepest canyons. On the cover of this month's issue of **COLORADO HIGHWAYS** we show a stretch of road looking up Ute Pass, being a part of the Ocean-to-Ocean highway. And, we'd say it's some smooth road—whadda you think? Tell your friends in the east.

Photo courtesy Denver Tourist Bureau.

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Good Roads Comment

Good Roads Show in Denver

Why not a Mid-Western Road Show in Denver?

We have road problems in this section unlike any other in the country. Because of this fact many pieces of equipment used in the mountain territory must be built to order.

So wouldn't it be interesting to road officials of the several mountain states to have a road show of our own?

There could be a road school conducted in connection with the show. Engineers could come to Denver and discuss their problems. Maintenance men could get together and exchange ideas. Classes in tractor operation and upkeep might be given.

An invitation could be extended to the county road officials of the mountain states to visit the show, more especially the commissioners to Colorado, New Mexico and Wyoming. We believe they would be glad to come.

The equipment displays could include nearly every type of equipment on the market today. This equipment could be shown under actual working conditions. Nearly all of the pieces of machinery are now carried in stock by the Denver dealers.

The editor of Colorado Highways would like an expression from those interested in the suggestion. The show could be held either in the fall or early spring.

World Highways

A few years ago any man who predicted a network of improved highways and broad paved roads reaching over the country to every state in the Union, with persons traveling thousands of miles in automobiles in safety and comfort as is the case today, would have been called visionary, if not actually crazy.

Now the tourist and the traveler can go almost anywhere in the United States on rubber tires over good roads. The Federal Government and every state have been active in a big road-building program. Yet this is by no means the end. The United States isn't the only country that is constructing highways. The time is coming when practically the whole world will be opened to the motorist.

Mexico now has a bureau of roads, the director of which was recently in this country conferring with federal and state authorities concerning the development of roads in that country. A time is foreseen when a network of highways will open Mexico's resources and tourist attractions to motorists.

A British baronet, Sir Abe Bailey, who has become

rich in South Africa, announces a plan to build a highway 4,000 miles long, reaching from the Cape of Good Hope to the mouth of the Nile, the entire length of Africa from Cape Town to Cairo, with branches that would open up all Africa.

Other world highways that are contemplated are from Paris to Shanghai; from European capitals via Constantinople and Jerusalem to India; from the highways of the United States to Mexico City, Panama, Rio de Janeiro, Buenos Aires (the Paris of South America) and Valparaiso on the west coast.

Mexico, Central and South America and parts of Canada in the western hemisphere, and the continents of Africa and Asia in the eastern hemisphere are still virgin territory for highway development. The men who vision highways to the distant points are no longer laughed to scorn. These highways will come, and they will do much to further good will and understanding among the countries of the world, just as the highways of the United States have made neighbors of the various communities in this country.

The Growth of Motor Transportation

There is published in the "Motor Transportation" section this month a map and short article which visualize in a striking manner the phenomenal growth of motor traffic upon our national highways. Over 270,000 miles are now being traveled by bus lines and only in those sections where there are few good roads do we find a scarcity of such means of transportation.

The antagonism existing between railroads and bus lines is a thing of the past for the figures show that 53 railroads are now operating motor bus lines of some sort or other, and 44 railroads operate buses in line service. Such close co-operation between transportation systems means there must be more good roads to act not only as feeders but in many cases as main arteries. The planning and construction of new highways must, accordingly, be made with these thoughts in mind.

Snow Removal Cost in California

A summary of reports on snow removal from state highways in California for 1926-1927, shows that 299 miles of highways were cleared of snow. Of this, 251 miles were kept open, and 48 miles were open to traffic by snow removal methods. The cost of keeping open the 251 miles was \$15,970, and of opening the 48 miles \$6,180. The machinery employed on the work included one rotary plow, 8 straight blade plows, 14 trucks, 14 tractors, and 14 graders.

U. S. Bureau Chief Urges Better Roads Thru Colorado Rockies

"COLORADO is overlooking one of the biggest opportunities that could possibly come to a state. She is letting the big stream of traffic go by her to the north through Cheyenne, and to the south over the National Old Trail, instead of bringing it into her state and making provision for it to travel through the Rockies."

So declares Thomas H. MacDonald, chief of the bureau of public roads, in an interview which appears in the latest issue of the *Western Highways Builder*.

"Colorado has done little in improving roads west of Denver," Mr. MacDonald continues. "People of the great plains in Iowa, Kansas and Nebraska would ask nothing better than to get into the southwest and northwest by traveling through the mountains. And the Rockies are truly beautiful.

"From Denver down through Monument valley and along the San Juan river to the south rim of the Grand canyon nature has been most lavish in displaying her handiwork. Few travelers have ever beheld her monuments, for there is no state or federal highway through this section."

One of the greatest needs in the West today, Mr. MacDonald asserted, is to get roads built over public lands.

"This is its biggest problem," he said. "Arizona, with 66 per cent of its area in nontaxable public lands or reservations; California, with 40 per cent, Nevada with 84 per cent, New Mexico with 37 per cent, Arizona with 45 per cent, Utah with 66 per cent, and Wyoming with 51 per cent, present a problem most difficult to solve."

Eleven western states, including Colorado, which embrace within their borders large areas of untaxable federal lands, are being unfairly burdened with the

expense of building government roads which benefit the population of the entire nation.

That was the charge laid before the Western Association of State Highway officials at their recent meeting in Los Angeles, by Henry H. Blood, chairman of the Utah state highway commission.

"The only way to equalize the burden on the western states is by increased congressional appropriation for road building in the states so burdened," Chairman Blood declared.

This is necessary for two reasons. First, because states embracing government lands are now required to meet the highway needs of the entire state with taxes collected from only part of the state, that part situated outside the limits of government reservations. And second, because such states find themselves under the necessity of building roads through government lands, improving government property, at their own expense, or at best with the same federal aid granted in more thickly populated areas of the east, in order to achieve maximum utility for present state and federal highway systems.

Colorado alone, it was pointed out, has 46,233 square miles of government lands, which is 32.2 per cent of the state's entire area! From these government lands, the state receives no taxes of any sort; yet it is under the obligation of meeting their highway needs.

"The problem is not that of one state, or a group of states," Chairman Blood declared. "It is a national need, and should be met in the broad spirit of nationalism. But it is of vital importance, nevertheless, to the eleven western states, because here lie the bulk of the federal lands. These lands are as much possession of the citizens of the east as of the west. They



Scene of State Road Near Grand Junction with Palisades in the Background

Photo by Grand Junction Chamber of Commerce.

are nontaxable by the states in which they are located; therefore, no road-building revenues accrue to the states from them.

"The states are willing to do all they can. But there is a limit beyond which they have no power to go. Generous as congress has hitherto been, appropriations have been insufficient to build properly laid out and constructed highways in forests, Indian reservations, parks, and across the public lands generally. The result is that nearly all the transcontinental and interstate highways show gaps in construction that should be closed. These gaps hinder and restrict traffic movement."

During the coming construction season Colorado will improve about twenty miles of the Victory highway, west of Denver. Two projects have been provided for in the 1928 budget. One of these projects is now under construction on Muddy Pass, west of Kremmling. Plans are now being completed for grading and gravel surfacing of several miles west of Craig.

"But we can't do it all in a year," said Major Blauvelt, state highway engineer. "Our funds are limited and we are trying to clean up the worst stretches of roadway first.

"It would be a great thing for the western states if the government would build some of our roads on a 100 per cent basis. We believe we are entitled to this aid in view of the fact that we have 46,233 square miles of nontaxable government lands within our borders. The state receives no revenue from the lands, and we feel that it is only fair that the government should lend a helping hand in closing the gaps on the transcontinental highways.

Colorado will expend over sixteen million dollars on her roads, streets and alleys this year. In other words, this state will expend that amount of money for her rubber and steel-tired vehicles to travel over. This is the greatest amount she has ever expended in any one year for the purpose of providing easy transportation for her people and her visitors. Of that amount \$5,058,000 will be expended by the state highway department and through federal aid. The counties will expend an additional sum of \$6,126,000 on county roads alone, the amount to be raised through county mill levies. Then the towns and cities will expend \$5,046,000 on streets and alleys. These are the figures that are shown by the levies and assessments that have already been made for the year.

With the completion of the work that has been outlined by the state highway department for this year, the road improvement in the northern and eastern part of the state will be completed. After this year the larger amounts that are raised through the state highway department funds can be applied to the southern, the southeastern, the southwestern, and the western part of the state. By October first of this year the system of highways north and east of Colorado Springs will be completed. Beginning next year the main line roads south of the Springs, east of Pueblo and to the Durango and Grand Junction districts will be placed in the list of roads to be immediately completed. Governor Adams believes that within another five years every main line road in the state will be in good shape and almost every feeder road will be passable the year round.

Eighty-five per cent of the road travel in the state moves north and south from Greeley to Trinidad and within forty miles of the eastern slope of the range.



*View of Silverton as Seen from the D. S. O. Highway,
the Switzerland Trail of America*

Photo by Denver Tourist Bureau.

That is why the greater part of the expenditure on roads the last ten years has been within that immediate locality. This year's program provides for the closing of the paving gaps between the larger cities and towns of the eastern slope and especially between Greeley, Fort Collins, Boulder and Colorado Springs and Fort Morgan.

The state has expended through its highway department over fifty million dollars in the last ten years. This has gone for new roads and maintenance. It has expended another sixty million through the mill levies that have been added by the local boards of county commissioners for county roads and it has expended over seventy-five million through its city and town authorities on streets and alleys. The indebtedness of the counties and towns and cities for all of this work is not available but the state only owes about five million dollars on the work it has done and that will be paid within the next five years. After that the state will be on a strictly cash basis, paying for every dollar's worth of road work when it is completed.

When Governor Adams was elected he gave out an interview that he expected to take care of the feeder roads and let the main highway wait until later to complete the work of making them boulevards. The increased amount of funds that have been derived from the increase in gasoline taxes and from the increase in motor vehicle license fees has been sufficient to take care of the feeder roads and not in the least impair the progressive work on the main line roads.



The Yampa River as Seen from the Rabbit Ear Pass Link of the Victory Highway

State Puts New Patrol System in Effect on Federal Roads

TAKING over by the state of the maintenance of Federal Aid highways is scheduled May 1. On this date the highway maintenance division expects to have 125 patrols engaged on the 3,360 miles of Federal Aid roads in Colorado, according to Robert H. Higgins, maintenance superintendent.

The state has purchased \$390,000 worth of road equipment including seventy-three tractors, 100 graders, forty maintainers, plows and hand tools. The state also has forty trucks for use as power units for maintainers and for hauling gravel.

Maintenance forces will be divided into 125 crews of two men each, each crew with approximately 25 miles of Federal Aid road to patrol regularly, insuring steady efficient maintenance of each Federal road, which bear the most travel of any of the Colorado highways.

During the last thirty days the equipment has been received and distributed in all parts of the state. The larger power units have been assigned to patrols located in the higher altitudes, while the smaller tractors were distributed in the plains counties. The graders were of seven and eight-foot blade capacity, while the tractors range from 20 to 40 horsepower.

The new maintenance system will be an innovation in Colorado, with the highway department taking over complete supervision of all work on Federal Aid roads. In the past, the custom has been for the county commissioners of each county to supervise maintenance work on the State and Federal Aid roads, the counties and the state dividing the cost. That system proved unsatisfactory to the U. S. Bureau of Public Roads, which demands that the Federal Aid network be kept up to a certain standard.

As a result, the State Highway Advisory Board,

in preparing the 1928 highway budget, provided for the counties taking over completely the maintenance of the state roads and for the department to keep up the Federal system.

Traffic surveys made by the department during the past two years show that nearly 85 per cent of all the motor traffic in the state is served by the Federal system. The sum of \$1,000,000 was set aside in the budget for maintenance in 1928. In counties having now Federal roads, the state will share the cost of maintenance on a 50-50 basis. There are eleven such counties.

Each patrol crew will be provided with a tractor or a truck and a grader or maintainer, together with other necessary equipment. These crews will be employed throughout the year. They will be kept constantly at work on their particular section of road.

The graders are all equipped with scarifiers. With these the rough places on the roads may be scarified and then smoothed out with the blade machine.

Forty government army trucks, bought by the department at nominal prices after the war, have been completely rebuilt and reconditioned. Some of these trucks had never been uncrated and were in the same condition as when shipped from the factories. They are of 2- and 3-ton capacity.

So far as possible the crews employed by the state have been men who live in the locality where they will be stationed. The majority are men who formerly were employed by counties and are experienced in the work which they will be required to perform on the Federal Aid system.

The first crews were put to work on the Golden and Morrison roads out of Denver. They started on

(Continued on page 10)

Federal Aid Funds for Western States to be Increased

By DR. L. I. HEWES Deputy Chief Engineer, U. S. Bureau of Public Roads

IN the western region of the 11 Rocky Mountain and Pacific Coast states, direct construction by the Federal Government may soon increase considerably by congressional appropriations for National Park highways. On forest highways during the calendar years 1924, 1925, 1926 and 1927, there has been spent by the Bureau of Public Roads respectively, in round numbers, \$8,400,000, \$7,400,000, \$6,650,000 and \$5,520,000. There has been a total expenditure on forest highways from all funds of \$51,225,000, and the Park Service expended \$4,750,000 for roads in the National Parks which have been constructed by the Bureau of Public Roads. There is now indicated by legislation pending, an annual program in the forests and parks of survey, construction and maintenance, amounting to over \$10,000,000.

The annual budget of Federal Aid, on the going basis, in the western region is approximately \$14,000,000 of Federal funds plus funds by the states and local authorities amounting to \$11,000,000.

Improvement Gratifying

Fortunately the Federal Aid System in the west, which amounts to approximately 32,000 miles, is a markedly restricted system of trunk highways, and the progress toward first stage of improvement of this mileage is very gratifying. There has been some improvement on about 70 per cent of the mileage by the combined construction efforts of the states and the Federal Government. A very considerable portion of the Federal Aid System (about 3,600 miles) lies within the National forests and thus the National forest road

construction is aiding in the completion of the Federal Aid highway system of the far west.

It is significant of the growth of highway transport and the use of the highways that already we are seriously faced with supplementary construction of highways built within the last decade. Construction that was of ample width and of sufficient standard of curvature and grade 10 years ago is now quite inadequate with the increasing traffic. Also the lower types of surfacing and particularly the fine crushed surfacing which has so characterized long stretches of the western roads, is becoming inadequate and uneconomical to maintain.

Limitations of Light Surfaced Roads

Five years ago, at a meeting of the highway officials of the public land states, at Yellowstone Park, the question of the duty of the gravel and light surface roads was taken up with a view to deciding upon the limitations of its usefulness under increasing traffic. It has been necessary as a first stage of construction, even on Federal Aid projects, to build first cheap surfacing on many miles of road, particularly in the desert areas. Two years ago it was found that over 8,000 miles of light surfaced roads had already been constructed on the Federal Aid System. This construction had so increased travel that the annual loss of surfacing in the drier areas was most serious. In some localities where a combination of traffic and wind-swept arid areas were unfavorable, an annual loss of several hundred dollars per mile per year was suffered by loss of surfacing alone. Apparently, and one might almost say miraculously, in point of time, has developed a method of moderate cost treatment with oil for the fine crushed surface roads. Following the lead of Oregon in treating such roads with light surface applications of light oils, other states began using this system and intense study has been given to developing the successful methods of its use. Hundreds of miles of road have been made dustless and the surface preserved by moderate cost application of the surface oil treatment.

Improved Pavement Construction

The improvement of methods of pavement construction throughout the west is keeping pace with the best practice established by the numerous experiments and results of laboratory and other research throughout the country. In this connection it is pertinent to say that because of the millions of dollars worth of road work done annually by each of the western states, the economy accruing to the taxpayer by the intelligent study of his engineers of the work in neighboring states cannot be exaggerated. It is gratifying that prejudice against highway engineers visiting the work in neighboring states is rapidly disappearing. Certainly the results which have followed the various inspections during the past summer of work in several states by outside engineers are proof of the economy of such study.

The technique of highway engineering constantly



A Spectacular Road Leading to Crystal Park Near Colorado Springs
Photo by Colorado Springs Chamber of Commerce.

improves. The quality of Portland cement concrete pavement now being laid is in marked contrast to that of even five years ago. The refinements have become understood by contractors and it is gratifying to note the pride they take in the finished product. The results from such details as the combination of various sized aggregates to produce favorable grading, washing of sand, the absolute control of the water-cement ratio, the care in finishing, are so clear to the contractor that no longer is there a feeling of resentment or contempt for specifications which demand these elements.

Motorists Pay \$58,000,000

It has become yearly more apparent that highway transport is a self contained operation. In 1926 the motorists of the 11 western states paid in license fees and gas tax a total of \$58,175,000, most of which was applied directly to road improvement and maintenance. The highway engineer is the servant of the road owner, and cannot be indifferent to the demands for improved service in highway construction and maintenance.

The highway contractors who are building the highways have a vital interest in the betterment of the industry. They are concerned with all measures which stabilize the business. They are entitled to know as far in advance of work as possible the highway programs in the various states in which they operate, for they must be equipped to handle the business which is developing at the various contract lettings throughout the season. A number of the western states are already programing in detail their expenditures well in advance, and in some cases two years in advance. The whole system of highways is developing with sufficient rapidity to eliminate the competition for individual sections of roads by the various communities who are anxious to be first. It is felt throughout that the question of filling in the gaps in the main highways is being rapidly settled and there is marked evidence of patience by the communities who await their turn for road improvement.

Stabilize Contract Letting

In respect to the immediate betterment of the contracting business, the Bureau of Public Roads in handling the building of highways for the Forest Service and the National Park Service, has established this year for the first time a uniform system of stabilizing the letting of contracts. This system is in brief one of qualification and classification of bidders prior to the opening of bids. It is an effort to scientifically and carefully determine responsibility of bidders before issuing plans to them upon which to base bids. The progress so far in the handling of contract lettings by this method have been gratifying. It is hoped that contractors will continue the cordial support to this system which they have already evidenced until it is established. It is unquestionably a step in advance to separate the determination of responsibility of a bidder from a selection of the low bidder among those found responsible. Too often in the past the responsibility of a bidder has been over-estimated after his has been found to be the lowest bid.

Another point in bettering the highway contracting business is the invitation to bidders to examine in the fall before snow comes such projects as must come up for early letting in the spring when funds become available. The Bureau of Public Roads, in co-operation with the Park Service, adopted this system last fall on a considerable number of projects in the National



A Section of the Colorado River, Showing Highway Entering Glenwood Canyon

Photo by Denver Tourist Bureau.

Parks which will come to letting this spring. Manifestly with a working season of 120 to 150 days in the high mountain altitudes, there must be every advantage taken of the construction interval in order to economize production, both in respect to public funds and to the contractor.

President Coolidge on Good Roads

In his annual message to congress, which has just convened, President Coolidge again stresses the great importance and benefit of good roads, not alone to this country, but to all nations. He points out that in the past it has been our practice to furnish other nations with military and naval advisors and so aid them in the arts of war. We should now, he says, lend our assistance toward helping them to build their national highway systems, and authority should be given by law to provide them at their request with engineering advisors for the construction of roads and bridges.

Such thoughts coming from the president reflect the sincerity of his foreign relation policy and desire to create international good will. Good roads linking up the United States with the countries to the south will unquestionably tend to stabilize friendship between the nations and help in large measure to maintain peace and good will.

Concrete Highways--Fore and Aft

By L. S. TRAINOR

THE road building period of 1927, particularly in the construction of pavements, was the greatest and most progressive ever known. Preliminary estimates for the year 1927 indicate a noteworthy increase in the construction of concrete pavements in 1927 over 1926.

In 1926, 115,000,000 square yards of concrete roads, streets and alleys were placed under contract. This established a new record, but it is now evident that the 1927 total of contracts awarded have exceeded this figure by 10,000,000 square yards.

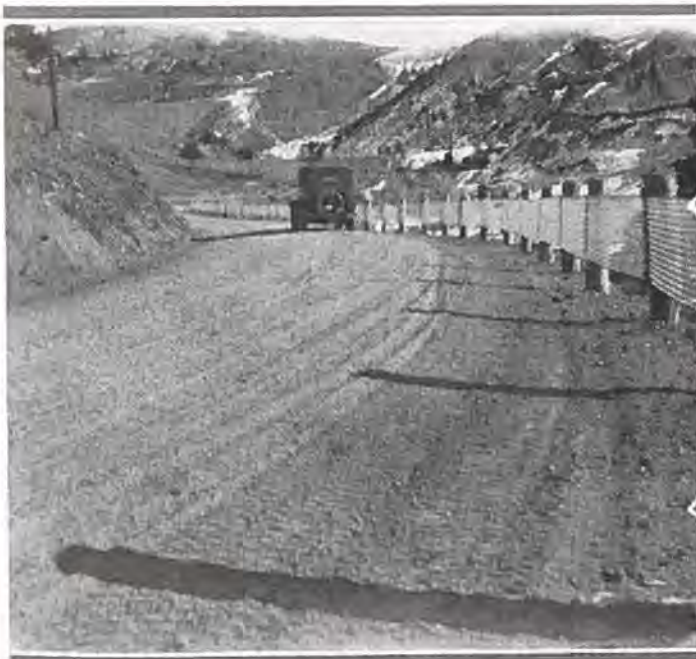
The amount of money spent for road building from year to year does not vary materially, but a gradual increase is in evidence which may some day make it possible for us to successfully accommodate automobile traffic. Looking ahead it appears that 1928 will witness road building activities equal in volume to those of the past year. This is assured by the early activities of the various states and counties. For instance, three Texas counties recently voted road bonds totalling \$1,335,000. Another county in Texas will doubtless vote a \$655,000 bond issue at an early election, and so it goes. All over the country there seems to be a tenacious feeling among road building communities to not fall behind in previous road building attainments.

In 1927 the states of Iowa, Wisconsin, South Carolina, Alabama and Texas, with large increases in concrete yardage, more than compensated for the slight slowing up of construction in Missouri, Pennsylvania, North Carolina and other states which had larger programs in the two previous years. Pavement construction fell off slightly in Illinois, but that state plans to build no less than 1,000 or 1,200 miles in the ensuing year. Cook County alone now has plans for the construction of 180 miles, of which a considerable amount

will be 40 feet in width. It is gratifying to note that the better practices in concrete paving construction are now being quite commonly adopted in road building. As in other industries, changes in method cannot be brought about over night. The transition is gradual. In road construction the spread of new ideas has been hastened by road builders' conventions and by magazines.

The thickened edge slab is an example of this gradual development. First tried and abandoned in Michigan, it was later used with success in several California counties. Engineers in charge of the Maricopa County highways decided it was fundamentally correct and used it on nearly 340 miles of concrete pavement. The following year five thickened-edge sections were included in the Pittsburg, California, test road. The first traffic tests on the Bates' Test Road revealed that stronger edges were needed. As a result thickened edge pavements were constructed and the tests were continued another year so that these thickened edge sections might be compared with those of uniform cross-section. Its greater strength for the same amount of concrete led to the immediate abandonment of the uniform 7-inch slab by Illinois and the substitution of the cross-section with 9-inch edge and 6-inch central portion. A longitudinal center joint was also added to eliminate longitudinal cracking. Some form of thickened edge section has since been adopted by nearly every community building an appreciable mileage of concrete roads.

The principal advances in construction methods have increased the quantity of slab laid per day and improved its quality. Quality has been improved by more accurate measurement of both aggregate and water, by less tamping or the complete elimination of



Two Views of the New Modern Highway Connecting Cripple Creek and Victor

Photos courtesy Matt Edwards.

the tamping template on finishing machines and by tools and attention which secure a better riding surface. The average yardage built per day has been nearly doubled by better, more reliable mixing and hauling equipment and, above all, by the realization that co-ordination of operations was of paramount importance. Time studies made by the U. S. Bureau of Public Roads formed the foundation for this better co-ordination and should be studied by every paving contractor and his superintendent.

Greater uniformity of batches has followed the substitution of weight for volume measurement. Nine states now require batching by weight and it is probable that others will make it mandatory for next season. One state specifies that sand be measured inundated. Since inundation measures both sand and mixing water accurately it has some advantages over weight measurement; the disadvantage is that batches must be carried from proportioning plant to mixer in water-tight containers.

The past year has witnessed an increase in the number of specifications which give the strength of concrete instead of proportions or definitely limit the quantity of mixing water to be used per sack of cement. That has created a demand for more accurate water measuring devices which is being met by mixer manufacturers. One such device is reported to have a possible error of only one pint per batch, regardless of the slope on which the mixer stands.

State Puts New Patrol System in Effect on Federal Roads

(Continued from page 6)

April 15th with new tractors and graders. The complete overhauling of these roads was their first assignment—the cleaning of ditches, smoothing out shoulders and making repairs on the concrete pavement.

To those crews who will be employed on concrete pavement maintenance the department has sent the following memoranda, stressing the importance of their task:

It should be no small part of the task of organizations engaged in the construction of highway systems to give "service" on the roads after they are built. The motorist who learns to depend on service stations operated by the manufacturer of the car he drives has the same right to expect careful and constant maintenance of the road over which he travels. Also the taxpayer who pays for the pavement is entitled to the utmost protection of his investment.

Concrete pavements, like all other types, must be maintained to give maximum service. The fact that concrete pavements require the minimum in labor and expense should be an incentive for regular and systematic maintenance rather than an excuse for letting the repairs to concrete wait while less durable types are taken care of. There is in many quarters a tendency to take it for granted that concrete will stand up without attention; a tendency which is not warranted by the ratio of cost of maintenance to the first cost of construction.

Too much stress can not be laid on the desirability of early maintenance; that is, the careful inspection and necessary repairs during the critical period of the first year after construction. This would include first of all the most obvious need of keeping the joints and cracks filled with bitumen. Less obvious is the necessity of watching for the subgrade failures which are usually the cause of breaks in concrete pavements when they occur. Maintenance of shoulders is essential to prevent settlement of the subgrade along the edges of the pavement. On new pavements careful watch should be kept of points of subgrade weakness such as points of change of grade, approaches to bridges and culverts, points where cut sections change to embankment, sections known to be laid on subgrade of doubtful bearing power and edges of pavement on heavy fills or side hill sections. By prompt discovery of settlement or heaving of slabs or settlement of subgrade at edge of slab, the defect can be remedied at slight cost before a succession of heavy loaded vehicles breaks the pavement slab.



The Summit of Independence Pass, One of Colorado's Most Spectacular Mountain Highways

Photo by Denver Tourist Bureau.

All-American Highway to Be Considered at Congress

Moved by the desire to see the spread of international understanding and goodwill in the Western Hemisphere and believing this will be best achieved by free and unhampered intercourse between the peoples of North and South America, President Coolidge recently expressed the hope that some day, in the not too distant future, there will have been established an All-American highway, extending from Canada through the United States, Mexico and Central America far into southern South America.

This hope is in a fair way to be realized and much of the route which it would necessarily follow already has been traveled by automobile. However, before certain sections may be constructed, proponents of such a highway realize that considerable time is bound to elapse, not only because of the very heavy financial burden that the scheme will entail upon certain of the South and Central American republics, but also because of the great engineering difficulties which will be encountered and which will have to be overcome.

That a Pan-American highway is feasible and only a matter of the future, is beyond question. Too much interest has been displayed in automotive transportation in Latin-America to warrant any other belief. Adequate railroad transportation has proved too heavy a burden for many of the South American republics, since it entails a large initial expense with very slow returns. For that reason, all of Latin-America is turning to the automobile as a solution to its transportation problems and an aid to the development of vast, untouched resources.

Indicative of the interest in highway construction are the Pan-American highway conferences, the second of which is to be held in Rio de Janeiro in July, 1928, at which will be representatives from virtually every American country. Numerous state highway conferences have also been held in the various countries from time to time. Road building has been actively progressing and in several countries first-class concrete highways are now being laid.

That there is a strong good roads movement throughout Central and South America is indicated by a survey of up-to-the-minute records kept by the Pan-American Union in Washington. This urge for highway transport has penetrated the fourteen countries

comprising Mexico, Guatemala, Salvador, Honduras, Nicaragua, Panama, Colombia, Ecuador, Bolivia, Peru, Chile, Argentine, Uruguay and Brazil. These nations have already in projects built, under construction or authorized, some six thousand miles. In the All-American highway as visioned today there would have to be taken care of gaps totaling 2,175 miles.

Such a highway is considered by many as holding promise of becoming one of the greatest boons to civilization and commerce that could be devised. Thousands of acres of fertile farm land will be thrown open to settlement and untold mineral resources will be made accessible for orderly development.

Snow Control for Longer Lasting Highways

Oftentimes in the growth and development of a movement that has been originated to achieve a definite purpose, new benefits are unearthed that the initiators of that movement had not anticipated. Sometimes these new aspects become as important as the original motive and prove to be worthy of development.

Such has been the case with the growth of snow control and removal in this country. The removal of snow from highways was first undertaken in response to the demand for open roads in winter. With the growth of automatic travel and the increased economic importance of highway transportation, it became apparent that the closing of roads from two to three months of the year was an unmitigated nuisance.

In the first place, the melting snows soften the subsoil and the surface of these roads. Traffic moves over them in ruts, picking out the line of least resistance, and causing great injury to the road. Washouts increase the damage so that in many cases whole sections of the road have to be completely rebuilt. The expense entailed in such operations is very heavy and is one of the biggest drains on the maintenance purse.

Engineers in charge of snow control operations have found that a proper snow removal plan will eliminate a large part of this spring repair work. If the snow is kept consistently off the road, the amount of melting in the spring is negligible and the wet period lasts only a short time. There is only a small amount of surface thawing and the water never gets very deep into the road. So great is the saving in maintenance where snow control operations are properly carried out that the cost of snow removal is more than offset.

Highway Funds Available for 1928

State	Total Available	New Construction	Maintenance	Federal Aid
Arizona	\$ 5,654,487*	\$.....	\$.....	\$ 1,056,994
California	46,496,000†	15,050,000	26,480,000	4,976,000
Colorado	4,900,000	3,200,000	1,400,000	1,500,000
Idaho	3,681,000	2,787,000	700,000	936,000
Montana	3,000,000	2,500,000	500,000	1,500,000‡
Nevada	1,577,000	1,201,000	376,000	957,955
New Mexico	4,000,000	3,000,000	1,000,000	2,000,000
Oregon	10,500,000	3,500,000	3,500,000	1,200,000
Utah	3,224,000	1,500,000	724,000	1,000,000
Washington	12,000,000	9,457,000	1,400,000	1,143,000
Wyoming	2,650,000	1,000,000	1,000,000	950,000
Total	\$97,682,487	\$43,195,000	\$43,080,000	\$17,219,949

* June 30, 1927, to July 1, 1928. † For fiscal years July 1, 1927, to June 30, 1929. ‡ To be used in 1928.

IDAHO HIGHWAY PROGRAM FOR 1928

By J. D. Wood
Commissioner of Public Works

All funds for construction and maintenance of Idaho state highways are derived from motor vehicle sources, the Department of Public Works receiving 10 per cent of the registration fees, all of the gasoline tax, now fixed at four cents per gallon, and all the revenues paid by bus and truck operators. No direct appropriations have been made by any legislature since 1921, so the question of money available for each biennium is a matter of estimate, rather than of definite determination.

Revenues for 1928 will amount to about \$3,730,000; of which \$930,000 has been apportioned by the Federal Government; \$800,000 will be contributed by counties, highway districts, and other political subdivisions; and \$2,000,000 will be received from registration fees, motor carriers, and the gasoline tax.

Expenses for administration, equipment and maintenance will total about \$1,000,000, leaving \$2,730,000 for new construction, oiling, and the heavier reconstruction projects.

The program for 1928 includes 12 miles of cement concrete and bituminous macadam paving, the cost of which is estimated at \$263,000; 300 miles of oiling, using the western mixed method, which will cost about \$255,000, including the expense of new surfacing material; 176 miles of new construction and gravel or crushed rock surfacing, \$1,360,000; bridges not included in road projects, \$135,000; and an undetermined mileage of resurfacing, for which \$118,000 has been allotted.

NATIVE ROAD MATERIALS OF NEW MEXICO

As Used in the Building of the Federal Aid Highways System

By W. C. Davidson
State Highway Engineer

New Mexico has a Federal Aid highway system comprising a mileage of 3,332, which constitutes 7 per cent of all road mileage in the state.

On January 1, 1928, a mileage of approximately 1,750 had been constructed, consisting of such types as concrete, crushed stone, crushed gravel, caliche and graded earth.

It will be interesting to note that the whole of this 1,750 miles, wherein surfacing was used, was built of local materials contiguous to the several projects, with one exception, and that being the cement used in concrete pavement. Even the aggregates for concrete pavement have usually been found at the roadside. In rare instances only has railroad haul been necessary.

Sixteen million dollars has been expended in the program of Federal Aid construction which began in 1919. This expenditure has resulted in the building of more than half the Federal Aid system, and comprises 74 miles of concrete; 487 miles of crushed stone; 686 miles of crushed or screened gravel; 206 miles of caliche; and 296 miles of graded earth.

Only the extreme abundance of local surfacing materials has permitted the completion of such an extensive program in a state ranking almost at the bottom of the list from the standpoint of wealth. New Mexico is forty-fourth in the scale of wealth as compared with other states. It is interesting to note further that New Mexico is fourth in size, comprising an enormous area of non-taxable public domain.

MONTANA'S STATE HIGHWAY PROGRAM AND PROBLEMS

By R. D. Rader
State Highway Engineer

Montana has a small state highway program as compared with some of the other states, but we believe that this program will be adequate and that within a few years tourist traffic will have no valid criticism to make of the road service provided. A three-cent gasoline tax was voted in November, 1926, the proceeds of which go to the state highway commission for the construction of Federal Aid roads. Montana's share of Federal Aid has been about \$1,550,000 each year. This is matched with state funds, the state paying 43.54 per cent and the Federal Government 56.46 per cent of the cost.

During the year 1928, approximately 250 miles of new road will be completed, and the same amount each succeeding year. It is expected that the whole Federal Aid system will be completed within ten years. Work is being done so as to improve the worst sections of the through highways first, leaving the better portions of the existing roads for later construction. In this way through traffic will be provided for within a few years.

Montana has adopted a crushed-gravel surfacing passing a 3/4-inch screen as standard for all highways.



Showing section of Cumbres Pass highway recently completed by U. S. Forest Service.

COLORADO GIRL WINS NATIONAL SAFETY ESSAY AWARD

Bethel Pugh, thirteen-year-old school-girl of Pueblo, Colorado, has been named as winner of the 1925-26 National Safety Essay Contest of the Highway Education Board, her essay being the selection of judges comprising: Mrs. Curtis D. Wilbur, wife of the Secretary of the Navy; Miss Gertrude B. Lane, editor of the Woman's Home Companion, and Mrs. John B. Henderson of Washington, D. C. Miss Pugh comes from the Bessemer School.

First place in the National Safety Lesson Contest conducted under the same auspices has been won by Miss Elizabeth M. S. Laughton, a teacher at Gaston School, South Boston, Mass. This lesson was chosen by a judging committee, comprising: Dr. Augustus O. Thomas, commissioner of education for Maine and president of the World Federation of Education Associations; Senator Simeon D. Fess, and J. N. Mackall, chairman, state roads commission for Maryland.

STATES BUILT 20,000 MILES OF SURFACED ROADS LAST YEAR

More than 13,600 miles of earth roads included in the state highway systems of the 48 states were surfaced by the several highway departments in 1926. The total length of surfaced roads constructed by state agencies during the year was 19,492 miles, of which 13,664 miles was laid over former earth roads and 5,828 miles represented a rebuilding of old surfaces.

The reports show that the total mileage of surfaced roads in the state highway systems increased by 18,205 miles during the year, but of this increase 4,541 miles represents no actual work by the states, but consists merely of mileage transferred from county to state jurisdiction, statistical changes resulting from resurveys, etc.

The above figures refer to increases in surfaced mileage on the state highway systems only and do not include surfacing laid by the counties or other local governments. They do include, however, all work done with Federal Aid.

The statistical table issued by the Federal bureau shows that the combined state systems embrace 287,928 miles and that of this mileage 163,059 miles is surfaced and 28,456 miles is graded and drained according to engineering standards. The state systems are now about 66 per cent initially improved. The types of surfaced roads existing at the end of 1926 were as follows:

	Miles
Asphalt, wood and stone block	165
Bituminous concrete	4,515
Bituminous macadam	12,927
Brick	3,215
Cement concrete	31,935
Gravel, chert and shale	79,216
Sand-clay and topsoil	11,316
Sheet asphalt	890
Waterbound macadam	18,428

Progress Reports from the Field

San Juan County—Maintenance crew expects to clear snow from Red Mountain Pass, between Silverton and Ouray, by May 1, about a month earlier than usual. As soon as road is cleared the Western Slope Motor Way will start operation of busses between Grand Junction and Durango. The latter has a mail contract between these two points.

Mesa County—Two state maintenance crews are now operating on Federal Aid roads in this county, according to George Toupain, division superintendent. These outfits consist of new tractors and blades. By May 1 Toupain expects to have all crews at work in his district. Deliveries of equipment are now being made daily. As each outfit is set up, crews are immediately put to work on the main roads.

Pueblo County—Bids on the proposed \$140,000 highway project between the towns of Crowe and Greenhorn will be opened by the state highway department in Denver on April 26. The specifications call for the construction of 6.6 miles of gravel surfacing and two bridges. This project is located on State Road No. 1, being a link in the Pueblo-Walsenburg route.

Morgan County—Engineers are rushing plans for the paving of the remaining link of pavement between Sterling and Fort Morgan. Plans also are being drawn for an extension of pavement west from Fort Morgan. The grading for these two projects, which will total about seven miles, was completed last year. Edw. Selander, contractor, has resumed paving operations between Brush and Hillrose. He has a contract for 11 miles of concrete pavement. With a tractor and elevating grader, A. R. Mackey, contractor, has completed seven miles of new road between Wiggins and Roggen.

Douglas County—H. C. Lallier Construction Co. has started pouring concrete near Tomah on their 13-mile contract south of Castle Rock. The project starts at Tomah and runs to Palmer Lake. Two mixers, a large central mixing plant and a fleet of heavy duty trucks are included in Lallier's equipment. Work has been started by J. Fred Roberts on the stretch of pavement to be laid from Palmer Lake to Monument. J. L. Busselle was the low bidder for the paving of .15 of a mile of road at Sedalia.

Chaffee County—According to present plans, there will be four maintenance crews with as many tractor-grader outfits working out of Salida. This is due to the fact that four federal roads radiate from Salida. These crews will work to Leadville, over Poncha Pass, down the Arkansas River toward Canon City, and over Trout Creek Pass toward Fairplay.

Lake County—Surveys are being made for a new construction project on Fremont Pass leading into Leadville from Dillon. Plans for the further improvement of the Tennessee Pass road also are under way. A snow removal crew employed by the state has been able to keep this pass open nearly all winter.



Section of State Road No. 1, south of Pueblo, showing unusual culvert installation.

With data obtained it is probable that the state will employ a large tractor and improved snow plow on the pass next winter.

La Plata County—Arrangements have been completed for the gravel surfacing of the road between Bayfield and Ignacio with county funds. A crushing plant will be located at Bayfield. About \$10,000 will be expended on the work.

Weld County—Negotiations are now under way to secure the right-of-way for the new paving which will be laid by the state between Greeley and Eaton this summer. It is expected that bids will be asked on this project at an early date. The sum of \$175,000 has been appropriated for the work.

Jefferson County—Rapid progress is being made on the Golden-Boulder road. A state steam shovel is now lowering the grade over Flynn hill, three miles north of Golden. This road gives a short-cut from Golden to the Coal Creek district. Another shovel is being used in the construction of a new road to Pine Grove, connecting with the Denver-Baileys route, near Shaffer's Crossing. Both projects are under the direction of Division Engineer Donovan.

El Paso County—Three maintenance patrols will be stationed in this county under the new patrol system to be inaugurated on Federal Aid roads on May 1. These crews will be located at Fountain, Husted and Calhan. At each station a crew of two men with tractors and graders will be posted for all necessary patrol and emergency work. Each is given twenty-five miles of road to keep in smooth condition. State highway engineers are now working on surveys for two paving projects between Colorado Springs and Pueblo. One of the projects calls for an extension of the present pavement south of the Springs, while the other involves the construction of five miles of pavement north of Pueblo. Both of these projects are to be completed this summer.

Gunnison County—Hinman Bros., contractors, have established a camp near here and have started grading of five

miles of new road leading to Sapinero. Gravel surfacing on Cerro Summit also is getting under way. Work on the Blue Mesa by state forces with a steam shovel will be continued this summer.

The famous Sand Dunes at the San Luis Valley side of the San Isabel national forest will be made more accessible for 1928 tourists. The highway from Alamosa to the Sand Dunes is being rebuilt to eliminate excessive grades and rocky stretches. When the tourist season opens the project will be open.

Oil development in southeastern Colorado has resulted in county commissioners of Otero and Las Animas county joining in the construction of a new road to the Red Rock structure. The new road will make it possible to cross the Picketwire River at Highbee instead of fording it at the old crossing.

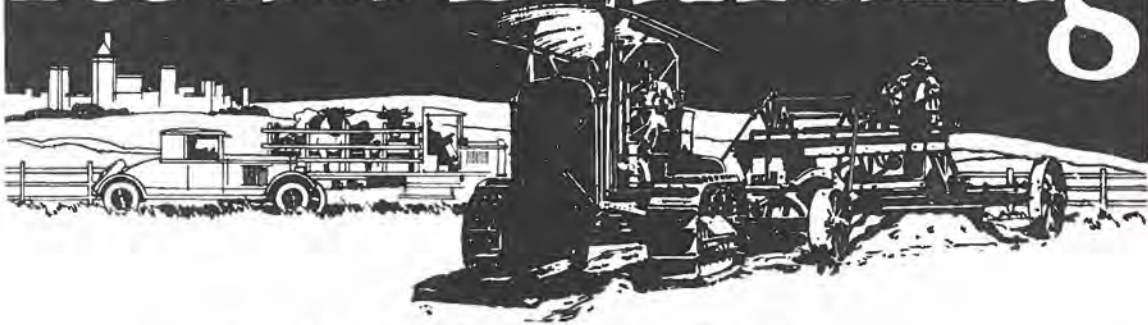
Highway engineers are observing two experiments in oiling highways in the San Luis Valley. Five miles of state highway south of La Jara and two miles between Alamosa and Monte Vista have been graded and treated with oil. The highway was rolled after each coating of heavy oil and was finished with a light layer of gravel, which was also rolled. The type of road, similar to the California oiled road, is expected to last at least ten years.

If the tests are found successful it is probable that the balance of the Monte Vista-Alamosa road will be oiled this year.

Al Wenger of Galatea has been appointed county commissioner of Kiowa county to succeed J. W. Lamberson, Arlington, who died a few weeks ago. Lamberson was one of the outstanding commissioners of the Arkansas Valley.

Fremont county commissioners have completed two important county road jobs this spring. One was the gravel surfacing of the Williamsburg-Florence road. The other was the surfacing and draining of the Wetmore road. Many new culverts, bridges and fills formed part of the Wetmore job.

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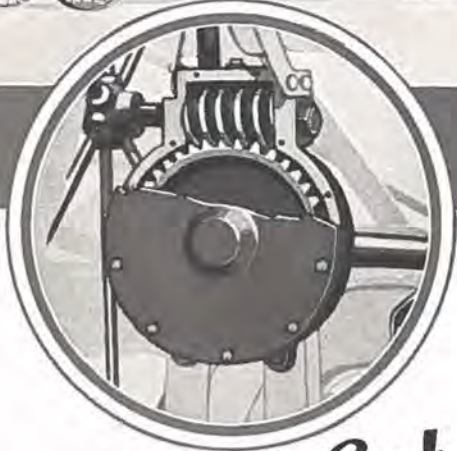
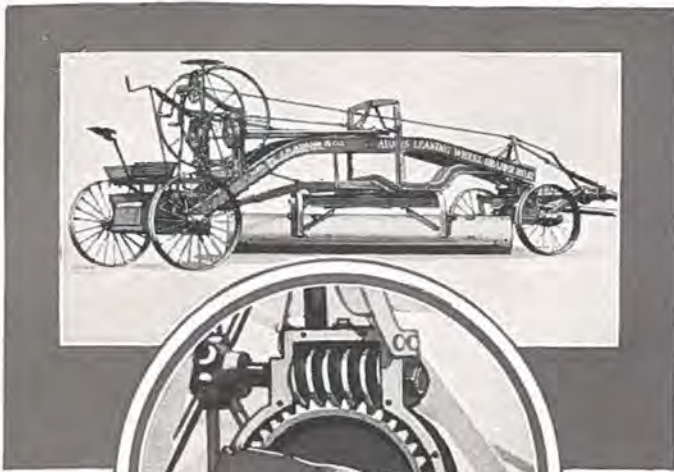
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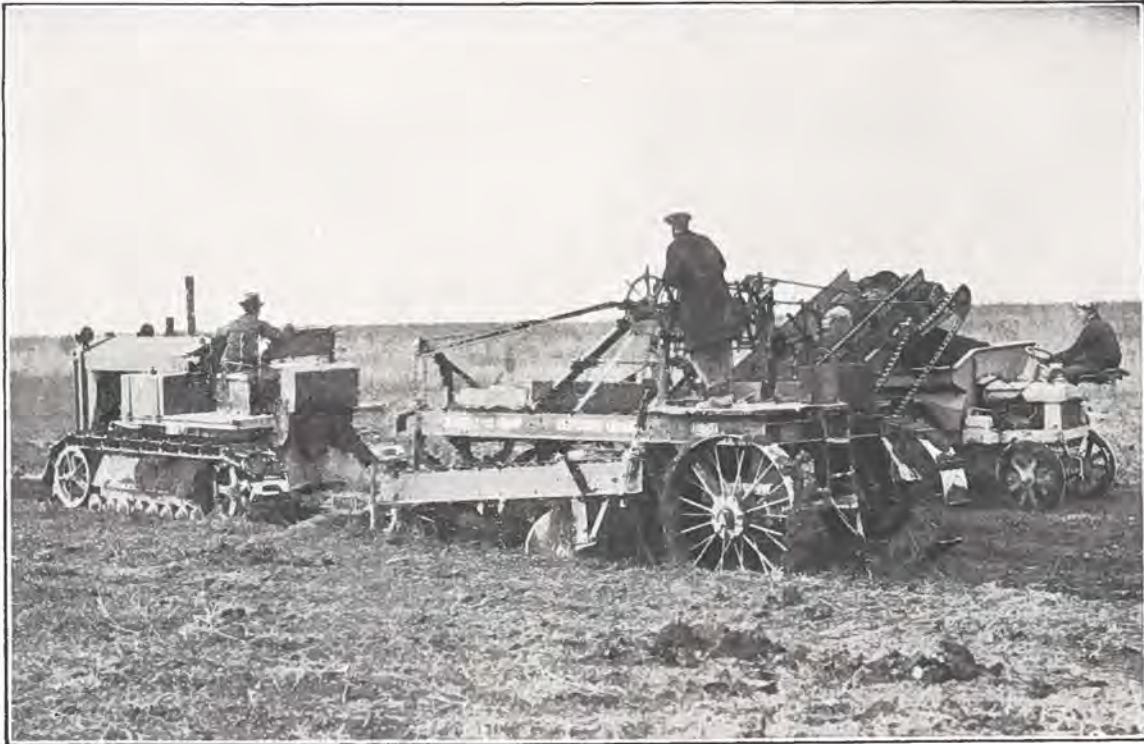
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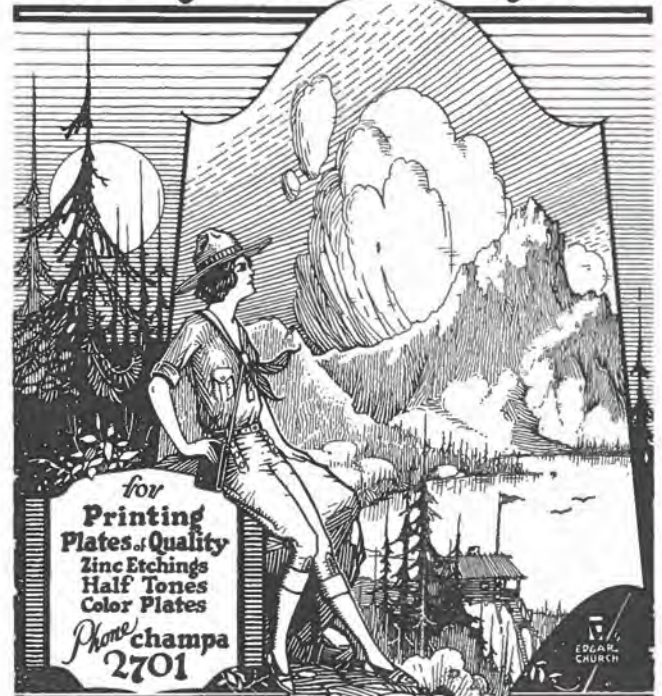
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New Highway Equipment and Materials

J. D. Adams & Company of Indianapolis, Indiana, have recently produced a new 7-foot grader, known as the Adams Leaning Wheel Grader No. 31. While the machine is furnished with or without scarifier, it will probably find its greatest popularity as a combination scarifier-grader among many counties who should have a machine of this kind.

It is claimed that with or without the scarifier, the machine is capable of splendid ditch work, and particularly with the scarifier, which may be used in connection with or independently of the blade, it is a very good maintenance grader. The scarifier will open up the uneven surface of a gravel or stone road and the blade immediately following, reshapes the surface as good and smooth as when new.

More and more road men every day are demanding graders with better fitting blade and scarifier controls to prevent and eliminate lost motion, which causes blade jumping or chattering. The day is not far distant when it will be difficult to sell any road grader which is not fully adjustable for wear in all its essential working parts. Sensing this growing demand, J. D. Adams & Company, within the past year, have refined the blade and scarifier controls in Adams graders to a point where there is no lost motion in either.

The National Equipment Corporation, a Delaware corporation, has been organized by Milwaukee financial interests for the purpose of purchasing and holding a controlling interest in several non-competing construction equipment companies in various parts of the country. The new corporation already holds an option for the purchase of a controlling interest in The T. L. Smith Company. It is generally understood that the option will be exercised some time during the present year. Among those interested in the new holding company are Harold E. Smith, President of the T. L. Smith Company, Philip Koehring, Joseph E. Uihlein, Robert Uihlein, and various other Milwaukee financial interests whose identity has not yet been announced. It is the intention of the holding company to purchase the controlling interest in several other construction equipment concerns and negotiations are now in progress for the completion of several such deals.

The officers, directors and management of the T. L. Smith Company will continue as heretofore, and the company will be operated on a more vigorous scale than ever. The company is looking for a big business next year, due to the expected increase in construction and road-building activities.

Harold E. Smith will continue as president and in active charge of The T. L. Smith Company.

Spears-Wells Machinery Company, Inc., announce the marketing of a new drag

type maintainer, new in design but not in principle, as it has been evolved from a somewhat cumbersome but very efficient multi-blade drag manufactured by this company several years ago.

This new machine consists of a heavy steel frame 18 feet in length by 6 feet in width to which is rigidly fastened a series of blades covering a width of 9 feet, and so arranged that the material planed from the road surface is worked backward and forward four times before passing from the distributing blade in the rear. In front of this frame is an adjustable scarifier carrying 16 teeth, tool steel, set in double row 7 inches apart and staggered so that distance between teeth is $3\frac{1}{2}$ inches.

This frame is carried at rear when traveling on rubber tired roller bearing wheels with bell crank axle controlled from tractor driver's seat.

Copies of new catalogs and bulletins published by the Galion Iron Works & Mfg. Co., describing their new motor graders, have recently been received at this office. They include a new 16-page catalog on McCormick-Deering E-Z Lift motor graders and bulletins describing the Galion Cletrac, Twin City and "Caterpillar" powered motor graders. Bulletins have also been received describing the Galion center control Fordson and McCormick-Deering power graders.

Copies of any of these bulletins will be forwarded on request to anyone writing for them to the H. W. Moore Equipment Co., Denver.

Responding to the increasing need for smaller portable units of power-driven, labor-saving equipment, The Buckeye Traction Ditcher Co., Findlay, Ohio, has added the Model 150 Service Ditcher to its present very complete line of chain-and-bucket trench excavators.

This newest Buckeye is a little, light-

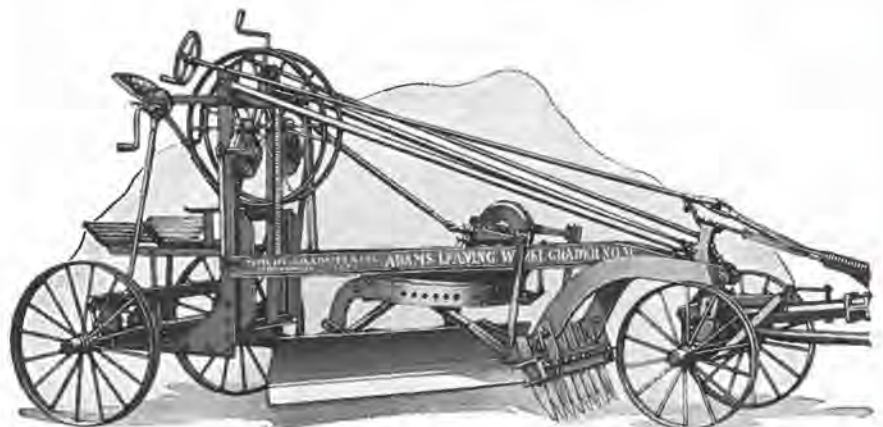
weight ditcher, exceptionally flexible in performance. Proportionately, it has the rugged construction and economical working ability of the larger, more powerful Buckeye excavators. It has, however, many distinctive features which particularly adapt it to service line excavation and for operation in restricted quarters where big excavators are unsuitable. It is offered to the construction world only after being thoroughly tested in all sorts of soils and under all kinds of conditions.

The Koehring Company, manufacturers of pavers, mixers, gasoline shovels, cranes and draglines, have just brought out the fifth edition of their book, "Concrete—Its Manufacture and Use." The present edition contains essentially the same material which appeared in the first volume issued in 1921, but with numerous additions and revisions made necessary by the great strides of the cement industry during the last six years.

The book is in no sense a textbook, nor does it prescribe formulas or rules.

A glimpse at the world's tough jobs as "Caterpillar"-ized for a "Better, Quicker, Cheaper" completion is periodically given some 145,000 readers of that colorful little house organ of the Caterpillar Tractor Co., San Leandro, Calif., and Peoria, Ill.

A brief review of issues 20, 21 and 22 pictures a Sixty hauling a little load of 35 tons across a stream in Alberta for the Turner Valley Oil Fields; a 2-Ton pulling a two-wagon trainload of sugar cane in Cuba; another 2-Ton drags a rotary scraper that is changing Windsor Forest, in England, into a golf course; a Sixty dragging down cactus jungle in Hawaii to make room for a pineapple plantation; a Thirty is bulldozing a Chicago rubbish heap into the world's greatest park and boulevard system on the Lake Michigan front.



New Seven-Foot Adams Leaning-Wheel Grader with Scarifier Attachment

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Growl at
Our Service*



"Cinders"

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ECONOMICAL OIL
FOR ANY CAR

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Costs a little more by the gallon than ordinary oils, but measured by miles run, it is the cheapest oil you can buy.

THERE'S AN EXTRA QUART OF LUBRICANT IN EVERY GALLON

QUAKER STATE is free from the non-viscous content that makes up 25%, or more, of the volume of ordinary oils. This undesirable matter is removed at the refinery by a special exclusive SUPER-REFINING process—it doesn't leave it for your engine to struggle with.

FOR ANY CAR QUAKER STATE WILL PROVE AN ECONOMY NOT ONLY IN YOUR YEARLY EXPENDITURE FOR OIL, BUT EVEN MORE IN IMPROVED RUNNING AND FREEDOM FROM WEAR AND REPAIRS.

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DENVER, COLORADO

Pueblo county recently completed its first 1928 highway project, which consisted of gravel surfacing of the road from Dotson Lake to the Santa Fe trail in the eastern part of the county. The job is one of several ones to be carried out this year on feeder roads which will make the arterial routes more accessible to outlying regions.

The underpass of the Santa Fe trail at Swink, under the Santa Fe tracks, was opened to traffic April 1. The subway, which has been under construction for several months, is part of the paving job through Swink, connecting Rocky Ford

and La Junta. With its completion the entire distance between La Junta and Rocky Ford, eleven miles, is paved.

Fremont county has added a 10-ton Monarch tractor to its road equipment.

Surveys for the Mosca pass highway between Alamosa and Gardner have been completed by state highway engineers, and plans for improving the route at a cost of \$40,000 are now under consideration by the highway department. The old wagon trail will be made passable. It will not only reopen a scenic part of the San Isabel national forest, but will

place the San Luis Valley forty miles nearer to Pueblo.

The state highway bridge department is preparing for Pueblo county bridge plans for the \$30,000 Beulah hill road reconstruction program. It is planned to build a new bridge across St. Charles Creek at the foot of the revamped Beulah hill. Pueblo county will ask for bids on the project soon.

County officials from ten counties in and adjoining the fifth highway district discussed highway and other matters at a recent meeting held in Colorado Springs.

PLANS SUBMITTED FOR APPROVAL TO U. S. BUREAU OF PUBLIC ROADS

Proj. No.	Length	Type	Location
F.A.P. 2-R #7	1.224 mi.	Pav't & R. R. Grade Separation	South of Aguilar
F.A.P. 147-A	15.896 mi.	Gravel Surfacing	South of Cortez
F.A.P. 253-C	4.502 mi.	Gravel Surfacing	West of Milner
F.A.P. 208-B	0.507 mi.	Grav. & R. R. Grade Separation	East of Grand Junction
F.A.P. 287-A3	2.550 mi.	Pavement	West of Fort Morgan

PROJECTS BEING ADVERTISED FOR BIDS

Proj. No.	Length	Type	Date Bids Opened	Location
F.A.P. 282-F	2.17 mi.	Gravel Surfacing	April 26, 1928	South of Craig
F.A.P. 296-C	6.606 mi.	Gravel Surfacing	April 26, 1928	South of Pueblo

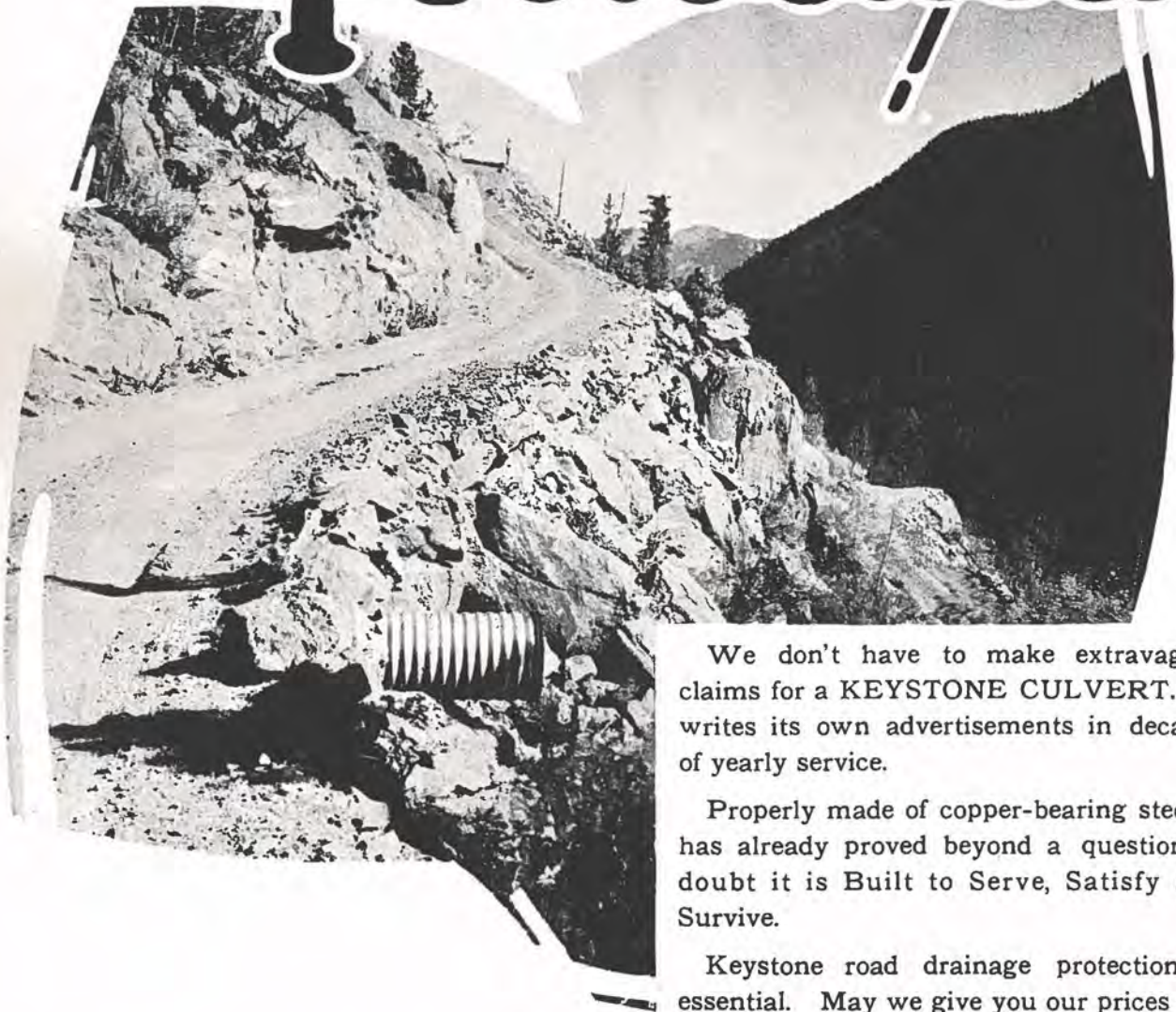
PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
F.A.P. 2-R #8	1.5 mi.	Pavement	Aguilar
F.A.P. 144-C	4.0 mi.	Gravel Surfacing	Northwest of Fort Collins
F.A.P. 154-A	2.0 mi.	Gravel Surfacing	South of Buena Vista
F.A.P. 208-B	0.5 mi.	{ Gravel Surfacing & Overhead } { R. R. Crossing }	Clifton
F.A.P. 251-C	4 mi.	Pavement	East of Boulder
F.A.P. 266-D	5.0 mi.	Gravel Surfacing	South of Bondad
F.A.P. 271-C	3.0 mi.	Gravel Surfacing	West of Portland
F.A.P. 272-D	1.0 mi.	Pav't & R. R. Grade Separation	Manzanola
F.A.P. 275-A #2	0.2 mi.	Pavement	Sedalia Connection
F.A.P. 277-C	5.0 mi.	Pavement	North of Pueblo
F.A.P. 282-E	6.0 mi.	Gravel Surfacing	North of Meeker
F.A.P. 282-F	3.0 mi.	Gravel Surfacing	South of Craig
F.A.P. 282-H	5.0 mi.	Gravel Surfacing	North of Rifle
F.A.P. 286-B Reop. #1	14.5 mi.	Oil Grav. Surf.	North of Nunn
F.A.P. 286-C	5.0 mi.	Pavement	North of Greeley
F.A.P. 287-A3	4.0 mi.	Pavement	West of Fort Morgan
F.A.P. 287-A #4	5 mi.	Pavement	West of Fort Morgan
F.A.P. 288-A3	4.0 mi.	Grading	Northeast of Brush
F.A.P. 290-C	0.5 mi.	Bridge	North of Lamar
F.A.P. 292-B	3.5 mi.	Graded & R. R. Grade Separation	South of Minturn
F.A.P. 295-D	2.5 mi.	Gravel Surfacing	North of Antonito
F.A.P. 298-B	4.0 mi.	Gravel Surfacing	North of Pagosa Springs

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1928

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj No
2-R5	Bet. Trinidad and Aguilar	1.959 mi.	Paving	W. A. Colt & Son	\$ 72,122.50	42	2-R5
2-R	No. 6 South of Aguilar	2.75 mi.	Pavement	W. A. Colt & Son	93,000.00	16	2-R No. 6
138-A	North of Kremmling	10.916 mi.	Grading	F. L. Hoffman	201,262.80	0	138-A
144-B	Northwest of Fort Collins	3.201 mi.	Gravel Surfacing	White & LaNier	44,000.00	25	144-B
145-A	West of Glenwood Springs	3.807 mi.	Gravel Surfacing	Winterburn & Lumsden	53,227.90	94	145-A
145-B	West of Glenwood Springs	1.051 mi.	Surfacing	Winterburn & Lumsden	42,389.72	0	145-B
210-B2	De Beque-Grand Valley	7.507 mi.	Gravel Surfacing	Fred Kentz	37,475.00	31	210-B2
247-C	Swink	0.8 mi.	Conc. Pav. & R.R. Underpass	J. Flinger & Son	62,559.58	67	247-C
254-C2	S. W. of Hot Sulphur Springs	Superstr. of	Bridge & Approaches	Northwestern Constr. Co.	48,203.50	66	254-C2
254-D	Parshall-Hot Sulphur Springs	3.013 mi.	Gravel Surfacing	Hinman Bros. Constr. Co.	37,124.18	94	254-D
258-D	Iola-Cebolla	4.426 mi.	Gravel Surfacing	H. C. Lallier Const. Co.	52,739.80	99	258-D
258-E2	Cimarron-Cerro Summit	1.487 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	32,377.70	0	258-E2
258-F	Gunnison-Sapineto	5.689 mi.	Surfacing	Hinman Bros. Const. Co.	100,968.50	0	258-F
266-C	Durango and N. Mex. State Line	2.401 mi.	Surfacing	Salle Const. Co.	32,499.80	0	266-C
275-C3	E2 G3 Palmer Lake-Pring	4.602 mi.	Concrete Paving	J. Fred Roberts & Sons C.C.	114,079.65	0	275-C3 E2 G3
275-E	North of Monument	0.926 mi.	Grading and Underpass	F. L. Hoffman	41,905.20	87	275-E
275-F1	Castle Rock-Larkspur	10.303 mi.	Grading	J. Fred Roberts & Sons	132,679.00	100	275-F1
275-F3	G2 Tomah-Palmer Lake	12.894 mi.	Concrete Paving	H. C. Lallier C. & E. Co.	232,309.95	3	275-F3 G2
277-B	South of Colorado Springs	4.860 mi.	Concrete Paving	J. L. Busselle & Co.	131,202.45	0	277-B
279-D	Morrison	0.264 mi.	Paving	M. E. Carlson	23,266.80	84	279-D
279-J	Schaffer's Crossing-Baileys	3.243 mi.	Grading	S. M. & S. J. Feely	54,305.60	100	279-J
279-F	North of Baileys	3.444 mi.	Graded	J. Fred Roberts & Sons	126,000.00	15	279-F
282-D	North of Meeker	2.864 mi.	Gravel Surfacing	Winterburn & Lumsden	42,155.00	95	282-D
287-D1	Two mi. E. of Kersey on S. H. 2	0.921 mi.	Grading	White & LaNier	14,046.40	37	287-D1
288-A2	Bet. Merino and Brush	9.741 mi.	Paving	Edw. Selander	245,043.50	51	288-A2
292-A	North from Minturn	6.417 mi.	Grading	H. C. Lallier Constr. & Eng. Co.	92,571.80	80	292-A
295-C	La Jara-Antonito	5.284 mi.	Surfacing	Poppe Bros. C. C.	29,414.60	0	295-C
297AR	Northeast of Palisade	2.848 mi.	Surfacing	O. J. Dorsey	15,043.00	100	297-AR
300A	Bet. Chattanooga & Red Mt.	2.277 mi.	Grading	Winterburn & Lumsden	59,480.80	20	300-A

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We don't have to make extravagant claims for a KEYSTONE CULVERT. It writes its own advertisements in decades of yearly service.

Properly made of copper-bearing steel it has already proved beyond a question of doubt it is Built to Serve, Satisfy and Survive.

Keystone road drainage protection is essential. May we give you our prices and further information? A letter from you will bring this information pronto.

COLORADO CULVERT & FLUME CO. *PUEBLO*



Fast—as a Unit!

NOT merely fast charging, or fast discharging, or fast in this or that feature—but *fast as a unit!*

That's why we have sold so many Koehring pavers!

That's why, on job after job, we know the Koehring will give the extra speed performance that means extra profits!

Put Koehring Speed and Heavy Duty Construction on your side and depend on us to give you generous, prompt service! Give us a phone call.

Wilson Machinery Co.

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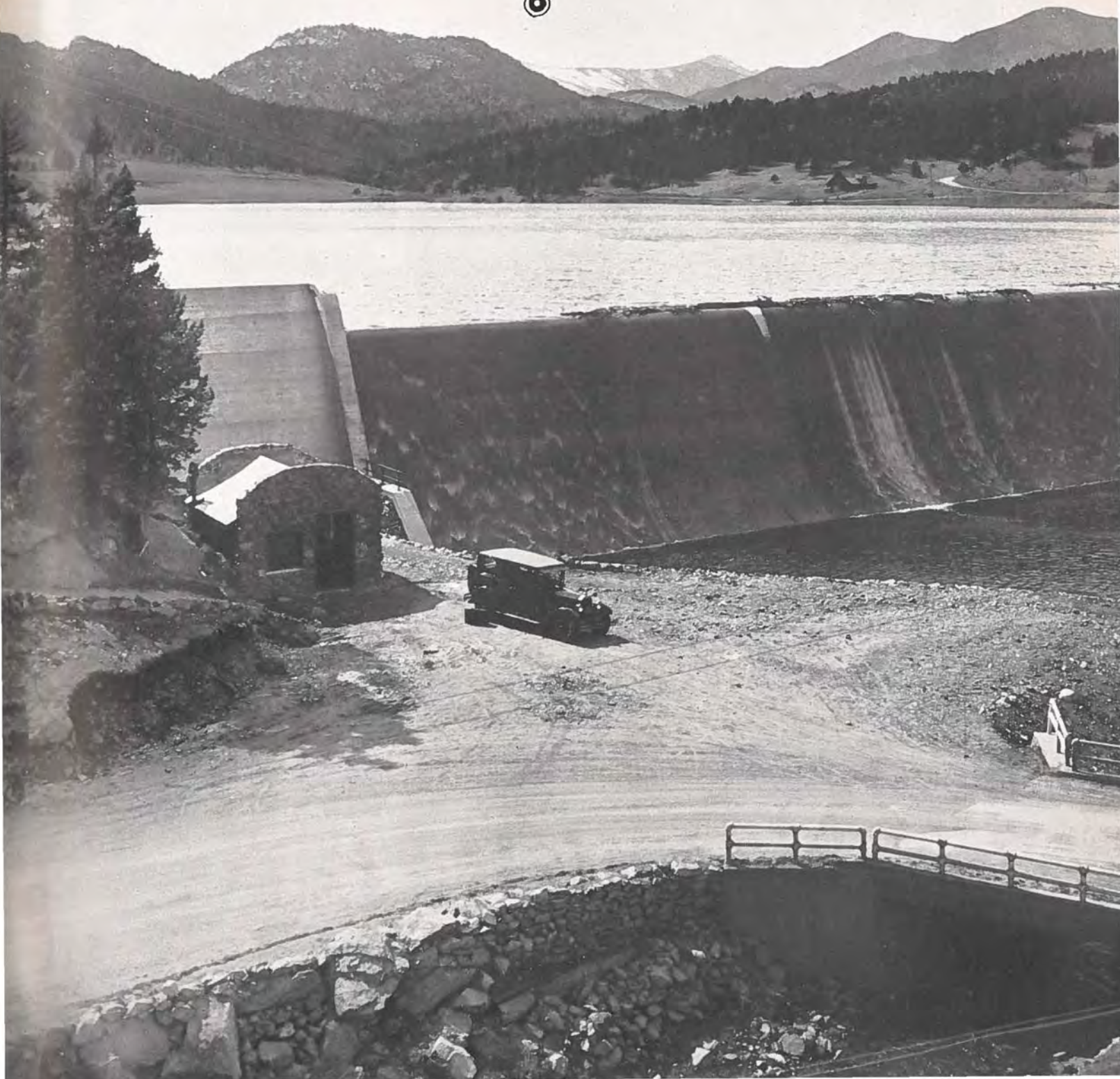
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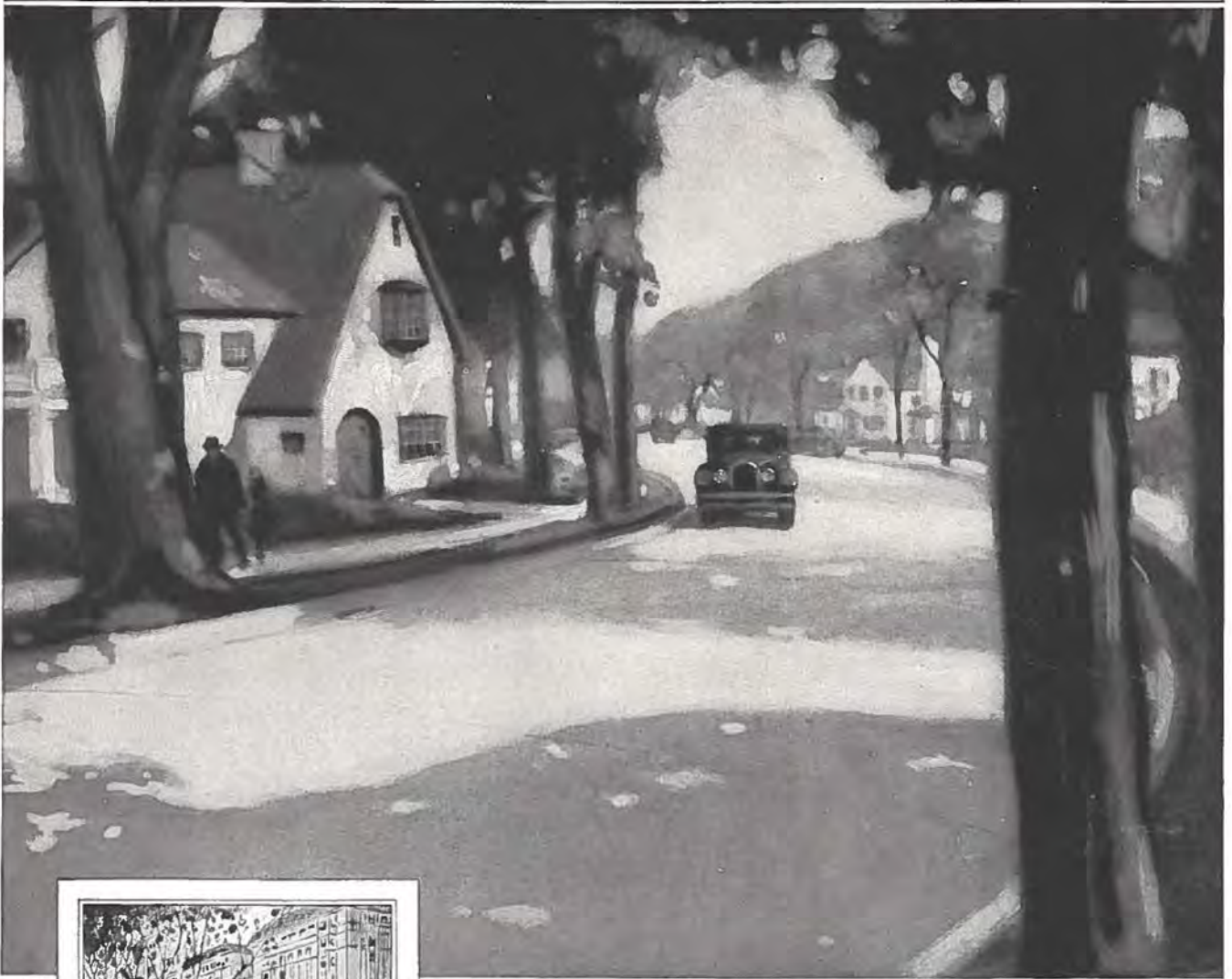


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COLORADO HIGHWAYS



Clean, Smooth Streets OF LASTING BEAUTY



*For further information about
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PORTLAND CEMENT ASS'N
Ideal Building
Denver, Colorado

WHAT impression does your town make on visitors—on you? Of course you who live there want it to be beautiful and attractive—because it is good business, and for your own happiness.

Consider your streets. Are they crumbling under motor traffic which must pick its laborious way around ruts and holes in a street designed for the horse and buggy? Or are they smoothly paved—clean and attractive—a good advertisement? Do they make the visitor wish to return?

Concrete is the ideal pavement for this motor age—in roaring metropolis or prosperous rural town. It is economical both to build and maintain, distinguished in appearance and—the safest pavement wet or dry.

CONCRETE *for permanence*



Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
 Denver, Colorado

GOVERNOR WILLIAM H. ADAMS, Chief Executive

L. D. BLAUVELT,
 State Highway Engineer.

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M. W. BENNETT, Editor

Articles on the subject of road building and highway development in Colorado are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible.
10 CENTS A COPY. \$1.00 A YEAR.

Our Cover Picture

A VIEW of the new dam and reservoir, with Mount Evans in the background, is shown on the cover of **COLORADO HIGHWAYS** this month. In the foreground is shown a glimpse of the Evergreen-Conifer road, which forms a link in the Denver Mountain Parks highway system. The concrete dam was recently completed by the City and County of Denver. The lake becomes a new feature of the Evergreen recreational area.

Denver Tourist Bureau photo.

Russell Standard Road Graders

The choice of many State
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Orders Since January 1, 1928

SOUTH CAROLINA

66 Standard No. 3's

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ALSO many smaller orders from other states, including both larger and smaller grades, Motor Patrols and Gravel Plants.

"Russell Always Makes Good"



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Construction Equipment

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Galion Leaning Wheel Graders

Sizes—7' 3" Blade, 8' Blade, 9' Blade, 10' Blade, 12' Blade

More machine work on Galion Leaning Wheel Graders than on any other grader built.



More alloy steel, more "machine-cut" steel gears in Galion Graders than in any other grader built. Easier operated, last longer, because "better built."

More Galion Leaning Wheel Graders sold than any other leaning wheel grader. There must be a reason. "Ask the operator who uses one." Stock and parts in Denver for immediate delivery. Almost 100 Galion E-Z-Lift Graders sold in Denver territory the first five months of this year.

There is a better grader built—buy it by name.

"Galion"

Sold, serviced and delivered from Denver stock

H. W. Moore Equipment Co.

A Colorado Owned Company

DENVER



Editorial Comment

Gas Tax Opens Rich Agricultural Region

OFFICIAL dedication of the Tamiami Trail, which extends from Tampa, on the west coast of Florida, to Miami, on the east coast, was observed the first of May. The road is 307 miles long and cost \$14,657,000. One section, from Miami to Everglade, 89 miles long, cost \$6,036,000, or \$66,000 per mile. To give a solid foundation through the Everglade section, it was necessary to excavate from one to ten feet of black muck and fill this with solid material.

The building of this and other cross-country highways has made accessible large tracts of land of great agricultural possibilities. Much of the central part of Florida was an impenetrable wilderness until the state began its program of highway building a few years ago.

Although Florida's population is only 300,000 in excess of Colorado's and its automobile registration about 100,000 greater than Colorado's, it has a trunk highway fund three times as large as ours. Gas taxes alone yielded nearly \$11,000,000 in 1927, the tax being 5 cents per gallon. Their receipts from motor vehicle fees was \$5,692,000. Florida, like Colorado, is visited by many tourists every year, and through the gas tax Florida gets a substantial contribution from them for building more roads. Instead of keeping tourists away, a high gas tax seems to attract them. They know that the states with high gas taxes have good roads.

Federal Highway Numbers

THE memorial highway was a worthy conception, but it lent itself to abuses. Nearly every secretary of a chamber of commerce can recall that but a few years ago each city was solicited for substantial contributions for maintenance of the highways—maintenance merely in name. Elaborate organizations were maintained, and the funds collected were paid out for secretaries and press agents who sought to get free advertising for the routes. Some of the funds were spent in "marking" the routes.

A good road doesn't need to be marked to be apparent. The motorist knows that it is good. Markers do not make the highway, though they help to guide the stranger.

The federal government has now progressed far enough in highway construction that continuous routes, improved virtually their whole length, stretch from coast

to coast. These are the roads on which federal aid funds are expended. They are good highways, not because they are marked, but because generous funds are provided for their construction and maintenance.

The government has adopted standard signs for all these highways and the routes are designated by numbers. The motorist can easily obtain maps and without difficulty can select the most direct route to his destination, without being the victim of "boosters" of local routes and combatants in local disputes.

Chambers of commerce and other organizations interested in tourist traffic should conform to the new order and adopt the numbers by which the federal highways are designated.—Sterling Advocate.

An Anti-Suicide Plan

THE state highway department is making it harder for reckless drivers to commit suicide. In ten years the department has eliminated sixty railroad crossings on trunk highways. What an appalling amount of business the department has eliminated for surgeons, undertakers and junk dealers!

A Gas Tax of a Dollar a Gallon

THE toll road, trying its best to come back after an absence of a generation, to compete under private ownership with the publicly-owned, free highway, won its first victory recently when the New Jersey legislature passed a bill authorizing the construction and operation of such a thoroughfare between Camden and Atlantic City.

The proposed speedway, if its franchise is utilized, will handle the vast traffic of ocean-bound Philadelphia motorists who are willing to pay for the privilege of escaping congestion on the public highway. The law permits the company to charge tolls as high as ten cents a mile.

Ten cents a mile! Worked out in terms of gasoline tax, that is a levy of at least a dollar a gallon. The promoters of the Camden-Atlantic City enterprise, even if they charge but half the maximum toll permitted, will be collecting a mileage tax twenty-five times as high as that collected by the state of Colorado for the use of the publicly-owned paved highways here.



The new steel and concrete bridge constructed by the State Highway Department which spans the Yampa River near Craig, Colo.

Motor Travel Shows Big Increase

HOW would you like to be assigned the task of driving a motor vehicle around the world sixty-one million times? Driving constantly at an average speed of 30 miles per hour, it would take you 571,000 years. But that is exactly what you would be forced to do could you undertake to duplicate the travel of motorists of the United States during 1927.

These interesting figures were compiled by the American Road Builders' Association following the association's report of gasoline consumption during 1927. Motorists consumed 11,563,490,000 gallons of gasoline, which, at an average of 13 miles to the gallon, would mean a total traveled distance of more than one hundred fifty billion (150,000,000,000) miles.

The average consumption per motor vehicle during 1927 was 550 gallons, and the average distance traveled estimated at 7,150 miles, on the ultra-conservative basis of 13 miles to the gallon.

The American Road Builders' Association accredits much of the increased motor travel to the existence of good roads. "These roads," it is claimed, "save from three to four cents for every mile traveled. If all the roads of the United States were improved to a degree proportionate to the amount of traffic they carry, the annual saving in transportation costs would exceed four billion dollars."

Road construction in 1928 will at least equal and probably exceed the highest mark recorded in any preceding year, according to reports received by the Bureau of Public Roads of the United States Department of Agriculture, and made by the bureau.

Improvement of the state and federal aid highway systems, under the supervision of the highway departments of the several states, will go forward during the season now opening with the construction of more than 20,000 miles of surfaced roads and about 8,000 miles graded and drained.

The state reports also indicate that at least 240,000 miles of the total of 288,000 in the state highway systems

will be maintained this year under the supervision of the state highway departments, a fact which should insure the traveling public a high degree of road service.

Funds estimated as available for expenditure during the year by the state highway departments are about 25 per cent greater in total amount than similar estimates indicated at the beginning of last season. Although it is not possible, so early in the season, to anticipate closely the yield of gasoline and motor vehicle taxes and other sources of revenue, it is practically certain that the funds available to all state highway departments for construction and maintenance of roads and bridges will exceed \$750,000,000, and local revenues, expendable by county and local authorities, will swell the highway total to upwards of \$1,300,000,000.

Details are not available concerning the work to be done by county and local authorities. It is anticipated that the year's work under state supervision will result in the construction of nearly 9,000 miles of hard-surfaced pavements, upwards of 12,000 miles of less expensive surfaced roads, and 8,000 miles of road adequately graded and drained.

The United States now has 666,900 miles of improved highway. There is a great demand for additional improved highways in the secondary system.

A total of 963.3 miles of federal aid highways have been completed in Colorado. Since June 30, 1927, 53.6 miles of federal aid road have been finished. The state on March 31 had 235.8 miles under construction. At the same time projects totaling 18 miles had been approved for construction.

On May 1 the Colorado department had projects totaling \$1,500,000 under contract. Work on these is now under way. It is expected that the department's record during the 1928 construction season will break all records for finished projects in any one year.

On March 31, Colorado had a balance of \$3,384,155 of federal aid funds available for new projects. This sum must be met by the state on a fifty-fifty basis.

During the past month work was started on ten new projects. These included paving, grading and gravel surfacing. Pouring of concrete on two projects between Tomah and Monument, on the Denver-Colorado Springs highway, was started. About three miles of this pavement is now laid. The total length of the two projects is seventeen miles. The contracts call for the completion of the entire stretch by December 1.

One of the most important projects put under contract by the department during the month was sixteen miles of grading and gravel surfacing between Shiprock and Cortez, in southwestern Colorado. This piece of work will connect with ninety miles of new roadway recently completed in New Mexico, running north from Shiprock. It will give a new outlet to the south from the Mesa Verde region. This work was given to Tobin & Maloney, contractors.

Another important project on which work was started is eleven miles of grading north of Kremmling. Frank Hoffman, contractor, started a large force of men and equipment to work on this project. The completion of this work will see the elimination of a bad piece of old road leading to Rabbit Ear Pass. Hoffman expects to complete the job by the end of the construction season.

In this connection it was announced that traffic is moving over the new road through Byers Canyon, which has been under construction for the past three years. The new route through the canyon eliminates a very bad stretch of road over Parshall Hill, which was almost impassable during wet weather.

Work also was started by Pople Brothers on their contract, calling for the surfacing of 5½ miles of surfacing between La Jara and Antonito. Later in the season this stretch of road will be oil treated. This will be the first piece of road in the state to be given oil treatment. The oiling process will be in the nature of an experiment.

Contractors are now busy constructing seven miles of new road between Gunnison and Cerro Summit. This work will eliminate two bad stretches on the Blue Mesa route between Gunnison and Montrose. The work of gravel-surfacing a part of the Blue Mesa road also will be started shortly. A steam shovel under state supervision is now at work on the Blue Mesa near the Half Way House. This will be operated all summer. The Blue Mesa route is one of the main arteries of travel between eastern and western Colorado.

The department also has awarded a contract for the improvement of six miles of State Road No. 1, between Crowe and Greenhorn, south of Pueblo. This road will be located partly on a new survey line and will eliminate several bad curves.

Five miles directly north of Pueblo will be paved, and about five miles south of Colorado Springs, extending the pavement already started there a year ago. Surveys are under way between these two projects so that in two or three years at the latest, the gap between Colorado Springs and Pueblo will be closed with concrete pavement. The pavement now reaching almost to Aguilar, north from Trinidad, will be extended as far as \$280,000 will build it.

Another important project for which plans are now nearly completed is the proposed pavement between Lafayette and Boulder. This will cost approximately \$175,000. Work will be started on this within a few weeks, according to present plans.

The road from Denver to Greeley already is paved.

Approximately five miles more will be added to this important artery of travel during the summer. It will be an extension of the pavement north of Greeley to the town of Nunn. Plans also are completed for the paving of seven miles west of Fort Morgan. This pavement will be awarded in two projects.

From Nunn north to the state line toward Cheyenne, oil will be applied to harden the present gravel surfacing. There is 14½ miles in this project. A number of other regrading and gravel-surfacing projects in various sections of the state, where traffic does not yet justify or funds permit paving, will be undertaken by the department.

A mile of pavement and a railroad underpass will be constructed at Manzanola; five miles of gravel surfacing north of Rifle; three miles of surfacing south of Craig, and three miles of gravel surfacing north of Antonito.

Plans also are well under way for the construction of a new highway over Mosca Pass, giving a new artery of travel into the rich San Luis Valley from the eastern slope. Over \$50,000 will be expended on this road this year.

Under the new system whereby the state highway department has taken over from the counties all maintenance of federal aid roads, crews already are getting busy on the main traveled roads of the state to keep them in shape. During the coming summer the state will have 125 patrol crews employed on these roads.



Pouring concrete on the paving project between Tomah and Monument. Lower photo shows finishing machine in operation.



A view of Battle Mountain highway, showing newly-constructed stone guard railing.

Congress Passes Colton Bill

PASSAGE by the Senate and House of the Public Land bill, providing \$3,500,000 a year for each of the fiscal years of 1929, 1930, 1931, as a special highway fund for federal aid in eleven western states was announced from Washington on May 16. This measure is now before the President for his signature.

The bill had the support of nearly every motorist organization in the country. The state of Colorado will receive \$195,710 under the apportionment to be made from the appropriation authorized by the bill.

The purpose of the special fund, created by the measure, is to permit the construction by the Bureau of Public Roads of main roads through unappropriated or unreserved public lands, non-taxable Indian lands, or other federal reservations. It will permit the filling of gaps in the federal aid highway system, which lie within those states largely owned by the federal government and which under the federal aid program could not be completed for lack of funds, due to the inability of the states to match dollar for dollar the federal government's appropriations.

In the state of Nevada, as an example, it is pointed out that 86 per cent of the entire domain is owned by the federal government. In that state there are 1,398 miles of federal aid highways, with several hundred miles of roads crossing the public domain.

The fund is to be apportioned among the states having more than 5 per cent of public lands, in proportion that the public lands bear to the total area. It will now

be necessary for this money to be appropriated, as the legislation which has passed is only an authorization. Supporters of the measure are hopeful of having it included in a deficiency appropriation bill before Congress adjourns, and that will make the money available on July 1.

Approximate apportionment to the public-land states of funds planned for authorization as outlined in the measure follows:

Arizona	\$ 445,599	Oklahoma	\$ 44,943
California	377,457	Oregon	258,139
Colorado	195,710	South Dakota.....	67,890
Idaho	280,938	Utah	329,872
Montana	265,426	Washington	124,036
Nevada	545,384	Wyoming	296,586
New Hampshire....	3,906		
New Mexico.....	271,124	Total	\$3,500,000

It will not be necessary for the several states benefiting under the terms of this measure to match this money with state funds. The fund will be expended under the direction of the Bureau of Public roads and may be expected on any sections of the federal aid system which lie within public domain.

Passage of this measure will mean much to the states and the federal government's highway construction program and will meet with the unanimous approval of the millions of motorists of the country. There are many places on the federal aid system in Colorado where this money can be expended on much-needed road improvements, according to Major L. D. Blauvelt, state highway engineer.

Forest Road Construction

By G. H. LAUTZ, Assistant Chief Engineer, U. S. Forest Service, Washington, D. C.

DURING the past fiscal year there has been constructed a total of 1,370 miles of roads, consisting of 292 miles of major highways and 1,078 miles of minor roadways. The road projects classified as major are those constructed by the Bureau of Public Roads, while those built by the Forest Service are called minor. The former are state highways and other roads where construction work is difficult; the latter are county, community and development roads of simple construction. The amount expended upon all construction was \$7,713,535. Of this, \$6,787,656 was secured from federal funds and the remainder, \$925,879, from local co-operative, state and county funds. The average cost per mile of the roads thus constructed was \$5,632 per mile, the major averaging \$19,599 and the minor \$1,856. During the same fiscal year, 1927, there was expended \$946,622 for the construction of 4,987 miles of trails, which averaged \$190 per mile.

In addition to the construction work, roads and trails were maintained requiring an expenditure of \$1,593,950 during the fiscal year. \$1,182,961 was used for the maintenance of 14,594 miles of roads and \$410,989 was used for the maintenance of 50,667 miles of trails.

To July 1, 1927, there had been completed a total of 13,219 miles of roads at a cost of \$62,044,158. This rep-

resents an expenditure of \$47,775,034 federal funds and \$14,269,124 co-operative funds. The trails constructed to July 1, 1927, amounted to 31,607 miles. The money for this work was composed of \$6,060,964 federal funds and \$251,012 co-operative funds, totaling \$6,311,976.

The total amount expended for all road and trail purposes; that is, construction, reconstruction, maintenance, surveys, administration and equipment, has to July 1, 1927, amounted to \$79,601,464. Of this, the federal government contributed \$63,989,508 and the local co-operators \$15,611,956.

The desired transportation system for the National Forests as planned for the next ten years includes a total of 51,268 miles of roads and 110,385 miles of trails, 83 per cent of the former and 98 per cent of the latter being located within the forest boundaries. The road system is composed of 15,068 miles of forest highways and 36,200 miles of forest development roads. Forest highways are roads of primary importance to the states, counties and communities, while forest development roads are those of primary importance, for the protection, administration and utilization of the forests. Of the former, 75 per cent of the mileage is located within the forest boundaries; 5,084 miles of the forest highways are now in satisfactory condition, 8,687 miles are passable but unsatisfactory; that is, require additional expenditure of funds; and 1,297 miles are non-existing; that is, simply planned for future construction in locations where no roads are located at the present time.

In the Forest Development System, 10,910 miles are considered satisfactory, 14,767 miles unsatisfactory, and 10,523 miles are non-existing. Eighty-seven per cent of the total mileage, 36,200, is within the boundaries of the Forests.

The Forest Trail System is at present composed of 73,431 miles of trails constructed to a satisfactory standard, 12,461 miles of unsatisfactory trails, and 24,493 miles of proposed. From the above it will be seen that the construction of a large mileage of both roads and trails must be completed before the desired and necessary transportation systems have been accomplished. During the past year there was available for road and trail work \$4,500,000 forest highway, \$3,000,000 forest road development and approximately \$500,000 ten per cent money. The first was used for forest highways, while the other two were used upon development roads and trails.

Colorado's \$17,000,000 program for a network of highways and trails in the National Forests of the state is nearly one-third finished. To date, 1,052.2 miles of roads have been built, including 324.2 miles of major highways, a report issued by Col. A. S. Peek, district forester, shows. Trails laid out total 3,309.7 miles.

The amount spent for this work is \$5,458,231.97, of which \$741,976.24 came from co-operative state and county allotments. From funds received from the use of National Forests in the state, 10 per cent is devoted to road and trail work. This aggregates \$495,342.11.

When the program is completed, a few years hence, there will be 1,698 miles of major highways at a cost of \$13,911,269, as well as 1,636 miles of minor or development roads, \$3,343,610; and 11,498 miles of trails, \$104,956.



Two views of concrete paving operations near Palmer Lake on the Denver-Colorado Springs highway.

Boulder Builds Model Road

THE Romans of old, who used materials at hand for road building, were all pikers in comparison to the modern highway builders of Boulder county, where mine dumps are being utilized for highway surfacing, upon the advice of Edward B. Hill, chairman of the board of county commissioners.

Boulder county has just completed the model gravel-surfaced highway of the state, the material selected being red ash, a by-product of the coal mines of the Marshall and Gorham sections of the country.

The new stretch of road is almost eight miles in length and branches off from the Denver-Boulder link of the Lincoln highway at the Eversman corner, two miles south of Lafayette, and runs west, forming the main line into the famous Eldorado Springs resort, the mecca for thousands of tourists and vacationists every summer.

Although the name implies a soft, dust-like material, red ash as taken from the mines is one of the hardest road-surfacing materials known to engineers, and was selected not only because it could be obtained adjacent to the road, but because of its hardness and the fact that it packs well into the dirt surface of the highway. The material also had an added advantage. During the wet weather when the ordinary gravel road is slippery and

"uncertain," the red ash road is extremely secure, and motorists who drive over the few short stretches in the county already surfaced with it claim it to be the safest kind of road constructed. There is practically no dust from it.

The surface of this Eldorado Springs line was given a covering of four inches, requiring more than 2,000 truck loads. A fleet of trucks was kept plying between the mines and the road during the surfacing operations, and two days ago the line was declared ready for use by Hill and was opened to the public. It was pronounced by him and representatives of the state highway department as one of the best stretches of surfaced road in this section of the state.

The highway was constructed with two thoughts in mind. In the first place, it will give a direct route to and from Eldorado Springs, located at the mouth of one of the deepest and most picturesque canyons in the Rocky Mountain region, and, in the second place, it can be used this season as a detour in and out of Boulder while a five-mile link of paving is being laid on the Arapahoe road out of Boulder, to connect with the Lincoln highway, nine miles east. This link of paving will complete the concrete highway between Denver and Boulder.



Showing different types of new equipment being employed by state maintenance forces on the federal aid system in Colorado. Upper left shows type of equipment discarded by the state, while on the right is shown one of the new tractor grader combinations now in operation. The two lower pictures show other types of equipment now in use.

New Cortez Highway Started

By RAYMOND EATON

ON May 1 the state highway department let a contract for the construction of a highway that is of more importance to Colorado than any similar road recently projected, in the opinion of Major L. D. Blauvelt, state highway engineer.

The contract calls for the gravel surfacing of sixteen miles of roadway south of Cortez. Tobin & Maloney, contractors of Madison, S. D., were the low bidders on the work. Their bid was \$119,000. Work on the project already has started. The contractors have one of the largest outfits in the country, and they are expected to make a speed record on the project.

Back of a connection with this road is the Automobile Club of Southern California, and marks the real beginning of Colorado and Southern California joining in the movement to attract motorists.

This is the road to begin 12 miles south of Cortez in the Montezuma Valley and extending to the Colorado-New Mexico line. Similar improvement work is to be done on the road from Shiprock, N. M., to the Colorado line to connect with this road. Construction is to be pushed at once after the contract is let and it is hoped before the year is over that the entire route from Shiprock into Cortez will be graveled.

IMPORTANCE OF ROAD

The importance of this bit of road comes in the fact that both Colorado and Southern California realize the motorist is not seeing all the West that he should see in his transcontinental traveling. The Automobile Club of Southern California has completed the logging of the National Old Trails route from New York to Los Angeles. This hits a part of Colorado, passing through La Junta and Trinidad and then over Raton Pass and on through New Mexico.

It has been noted in Los Angeles that a very considerable number of motor visitors return by the same route, and this, too, has been observed in Colorado. California also has seen that many motorists who cover Colorado do not go on through to Los Angeles.

The final opening of the Shiprock-Cortez road will, it is argued, work to the advantage of both Colorado and California. The motor tourist may go one route and return the other, and that is the point in this story.

CROSSES UTE RESERVATION

The opening of the new highway means that the motorist can follow the state highway out of Denver, Pueblo or Trinidad via Walsenburg and La Veta Pass (elevation 9,378 feet), Alamosa, Monte Vista, Del Norte, South Fork, Wolf Creek Pass (elevation 10,850 feet) and Pagosa Springs into Durango. Thence the route is by Mesa Verde and Cortez and thence by Shiprock to Gallup, N. M., where the National Old Trails is picked up.

The new road in Colorado will cross the Ute Indian reservation. It will bring this famous reservation and the agency at Shiprock on the main route of transcontinental motor travel, and will be the means, it is predicted, of increasing to a very large extent the number of motorists through Colorado in their trips across the country.

The present road from Gallup to Shiprock is called a boulevard, and there is a state highway from Denver,

Colorado Springs, Pueblo, Walsenburg and Trinidad into Durango and to Mesa Verde via Wolf Creek Pass as outlined. Mesa Verde as an attraction for tourists is increasing every year and the new road will make it possible for the transcontinental tourist to see the ruins of these prehistoric people.

The Ute reservation and the agency at Shiprock are on the direct route and the Ute agency at Ignacio in Colorado can be taken in with a detour. For scenic grandeur no other highway in Colorado surpasses the one now into Durango.

AIDS MONTEZUMA VALLEY

Considerable enthusiasm is aroused in the Montezuma Valley by the construction of this highway. It means opening that wonderful valley to the tourist. It also means Yucca House, a national monument, and the buried cities of that region will take on renewed interest for the motor traveler. It will also open an improved road into California from Western Colorado.

This route now is followed very largely by Californians, Coloradans and tourists, but the roads are not what they should be and automobile clubs and others have felt some hesitancy in directing motor tourists over this route.

While, perhaps, there is no scenery, yet there is another interesting point that probably will attract motor tourists, and that is the Four Corners, the only spot in the United States where you can stand in four states at once. This is where Colorado, New Mexico, Utah and Arizona meet. There is a stone there marking each state. It is off the traveled road, but will be easily reached by the proposed highway improvements.

In connection with this Cortez road is the improvement of the highway from Durango south to the New Mexico line. New Mexico plans to make a similar improvement from Farmington to the Colorado line and also from Shiprock into Farmington, forming another route for the tourist, provided he does not wish to visit Mesa Verde. This latter improvement is of special importance to Durango and the San Juan country and that tributary to Aztec and Farmington.

At Aztec is a federal monument comprising one of the Aztec communal houses of several hundred years ago and in an almost perfect state of preservation, which already is widely known to motorists.

Roy W. Crum Appointed Director of National Research Board

The Highway Research Board of the National Research Council announces the appointment of Roy W. Crum to be director, effective April 1, 1928.

Mr. Crum has been since 1919, Engineer of Materials and Tests, of the Iowa Highway Commission. He has been active in the research work of the Highway Research Board, and the various national organizations.

The membership of the executive committee is as follows: E. H. Eno, Chairman; H. C. Dickinson, Vice-Chairman; T. H. MacDonald, T. R. Agg, A. J. Brosseau, C. M. Upham and W. Spraragen.

Motor Vehicle Taxes Increase

State motor vehicle taxes increased three times as much as motor vehicle registrations in 1927 and the average per vehicle tax for the county increased 10 per cent in 1927 over 1926, according to the annual survey of the American Automobile Association.

The total increase of motor vehicle registration for the United States in 1927 was 5.6 per cent, while the increase in the total amount of special car taxes (exclusive of personal property taxes) for the forty-eight states and the District of Columbia was 16.1 per cent.

Following is a summary of other facts brought out in the annual tax review:

First: The average per vehicle tax levy for the entire country was \$23.78 in 1927, as compared with \$21.60 in 1926, an increase of 10 per cent in a period of twelve months. The per vehicle tax has increased 278 per cent since 1919, when it stood at \$8.55.

Second: Special taxes collected from car owners by the states reached a new high peak last year, with a total of \$552,629,828.16, as compared with \$475,885,583 in 1926, an increase of \$76,744,245.

Third: The states' revenue from the gasoline tax increased 35.4 per cent in 1927, the total being \$254,109,262, as compared with \$187,603,231 the previous year.

Seven states had more than a million registrations in 1927. They were: New York, 1,899,429; California, 1,693,195; Pennsylvania, 1,583,763; Ohio, 1,570,418; Illinois, 1,438,985; Michigan, 1,156,344; and Texas, 1,115,899.

In state fees, drivers' licenses and gasoline taxes, the highest five were: Pennsylvania, \$43,212,552.92; New York, \$31,743,545.47; Michigan, \$31,025,367.12; Ohio, \$30,540,901.99; and Texas, \$30,215,000.00.

In the amounts collected from the gas tax, Ohio with \$19,894,675 led the list; next came California with \$19,826,175; Pennsylvania, \$17,296,332; Texas, \$14,560,000; and Michigan, \$14,158,371.

The five states with the highest per vehicle tax were: Florida, \$41.95; Oregon, \$41.46; Arkansas, \$39.21; Georgia, \$38.84; and Virginia, \$37.93. The district of Columbia with \$10.92 had the lowest per vehicle tax levy.

Consumption of gasoline by motor vehicles increased 12.4 per cent during 1927. The number of gallons of gasoline consumed in the United States totaled 11,563,490,000 gallons.

California led all states in the consumption of the fuel, the vehicles of that state burning 1,017,681,000 gallons. The state of New York ranked second with 892,800,000 gallons. The average national consumption per motor vehicle was approximately 550 gallons. The total number of miles traveled, estimated on a basis of 13.5 miles per gallon, was placed at more than 15,000,000,000 miles.

All but two states were imposing a tax on gasoline at the close of 1927, Illinois and New Jersey having inaugurated a tax during the year. New York and Massachusetts are the only states without the tax.

The increased consumption of fuel was attributed to the greater popularity of long distance travel, and to the stimulation of vehicle transportation by a larger mileage of good roads.

The gasoline consumption figures for the states of New York and Massachusetts were estimated. The Illinois and New Jersey figures were estimated on the basis of consumption for the months during which a tax was imposed and figures made available. In most of the states the figures were final and revised, while in Arizona, Arkansas, California, Colorado, Indiana, Iowa, Maryland, Mississippi, New Mexico, Pennsylvania, South Dakota, Utah, Vermont and West Virginia they are still subject to revision when the final gasoline tax reports are published.

The gasoline consumption in the various states, as estimated for 1927 from figures furnished by the American Petroleum Institute and the various state departments, was as follows:

State	Gallons	State	Gallons
Alabama	147,225,000	Nebraska	169,677,000
Arizona	41,237,000	Nevada	12,720,000
Arkansas	99,394,000	New Hampshire	45,722,000
California	1,017,681,000	New Jersey	408,300,000
Colorado	129,750,000	New Mexico	30,654,000
Connecticut	159,953,000	New York	892,800,000
Delaware	24,273,000	North Carolina	219,583,000
Dist. of Columbia	57,804,000	North Dakota	88,641,000
Florida	247,951,000	Ohio	773,801,000
Georgia	192,262,000	Oklahoma	251,462,000
Idaho	43,343,000	Oregon	130,885,000
Illinois	750,960,000	Pennsylvania	684,097,000
Indiana	347,757,000	Rhode Island	61,436,000
Iowa	284,320,000	South Carolina	101,772,000
Kansas	270,615,000	South Dakota	87,975,000
Kentucky	118,273,000	Tennessee	148,942,000
Louisiana	151,650,000	Texas	591,447,000
Maine	74,738,000	Utah	41,278,000
Maryland	131,798,000	Vermont	33,532,000
Massachusetts	314,720,000	Virginia	166,782,000
Michigan	593,372,000	Washington	203,421,000
Minnesota	289,686,000	West Virginia	101,396,000
Mississippi	118,371,000	Wisconsin	313,586,000
Missouri	322,219,000	Wyoming	26,218,000
Montana	51,046,000		
		Total	11,563,490,000



Type of creosote wooden bridge being constructed by the department on secondary roads.

International Highway Congress

AT the invitation of the United States Government, the leading highway engineers, economists and administrators of the world will meet in Washington in 1930 to attend the Sixth International Association of Road Congresses.

Fifty nations and five continents are expected to send hundreds of delegates to the meeting, which will be historic in that it will mark the first time the International Road Conference has assembled in the Western Hemisphere.

The resolution authorizing the invitation has been signed by President Coolidge, having passed the Senate and the House of Representatives under the able leadership of Senator Lawrence C. Phipps, of Colorado, and Representative J. Charles Linthicum, of Maryland. Senator Phipps, as a member of the Senate Committee on Post Offices and Post Roads, sponsored the measure in the Upper Chamber, while Representative Linthicum, of the Committee on Foreign Affairs, introduced the bill before the House and followed it through committee hearings.

The formal invitation will be transmitted by Secretary of State Kellogg, by direction of President Coolidge, to the Permanent International Association of Road Congresses, the official name of the organization. The association had previously voted to accept the invitation if extended.

The willingness of the association officials to bring the sixth conference to the United States is held to be significant. It is recognition on the part of the Old World, with its background of centuries of highway building, of the new order of achievement of the New World in the mass production and methods of administration of highway construction and maintenance. While highway engineering on the Continent antedates the roads of the United States by thousands of years, the utility, science and economic benefits of highway transportation, it is held, have reached their highest fruition in this country; and it is the desire to observe these results, it is believed, that prompted the engineers of Continental Europe and Asia to accept the invitation of the United States.

At the Fifth International Conference at Milan in 1926, the delegates from the United States tentatively advanced the project of bringing the next conference to the United States. Their overtures, expressing the hope that it would prove possible for the United States to extend, and the conference to accept, an invitation for the next meeting to be held in Washington, were cordially received. The delegates from the United States at the Milan Conference were Thomas H. MacDonald, Chief of the Bureau of Public Roads and Chairman of the Highway Education Board; Pyke Johnson, Executive Director of the Pan-American Confederation for Highway Education; H. H. Rice, Treasurer of the National Automobile Chamber of Commerce; J. N. Mackall, Chairman of the State Roads Commission for Maryland; Paul D. Sargent, State Highway Engineer for Maine; and H. H. Kelly, European Commercial Attache from the Department of Commerce.

Senator Phipps, commenting on the importance of inviting the world engineers to the United States, said:

"For some years Congress has realized the vital necessity of good roads, and it is now highly desirable to encourage such activities in other countries. The International Roads Congress is world-wide in its scope, and our invitation will continue the leadership of the United States in the field of highway development.

"I believe that the proposed conference will prove of great value to this country and to every nation which participates in it. These meetings turn the minds of people to peaceful pursuits, tend to promote international good-will, and add greatly to the nation's prosperity and development."

26,618 Killed in 1927 Highway Accidents; Increase of 1,316 Over Year 1926

Highway accidents took a toll of 26,618 lives during 1927, according to figures compiled by the American Road Builders' Association. The estimates include serious injury to 798,700 persons and an economic loss for the year totaling \$672,097,000. The economic loss does not include minor damage to motor vehicles or accident insurance premiums.

The highway accident figures are based on an increase of 5.2 per cent over 1926. The association reported 25,302 persons killed in that year, in addition to 759,500 seriously injured. The increase of 5.2 per cent was shown in a progress report assembled by the Bureau of Census.

Grade crossing fatalities show a decrease for the first eleven months of 1927, the number of persons killed totaling 2,120, as compared with 2,244 for the same months of 1926. Grade crossing fatalities in 1926 had increased from 2,206 in 1925.



Getting ready for paving concrete section of state highway into the town of Sedalia.

NEWS OF THE MONTH

Current Events in the Field of Highway Engineering and Transportation—State, County and Municipal Activities

BYERS CANYON IS CONQUERED

Hot Sulphur Springs.—The Byers Canyon road, one of the most important and most expensive projects ever undertaken by the state highway department, will be completed and opened for traffic this month.

The road, which runs from Hot Sulphur Springs to Parshall, a distance of approximately 5.75 miles, will have cost when completed, including a large steel bridge in the canyon, nearly \$330,000. It removes one of the most treacherous stretches of road in the state and takes out one of the biggest obstacles to a safe, modern highway from Denver west through Steamboat Springs and Craig into Utah. The job was a federal aid project, the government bearing half the cost.

Years ago the old county road from Hot Sulphur Springs to Parshall ran down Byers Canyon, a natural route. The Denver & Salt Lake Railroad later came along and the county roadbed was given to the railroad and the highway was changed to cut up over the hill outside of Hot Sulphur Springs and then down to Parshall, the canyon being too narrow for both roadbeds.

But the hill is composed of soft, sticky clay that makes it virtually impassable during the winter months and whenever it has been moistened by rain. In order to make an improved highway, a new route had to be discovered, so the highway department found the only feasible way was down Byers Canyon on the side opposite the Moffat Road tracks. Funds were appropriated in the budget and work was started two years ago.

Where the new road cuts off down the canyon just outside of Hot Sulphur Springs, heavy rock work started almost immediately, and before the next two or three miles had been completed the highway department has done some of the stiffest rock work in its experience on mountain roads. Money was poured into the driving of those few miles. About half way down the canyon the road cuts across the stream by the new steel bridge. This has been completed, with the exception of concreting the floor and filling up the approaches, which is now being done. The road below the bridge is ready for use into Parshall and has been improved for a quarter of a mile west of that town.

TRINIDAD-WALSEN PAVING TO BE DONE BY SUMMER

Trinidad.—Paving of four miles of road on the Walsenburg-Trinidad highway has been started and will be completed by early summer. The federal aid project was included in the 1928 highway budget and \$90,000 was set aside as the amount

to be expended on the repairing of this rough stretch of road.

Work was started near Aguilar and from there the highway men will work each way until the paving is finished, it is said. For the total distance between Walsenburg and Trinidad, the site being paved was always one of the roughest and most dangerous during unsettled weather.

MILE OF GRADING FOR PUEBLO PAVING DONE

Pueblo.—Highway crews under James L. Busselle, local contractor, have completed about one mile of grading on the five-mile stretch south of the present pavement on the Pueblo road, it was announced yesterday. Pouring of concrete is to start in June. Culverts are being installed and preliminary work on an 80-foot bridge over an arroyo four miles south of the end of the pavement, has already started. Completion of the five-mile stretch is called for by December 1.

PHANTOM CANYON ROAD TO BE REPAIRED

Canon City.—County Commissioner Bald announces that plans are now completed for making a number of improvements in the Phantom Canyon highway, in preparation for the opening of the tourist season. A gang of men, with graders, will be sent to the canyon next week and in many places the road will be made wider and in others leveled up. The project will not be of an extensive nature, but will be sufficient to put the highway in good condition. H. J. Williams, of Adelaide, has the contract for removing 250 tons of dirt and rock which came down in a slide in the canyon last winter. Mr. Williams has already removed 150 tons of the material, and expects to complete the job before traffic reaches its peak. At present it is necessary to make a detour in the canyon until the mud and rock are removed.

WORK STARTS ON CROWE-GREENHORN ROAD

After a delay of nearly a year, work has started on the new highway alignment between Greenhorn and Crowe, on the Pueblo-Walsenburg highway. The project comprises 6.6 miles of gravel surfacing and two new concrete bridges.

A contract for the work has been awarded to the H. C. Lallier Construction Co. The road is to take a course west of the present highway between Crowe and Greenhorn. It will follow the Rye road for about half a mile and then strike a southern course to circle the steep hills

over which the present road runs. Placing of the road around the bad grades and abrupt curves will eliminate the last remaining dangerous stretch of the main north and south highway through Colorado, it is said.

Because most of the road is through new right-of-way, motorists can continue to use the old road without interference from the construction work. The project was included in the 1927 state highway budget, but was delayed because of surveys and right-of-way difficulties.

NEW ROAD THROUGH ARAPAHOE COUNTY IS PROPOSED

A new highway giving Littleton a more direct contact with the rest of Arapahoe county is being planned. The new highway will divide the county almost in half and will be known as "the east and west road."

The new road will be an extension of Breen avenue, Englewood, running east through Parker and connecting with the towns in the eastern part of the county. It will be approximately five miles from the Adams county line on the north, and seven miles from the Douglas and Elbert county lines on the south.

At present it is necessary for residents in the eastern part of the county to go north to Colfax and out Broadway to reach the county seat, or to take an equally indirect route to the south.

The road will be graveled and of the raised type of construction, Highway Commissioner Race stated today.

Some sections of the road are already completed. Work on the rest will start within the next three weeks, Commissioner Race said.

MORRISON PAVED ROAD OPENED

The new stretch of paved road at Morrison, on the road from Denver up into Bear Creek Canyon and the Denver Mountain Parks, has been completed and opened to traffic by the state highway department.

The project is approximately one-quarter mile long and from the town limits of Morrison up through the main street to the turnoff across to the Conifer-Bear Creek Canyon intersection. The old route made a bad curve as it entered Morrison, and there was another bad turn just inside the town proper. The new road eliminates the curves. In order to do this it was necessary for the state highway department to change the course of Bear Creek a maximum of 150 feet and fill up the old bed. It was also necessary to tear down five houses on the new line and build a concrete bridge.

GOV. ADAMS APPOINTS ROAD DELEGATES

Governor Adams appointed sixty-one delegates yesterday to the sixteenth annual convention of the United States Good Roads Association. The convention will be held in Des Moines, Iowa, June 28 to 31.

The list of Colorado delegates includes:

Maj. L. D. Blauvelt, State Highway Engineer; Peter Seerie, Denver; W. G. Duvall, Golden; E. M. Nourse, Gunnison; verton; George L. L. Gans, Pueblo; M. A. Frank H. Blair, Sterling; B. B. Allen, Sil-Ege, Colorado Springs; Finlay L. MacFarland, Denver; Dr. F. L. Bartlett, Denver; Roe Emery, president Denver Cab Co.; H. Brown Cannon, president Windsor Farm Dairy; Harry N. Burhans, Denver; J. E. Zahn, Denver; Dr. Geo. P. Schumacker, Denver; E. B. Hill, Boulder; Ezra D. Dickerman, Leadville; C. M. Keck, Glenwood Springs; William Weiser, Grand Junction; Walter Walker, Grand Junction; T. W. Monell, Montrose; Milton R. Welch, Delta; J. A. Clay, Durango; Roy Cox, Trinidad; Robert Young, Walsenburg; Geo. M. Corlett, Monte Vista; H. Emperius, Alamosa; Jas. R. Noland, Alamosa; Frank S. Hoag, Pueblo; Geo. W. Huntley, Flagler; Fred W. Flebbe, Kremmling; Arthur V. Coonradt, Kiowa; L. Wirt Markham, Lamar; J. J. Woodring, Sterling; E. Wheeler, Ouray; T. M. Hudson, Gardner; J. H. King, Sterling; Mat McCaslin, Longmont; W. M. Ault, Fort Collins; Thomas Brennan, Erie; L. C. Paddock, Boulder; Alfred W. Dulweber,

Fort Morgan; G. H. Austin, Julesburg; Clarence McGee, Seibert; J. D. Hensen, Sterling; Arthur S. Dean, Las Animas; Dennis J. Mooney, Ordway; W. D. Carroll, Antonito; Mel M. Simpson, McClave; Tom Duke, Pueblo; Ed Johnson, Craig; J. E. Beckley, Delta; Jesse Caldwell, Trinidad; A. M. Parrish, Lamar; F. D. Calkins, La Jara; A. E. Headlee, Monte Vista; Tom Burnsides, Kiowa; S. N. Smith, San Luis; Fred Catchpole, Pagosa Springs; Harry Jackson, Durango; M. M. Sutley, Center.

WORK STARTS ON LAFAYETTE-BOULDER DETOUR

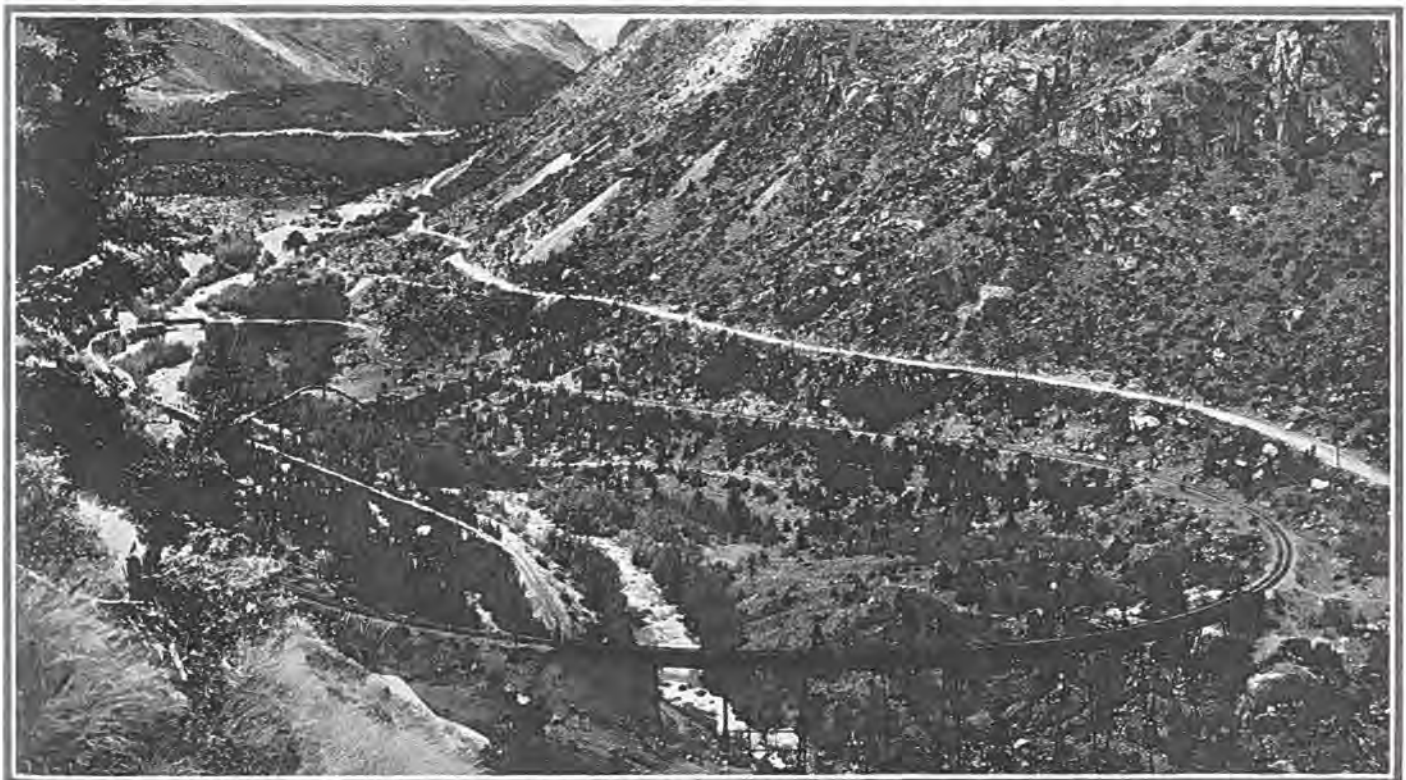
Between \$10,000 and \$12,000 will be spent on the Baseline road from the end of the concrete on the regular Boulder-Denver road, one-half mile west of Lafayette, to the southeast corner of Boulder, before work is actually started on the pavement of the remaining five-mile stretch of the Arapahoe road to Denver, according to preliminary estimates of the cost of making the Baseline road a suitable one for a detour here from Lafayette during the construction on the regular concrete highway, made today by County Commissioner E. B. Hill and Engineer Clyde Walters, representative of the state highway department here.

This expense will be incurred jointly by the federal and state governments when they let the contract for the construction of the five miles of concrete remaining to be done to complete the pav-

ing of the entire 33 miles between this city and Denver, Hill and the state engineer said today. According to rulings of the federal road department, work cannot start on the preparation of a detour for a highway until the bid on the road has been let to the successful contractor. No date has been set as yet for the opening of bids on the Arapahoe road, officers pointed out.

GOOD ROADS VALUABLE TO SMALL TOWN MERCHANTS

All this propaganda about the small town being doomed because of the automobile and good roads is nothing but pure bunk, started by people with a grievance against the smaller centers of population and kept going by many of the business men themselves. There never was a time when the small town merchant had so great an opportunity to make money as at the present, and his success depends entirely on how he uses the opportunity. Through lower rents, taxes, insurance and all overhead charges the small town offers an advantage to business men which the city cannot give. If he understands displaying and marking his goods and the art of advertising; can welcome people into his place of business with a smile, he has a big advantage over his city competitor. No one who has a working knowledge of business conditions and has studied present-day merchandising problems will dispute this fact.—Shelton Clipper.



Showing highway between Georgetown and Silver Plume, leading to Loveland Pass, with world-famous Georgetown railroad loop in the foreground.

FEDERAL HIGHWAY SYSTEM OF THE UNITED STATES

200,353 Miles Proposed Total—56,717 Miles Completed

(Figures from Bureau of Public Roads, U. S. Department of Agriculture)

NOTE—Under the Federal Highway Act, the Federal Government may participate with the states, under given conditions, in the building of 7% of the certified total mileage of each state. The proposed roads to be so surfaced have been approved up to 92% of the total 7% system. Actual construction, however, has progressed to completion on 23% of the system, leaving 69% of the system approved but not constructed, and 3% of the total yet to be approved and constructed.

States	Limiting 7% Mileage	Projects under and approved for construction	
		Dec. 31 Mileage	Dec. 31 Mileage
Alabama	3,959	1,399.3	310.6
Arizona	1,498	765.5	75.9
Arkansas	5,037	1,419.6	352.5
California	4,900	1,207.7	209.9
Colorado	3,360	782.9	283.9
Connecticut	840	125.1	76.1
Delaware*	266	141.9	32.5
Florida	1,928	195.6	235.6
Georgia	5,663	1,987.0	473.2
Idaho	2,814	803.7	270.2
Illinois	6,774	1,445.8	385.7
Indiana	4,966	610.3	497.3
Iowa	7,638	2,326.8	695.9
Kansas	8,690	1,216.1	893.4
Kentucky	3,710	807.2	405.4
Louisiana	2,800	1,087.8	230.3
Maine	1,617	325.5	101.0
Maryland*	1,037	439.0	72.7
Massachusetts	1,437	379.6	98.9
Michigan	5,250	991.4	428.0
Minnesota	7,214	3,643.5	365.6
Mississippi	3,710	1,200.7	421.8
Missouri	7,806	1,757.5	484.4
Montana	4,697	1,124.4	237.8
Nebraska	5,619	1,993.1	1,405.6
Nevada	1,540	753.9	226.5
N. Hampshire	988	241.2	41.4
New Jersey	1,193	310.0	61.3
New Mexico	3,333	1,427.6	259.4
New York	5,731	1,255.1	732.2
N. Carolina	4,200	1,382.6	155.7
N. Dakota	7,434	2,548.2	887.4
Ohio	5,915	1,465.0	392.5
Oklahoma	7,889	1,220.6	275.9
Oregon	2,928	962.9	139.8
Pennsylvania	6,300	1,192.0	662.1
Rhode Island*	166	94.3	40.4
S. Carolina	3,662	1,553.7	200.5
South Dakota	8,077	2,359.1	667.9
Tennessee	4,564	824.3	271.4
Texas	12,797	5,198.5	826.8
Utah	1,684	625.5	165.0
Vermont	1,043	137.7	39.9
Virginia	3,733	1,046.3	189.0
Washington	2,969	677.3	102.0
W. Virginia	2,214	419.4	248.8
Wisconsin	5,516	1,601.4	399.2
Wyoming	3,242	1,241.1	178.6
Totals	200,353	56,717.2	16,156.0

* Extensions of the 7% system have been approved in these states.

FOREST ROAD FUNDS APPORTIONED

Apportionment of federal forest road funds totaling \$7,500,000 among the states and territories which contain national forests, has just been approved by Secretary of Agriculture Jardine. The funds were authorized by congress in 1926 for appropriation for the next fiscal year which begins July 1, 1928.

Of the total of \$7,500,000, there was authorized \$4,500,000 for the forest highway fund, to be expended in the construction and improvement of roads in and adjacent to the national forests, of primary value to the public for travel, etc., and \$3,000,000 for the forest road development fund, to be used in the construction and maintenance of roads required mainly for the development, protection, and administration of the forests.

The states containing national forests and the amounts apportioned to each state from the two funds for the next fiscal year are as follows:

State	Total Apportionment of \$4,500,000 Authorized	Apportionment of \$3,000,000 Authorized
Alabama	\$ 4,214	\$ 11,932
Alaska	466,446	24,398
Arizona	284,884	136,371
Arkansas	38,197	41,181
California	671,088	441,067
Colorado	329,051	148,012
Florida	11,902	23,627
Georgia	7,298	18,919
Idaho	502,403	649,397
Illinois	383	.....
Kentucky	1,540	2,123
Maine	1,329	6,681
Michigan	3,450	1,628
Minnesota	27,946	32,702
Montana	394,994	285,157
Nebraska	4,604	1,171
Nevada	93,833	4,205
New Hampshire	17,729	21,993
New Jersey	810	421
New Mexico	208,313	121,185
North Carolina	12,439	34,773
Oklahoma	2,068	342
Oregon	621,758	453,141
Pennsylvania	6,838	6,262
Porto Rico	520	252
South Carolina	2,293	5,203
South Dakota	39,195	19,610
Tennessee	11,626	30,380
Utah	168,329	50,564
Virginia	15,591	27,948
Washington	330,255	303,624
West Virginia	5,603	21,033
Wyoming	213,071	74,693
Grand Total	\$4,500,000	\$3,000,000

How Long May I Stay in Foreign States Without Obtaining License Plates?

Alabama—*Reciprocal, except as to cars operated for hire.

Arizona—Four months, but must register with county sheriff within thirty days.

Arkansas—Ninety days, but must file description of car with Commissioner of State after thirty days.

* A reciprocal state allows the visitor from another state to stay for as long a time without obtaining license plates as is permitted by the state whose license plates he carries. A motorist from a reciprocal state may remain in a state granting reciprocal privileges for the remainder of the license year, without being required to obtain the plates of the state he is visiting.

California—Six months, but owner must register after ten days with the Division of Motor Vehicles.

Colorado—Ninety days, except for trucks and trailers. Must register with Secretary of State immediately.

Connecticut—Fifteen days, not necessarily consecutive, except as to Public Service vehicles.

Delaware—Reciprocal.

Florida—Reciprocal, except as to cars operated for hire.

Georgia—Thirty days.

Idaho—Ninety days, provided permit be obtained immediately, except for trucks of over one-ton capacity.

Illinois—Six months, except as to commercial vehicles.

Indiana—Sixty days.

Kentucky—Reciprocal.

Louisiana—Ninety days, except as to commercial vehicles, which are allowed five days.

Maine—Reciprocal, except as to vehicles used for hire.

Maryland—Reciprocal, except as to common carriers.

Massachusetts—Reciprocal, except if have place of business or abode for thirty days. May register for July, August and September at one-half fees.

Michigan—Ninety days. Commercial cars, ten days.

Minnesota—Two months. Must register after ten days.

Mississippi—Thirty days.

Montana—Reciprocal.

Nebraska—Reciprocal.

Nevada—Ninety days, but must register with Secretary of State after ten days.

New Hampshire—Twenty days.

New Jersey—Fifteen days.

New Mexico—Three months.

New York—Reciprocal.

North Carolina—Reciprocal, not exceeding sixty days.

North Dakota—Reciprocal.

Ohio—Reciprocal.

Oklahoma—Sixty days.

Oregon—Three months, but must register with Secretary of State immediately without fee.

Pennsylvania—Reciprocal.

Rhode Island—Thirty days.

South Carolina—Thirty days.

South Dakota—Reciprocal.

Tennessee—Thirty days.

Texas—Thirty days. If registered before thirty days expire, sixty days more granted on payment of \$1.

Utah—After ten days must pay \$1 for temporary registration good for six months.

Vermont—Reciprocal, except busses and trucks. After thirty trips into state in year must take out four months' license at one-half annual fee. Same applies to operators' permits.

Virginia—Reciprocal.

Washington—Reciprocal.

Wisconsin—Reciprocal, except as to commercial cars.

Wyoming—Ninety days, except if operated for hire.

District of Columbia—Reciprocal.

MOTOR VEHICLE REGISTRATION FEES, ETC., 1927¹

[Compiled from reports of State authorities]

State	Total gross receipts	Registration receipts ²					Miscellaneous receipts			Disposition of gross receipts				State	
		Motor car receipts			Other vehicles		Dealers' license	Chauffeur and operator permits	Other miscellaneous	Collection and administration	For rural highway purposes				For other purposes
		Total from motor cars	Passenger cars and busses	Trucks and tractors	Trailers	Motor-cycles					State highways	Local roads	State and county road bonds		
Alabama	\$3,127,000	\$3,109,976					\$3,919	\$8,246	\$4,859	\$125,956	\$843,850	\$609,765	\$1,547,429		Alabama.
Arizona	454,429	443,084				3,356	1,528	5,930		454,429					Arizona.
Arkansas	3,662,272	3,619,482				5,469	23,338	13,983		805,700	476,095	2,307,231		Arkansas.	
California	8,796,348	7,492,228	\$4,851,767	\$2,640,461	\$258,980	33,735	45,858	290,323	675,224	1,243,924	3,775,453	3,775,453	1,518	California.	
Colorado	1,600,222	1,499,784	1,248,325	251,459	1,410	2,303			96,725	80,011	760,106	760,105		Colorado.	
Connecticut	6,805,664	5,196,922	3,894,856	1,302,066	274	14,121	72,776	979,629	541,942		6,805,664			Connecticut.	
Delaware	846,289	673,682	489,004	184,678	3,619	1,284	7,685	158,637	1,382		846,289			Delaware.	
Florida	5,692,128	5,600,653	4,077,130	1,523,523		5,971	33,860	9,325	42,319	584,154	3,829,579	1,276,526		Florida.	
Georgia	3,712,978	3,658,646	3,039,048	619,598		4,222	40,260	4,908	4,852	114,730	3,598,248			Georgia.	
Idaho	1,502,185	1,458,694	1,211,031	247,663		3,793	2,195	24,225	12,326		156,269	1,345,916		Idaho.	
Illinois	14,839,593	13,929,037	10,635,412	3,293,625	61,930	20,644	89,860	353,472	384,650		9,191,015	5,606,010	42,568	Illinois.	
Indiana	5,430,806	5,069,422	3,914,846	1,154,576		31,406	6,414	52,030	36,955	251,341	414,070	353,080		Indiana.	
Iowa	10,371,699	9,742,671	8,785,993	956,678		3,322	0,354	78,604	77,593	252,822	3,934,480	2,331,320		Iowa.	
Kansas	6,518,622									224,289	3,676,512	464,261		Kansas.*	
Kentucky	4,365,062	4,304,022	3,375,500	928,522		5,262	20,888	16,143	9,747		4,199,347			Kentucky.	
Louisiana	4,199,347										4,199,347			Louisiana.*	
Maine	2,558,046	1,980,811	1,535,384	445,427		3,375	6,733	48,683	405,848	201,546	1,370,251	986,249		Maine.	
Maryland	2,987,912	2,347,223	2,070,731	276,492		16,029	10,933	31,349	392,713	298,791	2,151,297		537,824	Maryland.	
Massachusetts	13,136,442	10,557,782	7,318,651	3,239,131		19,468	32,177	60,990	1,628,188	1,266,525	10,821,659	1,048,258		Massachusetts.	
Michigan	17,984,210	16,527,569	12,464,719	4,062,850		200,949	13,658	94,568	897,654	1,117,214	9,784,936	6,000,000	1,082,060	Michigan.	
Minnesota	10,233,644	10,110,633	8,210,901	1,899,732		14,277	8,781	38,535	20,330		6,449,904		2,303	Minnesota.	
Mississippi	2,556,627	2,220,942								125,602	202,077	2,228,948		Mississippi.	
Missouri	8,253,009									401,822	10,271,162	5,136,025		Missouri.*	
Montana	1,136,103	1,039,235	855,491	183,744		1,087	37,078	676	58,027		1,105,245			Montana.	
Nebraska	3,740,553	3,574,994	3,016,632	558,362		5,079	3,728	43,919	112,833	111,983	1,088,571	2,539,999		Nebraska.	
Nevada	229,839	229,124					495		220	89,870		130,097		Nevada.	
New Hampshire	1,915,291	1,536,502				7,540	28,690	264,055	78,504	156,044	1,759,247			New Hampshire.	
New Jersey	12,963,541	9,293,964	5,680,418	3,613,546		66,552	13,714	72,775	1,066,335	532,755	7,900,000	4,530,786		New Jersey.	
New Mexico	528,193	502,447	444,401	58,046		2,621	527	8,759	13,839	53,795	316,265	158,133		New Mexico.	
New York	31,757,889	28,375,610	20,140,775	8,234,835		76,825	70,654	188,907	580,117	1,922,049	22,072,465	4,743,169	3,020,206	New York.	
North Carolina*	13,246,853									150,000	12,331,853	765,000		North Carolina.*	
North Dakota	1,595,442	1,570,120	1,338,798	231,322		1,362			23,960	170,000	777,721	647,721		North Dakota.	
Ohio	10,745,471	10,398,977				23,014	124,302	9,979	189,199	366,883	5,128,532	5,250,056		Ohio.	
Oklahoma*	5,753,912										2,301,565	3,452,347		Oklahoma.*	
Oregon	6,527,341	6,325,637	5,408,300	917,337		11,209	29,312	60,636	94,547	367,341	1,356,800		4,803,200	Oregon.	
Pennsylvania	26,017,495	19,693,780	13,734,183	5,959,597		41,031	35,775	330,316	3,590,646	1,565,703	15,048,520	1,501,550	101,275	Pennsylvania.	
Rhode Island	2,093,309	1,693,999	1,265,199	429,800		1,034	4,438	13,440	273,720	106,678	1,914,005			Rhode Island.	
South Carolina	2,187,290	2,078,546	1,771,878	306,668		22,386	1,293	23,457	61,608		2,178,290	9,000		South Carolina.	
South Dakota	2,491,981	2,472,926	2,142,266	330,660		1,072			17,983	67,463	1,236,999	1,187,519		South Dakota.	
Tennessee*	3,765,775									92,850	3,672,925			Tennessee.*	
Texas	15,626,531	15,045,978	12,583,812	2,462,166		117,998	12,024	55,872	69,678	598,805	10,884,403	4,143,323		Texas.	
Utah*	672,403									132,000		540,403		Utah*.	
Vermont	1,878,950	1,610,899	1,385,081	225,818		4,146	30,350	203,187	30,368	119,619	1,759,331			Vermont.	
Virginia	5,235,953	4,840,384	4,143,391	696,993		4,692	6,863	61,354	39,445	283,215	4,978,163			Virginia.	
Washington	6,482,354	5,930,338	4,606,495	1,323,843		44,869	13,454	86,833	399,517	7,343	4,940,884	892,976	399,517	Washington.	
West Virginia	4,004,391	3,605,153	3,084,218	520,935		3,396	5,587	54,089	136,696	199,470	1,390,324	2,320,000	37,179	West Virginia.	
Wisconsin	9,772,887	9,518,220	7,872,419	1,645,801		17,655	36,354	103,655	97,003	550,000	5,428,287	3,794,600		Wisconsin.	
Wyoming	525,807	515,019	404,275	110,744		638	9,500		650		274,028	251,770		Wyoming.	
District of Columbia	531,044	120,279	99,026	21,253		1,151	1,958	185,271	222,385	159,388			371,656	District of Columbia.	
Detailed totals ²	268,651,211	239,515,394	(18)	(18)	1,005,315	412,744	1,999,180	13,449,421	12,269,157					Detailed totals. ³	
Grand total	301,061,132									14,876,410	189,985,289	53,577,893	38,087,598	4,533,942	Grand total.

¹ All States report amounts for calendar year except North Carolina, which reports for 6 months, July 1 to Dec. 31, for registration for last half of year.

² The States starred do not show complete receipt details and are not included in totals under first 2 columns, shown as "Detailed total." The disposition of total gross receipts is shown for all States and such totals are shown in the last 5 columns.

³ County bond payments in Arkansas amounted to \$2,124,118; in Oregon, \$1,540,000, and in Michigan the full amount shown.

⁴ Undistributed receipts.

⁵ Unpaid claims.

⁶ To State general fund.

⁷ Includes \$140,000 for State police.

⁸ For Baltimore city streets.

⁹ Does not include part of collection expense paid from State appropriations.

¹⁰ Includes \$1,006,128 for administration of State highway department.

¹¹ New York City general fund.

¹² Second half of year only as fiscal year changed to agree with calendar year in 1928.

¹³ Gross receipts (with motor fuel taxes) from State highway fund used for: Administration, financing highway obligations, maintenance and construction of State highway system. The data is estimated on a pro rata basis here.

¹⁴ Includes \$130,000 of special bridge fund.

¹⁵ Refunds.

¹⁶ Highway safety fund derived from operators' permits.

¹⁷ For repair and construction of Washington streets, if so appropriated by Congress.

¹⁸ Only 35 States report details of motor car registration receipts, which total here as follows: Passenger cars and busses, \$167,100,356; trucks and tractors, \$50,856,951; making a combined total of \$217,957,307.



Supreme!

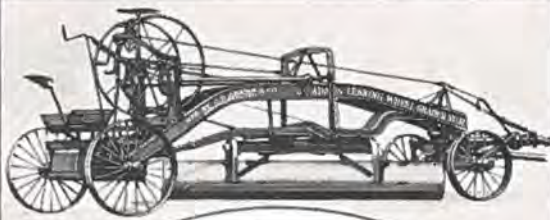


FOR road construction or maintenance there simply is no better tractor than CLETRAC! CLETRAC on the job means a definite reduction in costs—a big saving of time and labor on every power operation—an ability to perform more work and better work every day in the year.

Here is **POWER** and **TRACTION** to handle your heaviest equipment—**SPEED** that enables you to wade through work in record time—**EASE OF CONTROL** and **SHORT TURNING** that permits operating in close quarters—**INSTANT "ONE-SHOT" LUBRICATION** that saves time out for oiling. These and a score of other valuable tractor features are built into CLETRAC to increase its value to you and to make it *supreme in the field of highway work!*

For full information regarding Cletrac 20 for specific types of work—or for information on the entire line—write us and further details will be sent. Cletracs can be had in a complete line—20, 30, 40, and the super-powered 100.

Liberty Trucks & Parts Co.
Sugar Building, 16th and Wazee Streets •• Denver, Colorado



The Simplest Rear Axle!

THE ADAMS Patented "One-Piece" Rear Axle is much simpler and more practical than telescopic or pivotal types. The grader frame rests directly on the axle where it belongs, and an easy-working control of *only three gears* shifts the frame to any desired position. One set of *only four gears* leans both rear wheels. This simpler construction means fewer working parts, less chance for wear, easier and faster operation, and longer life. With ADAMS Graders, blade position is *never* sacrificed to keep the rear wheels free from discharged dirt. Write for the new ADAMS catalog before you buy.

ELTON T. FAIR CO.

1611 Wazee Street Denver, Colorado
Complete Stocks for Immediate Shipment

The Adams line includes graders in 6½, 7, 8, 10 and 12-foot blade lengths, Scarifier Graders, Motor Graders, Road Main-



tainers, Patrols, Drags, Elevating Graders, Dump Wagons, Wheeled Scrapers, Fresnos, Drag Scrapers, Plows, etc.

ADAMS ADJUSTABLE LEANING WHEEL GRADERS

"The Original - A Proved Success Since 1885"

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IRRIGATION
SUPPLIES
WELL
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QUICK CULVERTS

We mean it, for when you want 'em, you *WANT* 'em. We have the skilled men—the "know how"—and a big modern plant.

And our stuff is *good*.

THE THOMPSON

▲ MANUFACTURING CO. ▲
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Contractors' Service

We Buy, Sell, Rent, Exchange and Rebuild Contractors' Equipment.

Dependable information on rebuilt equipment. Contractors, before buying your equipment, call or write us.

List the equipment you have for sale or trade with us.

We can save you money

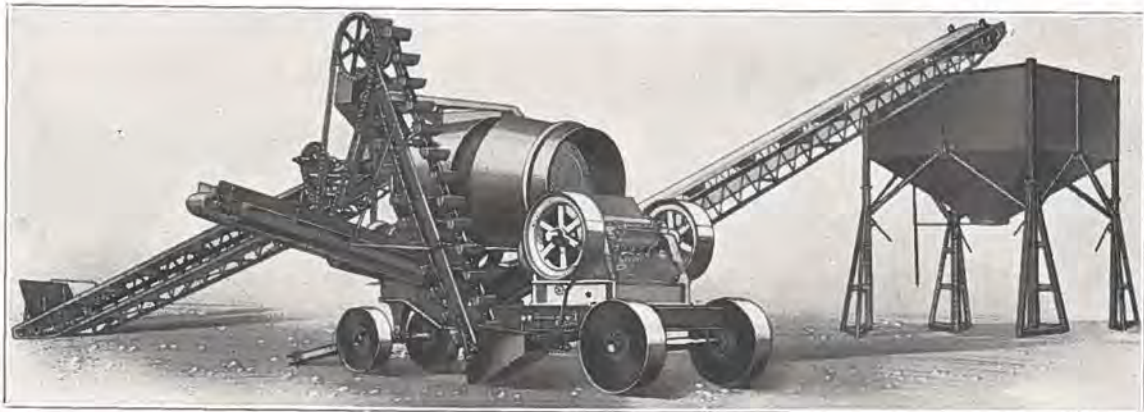
Rocky Mountain Equipment Co.

1117 WAZEE ST., DENVER

MAIN 9269

Cedar Rapids One Piece Outfits

Chosen Again



Pople Bros. of Trinidad purchased their first No. 936 One-Piece Outfit in September, 1926. May 9, 1928, they purchased their second machine. If it won't deliver the goods for less money, why do we sell the same customers over and over again? You, too, can save money by using "Cedar Rapids" Conveyors, Screens, Bins, Crushers and have the material of the right size on the job at a cost much less than others using other types of equipment. Let us help you make money with "CEDAR RAPIDS."

H. W. Moore Equipment Co.
DISTRIBUTORS

120 West Sixth Avenue, Denver

Phone South 9000

Dump Truck Bargains

We have twenty (20) Model 63 3-Ton INTERNATIONAL TRUCKS made by the International Harvester Co. for sale.

Equipped with gravel spreading dump bodies. Good pneumatic tires, 36"x6" front and 44"x10" rear. Wheelbase 140 inches. These trucks are in good mechanical condition, ready to go to work. They were traded in on new MACKS.

Price \$1,000.00 each, delivered at any reasonable distance from Denver. Cash or Terms.

Mack Truck Co.

585 So. Broadway

DENVER, COLO.

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The State Highway Department and the U. S. Bureau of Public Roads take the necessary precaution to have their concrete structures and corrugated culverts

"PIERCE TESTED"

These public officials know the true value of having their concrete and culverts tested as a protection against faulty materials before they go into the job.

They have found that Pierce Testing pays.



THE PIERCE TESTING LABORATORIES, INC.

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100 ft. Riveted Low Truss Span, Dillon, Colo.

Bridges and Structural Steel

For every purpose

Plans and specifications gladly sent upon application

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General Shovels

*Engineered from
Motor to
End of Dipper.*

1/2-yard capacity, full crawlers, full revolving, fully enclosed, all-steel cab. Silent chain driven — from power unit to hoisting drums.



One carried in stock at Denver at all times. Certainly, we'll demonstrate it for you.

Late purchasers: Scott and Curlee, Winterburn and Lumsden, San Miguel County, Gardner Bros. and Glenn.

H. W. MOORE EQUIPMENT COMPANY. Distributors, Denver

The Test of Time

It is now 19 years since the first ARMCO Culverts were installed under American railways and highways.


During the past few years the Armco Culvert & Flume Manufacturers' Association has inspected more than 17,000 culverts of all types; more than 7,000 of which have been photographed. The results of this investigation indicate:

1. No culverts of any material seem so dependable—give such certain service—as ARMCO Culverts.
2. No culvert material shows greater evidence of actual permanence than ARMCO Culverts.
3. Year for year of life, no culverts seem so unaffected by time and service as ARMCO Culverts.

ARMCO CULVERTS

Look under your roads for the proof

**The R. Hardesty Mfg. Co. 31st and Blake Streets
DENVER, COLORADO**

..If it hasn't got a  WIGGLE on it, it is not a Caterpillar Tractor. If it is a Caterpillar, it's always got a WIGGLE on it. You can depend on a Caterpillar to get you somewhere.

There is no substitute for the Caterpillar Tractor. Dependable power is profitable.

Clinton & Held Co.

1637-43 Wazee Street

DENVER, COLORADO



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LEGAL BLANKS
GENERAL PRINTING
BLANK BOOKS



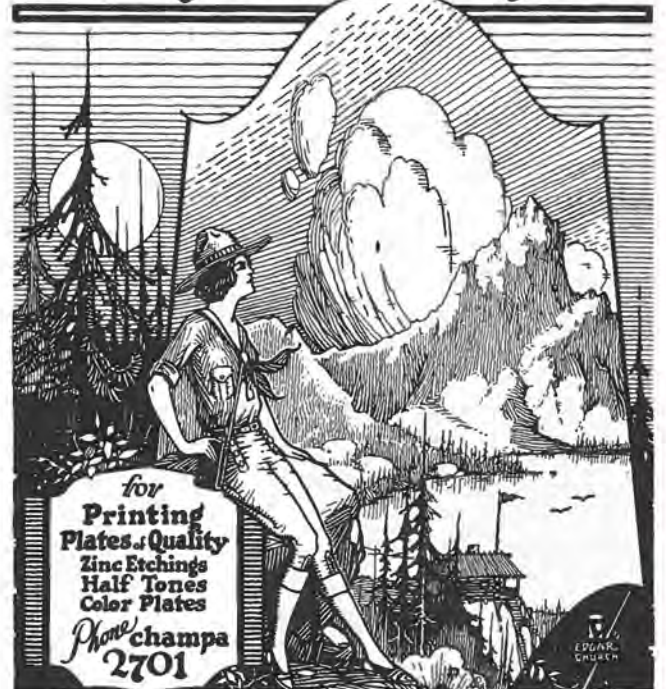
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New Highway Equipment and Materials

AUSTIN-WESTERN ANNOUNCES TWO GRADER MODELS

The Austin-Western Road Machinery Co. announces two new grader models for 1928. Literature on these models is now being distributed by the Wilson Machinery Co., Denver agents. Both are manufactured by the Western Wheel Scraper Co. One is called Model No. 22, and is equipped with roller bearings and leaning wheels, telescopic rear axle and is equipped with an eight-foot blade. It weighs 2,200 pounds and is particularly adapted to mountain road work. The other is Model No. 55, which is equipped with straight wheels; one-piece axle and has worm gears. The lifting gears are enclosed and run in oil. It weighs 5,500 pounds. This grader is designed for particularly heavy work and will stand up to 40 h. p.

Harry P. Wilson, president, announces that the Wilson Machinery Co. is now the agent for the Littleford Bros., in this territory, carrying a line of tar kettles, heaters, traffic markers, and small asphalt tools, in Denver stock.

Mr. Wilson reported business very good for the last sixty days in all lines, his firm selling everything from hand shovels to power shovels.

Ray Corson, in charge of sales to contractors for the Wilson firm, is spending his vacation on a motor tour to Virginia and New York. He will be gone for a month. He reported home first from Booneville, Mo. "Covered 940 miles with one puncture" was his cryptic message. He is accompanied by his wife and daughter.

NEW CONTRACTORS' EQUIPMENT SERVICE

A new concern dealing in new and used contractors' machinery and supplies has entered the Denver field. The name of this organization is the Rocky Mountain Equipment Co., offices and warehouse of which are located at 1117 Wazee Street.

Officers of the concern are: Richard E. Schmuck, president; George Young, vice-president, and George W. Grover, secretary-treasurer. These men have had long and practical experience in the construction machinery field and are well known to the local contracting fraternity.

The concern will buy, sell, rent, exchange and rebuild all kinds of used road and contractors' equipment. Mr. Schmuck has had twenty years of experience in the handling of contractors' equipment, being identified with the leading equipment concerns of Denver. Mr. Grover has had many years of experience as a road, bridge and irrigation work contractor. Mr. Young also has been identified with the contracting field. He is also a first-class mechanic.

NEW LEANING WHEEL GRADER DEVELOPMENTS

The Galion Iron Works & Mfg. Co. has announced two new Leaning Wheel E-Z Lift Graders Nos. 77 and 78, and import-

ant improvements in their large size Nos. 10 and 12 E-Z Lift Leaning Wheel Graders.

The two new graders are smaller, lighter machines of sizes for 7-foot and 8-foot mouldboards. They have all of the good features of the larger machines, including the Simplex pivoted frame adjustment and E-Z lift gearing.

Open E-Z lift springs are used, however, instead of the enclosed springs operating under compression as used in the larger sizes.

Some changes have been made in the E-Z steer assembly for this size grader although the self-locking machine-cut worm gearing operating in oil in an oil-tight gear case is used. The operation of this steering device is very easy and positive.

STEINBARGER CELEBRATES TWENTY-FIRST BIRTHDAY

The Herbert N. Steinbarger Co. celebrated its twenty-first birthday on April 28. On this date, in 1907, Mr. Steinbarger started in business in Denver with one line—the Austin line of cube mixers, excavators and trenching machines. Today the concern represents twenty-four lines in the Denver territory, including the following: Bucyrus-Erie, Buffalo-Springfield rollers, Butler bins, Chain Belt mixers, Clyde Iron Works hoists, Curtis compressors, Domestic pumps, Le Roi gasoline engines, Metaforms, Russell road machinery, Sauerman cableways, Williams buckets and Hardsoc drills, and others.

The Steinbarger concern has just issued its 1928 equipment catalog and distribution is now being made to county road officials and contractors.

NEW CATALOG ON STROUD ELEVATING GRADERS

J. D. Adams & Company of Indianapolis, Ind., have just issued an attractive and interesting catalog on Stroud Elevating Graders and Dump Wagons, for which they are exclusive sales agents in the United States and Canada. Three sizes of elevating graders are shown in 36- and 42-inch belt widths and the wagons, more familiarly known as the "Little Red Wagons," are shown in 1½- and 2-yard capacities.

Stroud Elevating Graders and Dump

Wagons have been standard equipment among dirt moving contractors for 30 years and enjoy an enviable reputation for easy and convenient operation, dependability and durability. Recent improvements have been made in Stroud Elevating Graders which will be of interest to all users of this kind of equipment.

The catalog, profusely illustrated, will prove interesting to everyone concerned with dirt moving. A copy will be sent to anyone.

SELLS TRACTORS BY TELEPHONE

Selling tractors by telephone seems to be a bit commonplace with the Clinton & Held Co., Denver Caterpillar distributors. During the past month, L. L. Clinton, president, took orders for four tractors over the telephone from various points of the state.

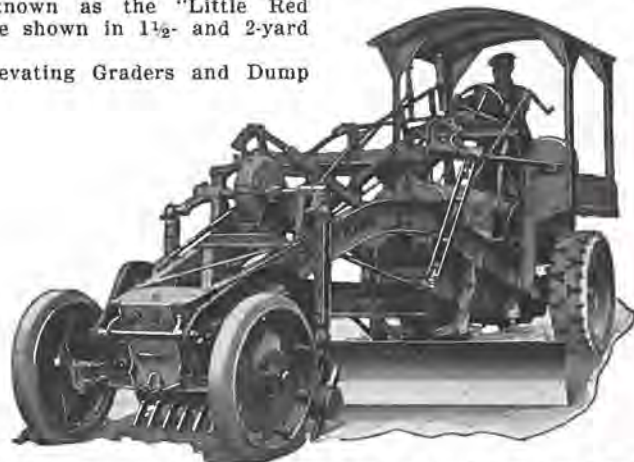
"The month of April was the largest month in point of gross sales in the history of our concern," said Mr. Clinton. "And we could have sold more, but were unable to get deliveries."

Recently the local agency of the Caterpillar tractor was transferred from the western to the eastern sales division of the Caterpillar Tractor Co. All deliveries to the Denver territory are now made from the Peoria, Ill., factory.

MEFFLEY VISITS EASTERN FACTORIES

George Meffley, general sales manager of the H. W. Moore Equipment Co., spent the greater part of the month of April in visiting eastern factories represented by his concern in this territory. During the time he was away he supervised the shipment of several carloads of Galion graders, recently purchased by the Colorado state highway department.

During his absence the Moore sales force made a score of sales of Cedar Rapids portable crushing plants and road equipment to city and county road officials. Altogether it was one of the biggest months the Moore firm has enjoyed in several years, according to Mr. Meffley.



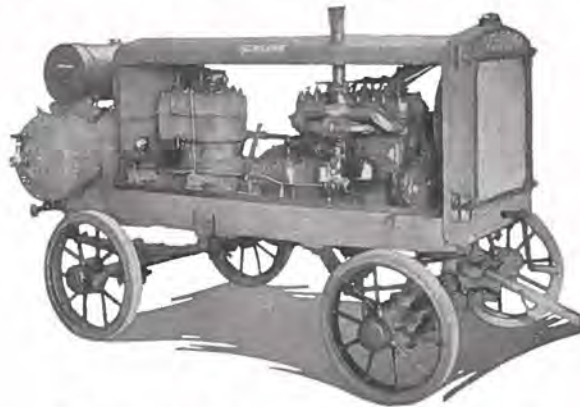
New motor grader recently introduced by the Galion Iron Works

Schramm Compressors

"What's on the Air"—BY SCHRAMM

Correctly Powered for High Altitude Work
New Models (a carload) on Display

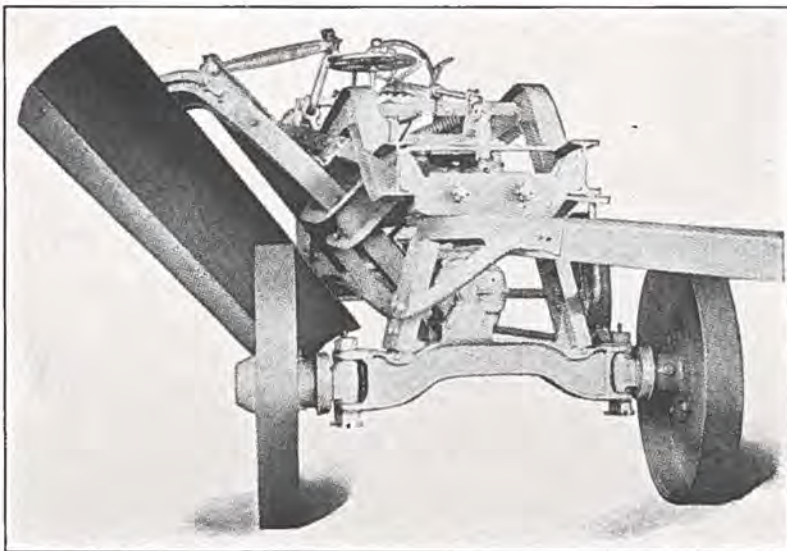
We guarantee each and every Schramm Compressor to do the job, or we own the compressor.



Take it out on the job—try it out for power, for air. If it doesn't deliver, send it back—we'll pay the freight.

H. W. Moore Equipment Co., Distributors

120 WEST SIXTH AVE., DENVER



Rome High Lift Graders

Sizes
6½ to 14 Feet

State Highway Department has placed twenty-five Romes in service. Watch for them on the road.

John W. Fink Company

1645 WAZEE ST., DENVER, COLO.

Phone Main 9399

The elimination of all grade crossings between Salida and Leadville, except one at Malta, will probably not be undertaken until next year, according to highway engineers. A new road would be built through Buena Vista west of the railroad track.

Pueblo county commissioners contemplate condemnation suit to gain right-of-way so that work can start soon on the seven-mile road project between Pueblo

and Walsenburg in the southern part of the county. The \$140,000 project has been delayed almost 18 months.

West Fourth street, which circles out of the Pueblo city limits for 1,000 feet, may be dedicated as part of the Pueblo-Siloam state highway. The state, county of Pueblo and Pueblo conservancy board plan to pave the stretch. Other improvements for the Siloam road will be reconstruction of two bridges over dry arroyos.

The Arkansas River bridge at the Otero-Crowley county line has been rebuilt. Concrete and steel were used in the span, which replaced the one swept away last summer during flood season.

Survey for the Trinidad-San Luis Valley road will be started in May by the state highway department. A total of \$40,000 has been made available by the state and county for preliminary work.

PLANS SUBMITTED FOR APPROVAL TO U. S. BUREAU OF PUBLIC ROADS

Proj. No.	Length	Type	Location
F.A.P. 2R No. 7	1.224 mi.	Pav't & Overhead R. R. Crossing	South of Aguilar
F.A.P. 271-C	2.430 mi.	Gravel Surfacing	West of Portland
F.A.P. 282-A No. 2	.....	River Protection Work	South of Craig

PROJECTS BEING ADVERTISED FOR BIDS

Proj. No.	Length	Type	Location	Date Bids Opened
F.A.P. 253-C	4.502 mi.	Gravel Surfacing	West of Milner	May 18, 1928
F.A.P. 287 A No. 4	5.087 mi.	Concrete Paving	West of Fort Morgan	May 18, 1928
F.A.P. 242-B	0.197 mi.	Timber Bridge & Gravel Ap.	West of Mack	May 31, 1928
F.A.P. 286 BR No. 1	14.516 mi.	Gravel Surfacing and Oiling	North of Nunn	May 31, 1928
F.A.P. 286-C	5.566 mi.	Concrete Paving	North of Greeley	May 31, 1928

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
F.A.P. 2R No. 8	1.5 mi.	Pavement	Aguilar
F.A.P. 134-B	3 mi.	Gravel Surfacing	Vona
F.A.P. 149-A	5 mi.	Gravel Surfacing	North of Agate
F.A.P. 144-C	4 mi.	Gravel Surfacing	Northwest of Fort Collins
F.A.P. 147-B	6 mi.	Gravel Surfacing	South of Cortez
F.A.P. 208-B	0.5 mi.	Gravel Surf. & Overhead R. R. Crossing	East of Grand Junction
F.A.P. 242-B No. 2	9 mi.	Gravel Surfacing	West of Fruita
F.A.P. 251-C	4 mi.	Pavement	East of Boulder
F.A.P. 258-G	3 mi.	Gravel Surfacing	West of Cerro Summit
F.A.P. 266-D	5 mi.	Gravel Surfacing	South of Bondad
F.A.P. 272-D	1 mi.	Pav't & R. R. Underpass	Manzanola
F.A.P. 277-C	4 mi.	Pavement	North of Pueblo
F.A.P. 258-D	2 mi.	Gravel Surfacing	Mt. Harris
F.A.P. 282-E	6 mi.	Gravel Surfacing	North of Meeker
F.A.P. 282-H	5 mi.	Gravel Surfacing	North of Rifle
F.A.P. 290-C	0.5 mi.	Bridge	North of Lamar
F.A.P. 292-B	3.5 mi.	Graded & R. R. Overhead Crossing	South of Minturn
F.A.P. 293-C	4 mi.	Graded	North of Ouray
F.A.P. 295-D	2 mi.	Gravel Surfacing	North of Antonito
F.A.P. 298-B	4 mi.	Gravel Surfacing	North of Pagosa Springs
F.A.P. 262-I	4 mi.	Gravel Surfacing	South of Russell

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1928

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj No
2-R5	Bet. Trinidad and Aguilar	1.959 mi.	Paving	W. A. Colt & Son	\$ 72,122.50	50	2-R5
2-R No. 6	South of Aguilar	2.75 mi.	Pavement	W. A. Colt & Son	93,000.00	23	2-R No. 6
138-A	North of Kremmling	10.916 mi.	Grading	F. L. Hoffman	201,262.80	6	138-A
144-B	Northwest of Fort Collins	3.201 mi.	Gravel Surfacing	White & LaNier	44,000.00	47	144-B
145-A	West of Glenwood Springs	3.807 mi.	Gravel Surfacing	Winterburn & Lumsden	53,227.90	96	145-A
145-B	West of Glenwood Springs	1.051 mi.	Surfacing	Winterburn & Lumsden	42,389.72	30	145-B
147-A	In Ute Mt. Reservation, S. of Cortez	15.896 mi.	Surfacing	E. J. Maloney	119,100.10	0	147-A
210-B2	De Beque-Grand Valley	7.507 mi.	Gravel Surfacing	Fred Kentz	37,475.00	65	210-B2
247-C	Swink	0.8 mi.	Conc. Pav. & R.R. Underpass	J. Finger & Son	62,559.58	73	247-C
254-C2	S. W. of Hot Sulphur Springs	Superstr. of Bridge & Approaches		Northwestern Constr. Co.	48,203.50	73	254-C2
254-D	Parshall-Hot Sulphur Springs	3.013 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	37,124.18	94	254-D
258-D	Iola-Cebolla	4.426 mi.	Gravel Surfacing	H. C. Lallier Const. Co.	52,739.80	100	258-D
258-E2	Cimarron-Cerro Summit	1.487 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	32,377.70	8	258-E2
258-F	Gunnison-Sapineto	5.689 mi.	Surfacing	Hinman Bros. Const. Co.	100,968.50	8	258-F
266-C	Durango and N. Mex. State Line	2.401 mi.	Surfacing	Salle Const. Co.	32,499.80	40	266-C
275-C3	E2 G3 Palmer Lake-Pring	4.602 mi.	Concrete Paving	J. Fred Roberts & Sons C.C.	114,079.65	15	275-C3 E2 G3
275-E	North of Monument	0.926 mi.	Grading and Underpass	F. L. Hoffman	41,905.20	91	275-E
275-F1	Castle Rock-Larkspur	10.303 mi.	Grading	J. Fred Roberts & Sons	132,679.00	100	275-F-1
275-F3	G2 Tomah-Palmer Lake	12.894 mi.	Concrete Paving	H. C. Lallier C. & E. Co.	292,309.95	23	275-F3 G2
277-B	South of Colorado Springs	4.860 mi.	Concrete Paving	J. L. Busselle & Co.	131,202.45	4	277-B
279-D	Morrison	0.264 mi.	Paving	M. E. Carlson	23,266.80	99	279-D
279-H	Schaffer's Crossing-Balleys	3.243 mi.	Grading	S. M. & S. J. Feely	54,305.60	100	279-H
279-F	North of Balleys	3.444 mi.	Graded	J. Fred Roberts & Sons	126,000.00	24	279-F
282-D	North of Meeker	2.864 mi.	Gravel Surfacing	Winterburn & Lumsden	42,155.00	95	282-D
282-F	So. of Craig on S. H. No. 13	2.17 mi.	Surfacing	Gardner Bros. & Glenn	49,063.00	0	282-F
287-A3	W. of Ft. Morgan on S. H. No. 2	3.55 mi.	Concrete Paving	Ed. Selander	90,749.50	0	287-A3
287-D1	Two mi. E. of Kersey on S. H. 2	0.921 mi.	Grading	White & LaNier	14,046.40	70	287-D1
288-A2	Bet. Merino and Brush	9.741 mi.	Paving	Edw. Selander	245,043.50	61	288-A2
292-A	North from Minturn	6.417 mi.	Grading	H. C. Lallier Const. & Eng. Co.	92,571.80	82	292-A
295-C	La Jara-Antonito	5.284 mi.	Surfacing	Poppe Bros. C. C.	29,414.60	0	295-C
296-C	N. of Greenhorn on S. H. No. 1	6.606 mi.	Surfacing	H. C. Lallier Const. & Eng. Co.	115,466.80	0	296-C
297AR	Northeast of Palisade	2.848 mi.	Surfacing	O. J. Dorsey	15,043.00	100	297-AR
300A	Bet. Chattanooga & Red Mt.	2.277 mi.	Grading	Winterburn & Lumsden	59,480.80	20	300-A



KEYSTONE

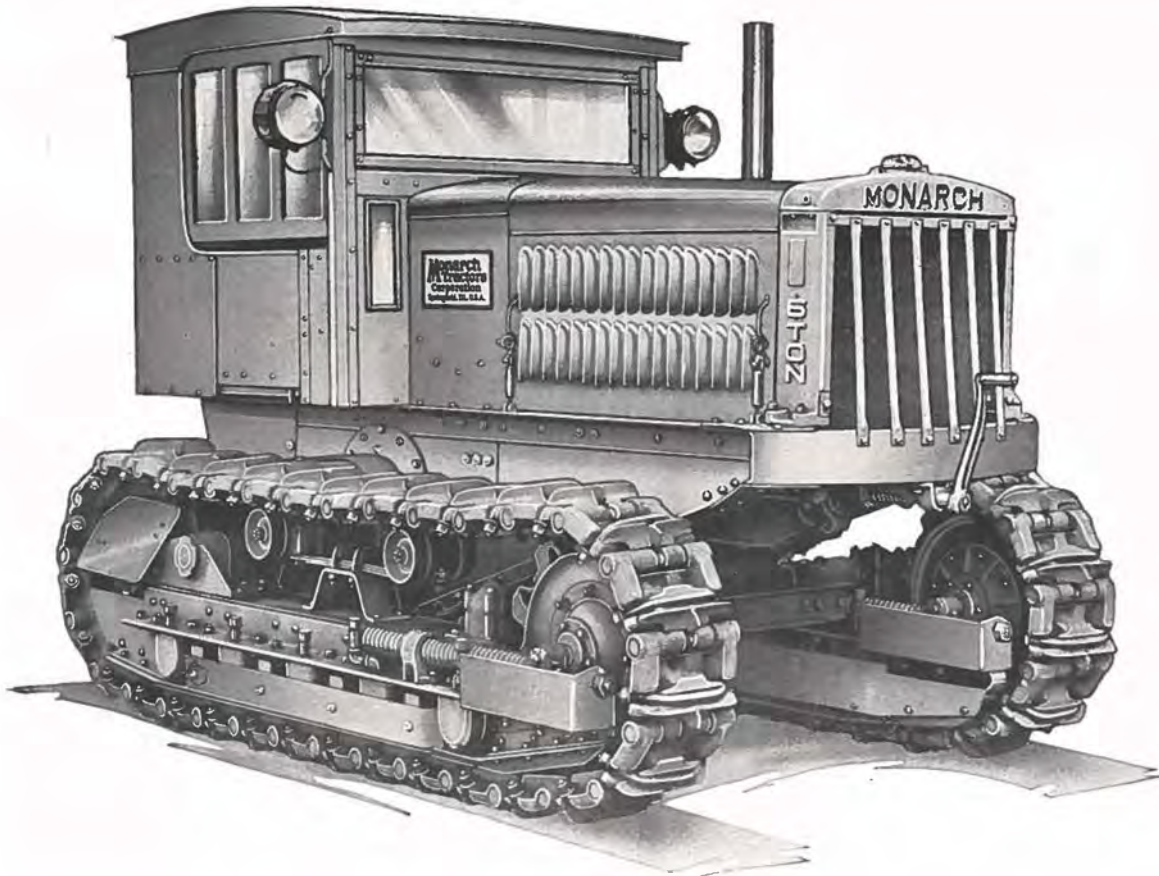
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Consistently
the
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**"BUILT TO SERVE, SATISFY
AND SURVIVE"**

COLORADO CULVERT & FLUME CO. *PUEBLO*



MONARCH 6-Ton, now known as Model "50"

Monarch Tractors

will hereafter be rated "50" in place of 6-ton, and "75" in place of 10-ton, indicating their drawbar horsepower.

If you want tractive power at least cost, use MONARCH Tractors.

Send for new bulletin descriptive of the "50" and "75" or, better still, come and see the machines and judge for yourself.

Wilson Machinery Co.

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DENVER, COLO.

Complete Line of Construction Equipment

COLORADO HIGHWAYS



Route No. 70 to Fort Logan

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C O N C R E T E
for permanence



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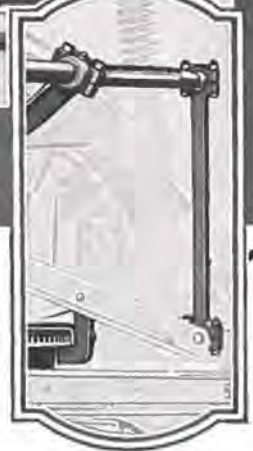
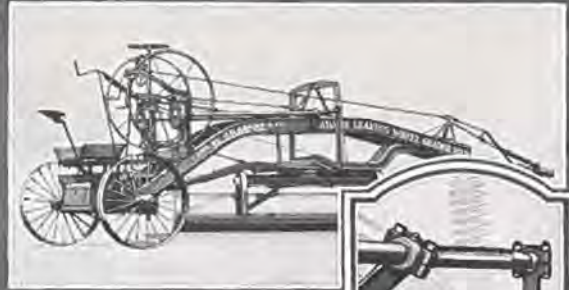
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Our Cover Picture

This month's view on the cover of COLORADO HIGHWAYS shows the concrete pavement leading to Fort Logan, where a regiment of U. S. Army engineers is now stationed. The bridge in the foreground spans the Platte river. In the background is a good view of the snow-capped mountain range.

Denver Tourist Bureau photo.



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Editorial Comment

A Good Argument

WE recently heard a story that is worth passing on to our readers because it touches on good roads. Men were seeking a right-of-way for a road in the Kentucky mountains. Some were giving it freely, others were charging for it. Exorbitant prices were asked by some for their lands. One old pioneer, when told the highway would run right through his garden, said: "Go ahead, take the garden. Move the house if you want to and I'll even pay the expense of moving it. I've hauled truck in the mud for 40 years and now I'm through. That's my answer."

Every year finds good roads supporters more numerous. More and more people are coming to realize that our salvation, as far as prosperity and living conditions are concerned, depends on the kind of highways we have and the number of them. That being true, it is a poor idea for anyone to stand in the way of progress by contesting a right-of-way. If it is impossible to donate land, then cut the cost to the lowest possible figure. No man can afford these days to block a highway improvement, because when he stands in the way of road-building he is standing in his own light.

The old Kentuckian set a good example for the people of every community as well as his own. Let us hope that the same spirit will prevail in Colorado at any time and every time there is a road-building proposition on foot.

Paving Cheapest and Best

STRONG gravel advocates in the past are now admitting that pavement is cheaper in the long run. They find by experience that a hard winter, with a great amount of snow works havoc with the gravel highways. And a wet season gives an additional amount of grief. This applies to those stretches of roadway carrying a heavy amount of traffic. It takes maintenance crews continually at work to keep the gravel roads in condition and when heavy rains come, it is humanly impossible to take care of the soft and broken roadbeds with a constant stream of traffic to contend with. Paving eliminates all of this trouble and expense.

Yes, traffic demands pavement. No amount of maintenance will keep a gravel road in smooth condition, where the traffic runs as high as 1,000 cars per day.

Some figures just given out show that it has been costing some states from \$500 to \$2,100 per mile per year to keep up some of the main traveled, unpaved roads. The smaller charge was on roads carrying about 200 cars per day, while the larger was on roads carrying around 2,000 cars per day.

Upkeep expense on a paved route, carrying an average of more than 2,000 cars per day was \$350 per mile, not figuring the saving to car owners. So it is easy to figure which is by far the better investment in the long run.

There is no question but that we will have to hard-surface a large mileage of our trunk highways, and the sooner the better, or they will break us up with maintenance charges.

Surplus Labor Aided by Roads

ROAD building, now an industry well over the billion dollar classification, takes up much of the slack in labor surplus.

In constructing the 7,000 miles of concrete rural roads and 3,200 miles of streets last year, for instance, it was necessary to transport and mix 38,000,000 cubic yards of cement, sand, gravel, stone and slag. To build a single mile of concrete roadway 18 feet wide requires roughly two train loads of these materials. The amount of labor required for these operations can be easily appreciated.

Economists have long been urging that needed public improvements be pushed beyond the blue-print stage into actual construction during the short industrial depressions that may be occasionally expected. Accrued government surpluses, they maintain, could well be applied to road-building projects and other improvements. Practically every community has had projects in contemplation for a long time. These should be built without delay, for they will help keep labor employed until conditions readjust themselves.

Looking back over this nation's economic history for the last few years, it is apparent that highway building has been of prime importance in giving the coin of the realm a wide distribution. The construction of public improvements, particularly of highways, it must be borne in mind, accomplishes something else and that is the deeper rooting of prosperity.

Strikingly significant is the fact that this, the world's most prosperous country, has more good roads than any other nation. And more are needed.

Large Sums to be Spent on County Roads

A GOOD road passed every farmer's front door! This is a dream that will some day come true in Colorado. Already we are on the way to its realization. With the taking over of maintenance by the State Highway Department on all Federal aid roads in the state, road officials in nearly every county have set about to improve the secondary roads—those "feeder" roads that lead to the trunk highways.

On the first day of May the highway department swung into action with 125 maintenance patrol crews on the Federal aid system. At the same time the county commissioners put to work nearly an equal number of outfits on the secondary system. As a result there is today more actual road construction and betterment work going on in Colorado than ever before.

During the year of 1928 the state, counties and Federal government will expend approximately \$10,000,000 in Colorado for road betterments. Of this sum \$3,095,372 will be spent from direct taxation by the various counties. And a few years under the present system, it is claimed by road officials, will see a good road to every farmer's front door.

In Colorado there are 30,000 miles of roads of all classes—good, bad and what have you? Of this number there are 8,900 miles of state aid roads. And included in this we have 3,360 miles of Federal aid roads. In other words, we have in Colorado approximately 20,000 miles of county roads of every description—some very important.

The entire responsibility for the upkeep of the Federal aid system in Colorado now rests with the State Highway Department. This system includes all of the main arteries of travel through the state. These roads serve about 80 per cent of all motor traffic in the state. Responsibility for the construction and maintenance of

the secondary roads rests with the county commissioners.

During the past ten years the farmers of Colorado have backed the improvement program that has been carried out on the trunk highways. A considerable portion of the moneys expended on this program has been appropriated to the state by the Federal government. But the farmers have now come forward with a demand that the roads that pass their "front door" be improved. This demand from the farmers had much to do with the highway department taking over the maintenance on the Federal aid roads.

Under the new trunk highway plan, the cost of keeping up the main highways is thrown directly on the state, thus relieving the counties of this expense, and permits the latter to spend all their road funds on secondary routes. This cannot but result in a greater improvement of roads of all classes in the state.

As a result of this change in policy numerous counties are now busy working out county highway systems, which will bear the same relationship to the counties as the Federal aid system bears to the state. A tremendous gravel surfacing program is now under way. Intensive maintenance is being instituted in the larger counties on the secondary system.

A recent investigation disclosed that in nearly every county the program of road improvement would have been larger if funds had been available. These enlarged programs are in response to the ever-increasing demand for the improvement of the secondary systems.

While the improvement of the state system in Colorado has progressed rapidly and is gradually working to the point where it will all be surfaced, yet many miles of the state highways are proving too narrow and inadequate to properly carry the traffic and de-



Two views of the Victory Highway. On left, a picture of new Federal Aid highway west of Milner; on the right, another completed Federal Aid project west of Craig. Photos by H. L. Jenness, division engineer.



Showing a county truck spreading gravel on State Aid Road No. 51, north of Wray, in Yuma county. This road forms a part of Yuma county's splendid gravel road system.

mands are being made by the traveling public for increased transportation facilities.

With the modern road-building equipment and a more thorough knowledge of the art of highway construction, the job of completing the various county systems does not seem so large as it would have seemed a few years ago.

Wonderful strides have been made in recent years in the construction of roads on the Federal aid system and there is a popular demand for "feeders" to these main lines so that the rural population may be afforded the same transportation facilities as its more fortunate urban cousins.

The population of this country is growing and at the present rate 210,000,000 people will be here at the end of the present century. Applying this rate of increase to Colorado we find that by 1940 we may expect a population of two million people who will be using approximately 510,000 cars. Assuming that in 1940 we have 9,000 miles on the state system and 21,000 miles on the county system, it is a very simple problem to figure that if these 510,000 cars were all out at one time on these two systems we would find a car every 300 feet.

Gravel surfacing is the chief item of improvement now being made by the counties. Some of the counties have as many as three gravel-crushing plants in operation. A majority of these are of the portable type and some have a capacity of as high as 600 cubic yards of crushed gravel per day. Trucks are used in hauling the crushed stone on the road.

As an illustration of how the plan works out, in Weld County, with its 7,700 miles of county and public roads, a progressive construction program has been inaugurated. Under this plan 4,500 miles of roads are maintained during the year. The county will have more than 60 trucks hauling gravel this summer. Three crusher outfits are being installed. The commissioners

expect to gravel 200 miles of road in 1928. In 1920 there were 110 miles of graveled roads in Weld county; at the end of 1927 there were 800 miles of improved gravel roads in the county.

This improvement was made possible through the employment of motor equipment. It has been found that the motor outfits could do as much work for \$7.50 as a team could for \$25, the motor outfits being owned by the county and the teams being hired from first one farmer and then another.

Like programs are now being carried out in Pueblo, Fremont, Boulder, Larimer, Washington, Yuma, Las Animas, Mesa and Montrose Counties.

"We find that the farmers are heartily in favor of the new system," said one county commissioner. "They have even come to us with propositions whereby they would agree to an increase in their taxes provided we would gravel surface the roads leading past their places. Others have offered to donate cash or labor in extra payment for the improvement.

"We have also found that increased truck sales follow every gravel surfacing job. The ranchers dispose of their teams the minute the gravel reaches their front doors. They have found that where the team will haul one mile, motor trucks will permit them to travel three miles at the same cost. That's why they are back of us in the gravel surfacing program. They're getting tired of bucking mud.

"And that's why I supported the new trunk highway plan whereby the state relieves the counties of the work on the Federal aid roads. We can now use our equipment on the secondary roads."

The use of up-to-date equipment has made it possible for many of the counties to cut their maintenance costs in half and to do about four times as much, according to road engineers. All but a few of the counties keep their organizations at work throughout the year.

In the past the counties have been using mostly graders with trucks as motive power. But gradually these are being replaced with tractors and motor graders. Roads that were gone over with a team once a year are now gone over with a scraper 10 to 15 times a year. Big grader outfits with heavy tractors are being used to widen and drain narrow roads at a fraction of the cost by the old method of team and labor. By the use of big graders grubbing is eliminated which makes a big saving. Instead of plowing, all dirt roads are scarified, thereby making another saving. A grader type of scarifier is used.

A large number of the counties of the state have well-equipped repair shops to keep the machinery in smooth running order. In this way the county is enabled to purchase all supplies, tools and oils at wholesale, thus effecting a big saving to the taxpayers over the old methods. The employment of highway engineers and road superintendents by the larger counties has been another factor in road improvement in Colorado, by helping to get the best returns for the money.

Co-operative creameries gave the good roads movement a good start before the automobile came into general use. The growth of the cities also spurred the demand for good roads into the dairy districts. Good roads make it possible to bring perishable food stuffs to market in less time, in better condition, and with less waste. As diversified farming has stimulated the demand for good roads, improved highways in turn have done much to promote diversified farming in the state. Trucks carrying dairy and poultry products, potatoes, vegetables and live stock direct from the farms to the terminal markets, are seen on the trunk highways all over the state almost every day of the year.

Practically every farmer in the state has an automobile or a truck, and frequently both, and there are few farmers who do not regularly avail themselves of the highways on trips for business or pleasure. They appreciate the splendid trunk highways. Another fact is that scores of farmers within a hundred miles of the stockyards at Denver are using trucks to haul their stock direct to the market, saving railroad charges. They could not do this without the state highways.

Truck transportation is increasing all over the state. The state highway system is fine, as far as it goes, but it also has a long way to go before it can be put in condition to serve the motoring public as it should. Nevertheless, it is saving Colorado motorists thousands of dollars in reduced operating costs at the present time. And each year sees a further reduction.

In this connection it might be interesting to note that during the past ten years several states have authorized huge bond issues for roads that brought tremendous prosperity to those states. It is a fact that Colorado enjoyed the greatest period of prosperity in its history during the years that the State Highway Department was expending moneys from her two road bond issues, from 1920 to 1926.

A few years ago California issued \$18,000,000 in bonds for construction of roads. Prosperity immediately followed and today we find California spending \$28,000,000 yearly for road betterments. North Carolina came along with an \$85,000,000 road bond issue and her people enjoyed unprecedented prosperity. Illinois built 1,000 miles of paved roads last year from a \$100,-



A section of the Federal Aid concrete pavement south of Sterling, in Logan county. This road serves a rich irrigated agricultural section, and also carries large tourist traffic from the east. The paving between Sterling and Fort Mogan will be completed this summer, a distance of about thirty miles.

000,000 bond issue. The state of New York spent \$55,000,000 in 1927 for road improvements, while Pennsylvania expended \$48,000,000 through its highway department.

A total of 1,820,536 motorists visited the national forests in Colorado last year. It is estimated that tourists spent in this state during the last season \$60,000,000. Our total road bill was less than \$10,000,000.

Good roads pay big dividends—there's no doubt. The more spent on good roads generally means less money spent on car repairs. A good road is an asset to a community and a pleasure to the individual motorist; a bad road is a liability nearly as serious as no road at all. We all enjoy paved roads and the more we have, the more travel we secure from outside tourists.

GAS TAX RAISED IN TWO MORE STATES

The beginning of the year 1928 saw increases in the gas tax from 3 to 4 cents taking effect in two states, Arizona and New Hampshire. The Arizona legislation was passed in August. In New Hampshire the rate was increased from 2 to 3 cents early in 1927 and the special session in November boosted the rate another cent.

This makes twelve states which have a four-cent gas tax, while six states have a higher tax, one having a 4½-cent rate and five having a five-cent tax.

Fourteen states have the three-cent tax and one state has 3½. This makes a total of thirty-three states which have a gas tax of three cents or more.

Thirteen states have a two-cent tax. Only two states, New York and Massachusetts, have no gas tax.

Ten Million for Colorado Roads

COLORADO'S road bill will total \$10,523,372 in 1928. This sum will be expended by state, federal and county governments.

The expenditures will rank as follows:

State Highway Department.....	\$5,158,000
Counties	5,065,372
Federal Government	500,000

With the completion of the disbursing of this large sum this year the main-traveled thoroughfares and the feeder roads of the state will be in the best condition in their history.

The sum to be expended by the state is divided as follows: 70% of the 3-cent gasoline tax, \$2,800,000; one-half mill property tax, \$775,000; internal improvement fund, \$50,000; Federal aid, \$1,533,000.

The money to be expended by the counties will be raised as follows: road and bridge levies, \$3,095,372; one-half motor vehicle taxes, \$770,000; 30% of 3-cent gasoline tax, \$1,200,000.

The Federal government will expend approximately \$500,000 for road improvements in the national forests and parks in the state.

Disbursements of the state will include \$3,066,000 for the construction of Federal aid projects, and \$292,000 for state aid projects, and \$1,300,000 for maintenance. A portion of the counties' expenditures will be matched with state aid in the improvement of state highways not included in the Federal aid system. The balance will be devoted exclusively to the betterment of county "feeder" roads.

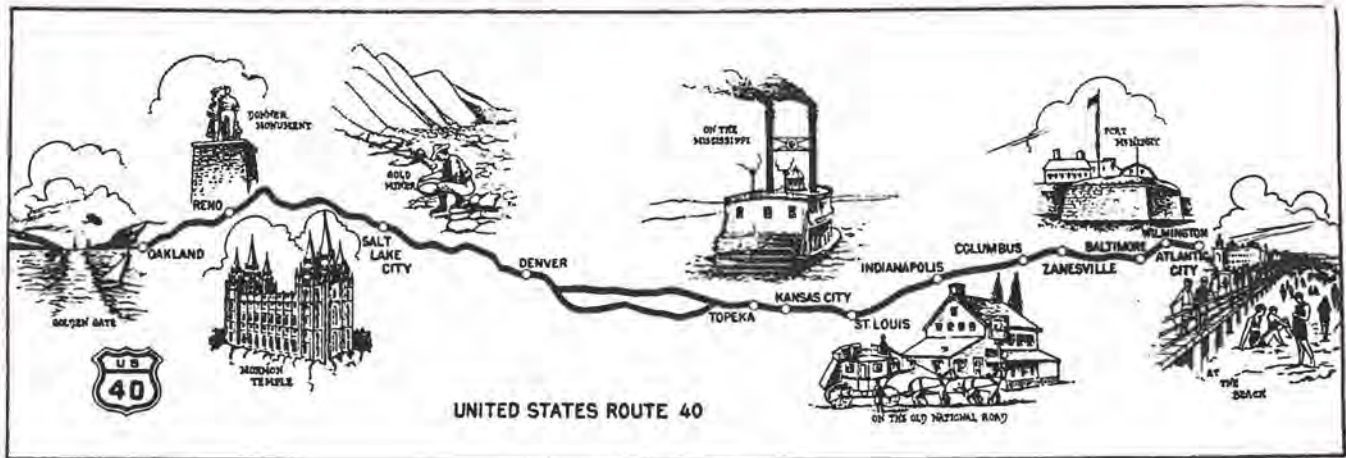
The road and bridge levies of the counties must be used within the confines of each county. Weld County leads the entire state in its appropriations for county road work, a total of \$319,901.55 being made available as the result of the annual tax levy. Expenditure of this sum is aside from and exclusive of the money to be expended within the county limits during the year by the state highway department and the Federal government on Federal aid projects. A total of \$265,000 will be spent by the state on two Federal aid projects in Weld County this summer. These include five miles of paving north of Greeley, and 14 miles of oil-surfacing north of Nunn.

The figures setting forth the sums set aside by each county for road work was released May 16 by the Colorado Tax Commission.

The following is the sum raised by direct taxation in each county of the state for road purposes and does not include the additional thousands distributed among the counties as their share of the gasoline tax and motor vehicle fees by the state treasurer:

County	Amount Appropriated
Adams	\$ 94,282.83
Alamosa	16,531.50
Arapahoe	65,580.99
Archuleta	10,642.85
Baca	27,658.59
Bent	41,135.04

County	Amount Appropriated
Boulder	151,369.26
Chaffee	4,657.89
Cheyenne	22,006.93
Clear Creek	16,286.81
Conejos	23,804.43
Costilla	10,530.54
Crowley	19,866.01
Custer	6,186.89
Delta	63,471.96
Denver (Mountain parks).....	154,041.46
Dolores	8,709.41
Douglas	30,201.94
Eagle	41,040.11
Elbert	45,222.78
El Paso	84,716.20
Fremont	70,612.09
Garfield	84,917.78
Gilpin	9,635.95
Grand	13,828.10
Gunnison	26,851.78
Hinsdale	1,160.51
Huerfano	51,823.99
Jackson	6,805.54
Jefferson	113,673.93
Kiowa	17,182.06
Kit Carson	60,813.00
Lake	17,310.63
La Plata	80,563.83
Larimer	166,987.02
Las Animas	118,642.16
Lincoln	53,402.15
Logan	67,241.33
Mesa	90,661.36
Mineral	4,648.10
Moffat	22,859.58
Montezuma	43,438.53
Montrose	40,881.26
Morgan	65,355.60
Otero	67,772.52
Ouray	14,042.52
Park	17,920.34
Phillips	23,303.06
Pitkin	12,604.36
Prowers	27,108.82
Pueblo	109,010.34
Rio Blanco	11,903.16
Rio Grande.....	27,236.56
Routt	39,332.58
Saguache	33,169.48
San Juan.....	9,751.89
San Miguel.....	33,183.59
Sedgwick	49,651.56
Summit	13,832.84
Teller	14,871.87
Washington	50,506.63
Weld	319,901.35
Yuma	52,727.75
Total.....	\$3,095,372.12



Route 40 Traces Path of Pioneers

THE Bureau of Public Roads of the United States Department of Agriculture has issued an informative and historical story of United States Route 40. Starting at Atlantic City, N. J., it extends for 3,205 miles to San Francisco, crossing 14 states, and nearly every mile of it is of interest to the motor tourist. It follows east of the Missouri River the trail of pioneers and west of the Missouri the route of the founders of Colorado and the West, and beyond follows the old Mormon trail.

Route Through Kansas

In its description of the highway, the Bureau of Public Roads sketches historical points of interest from Atlantic City across New Jersey, Delaware, Maryland, Pennsylvania, West Virginia, Ohio, Indiana, Illinois and Missouri, and of Kansas and Colorado, it says:

"From Kansas City the paved road continues for 101 miles through Lawrence and Topeka to St. Marys. This is the end of the 1,234-mile paved section which begins at Wilmington, Delaware. Thirty-six miles farther on is Manhattan, where the route divides into 40-north and 40-south, and continues as two branches of the same road as far as Limon, Colorado. It was the discovery of gold in Colorado in 1858, more than any other occurrence, that caused the direct westward extension of the original road across Kansas, over practically the same location as the present route. The overland stages traveled over the road, branching off at Junction City onto the divide between the Smoky Hill and Republican Rivers. Of the 486-mile distance across Kansas, 101 miles is paved, 73 miles is gravel-surfaced and 292 miles is earth, or graded and drained road.

Highways in Colorado

"In the western states the passes over the Rocky Mountains and the Sierra Nevada range may be expected to be blocked by snow at any time after October 15, and remain closed to travel until the following April or May. Beginning at little above sea level at St. Louis, the traveler has now motored over the gently-rising topography of Kansas and has climbed gradually to an elevation of a mile above sea level at Denver. Many scenic drives adjacent to the city afford interesting side

trips—to Estes Park, the entrance to Rocky Mountain National Park, and the grave of William F. Cody (Buffalo Bill) situated on Lookout Mountain, 14 miles west of the city. The traveler finds it difficult to believe that this bustling American city was a rude mining camp only 70 years ago. But, when fortune hunters swarmed westward to seek the gold that had been discovered on a stream tributary to the South Platte, the trail to the new El Dorado developed into a well-worn road over which, on what was said to be one of the proudest days in the history of Denver—June 7, 1859—there arrived the first two horse-drawn Concord coaches of the Leavenworth and Pikes Peak Express.

Attractions of State

"In 1861, wishing to gain a westward connection from Denver to Salt Lake City, a civil engineer named E. L. Berthoud, was employed by W. H. Russell and Ben Holladay—the overland transportation magnates—to examine the country in search of such a route. The survey proved that a road could be constructed which would shorten the distance from the Missouri to the Pacific by 250 miles. It has only been within the last few years, however, that the state and federal governments have been active in constructing this road, largely as Federal aid and forest road projects.

"Proceeding by circuitous mountain construction, the road is built across the Continental Divide, through the Berthoud Pass—62 miles west of Denver—at an elevation of 11,313 feet. Again it crosses the Rocky Mountains at Muddy Pass—94 miles north of Berthoud—at an elevation of 8,772 feet, and for the third time via the Rabbit Ear Pass—7 miles northwest of the Muddy Pass—at an altitude of 9,808 feet above sea level. Thus, the Continental Divide is crossed three times within 163 miles of Denver.

"Of the 512-mile length of United States route 40 across Colorado, there are 20 miles of concrete pavement, 38 miles of gravel surfacing, 287 miles of graded and grained earth road, and 167 miles of unimproved road."

Beyond Colorado and through to San Francisco the same historical sketches of the country traversed is sketched.

Federal Aid Bill Approved

FIVE major pieces of legislation, of interest to the motorists of the country, involving \$239,200,000, were passed by the 70th Congress, which adjourned last week, according to the legislative department of the American Motorists' Association. Four bills, likewise of interest to the motorists, were left pending before various committees. One bill, viz., the Oddie-Colton bill, involving \$10,500,000 for the construction of the gaps in the Federal aid highway program, failed by virtue of the president's veto after being passed by the Senate and House.

The five measures which passed were the \$165,000,000 Federal aid bill; the \$66,000,000 automobile excise tax elimination bill; the \$4,200,000 appropriation for the Mt. Vernon Memorial Highway; the \$4,000,000 flood relief measure for reconstruction of Federal highways in the states of Vermont, Kentucky and New Hampshire and the Oddie amendment to the Federal highway act. The amendment marks the first step that the Federal government has taken in beautification of the Federal highway system. It authorizes the planting of trees along the Federal aid route, and provides that the Federal government shall share with the states on an equal basis, the original cost of tree-planting and maintenance.

The four measures which are now pending before various committees, and which will be considered further at the December session include the Browne-Watson bill, which authorizes a special highway building fund of \$407,341,000 and which, it is estimated, will speed up five times highway construction in the United States. The second is the Du Pont Rathbone bill, which provides for the construction of a 50-foot highway across the United States, to be financed by the leasing

of business sites, throughout its 3,000-mile length. Federal regulation of interstate motor bus traffic, recommended by the Interstate Commerce Commission, and endorsed by more than a score of national motorists and commercial organizations, failed, but will be taken up early in December, according to Congressman James S. Parker, author of the bill. The fourth measure, which did not reach a final vote, was a \$1,000,000 appropriation for the widening of the National Defense Highway, linking the nation's capital with the Naval Academy at Annapolis.

In addition to the bills passed, three joint resolutions were adopted, the first authorizing a \$15,000 appropriation to send American delegates to the Second Pan-American Congress on Highways at Rio de Janeiro; the second authorizing \$25,000 expenditure for the Federal government to entertain delegates to the Permanent International Association of Road Congresses, which will hold its sixth session in the United States in 1930, and the third authorizes the appointment of a commission to study the construction of a North-American highway traversing North, South and Central Americas.

"From the motorist's viewpoint, the legislation passed by the last Congress was most satisfactory," according to J. Borton Weeks, president of the American Motorists' Association. "The continuation for two years of the Federal aid program and the elimination of the three per cent automotive excise tax were unanimously endorsed by the motorists. The Oddie amendment, authorizing an expenditure out of Federal funds for tree-planting along the Federal highway system, marks the first step in the beautification of our highway system, which will bring pleasure to the millions of motorists for all time to come," President Weeks points out.

Figures compiled by the association show that on July 1 there will be a total of \$241,115,000 of Federal funds available for the Federal aid highway program. Of this sum \$128,000,000 is available for projects now under construction; \$29,000,000 being available for projects not yet begun, but which have been approved, and \$84,115,000 being available for new construction projects.



A view of Byers canyon, Federal Aid project recently opened to traffic. Note heavy rock excavation. Colorado river on left.

Highway Engineers Protect Taxpayers

To have good roads requires the services of good engineers. The old system of building a road by the winding route was scrapped long ago.

Today roads are built as straight as possible and over the shortest route possible between two given points. Modern traffic demands that they be built on easy grades. To get easy grades and good alignment necessitates the employment of engineers.

Engineers are the best protection the taxpayer has in getting his money's worth in roads. Thousands of dollars are saved the traveling public in reduced travel costs on the roads now being constructed in this state.

Not every road that is surveyed is actually built. Sometimes it is necessary to make two or three surveys to find the best route.

Why Proceeds from War Goods Should be Used for Roads

BY EDWARD E. BROWNE, Congressman from Wisconsin

Congressman Browne, a former member of the House Committee on Roads, recently introduced a bill in Congress providing that bonds aggregating \$407,341,145 given by the French government to the United States for surplus war material be turned over to the Department of Agriculture for road-building purposes. Under the provisions of the bill, 90 per cent of the fund would be distributed among the states as Federal aid and the remaining 10 per cent would be utilized equally for building roads within the national forests and for boulevards within the regional area of Washington, D. C.

TEN years of Federal aid for roads has convinced the most skeptical of the public that the money appropriated by Congress for the improvement of our highways was thoroughly justified. I do not believe that any other appropriation for internal improvements has ever benefited so many of our people or has caused so much happiness as the appropriation for the improvement of our highways.

The question asked is not should the Federal government continue to assist in building interstate roads, but why does it not give more assistance, and why did it not continue the good work of Federal aid for roads begun by Washington and Jefferson over 100 years ago.

The 23,000,000 owners of automobiles, which means practically every family in the United States, are urging that road building be hastened in order to keep pace with the increased traffic demands.

Automobile vehicles have increased from 1916, when Congress passed the Federal aid road act, from

three and one-half millions to over 23,000,000 and are valued today at the stupendous sum of \$14,000,000,000. These auto vehicles are almost 100 per cent perfect and are being operated upon highways which are not 25 per cent efficient.

It is estimated that the increased wear and tear on the 23,000,000 auto vehicles by reason of the imperfect roads over which they are being operated amounts annually to from six to seven hundred million dollars.

The question of whether the Federal government is contributing its share to the building of interstate roads is also frequently asked. I desire to discuss this question and other questions related to it, and also the source from which we propose to get the money authorized to be appropriated.

February 28, 1919, Congress passed a law directing the Secretary of War to transfer to the Secretary of Agriculture all war material, equipment and supplies, declared surplus, to be distributed among the states as a highway fund under the Federal aid act. At the close of the war the United States had surplus war supplies and road equipment in France estimated at fully \$2,000,000,000. Before the order for the return of the surplus war material, equipment, and supplies then in France had reached France negotiations had been made by our representatives in France for the sale of the property to France at approximately 20 cents on the dollar. As this surplus war material was sold,



Showing a fine stretch of gravel surfaced highway near Grand Valley in Garfield county, recently finished with Federal Aid funds. This road is a part of "U. S. Highway 40—south." Photo by H. L. Jenness.

the government of France issued its bonds to the United States for the same as follows:

August 1, 1919, \$400,000,000; due August 1, 1929. On May 9, 1920, \$6,566,762.42. July 5, 1920, \$774,382.59; due July 5, 1930. These bonds aggregate \$407,341,145.01 and bear interest at the rate of 5 per cent per annum and are in the treasury of the United States and payable semi-annually. France is paying interest upon these bonds currently.

Congress by its action, February 28, 1919, had given the surplus war material to the Agricultural Department to be distributed among the states for the building of roads. These bonds, therefore, rightfully belong to the several states to aid them in the construction of their roads.

It is the intention of the Debt Settlement Commission to place these bonds with the indebtedness of France to the United States contracted prior to our going into the war, which aggregate considerably over \$3,000,000,000, and accept obligations extending over a period of 62 years, with no interest until 1930 and then 1 per cent interest until 1940 and 2 per cent from 1940 to 1950 and graduated until the same bears 3½ per cent interest.

I maintain that the indebtedness for war material sold to France for which she gave the United States bonds for \$407,000,000 has an entirely different status from the \$3,000,000,000 indebtedness which was loaned France during the period she was in war. I also maintain that the bonds issued for surplus war supplies rightfully belongs to the highway fund.

It should be remembered that Federal aid is only given for a system of roads embracing 7 per cent of the total road mileage of any state, the remainder, or 93 per cent, of the roads have to be constructed and maintained by the states and the subdivisions of the state.

In order to obtain Federal aid for roads the states are required to raise a large amount of money, and the states in return have called upon the counties and smaller subdivisions of the state to contribute. In this way the states have raised a much larger amount of money than they have received from the Federal government, besides being obliged to maintain roads which serve the entire nation. This heavy tax burden upon the farmer has helped to make farming unprofitable. The farmer is the victim of excessive taxes. The farmer's taxes the last 10 years have increased over 30 per cent more than the taxes of the man living in the city or village. We believe as a matter of justice that the appropriation asked for in this bill should be distributed by the Secretary of Agriculture under the present Federal aid act and the states should not be required to pay to exceed 20 per cent of the cost of the roads built with the moneys received from this fund. This bill provides that the money received shall be expended upon primary or interstate or state trunk highways and shall be durable roads.

The 7 per cent of roads upon which the Federal government gives aid aggregated 200,353 miles. In the 10 years of Federal aid, with the contributions of states and local units only 56,017 miles have been completed, and 144,336 miles remain unimproved. I get that from the Bureau of Roads. At this rate it will take us from 25 to 30 years to complete the system, and in the meantime the increased wear and tear on automobiles because of our incomplete and poorly con-



View of Glenwood canyon, showing highway which was damaged by recent high water in Colorado river. State maintenance forces made speedy repairs and kept traffic moving with a delay of only a few hours.

structed system of highways will cost us in the extra wear and tear on automobiles, it is estimated, at the rate of \$600,000,000 a year.

Before the invention of the automobile when traffic moved slowly over our highways in horse-drawn vehicles the improvement of highways might have been considered of only local concern. The invention of the automobile revolutionized transportation over our highways. The situation has changed very greatly since the Federal aid road law was passed in 1916. Besides the 3,000,000 trucks and the 20,000,000 automobiles which are traveling over the highways there are 80,000 buses, 7,284 of which are interstate buses. There are 32,788 buses which are carrying school children. Sixty steam railroads are using buses as feeders for their railroads. Fifteen million four hundred and eighty-nine thousand motorists from all the states of the Union visited the national forests in 1926, a million and one-half more than the preceding year.

The state highway engineer of Wisconsin informed me the other day that an accurate record of the number of cars with out-of-state licenses coming into the state of Wisconsin had been kept, and the number of people these cars brought into the state in a hundred days during the summer season, and that over 4,000,000 people from out of the state had come into Wisconsin by automobile during that time.

In determining what portion of the cost of interstate highway should be paid by the states and the Federal government, we should consider first, that

(Continued on page 24)

International Highway Proposed

INTERNATIONAL friendship and good-will between the United States, Canada and Mexico will receive a great stimulus from development of the Glacier to Gulf highway, linking the three countries, according to Harold W. Riley, Calgary, Canada, director of the Alberta (Canada) Motor Association.

The highway, 2,680 miles in length, connects with Calgary, its northern terminus, and Tampico, Mexico, on the south, crossing Montana, Wyoming, Colorado, New Mexico and Texas. It passes through Denver, Colorado Springs and Pueblo.

By affording an easy route into the United States the highway, the speaker pointed out, will serve to bring many tourists from Canada, particularly in winter, while travel from Mexico and between states also will be greatly stimulated.

"Three years ago," said Mr. Riley, "the Alberta Development Association arrived at the conclusion that a better north and south highway was needed. In your country there are innumerable east-west transcontinental highways and it was believed that an outlet from western Canada linking up these motor routes would be invaluable to the thousands of farmers in our provinces who desired to tour in the United States. Likewise it would be a good thing for Americans desirous of visiting in our country.

"As a result the Glacier to Gulf highway was mapped, platted and charted in every possible means to make information to tourists accurate and first-class in every way. Our association which is affiliated not only with the Canadian Automobile Association but the American Automobile Association sent three members over the route to complete this work which required two months. Now maps showing the route intersected by 25 east-west highways in the United States is available in garages, information bureaus and chambers of commerce.

"Our farmers formerly toured the Pacific north-west and went from Spokane down your west coast, but in view of the fact that they desired to take their vacations in November after their harvests were all cared for and the mountain passes are then closed by snow they asked us for a southern route this side of the Rockies. That is now available and an enormous tourist traffic may be expected in the future. The road is good throughout its 2,680 miles. The main stops are well spaced, including Great Falls, Billings, Casper, Cheyenne, Denver, Colorado Springs, Pueblo, and other cities to the gulf. The states of Montana, Wyoming, Colorado, Arizona, Oklahoma and Texas are crossed or touched upon and the three countries, Canada, United States and Mexico, connected.

"In the last year Canada has extended her stop-over privilege from 30 days to 90 days without bond. If Americans desire to stay six months they are required to put up a bond to the value of their car to care for the duty regulations. Canada wants American visitors and the United States can have a tremendous business through this new motor route."

Mr. Riley addressed a number of motor clubs and chambers of commerce in Colorado during the month

of May, urging their members to take a more active interest in this international highway.

Boston Post Road Is Now 255 Years Old

BY E. E. DUFFY

America's first lengthy highway, the Boston Post Road, is now 255 years old. The story of this ancient trail, first a post rider's path, now a smooth, rigid roadway, is a history of highway building in itself.

The Boston Post Road has evolved into one of America's truly modern thoroughfares. This route was one of the earliest roadways four traffic lanes wide, and is considered the longest wide highway in the country.

In the early winter of 1673, the first horseback post left New York City for the other principal city of the New World, Boston. This was the earliest attempt to link together these two cities, towns then, by land. The rider left New York with messages from Governor Lovelace to Governor Winthrop of Connecticut and the governor of the Massachusetts Bay Colony. At the end of the second day the message bearer was still in the confines of the present New York City, for the trail was poorly marked.

The first journey required two weeks. Later, when provisions were made for changing horses along the route, the time was reduced to one week, with 30 to 50 miles as the average daily distance.

Frail bridges that trembled under the impact of horses' hoofs were erected to eliminate the countless fords necessitated by the meandering trail. In 1713 the New York Assembly established a right-of-way four rods wide between New York City and the Connecticut boundary. But it was not until 1772 that the first coach journey was made by Jonathan and Nicholas Brown. Riding on hard, backless seats, the travel-worn tourist welcomed the end of the daily 40-mile jaunt lasting from sunup to sundown.

The need for paving was evidenced even in those days, but the early attempts were not so successful. The "turnpiking" process consisted in placing a layer of rock covered with sand over the roadway. This gave an excellent roadway for a time, but soon rain washed away the sand and travel over the exposed rocks was more difficult than ever. Later crushed stone and planking smoothed the way of the coach and four.

Motor traffic, increasing at the rate of ten per cent a year, made it mandatory that the road be widened. Even five years ago from 10,000 to 16,000 vehicles were using the road daily. For a time consideration was given the practicability of constructing a parallel route, but it was decided that it would be more economical to pave the Boston Post Road to a double width. The roadway, now concrete for the most part, is paved to a width of 36 or 40 feet.



View of U. S. Highway 550, near Durango, in La Plata county, being a part of the "Million Dollar Highway" between Durango, Silverton and Ouray, the most mountainous region in the state, and sometimes called "the Switzerland of America."

New Mexico's Five-Cent Gasoline Tax

The New Mexico legislature passed a 5-cent gasoline tax bill early in 1927, the law becoming effective on March 4, 1927. The bill carried an emergency clause and thereby became effective the date of passage or as soon thereafter as signed by the governor.

Prior to the 5-cent gasoline tax law there had been a 3-cent tax on gasoline extending over a period of two years.

Those who opposed an increase from 3 to 5 cents argued that such an increase would result in a less tax return than under the previous 3-cent law. It was claimed by those who opposed the measure that consumers within the state would buy only such gasoline as was absolutely necessary, and as a result there would be a reduction in gallonage over the previous year. It was further claimed that tourists would avoid going through New Mexico and would choose routes through other states wherein the taxes were less. It was also claimed that numerous filling stations would spring up on the borders of the state and that those tourists who were compelled to enter would fill their gas tanks before doing so and would perhaps carry along an extra 5 or 10 gallons for good measure.

After practically a year of operation under the new law figures will show that these surmises were without foundation. The increase in consumed gallonage during the year of 1927 as against the year 1926 was 22½ per cent. This increase amounted to \$666,246.90.

Through an efficient gasoline tax department, collections have been made promptly and the evasions of the law, if any, have been negligible. Collectors stationed at several points in the state have rigidly enforced the law. As provided by law, they are paid out of a fund amounting to 2 per cent of the gross proceeds of the tax.

What effect has this tax had upon the road-build-

ing program of the state? A provision was made in the law for the issuance of \$1,250,000 in debentures, yearly, against the anticipated returns. Consequently, the state highway department has been enabled to plan a very definite maintenance and construction program. The law is liberal in its scope, permitting the moneys so derived to be used in the maintenance, construction and improvement of highways.

The money from the gasoline tax debentures, together with certain revenues from the motor vehicle license and a levy on property, is being used to maintain a state road system consisting of 5,042 miles; to construct annually 250 miles of secondary state highways; and to meet Federal aid on a proposed improvement of 195 miles of the 7 per cent Federal aid system. The latter is composed mainly of concrete, crushed rock, crushed gravel and caliche types.

The gross receipts for the year of 1927 were \$1,439,789.41. It is anticipated that this figure will be increased to \$1,650,000 for the year of 1928.

In general, there is universal satisfaction and commendation of the new law. Some of its bitterest opponents of legislative days are now its most enthusiastic boosters. People generally realize that good roads cost real money and they are willing to foot the bill. One hears less nowadays of criticism because a particular project cost a large sum of the taxpayers' money, than formerly. But let some important thoroughfare fall into a bad state of repair and it is certain that some highway official will spend a great deal of his time receiving delegations until that particular road is fixed. The fact that it will cost a large sum of money to effect the needed repairs is no excuse in this age. Improved highways are no longer considered as an extravagance and luxury, but rather as a good investment from which a substantial profit may reasonably be anticipated.—
New Mexico Highway Journal.

NEWS OF THE MONTH

Current Events in the Field of Highway Engineering and Transportation—State, County and Municipal Activities

James E. Maloney, assistant highway engineer, made a trip to California for the purpose of inspecting their oil-surfaced roads the week of May 21. In California he covered 1,200 miles of various types of surfaced highways in five days. He was the guest of the California Highway Commission. During the current construction season the Colorado department will construct 21 miles of oil-surfaced roads. Information gathered in California will be used in planning the local roads. He found that several types of oiled roads are being constructed in the coast state, some of them costing as high as \$12,000 per mile. The average cost, however, is about \$4,000. The latter roads are oiled to eliminate dust in the rural districts.

The Colorado department has provided for the oiling of three projects this summer. A contract has been let to A. R. Mackey for the graveling of 14 miles between the state line and Greeley, preparatory to oiling. Pople Brothers are now preparing the grade between La Jara and Antonito for five miles of oil-surfacing. The state will do three miles of oiling between Alamosa and Monte Vista.

Bids for the oil to be used on the two projects in the San Luis Valley were opened on May 31. About \$8,000 worth of oil will be required for the two projects.

A new oiling machine has been purchased for use on these projects. The 14-mile oiling project north of Nunn will be handled by contract. This project will be watched very closely by the county commissioners of Weld County, and if same proves satisfactory it is probable that several miles of county roads will be oiled next year.

The steam shovel outfit which for several months has been constructing a new road between Golden and Coal Creek was moved to Pine Cliff in Boulder County on May 10. The shovel crew will be employed all summer in widening the old road to the top of the Pine Cliff ridge, connecting with a new piece of road constructed by Hinman Bros. last year. Clyde Waters is in charge of the shovel crew. Fred Reibling is the district engineer. It was announced that the road through Coal Creek Canyon will be closed from 7:30 to 5:30 daily. Traffic will be permitted on this road only on Sundays.

All maintenance equipment purchased by the highway department in April has now been delivered. The department now has over 100 maintenance crews working on the Federal aid system. Robt. H. Higgins, superintendent of maintenance, has spaced the crews about 25 miles apart. State forces have been engaged for four weeks in the opening of the mountain pass roads over the Continental Divide. Most of this work has been done in altitudes of 10,000 feet or over.

Dan Rosenzweig has been appointed equipment inspector of the state maintenance division. He was formerly employed as inspector in engineering division No. 1. He has just completed a survey of the new equipment being used by the maintenance forces on Federal aid roads. Forty government trucks were placed in working condition under his supervision. Before becoming identified with the highway department, Rosenzweig was employed as an expert automobile and truck mechanic.

Joe Shea, resident engineer for several years, in Division No. 1, left Denver on May 26, for Persia. He will join the engineering force of Ulin & Co., who have a contract to construct 500 miles of new railroad from the Persian Gulf to the Caspian Sea. The job will probably take three years to complete. Shea sailed from New York on May 31 on the S. S. Majestic.

At the time of going to press, Contractor H. C. Lallier has poured four miles of concrete on his 14-mile contract between Tomah and Palmer Lake. At one time he had three mixers working on the project. On May 15 he put a new Smith 27-E mixer to work south of Tomah. His old mixer was moved to the Palmer Lake end of the project. A short strip of concrete was poured through the town of Larkspur. This will be opened June 15 to facilitate the movement of traffic through the town.

On May 29 traffic started moving over the new grade about a mile and a half in length in Crow Creek Canyon above Baileys. This eliminates all detours on this project until after the close of the

heavy traffic season next fall, according to J. J. Donovan, division engineer.

On May 4 Edward Selander was given a contract for the construction of 3½ miles of concrete pavement west of Fort Morgan. This project connects with the Roberts contract on the east, making a total of 8½ miles new pavement to be laid between Greeley and Fort Morgan this year. Selander is now working on five miles of pavement north of Brush. On this project he has one of the most complete paving outfits in the state at work.

During the month O. J. Dorsey completed three miles of gravel surfacing northeast of Palisade in Mesa County. This project was on State Road No. 4, leading from Glenwood Springs to Grand Junction.

Winterburn and Lumsden have completed four miles of gravel surfacing west of Glenwood Springs, and are now working on one mile of gravel surfacing adjoining the above project on the west. Contractor Fred Kentz is making rapid progress on 7½ miles of gravel surfacing between De Beque and Grand Valley. The completion of these two projects will give a gravel surfaced highway between Glenwood Springs and De Beque, a distance of approximately sixty miles.

Contractor H. C. Lallier has practically completed 6½ miles of grading north of Minturn on State Road No. 4. Plans are now being made for 3½ miles of grading and an overhead crossing south of Minturn. Both of these are Federal aid projects and eliminate bad stretches of old unimproved road.



Steel highway bridge which spans the Arkansas river near Salida, in Chaffee county, constructed with Federal Aid funds.

Hinman Brothers have completed three miles of gravel surfacing east of the town of Parshall, leading to the newly-completed Byers Canyon highway. Northwestern Const. Co. have practically completed a new steel and concrete bridge over the Colorado River adjoining the Hinman contract. Movement of traffic over these two projects eliminates the old dangerous drive over Parshall Hill.

During the past month H. C. Lallier Const. Co. completed $4\frac{1}{2}$ miles of gravel surfacing between Iola and Cebolla on State Road No. 6, west of Gunnison, leading to the Blue Mesa. Hinman Bros. are now working on six miles of surfacing between Cebolla and Sapinero. The completion of the latter project will give a graveled road from Gunnison to the Sapinero bridge, a distance of about forty miles.

Plans are being drafted for nine miles of gravel surfacing between Fruita and Mack in Mesa County. This improvement will be located on the main traveled road between Grand Junction and Salt Lake City, Utah. The road in Utah already has been improved for a considerable distance in the direction of Grand Junction. This work is located on United States Highway No. 50, which runs from Thistle, Utah, to Annapolis, Md.

Engineers are making plans for the gravel surfacing of four miles of the road north of Pagosa Springs, leading to Wolf Creek Pass. Those who have traveled this road will appreciate what this improvement will mean to traffic in that district. Also plans are being made for the gravel surfacing of six additional miles south of Cortez, connecting with the 16-mile gravel project recently contracted across the Ute Indian Reservation in Montezuma County. E. J. Maloney of Madison, South Dakota, recently put a large construction outfit on the latter project. The department also is drawing plans for a mile of concrete pavement and a railroad underpass near Manzanola on the Santa Fe Trail in Otero County. Plans will shortly be ready for four miles of



State highway bridge south of Colorado Springs, over the Fountain river. A five-mile stretch of concrete pavement is being constructed by the Highway Department, connecting with this bridge on the south.

pavement north of Pueblo. With the start of this work the department will have $9\frac{1}{2}$ miles of pavement under construction between Pueblo and Colorado Springs.

Plans for the new six-mile paving project located between Boulder and Lafayette were submitted to the United States Bureau of Roads on June 2. Construction of this project will complete the pavement between Denver and Boulder. The plans call for the completion of the project in 1928.

Contractor Luke Smith has returned to his contract on Loveland Pass. He has about four miles to construct on the pass this summer, which will extend the new Holy Cross trail to the summit of the pass. There will remain about eight miles to construct on the west side of the pass. This work will be extended as funds become available.

The work of grading twenty miles of highway between Roggen and Wiggins will probably be completed by the first of July, according to A. R. Mackey, contractor. This road is a cutoff on the D. L. D. route to Denver and will undoubtedly be surfaced at a later date, greatly shortening the distance between Roggen and Wiggins.

The highway department opened bids on three projects on May 31. They were: F. A. P. 286-C, 5,556 miles of concrete pavement north of Greeley, New Mexico Const. Co. low bidder, \$126,360; F. A. P. 286-B, 14 miles of gravel surfacing north of Nunn, A. R. Mackey, low bidder, \$38,978, and F. A. P. 242-B, timber bridge and approaches, west of Mack in Mesa County, Hinman Bros., low bidder, \$13,996.

The forty-one-mile stretch of highway between Durango and Silverton was opened to traffic on May 8, according to D. Kirk Shaw, assistant state maintenance superintendent. Two highway crews, operating big snowplows, were employed in the work. Until this time there had been no automobile traffic between these two towns since last November. Clearing of the snow was appreciated by hundreds of car owners in the San Juan basin. Ernest McConnell of Durango and C. C. Campbell of Silverton directed the work of the two crews working on Molas Pass.

C. F. Oehlmann, vice-president of the Colorado Motor Club, was elected vice-president of the American Motorists Association on May 20. The election is regarded of importance to Colorado motorists, since through it they are assured representation in western road bills before Congress. One of the most important bills now pending is that to create a special highway fund from the proceeds of surplus war material, highway equipment, and supplies sold to the French government. If passed, the bill would give Colorado an additional \$7,000,000 for highway work. This sum would not have to be matched by state funds.



One of the new state maintenance tractor-grader outfits smoothing out the "wrinkles" on road north of Monument in El Paso county.

Increasing Maintenance Costs

One of the problems always before highway officials is the proportionate allotment of mileage to different types of road construction materials. The lower the type of material specified, the larger the mileage of roads that can be built, and, conversely, the higher the type of surfacing, the less the mileage that can be built.

Where to draw the line is the difficult problem.

Probably there is no set basis for calculation except the fact that too great a mileage of light or temporary surfaces will eat up road funds leaving no money with which to permanently improve the roads.

The situation is illustrated by some figures published by the Nebraska Highway Department: "The mileage of gravel roads is steadily increasing and with it is increasing the cost of maintenance. The experience the state has had is proof that before the present system of state highways is completely surfaced, the cost of maintenance alone will more than equal the entire amount of funds now available for maintenance and construction.

"In 1926 there was spent for maintenance alone \$1,981,480, while in 1927 the cost had jumped to \$2,256,057.

"In this same period the mileage of graveled roads increased about 1,100 miles. Minnesota with not quite a thousand miles more of state highways than Nebraska is maintaining, spent in 1927 as much money for maintenance alone as Nebraska has state funds available for both maintenance and construction.

"The present 2-cent gas tax is yielding an increasing amount of revenue each year, but the increase is

not in any near proportion to the increase in cost of maintenance."

Seemingly, the basis for calculation is to set some mileage of permanent paving to be laid each year and allot remaining funds to the job of temporarily surfacing as many miles of the state system as possible.

New Ideas on Speed Limits

With the development of better automobiles, trunk highways, and traffic guidance, the question of what is the speed limit for motor vehicles takes on new phases. One motor industry leader predicts that within five years all speed limit laws will be abolished in order to prevent traffic congestion, and that life will be just as safe. There is distinct difference between fast driving and reckless driving. It is against the latter that more stringent laws must be aimed. Many towns still retain the unenforced notice, "Speed limit 15 miles." On the other hand, some of the most traveled highways in the country are enforcing increased speed. On the road between Philadelphia and Atlantic City, the motorist who slows down below 40 miles an hour is warned off for obstructing traffic. There are other fast express highways where speed is encouraged. This is merely in accordance with development of a new method of locomotion. When steam railroads first were operated, a man sometimes rode on horseback ahead of the train to warn people off the track.—St. Paul Pioneer Press.

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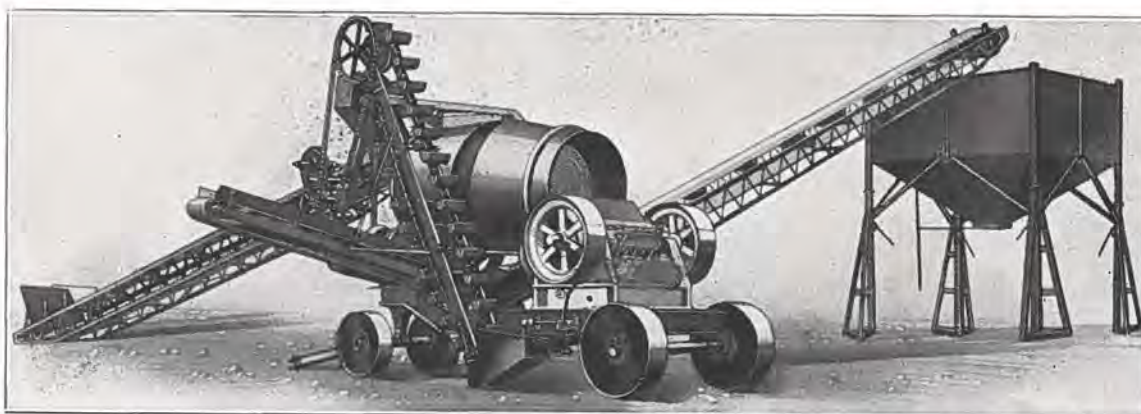
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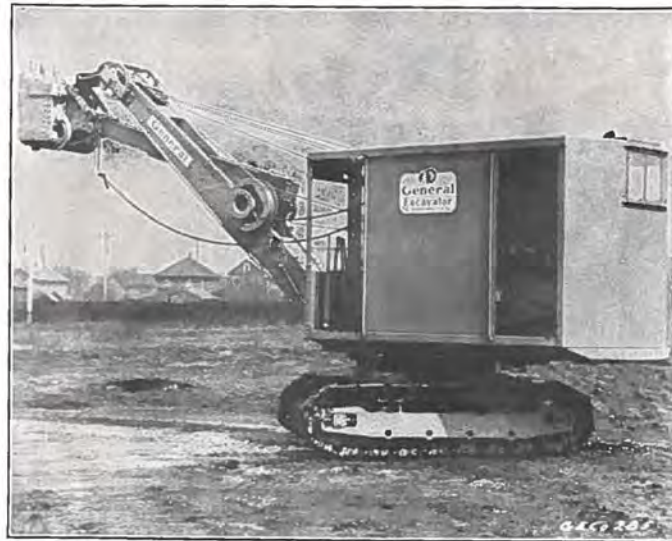
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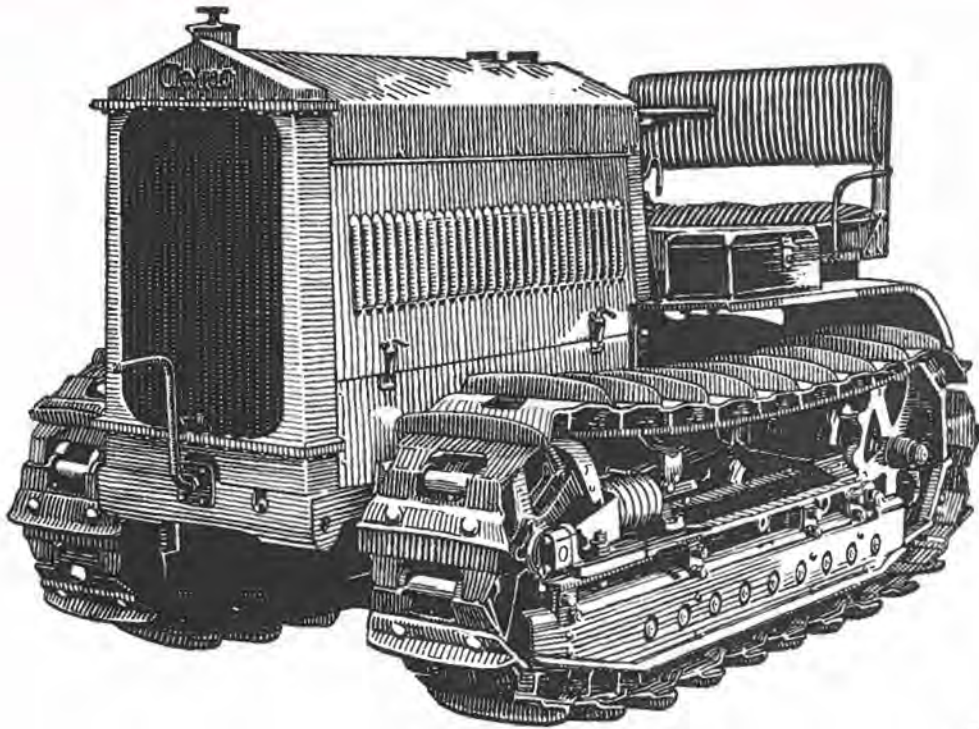
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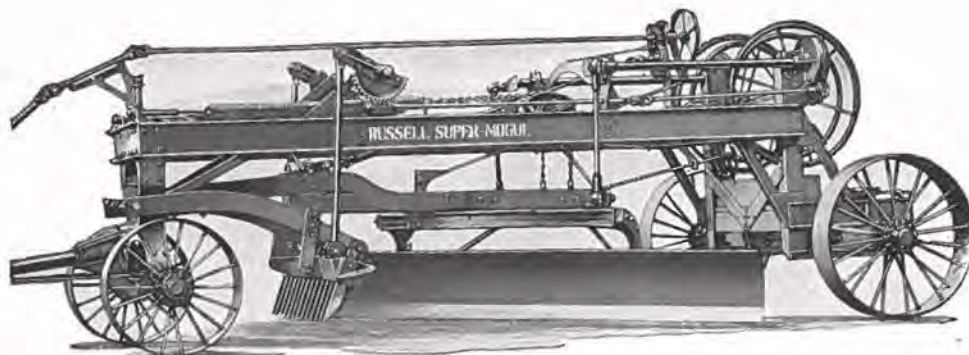
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New Highway Equipment and Materials

The Wehr Company of Milwaukee announces a new model T-2 power grader, for use with the McCormick-Deering power unit. Literature on the new grader is now being distributed by the H. W. Moore Equipment Company, Denver, distributors. The weight of the grader complete with tractor, rubber-tired wheels, cab and scarifier, is approximately 11,500 pounds.

It is furnished with 8, 10, 12, 14 and 16-foot mouldboards and blades. The operator's platform is mounted on springs. The steering device operates after the fashion of a heavy duty truck. The lifting arms are of new ball and socket design. The "A" frame is die-formed from heavy angle steel. The circle is a solid unit cast from high carbon steel. The blade control is through machine-cut worm gears which are enclosed in oil-tight housings. Lifting is made easy by a dual spring-lifting device.

The Wilson Machinery Company are sending out to customers a 104-page illustrated catalogue of road machinery and contractors' equipment distributed by them in the Rocky Mountain territory. The lines include the Koehring Company, draglines, shovels and mixers; C. H. & E. Mfg. Co., pumps and saw rigs; the Le Roi Company, gasoline motors; Construction Machinery Co., Wonder mixers; Page Engineering Co., scraper buckets; Cleveland Wheelbarrow Co., Heil Co. dump bodies and noists; Western Wheeled Scraper Co., graders, fresnos, plows, wagons; Buck Traction Ditcher Co., trench excavators; Waukeska Motor Co., industrial power units; Heisler geared locomotives; Zenith hand shovels; Sullivan Machinery Co., compressors; Blaw-Knox Company, road forms and batcher-plants; Insley Company, mast hoists and concrete chuting equipment; Littleford Bros., tar heaters and asphalt tools.

A number of radical improvements have been made in the Wonder 10-S and 14-S concrete mixers, according to Harry P. Wilson, president. The hoisting gears run in oil, while the moving parts are equipped with Timken bearings. The sprockets are machined. Both machines are equipped with Wonderquick water measuring tanks.

A new portable gravel crushing plant has been placed on the market by the Western Wheeled Scraper Co., according to Mr. Wilson. It has a capacity of 600 cubic yards in ten hours. It reduces gravel to the size desired. It is equipped with a Western jaw crusher. It weighs 34,000 pounds.

An elevating grader with a power take-off from the tractor is the latest innovation in elevating grader machinery introduced by the Austin-Western Road Machinery Co. The Austin Power take-off

is a device installed on the Contractor's Special grader and is driven directly from the engine of the Caterpillar Sixty tractor. With this device it is said that the capacity of the grader has been increased in some cases as much as fifty per cent. The Wilson Machinery Co. are distributors for this machinery in Colorado.

Another new motor grader is announced by J. D. Adams & Company. It is known as the Adams Motor Grader No. 11 and is adapted to the new Caterpillar "20" tractor.

In general design this machine is very much like the Adams Motor Grader No. 10 with McCormick-Deering 10-20 tractor, announced the first of the year. It has enclosed machine-cut gears throughout with adjustable end thrust bearings for the worms and has machine finished bearings and ball and socket joints throughout the blade and scarifier controls. All are Alemite lubricated and adjustable for wear, so that there is absolutely no lost motion in these two controls to cause jumping or chattering of the blade or scarifier. It also has the new and distinctive Adams blade control which, it is claimed, operates much easier and 50 per cent faster than the controls ordinarily used.

The Adams Motor Grader No. 11 is the first grader to be adapted to the Caterpillar "20" tractor. The grader is furnished with 10, 12, 14 or 16-foot blades and with or without scarifier and cab. The grader alone with cab and scarifier weighs 8,000 pounds; the weight of the outfit complete with tractor is approximately 15,500 pounds. A special circular on this machine will be sent gladly to anyone addressing Ethan T. Fair Company, Denver, Colorado.

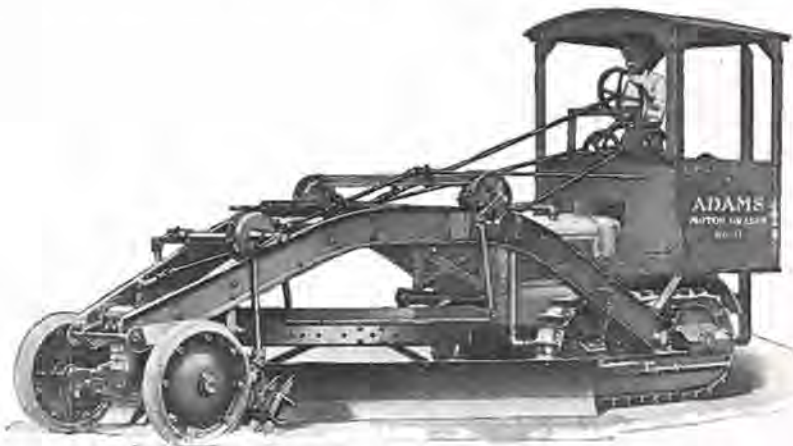
A new model Rome motor has just been placed on the market during the month

by the Rome Mfg. Co., according to announcement made by John W. Fink. This grader is equipped with the McCormick-Deering power unit. It has a scarifier and has the Rome high-lift blade feature.

A new catalog on the Rome line of graders is now being distributed by the Fink Company. Twenty-five of these graders are now in use on the state highways. New catalog on the improved Speeder shovel and Huber gasoline rollers, distributed by the Fink Company in this territory, also are available to those interested for the asking. Good business for the month of May was reported by Mr. Fink.

A new method of moving dirt is being employed by the Mountain States Construction Co., on their highway contract west of Milner, in Routt County. They have purchased a Caterpillar tractor equipped with a LaPlant-Choate bulldozer for spreading material on several long fills which the contract requires. They have a new shovel for loading the material on trucks for hauling to the fills. The tractor also will be used for pulling fifteen acres of cottonwood trees to be cleared from the right-of-way. The firm uses a Cedar Rapids crusher in its graveling operations. The tractor was purchased through the Clinton & Held Co.

A. E. Loder, in charge of government sales of the Caterpillar Tractor Co., was a visitor in Denver the week of June 4. He called on the highway departments of Colorado and Wyoming. Mr. Loder was formerly identified with the U. S. Bureau of Public Roads and is well-known to road officials of the Rocky Mountain territory. He commented most favorably upon the condition of roads in Colorado and Wyoming as compared with five years ago, the occasion of his last visit here. While in Denver he was the guest of the Clinton & Held Co.



New motor patrol announced by J. D. Adams & Company.

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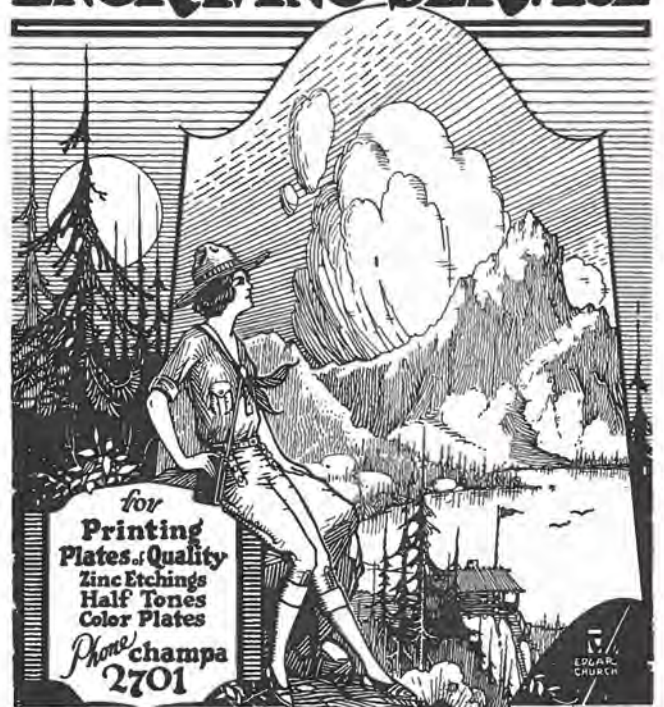
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Why Proceeds from War Goods Should be Used for Roads

(Continued from page 11)

under the Federal aid road act the burden of maintaining these roads is borne wholly by the states. No road made is so perfect that it does not require constant attention and maintenance. Roads have to be constantly patrolled and in the wintertime in the northern states, snow removal is a heavy burden, in some states amounting to over a million dollars per year. These burdens fall entirely upon the states and local units. The heavy traffic of trucks on interstate business and the millions of automobiles that come into each state from other states all increase the burden of the state in maintaining the highways.

The Federal aid goes to the improvement of only 7 per cent of the roads. The remaining 93 per cent

which means over 2,000,000 miles of roads is constructed and maintained without a penny of Federal aid. These roads are used very much more than they were before the automobile came into such general use and the localities are obliged to keep them in much better repair than formerly to avoid accidents by travelers from their own state and other states, which places an additional burden upon the counties and the smaller units under the counties. Take, for example, the county trunk roads, many of which are used almost as much as the Federal trunk lines in their locality, receive no Federal aid. In Wisconsin in 1927 approximately \$40,000,000 was expended for highway purposes. Of this amount the state paid \$14,711,000, the counties and local units approximately \$24,000,000, while Federal aid only amounted to \$1,870,000. Similar figures could undoubtedly be procured from other states.

PLANS SUBMITTED FOR APPROVAL TO U. S. BUREAU OF PUBLIC ROADS

Proj. No.	Length	Type	Location
F.A.P. 2R No. 7	1,224 mi.	Pav't & Overhead R. R. Crossing	South of Aguilar
F.A.P. 2R No. 8	1,633 mi.	Pavement	Aguilar, south
F.A.P. 271-C	2,430 mi.	Gravel Surfacing	West of Portland
F.A.P. 282-A No. 2	.....	River Protection Work	South of Craig
F.A.P. 293-C	3,661 mi.	Graded	North of Ouray

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
F.A.P. 134-B	3 mi.	Gravel Surfacing	Vona
F.A.P. 149-A	5 mi.	Gravel Surfacing	North of Agate
F.A.P. 144-C	4 mi.	Gravel Surfacing	Northwest of Fort Collins
F.A.P. 147-B	6 mi.	Gravel Surfacing	South of Cortez
F.A.P. 208-B	0.5 mi.	Gravel Surf. & Overhead R. R. Crossing	East of Grand Junction
F.A.P. 242-B No. 2	9 mi.	Gravel Surfacing	West of Fruita
F.A.P. 251-C	4 mi.	Pavement	East of Boulder
F.A.P. 258-G	3 mi.	Gravel Surfacing	West of Cerro Summit
F.A.P. 266-D	5 mi.	Gravel Surfacing	South of Bonadad
F.A.P. 272-D	1 mi.	Pav't & R. R. Underpass	Manzanola
F.A.P. 277-C	4 mi.	Pavement	North of Pueblo
F.A.P. 253-D	2 mi.	Gravel Surfacing	Mt. Harris
F.A.P. 282-E	6 mi.	Gravel Surfacing	North of Meeker
F.A.P. 282-H	5 mi.	Gravel Surfacing	North of Rifle
F.A.P. 290-C	0.5 mi.	Bridge	North of Lamar
F.A.P. 292-B	3.5 mi.	Graded & R. R. Overhead Crossing	South of Minturn
F.A.P. 295-D	2 mi.	Gravel Surfacing	North of Antonito
F.A.P. 298-B	4 mi.	Gravel Surfacing	North of Pagosa Springs
F.A.P. 262-I	4 mi.	Gravel Surfacing	South of Russell

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1928

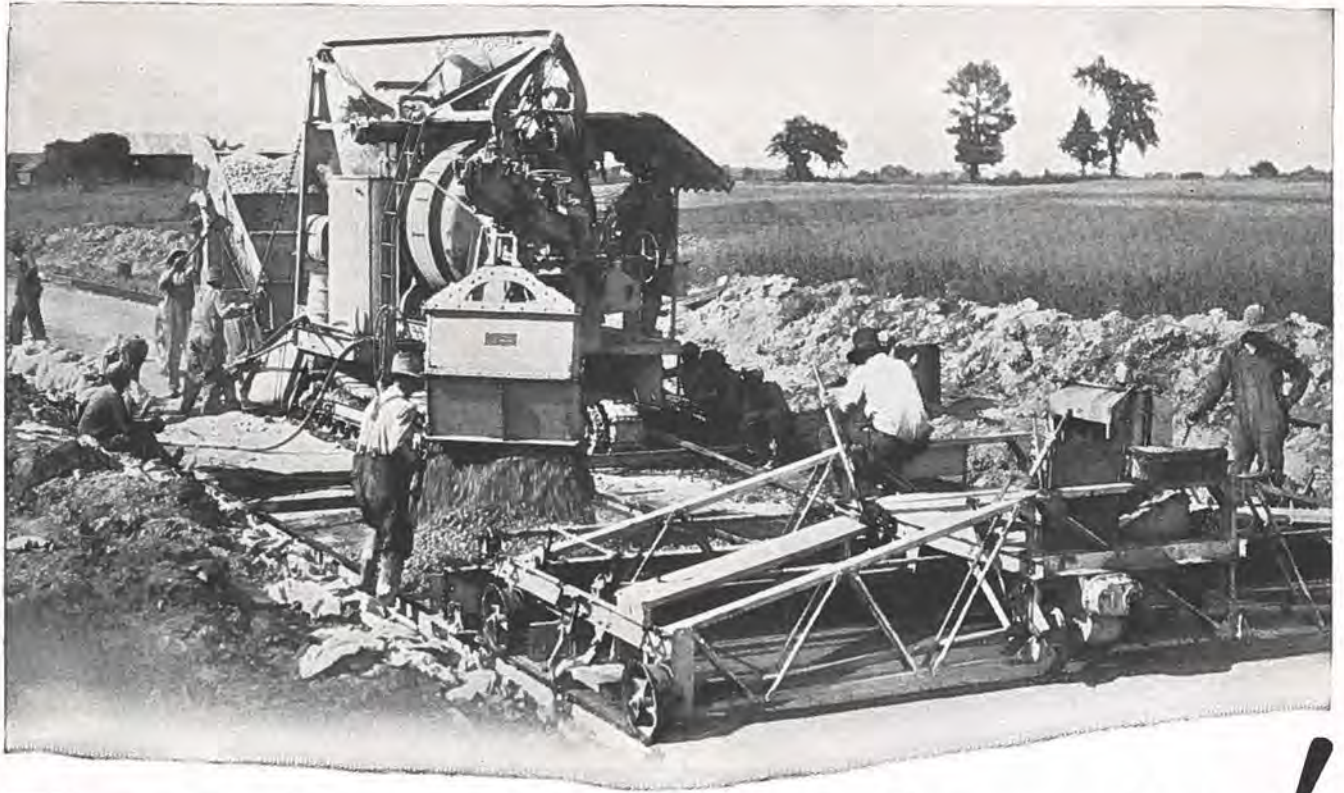
Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R5	Bet. Trinidad and Aguilar	1,959 mi.	Paving	W. A. Colt & Son	\$ 72,122.50	82	2-R5
2-R	No. 6 South of Aguilar	2,75 mi.	Pavement	W. A. Colt & Son	93,000.00	33	2-R No. 6
138-A	North of Kremmling	10,916 mi.	Grading	F. L. Hoffman	201,262.80	6	138-A
144-B	Northwest of Fort Collins	3,201 mi.	Gravel Surfacing	White & LaNier	44,000.00	47	144-B
145-A	West of Glenwood Springs	3,807 mi.	Gravel Surfacing	Winterburn & Lumsden	53,227.90	96	145-A
145-B	West of Glenwood Springs	1,051 mi.	Surfacing	Winterburn & Lumsden	42,389.72	30	145-B
147-A	In Ute Mt. Reservation, S. of Cortez	15,896 mi.	Surfacing	E. J. Maloney	119,100.10	0	147-A
210-B2	De Beque-Grand Valley	7,507 mi.	Gravel Surfacing	Fred Kentz	37,476.00	68	210-B2
247-C	Swink	0.8 mi.	Conc. Pav. & R.R. Underpass	J. Finger & Son	62,559.58	73	247-C
253-C	West of Milner	4,502 mi.	Surfacing	Mountain States Con. Co.	88,108.40	0	253-C
254-C2	S. W. of Hot Sulphur Springs	Superstr. of Bridge & Approaches	Northwestern Constr. Co.	48,203.50	73	254-C2	
254-D	Parshall-Hot Sulphur Springs	3,013 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	37,124.18	94	254-D
258-D	Iola-Cebolla	4,426 mi.	Gravel Surfacing	H. C. Lallier Const. Co.	52,789.80	100	258-D
258-E2	Cimarron-Cerro Summit	1,487 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	32,377.70	8	258-E2
258-F	Gunnison-Sapineto	5,689 mi.	Surfacing	Hinman Bros. Const. Co.	100,968.50	8	258-F
266-C	Durango and N. Mex. State Line	2,401 mi.	Surfacing	Salle Const. Co.	32,499.80	40	266-C
275-C3	E2 G3 Palmer Lake-Pring	4,602 mi.	Concrete Paving	J. Fred Roberts & Sons C.C.	114,079.65	15	275-C3 E2 G3
275-E	North of Monument	0,926 mi.	Grading and Underpass	F. L. Hoffman	41,905.20	91	275-E
275-F1	Castle Rock-Larkspur	10,303 mi.	Grading	J. Fred Roberts & Sons	132,679.00	100	275-F-1
275-F3	G2 Temah-Palmer Lake	12,894 mi.	Concrete Paving	H. C. Lallier C. & E. Co.	292,309.95	23	275-F3 G2
277-B	South of Colorado Springs	4,860 mi.	Concrete Paving	J. L. Busselle & Co.	131,202.45	4	277-B
279-D	Morrison	0,264 mi.	Paving	M. E. Carlson	23,266.80	100	279-D
279-E	Schaffer's Crossing-Baileys	3,243 mi.	Grading	S. M. & S. J. Feely	54,305.60	100	279-E
279-F	North of Baileys	3,444 mi.	Graded	J. Fred Roberts & Sons	126,000.00	24	279-F
282-D	North of Meeker	2,864 mi.	Gravel Surfacing	Winterburn & Lumsden	42,155.00	95	282-D
282-F	So. of Craig on S. H. No. 13	2,17 mi.	Surfacing	Gardner Bros. & Glenn	49,063.00	0	282-F
287-A3	W. of Ft. Morgan on S. H. No. 2	3,55 mi.	Concrete Paving	Ed. Selander	90,749.50	0	287-A3
287-D1	Two mi. E. of Kersey on S. H. 2	0,921 mi.	Grading	White & LaNier	14,046.40	70	287-D1
288-A2	Bet. Merino and Brush	9,741 mi.	Paving	Edw. Selander	245,043.50	61	288-A2
292-A	North from Minturn	6,417 mi.	Grading	H. C. Lallier Constr. & Eng. Co.	92,571.80	82	292-A
295-C	La Jara-Antonito	5,284 mi.	Surfacing	Popple Bros. C. C.	29,414.60	18	295-C
296-C	N. of Greenhorn on S. H. No. 1	6,606 mi.	Surfacing	H. C. Lallier Const. & Eng. Co.	115,466.80	4	296-C
297AR	Northeast of Palisade	2,848 mi.	Surfacing	O. J. Dorsey	15,043.00	100	297-AR
300A	Bet. Chattanooga & Red Mt.	2,277 mi.	Grading	Winterburn & Lumsden	59,480.80	20	300-A



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Official Publication of the
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 Denver, Colorado

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L. D. BLAUVELT,
 State Highway Engineer.

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M. W. BENNETT, Editor

Articles on the subject of road building and highway development in Colorado are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible.

10 CENTS A COPY. \$1.00 A YEAR.

Our Cover Picture

"ON THE ROAD TO THE MESA VERDE" is the title we have given the picture on the cover of this month's Colorado Highways. It shows a view of the splendid highway leading to Colorado's prehistoric ruins, located west of Durango. This stretch of road was constructed with Federal Aid funds and is now maintained by state forces. It is located on the direct route to the Mesa Verde National Park from the east, and carries heavy traffic throughout the tourist season. Besides, it is an all-year, all-weather thoroughfare. *Photo courtesy Denver Tourist Bureau.*



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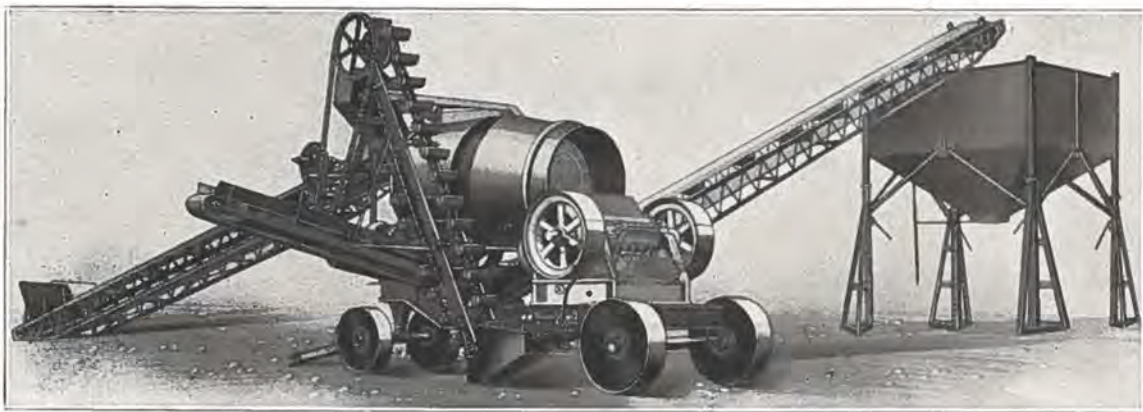
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NOTE—It will soon be five years ago that Mr. Buster purchased the first One Piece Outfit used in the State of Colorado. The City of Longmont purchased this machine from Boulder County for preparing the "correct" surfacing material for its streets, so Mr. Buster just naturally told us to ship him another "Cedar Rapids" One Piece Outfit.

Five years of satisfaction and five years of making good roads better.

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Editorial Comment

Wide Variance in Price of Gas

Gasoline prices in the United States range all the way from 10 cents a gallon to 27 cents for straight run and from 13 cents a gallon to 29 cents for high test gas.

This wide variation in the price of gasoline throughout the country was revealed in a check-up by 950 motor clubs affiliated with the American Automobile Association.

The check-up showed that on November 22, gasoline was selling at 47 different prices.

The lowest price reported was 10 cents for straight run and 13 cents for high test gasoline, at Peoria, Illinois, and the highest was 27 cents for straight run and 29 cents for high test, at Phoenix, Arizona.

Proximity to sources of supply appeared to be a negligible factor in determining current prices, since prices were in many instances higher close to the oil fields than they were at points to which a long haul was necessary. Prices at tidewater were on the whole higher than those charged at inland points.

The average price at points along the Atlantic Seaboard on November 22, the date of the nation-wide check-up was 22 cents a gallon. The average price in the Mississippi Valley region was 19 cents a gallon. The average price on the Pacific Coast was 20 cents a gallon.

The southwest states showed a variation of 12 cents in the price of straight run and 9 cents in the price of high test gasoline. The range was from 15 to 27 cents for the former and 20 to 29 cents for the latter.

Railroads Increase Bus Service

That there are over 270,000 miles of common carrier bus routes covered by 80,000 buses in the United States in 1927, according to figures compiled by the National Automobile Chamber of Commerce, is striking evidence of the vast and rapid growth in bus transportation. Expressed more graphically, common carrier bus routes of the United States if extended in a single line would reach around the world ten and four-fifth times. Of this great mileage 52,017 miles represent interstate lines.

In many states buses now run regularly between points having no rail connection. Large areas of various states such as North Carolina, Oregon and the New England states, depend mainly for contact with the outside world upon their bus systems. It is significant

of the transportation trend that bus service in very small towns is much more frequent than rail service in towns many times as large.

The greater mobility, flexibility and cheapness of small-unit transportation have made this increased service possible.

The country's railroads have been among the first groups to recognize the value of bus transportation. Today more than sixty steam railroads in the United States use buses, either directly or through subsidiaries. These buses are used on routes substituted for branch lines, on roads paralleling rail lines or on new feeder routes. In addition to this heavy bus use by steam railways, 266 electric railways are now using buses.

We Can't Keep Up

No matter how far ahead we may be planning our highways, no matter what our improvement of traffic facilities may be, we just can't keep up with the fast-speeding automobile.

There's the new Holland vehicular tunnel, for example. This pair of pipes under the Hudson river at New York has been devouring and ejecting automobiles for about four months. During that period nearly 2,500,000 motor vehicles of all types have passed through it.

Of course, the tubes can accommodate many more cars at a steady stream of about 25 miles an hour. But even now as they are, they show signs of clogging up when the big rush comes in summer. More tunnels are needed already. The new is aging fast.

The same is true of highways. Today we plan 100-foot highways, tomorrow they will have to be extended to 200 feet, and before long we shall have to build double-deck roads to accommodate slow and fast traffic.

The road we build today with prospect of accommodating for the next decade, may be overburdened in two years instead.

The automobile registration is growing faster than our highways and only radical and far-sighted planning can succeed in catching up with this growth.

North Carolina is third in the list of states in school transportation, 2,317 busses carrying children to and from the consolidated schools, which have been built in large numbers since road improvement began. Good roads have also stimulated diversified farming, increasing and stabilizing the prosperity of the farmers.



The highway department's new rotary snowplow working in 10 feet of snow and ice near the summit of Berthoud Pass.

State Clears Pass Roads of Snow

THE battle with snow on roads in Colorado has ended. June 15 saw all high passes in the state opened to traffic. The work of clearing the mountain passes of snow started in May, when the state highway department put its big rotary plow in operation on Berthoud Pass. This main artery of travel running west from Denver into Middle Park, was opened the earliest in history, notwithstanding the fact there was deeper snow on the pass this year than in previous years.

On June 1 automobiles started moving over the pass. This was ten days earlier than in former years. The early opening of the pass was made possible by the use of the mammoth rotary plow owned by the state highway department. Last fall the plow was mounted on a heavy-duty Coleman four-wheel truck, and the plow made into one unit. Two motors are now used, one to drive the wheel of the plow exclusively, while the other furnishes power for the truck.

Snowslides and drifts measuring twenty feet in depth were encountered by the plow, and long stretches of snow and ice ten to fifteen feet deep were moved from the roadbed. With the rotary plow it was possible to throw this snow clear of the road. In places the snow had melted and then frozen into almost solid ice. Dynamite was used to break this up. Two maintenance crews were employed on the work, with ten men in each crew. One crew worked from the bottom of the east slope, while the other started at West Por-

tal and worked to the top from the west. The altitude at the summit of the pass is 11,315 feet.

In charge of the work on this pass were: Robt. H. Higgins, state maintenance superintendent, and John Stamm, assistant, with John Sharp and Frank McQueary, foremen. The plow used in the work was constructed in the state highway shops.

While the work on Berthoud was progressing, other state crews were busy in other parts of the state in clearing snow from the high passes, getting them open for the tourist season, which starts early in June. In almost all cases it was necessary to furrow huge cuts through the snow. It is a gigantic task, and few motorists realize the tremendous amount of work that is required.

Perhaps a better understanding of the work of opening these mountain roads is to cite the elevation above sea level of the more important passes. To refresh the memory, a mile is 5,280 feet, and the elevations of these passes are: Berthoud, 11,315 feet; Fall River, 11,797; Rabbit Ear, 9,680; Willow Creek, 9,683; Muddy, 8,772; Cameron, 10,285; Fremont, 11,320; Independence, 12,095; Monarch, 11,650; Red Mountain, 11,018; Wolf Creek, 10,850; Cumbres, 10,003; Tennessee, 10,276; Hoosier, 11,542; Milner, 10,759; Cochetopa, 10,032.

For the first time an effort was made to keep Tennessee Pass open last winter. Success marked this undertaking. With the exception of a few days after

storms, traffic moved over this pass throughout the winter months. Two tractor and blade outfits were employed in this work. These outfits operated over a distance of about sixty miles, from Granite to Eagle. The equipment included two 10-ton Caterpillar tractors and two 12-foot graders, a Big Buster and a Rip Snorter. Also, there was a crew operating a one-man maintainer on the Eagle end of the work. Eagle county furnished the one Holt tractor, the Rip Snorter and maintainer.

The crews worked all winter in snow from 4 to 10 feet deep. A two-way road was maintained over Battle Mountain. Four and five feet of snow were encountered on this spectacular stretch of roadway. George Toupain, assistant maintenance superintendent, had supervision of this work, with Frank McQueary, foreman, in charge.

Tractors with push-plows were used in clearing the snow from Molas Pass, located between Durango and Silverton, and also in the removal work done on Red Mountain Pass, between the latter town and Ouray, on the world-famous "million-dollar highway." D. Kirk Shaw, assistant superintendent in the Durango district, was in charge of this work. Crews operated from both the Durango and Silverton ends, using state and county equipment in the work. San Juan and La Plata Counties contributed the equipment.

Similar operations were carried out on Monarch, Cumbres, La Veta and Wolf Creek passes. Several of the men employed on the crews were temporarily blinded in this work. Blistered faces and hands also were a common occurrence. Shovel crews are still employed in the clearing of the roads of rock slides.

Men and equipment from Routt county opened the Gore Pass road. This road was opened to travel the middle of May. Rabbit Ear Pass was opened on June 8. Volunteers from Steamboat Springs aided in this work, using shovels to hasten the clearing of the road on the summit. Lloyd Gregg and Lou Watson are operating the state highway patrol over this pass from the Grand county side, and Andy Shupp and John Giggey are working from the Routt county side.

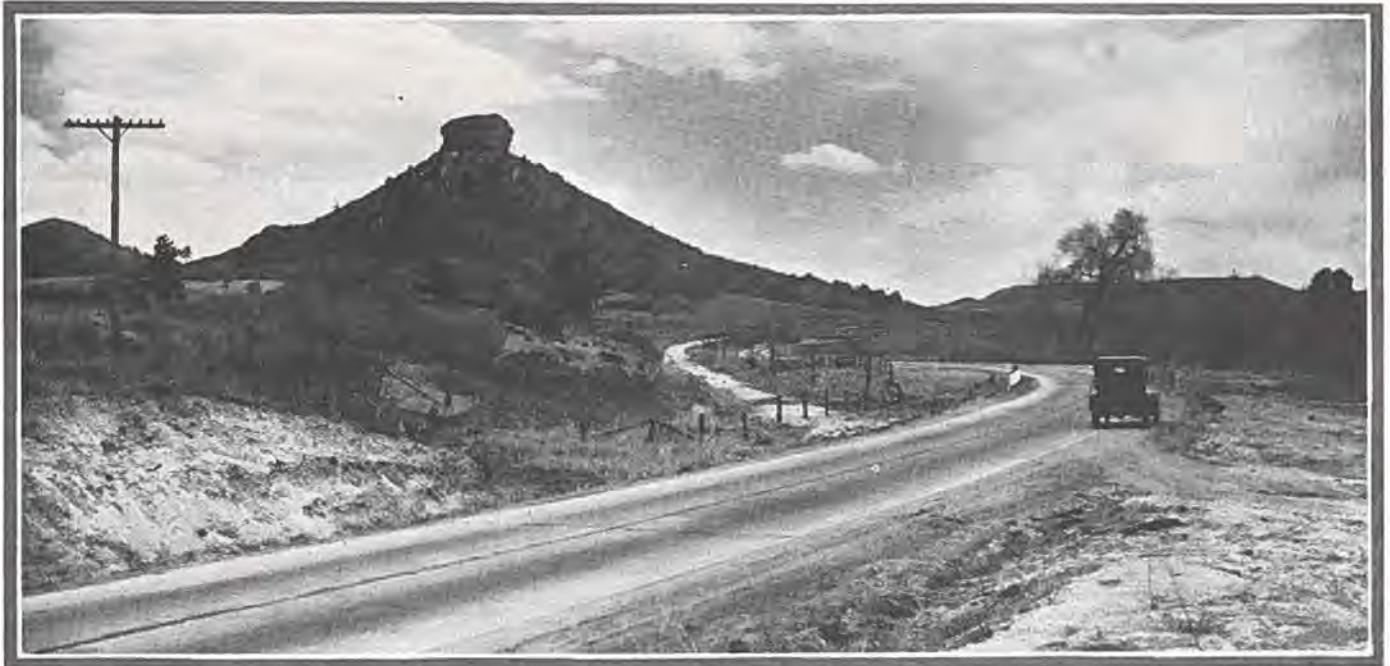
The road over Monarch Pass was opened on June 8. John Jay, in charge of a crew, started work on the pass May 30, but was delayed on account of high water in the river, which threatened several bridges. Last year Monarch Pass was reported open on June 9, but, according to snow charts this year, there was at least twice as much snow in 1928 as in 1927.

Traffic started moving over Fall River and Milner passes on June 15, the date of the formal opening of the Rocky Mountain national park season. The steam shovel crew cut through snow 26 feet deep. A hand crew of twenty-five men cleared the snow from the west slope of Milner, the steam shovel being employed near the summit on the east slope of the pass. Roger W. Toll, superintendent of the Rocky Mountain national park, was in charge of this work.

Reports reaching the highway department state that the pass roads were never in better condition at this time of the year. Major I. D. Blauvelt, state highway engineer, has issued orders that these important arteries of travel be put in first-class condition, and every effort be exerted by the state maintenance forces to keep them smooth for the heavy summer motor traffic.



Snow removal scenes in Colorado during the month of June. Left—Shovel crew on west slope of Berthoud Pass. Upper right—Tractor-grader outfit clearing road on Tennessee Pass. Circle—Caterpillar with Killefer power control plow opening road near Electra Lake, above Durango. Lower left—Midwinter tourist party on summit of Tennessee Pass.



Concrete pavement on State Route No. 1, with Castle Rock in the background, one of the noted landmarks of Douglas county.

Federal Aid Procedure

BY W. J. KELLER

AS originally intended the Post Roads Act of 1916 in brief provided for Federal Aid to be applied on any road project where it was definitely established that United States mails were being transported. Several amendments were made to the Original Post Roads Act, but primarily the selection or location of projects was not affected. The Act of November 9, 1921, under which Federal Aid is at present being allocated, authorized the Secretary of Agriculture to proceed with the distribution of certain appropriations under several new limitations which had not heretofore been in force. To quote the Act on these points:

"That in approving projects to receive Federal Aid under the provisions of this act, the Secretary of Agriculture shall give preference to such projects as will expedite the completion of an adequate and connected system of highways, interstate in character.

"Before any projects are approved in any state, such state, through its State Highway Department, shall select or designate a system of highways not to exceed 7% of the total highway mileage of such state as shown by the records of the State Highway Department at the time of the passage of this Act.

"Upon this system all Federal Aid apportionments shall be expended.

"Highways which may receive Federal Aid shall be divided into two classes, one of which shall be known as primary or interstate highways, and shall not exceed three-sevenths of the total mileage which may receive Federal Aid, and the other which shall connect or correlate therewith and be known as secondary or inter-county highways, and shall consist of the remainder of the mileage which may receive Federal Aid."

In complying with the requirements of this act the secretary has set forth certain rules and regulations

which each state had to comply with in order to secure any of their apportionment of Federal Aid funds. It would not be amiss at this time to quote several sections of the regulations regarding the selection and approval of the Federal Aid Highway System.

"Each State Highway Department shall file with the Secretary of Agriculture a state map showing the proposed Federal Aid highway system, and indicating the primary and secondary portions thereof, in such form and with such information as he may require.

"The secretary, through his authorized representatives will make an examination of the proposed system and will, from time to time, notify the State Highway Department of the acceptability of the parts of the system examined.

"When an agreement has been reached between the State Highway Department and the secretary as to the whole (or if the state so desires, of a material portion) of the Federal Aid Highway System, the state shall make formal request for the approval of the Secretary of Agriculture. This request will be accompanied by a state map showing the full proposed Federal Aid highway system with the primary and secondary highways upon which formal approval is requested, in such form and with such information as may be prescribed by the secretary or his authorized representatives."

The foregoing gives in brief an idea as to how the system was selected. One must bear in mind that to gather this data, segregate and compile the information, required to comply with the requirements of the Act, took considerable time and effort on the part of the State Highway Department and Bureau of Public Roads. The Federal Aid Highway System maps referred to have been completed, and are available to anyone interested.

In order for the state to request Federal Aid on a

project, the proper form, together with a sketch map, is submitted to the Bureau of Public Roads. Such form is known as the Project Statement. This statement shows the state, the project number, proposed location, and length.

The proposed location does not establish definite alignment and grades, merely establishing the project between two definite points.

It may be well to state at this time that the secretary, in approving the Federal Aid Highway System, described the approved routes from one point to another, by naming towns or citing topographic features of control. In determining a Federal Aid Project the method is to cite in the Project Statement, that the project termini are two control points as mentioned in the secretary's approval, or, if the distance is such to make the project too long, the district engineer has the authority to select an intermediate point of control. For example: in Colorado the secretary's approval reads in one instance from Del Norte to Durango. To have this as one project would not be feasible; first, because of the distance and second, funds could probably not be made available to construct the project within ten sections as is necessary under the regulations. Therefore, the town of Bayfield was selected by the State and District Engineer of the Bureau as an intermediate point of control.

In addition, the Project Statement gives an estimate as to the cost of construction, amount of funds available for construction and maintenance of the project, and to whom Federal Aid payments, are to be made. The sketch map is merely a sketch showing a rough outline or general location of the project in reference to towns, streams, or other controlling features. A field inspection by a member of the bureau, in company with representatives of the State Highway Department, is made to determine roughly the location or route of the project, to report upon possible alternate routes, any ineligible sections, and to give descriptions and locations of deposits of materials suitable to the construction of the project.

During this inspection the state is represented by their own engineers and any difficulties in location are usually considered on the ground and straightened out, so that when the bureau engineer returns to the office, in most cases a definite route has been determined upon and one which is acceptable to both the state and bureau engineers.

Data is taken in the field relative to major structures and railroad crossings and in short sufficient information is taken to enable the inspecting engineer to make a complete intelligent report upon the entire proposed project.

The project statement and report having been reviewed by the district engineer and found satisfactory, the report is submitted to the State Highway Department for their concurrence in the route selected, or as has been done in some instances, the state may submit copies of the report of their engineer. In that case it is necessary for the state and federal officers to reach an agreement, as the route selected must be satisfactory to both. When the state has concurred in the selected route, the papers complete are forwarded in triplicate to the regional headquarters with the recommendation of the district engineer. It usually requires from five to six weeks for the Project Statement form and supporting papers to be acted upon by the secretary. Meanwhile, engineering can proceed toward getting the project in shape for actual construction.

The next phase of work is the submission by the state of the plans, specifications, and estimate. It is customary for the states to submit advance copies of the plans to the bureau, so that a field inspection can be made and any changes found desirable by the inspecting engineers, both state and federal, can be made before the final plans are drafted. The field investigation with the detailed plans varies from the Project Statement inspection, in that it definitely establishes the project and determines in detail each unit of construction. Grades and alignment are definitely set, as are all structures. Suitable deposits of material are located and reported upon and each item and unit of work is reviewed in detail to determine its value to the project. In other words, the inspecting engineer has to bear in mind that for the available money to be set aside for the construction of this project he must secure good grades, alignment, and structures that are adequate and suitable for traffic requirements. Further, he must take into consideration local conditions and available materials to secure a well-designed road as economically as possible.

When the field inspection has been completed and the report thereon compiled, the same is presented to the district engineer for his approval. Any desirable changes in the plans, specifications, or estimate are taken up by him with the state and when the changes have been made the plans are in shape for his recommendations.

The recommendation of the plans, specifications, and estimate can not be given by the district engineer before the project statement has been approved by the secretary. Nor can construction work start before the plans, specifications, and estimate have been made satisfactory to the district office. At the same time that the plans, specifications and estimate are recommended for approval by the district engineer, the State Highway Department is notified and construction work may proceed from that date. The State Highway Department then advertises the project, bids are received and opened. A representative of the bureau is usually present at the opening of bids, and award of contract. The district office must concur in the award of the contract before it is acceptable to the Washington office.

The next stage in Federal Aid is the execution of the project agreement. Construction work may now proceed with the understanding by the states that no Federal Aid will be paid on account of this project until or unless the project agreement is executed.



Keeping the road smooth between Pueblo and Florence for the heavy summer traffic.

The project agreement gives a brief history and description of the project, together with a statement of tion, and in the case of Colorado the agreement must have the signature of the state highway engineer, and be approved by the governor. Upon the proper execution of the project agreement on the part of the state, the document is sent to the Washington office, through the district office, for signature of the secretary, who also issues a certificate setting aside the required federal funds for the construction of the project. As soon as the certificate has been issued the state may, as work progresses, request payment for the federal portion of the work done. The execution of the project agreement usually requires from six to eight weeks.

Construction inspections begin as soon as construction work actually starts, and are made monthly on the part of the bureau, from that time until completion, except on such projects where the activity or character of work demands more attention, when inspections are made more often. On the other hand, inspections are not necessarily made on projects which have closed down for weather or other reasons.

In the construction inspection the project is covered completely, each and every unit of work involved gone over and in brief a careful review of the work is made to see that it is being done in a workmanlike manner, and in accordance with the approved plans, specifications, and estimate. There are innumerable things which occur during construction which require careful consideration. Changes in grade, alignment and structures which may be of benefit to the project must be taken up with the resident engineer in charge of the project and be reported upon accordingly. In short, it is up to the inspecting engineer of the bureau to review the project in the condition he finds it and reports the facts as they are.

It might be well to say that an inspecting engineer has no authority to order any piece of work discontinued, to reject any materials, or, in short, give any orders on any Federal Aid project. His duty is to report on the project as it is to the district engineer, and, if there is in his report any unit of work criticized or unfavorably reported upon, the necessary action is taken by the district engineer to remedy the condition. The inspecting engineer can, however, if called upon, offer suggestions or criticisms to the local engineer and assist him as much as possible in securing a well-constructed project.

It has been said that the federal engineers are continually finding and reporting the faults of the project, but fail ever to report any good features. This is not the case. In approximately nine years' service in the bureau, I find that they would rather ten times hand in a report commending the project and work being done than to submit one report showing up some faulty piece of construction. Each man has enough pride in his work that he tries to keep the projects he covers in good shape and in condition to be able to report upon them favorably. On the other hand, if a project is not as it should be, and there is some faulty work done, the facts must be reported to the district engineer for his action. I know there are in the bureau files innumerable letters to the states commenting on certain projects, and specifically stating that the engineer and contractor are to be commended for the work done. Of course, there are plenty of others which are not so favorable.

Where bridges of any size are involved, the bridge department of both bureau and state assist in the field



State force making repairs on Denver-Golden pavement—now in splendid condition.

inspecting, the method of reporting being the same as the regular inspecting engineers.

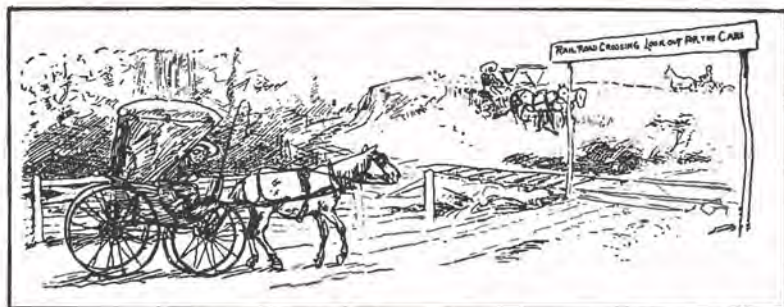
It is sometimes necessary to revise the approved quantities during construction, and in some instances new items or work show up. In order to secure additional federal funds a revised estimate is necessary, and this estimate is used for a modification of the existent project agreement. A supplemental agreement to the contract is necessary for any new items of work to be performed by the contractor, and if the work is to be performed by force account a cost analysis of the work must be submitted by the state and approved by the bureau. Procedure with a modification of the project agreement is practically the same as with the original project agreement. The district engineer is vested with the authority to approve outright any minor revisions or changes in design, which involve no additional funds. Any changes which are major in character or involve any increase in funds must be forwarded with the district engineer's recommendations, and be acted upon by the chief engineer.

Upon completion of the project a final inspection is made by an authorized representative of the district engineer. At this time the work is checked through in detail to determine that the project has been constructed substantially in accordance with the approved plans, specifications, and estimates. This report is made to the district engineer, and gives a brief history of the project, together with a detailed description of the completed work. Upon the acceptance of this report by the district engineer, the project is considered completed, and in a maintenance state.

Vouchers are submitted by the states from time to time as work progresses, which are received and audited in the district office, and forwarded to Washington with the district engineer's recommendation for payment. The voucher requires a complete check of construction reports, and correspondence files to determine that all work shown in the voucher has been completed to the satisfaction of the bureau. All engineering and contingency items are held until the final voucher, and these items are checked at that time. Engineering items must be limited to actual construction engineering, and further cannot include salaries of employees higher in rank than the resident engineer.

Contingency items are limited to those items not in

(Continued on page 14)



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Reaching Home Alive

THE worried individual in the old time phaeton found the frequency of grade crossings a source of great annoyance and wailed:

“Once I my sorrel nag in peace could drive,
With some fair chance of reaching home alive:
But now, every mile, a sign-board bars,
With ‘Railroad Crossing—look out for the cars.’”

So distressing was the encroachment of modern “abominations” that the “sorrel nag” driver felt—

“The world keeps *newing* so: they fashion it
So old men find no place wherein to fit”—

and seemed so utterly at a loss to grasp the “new-flangled ways” that he looked forward to his advent in heaven, where he hoped “fashions maybe do not change”.

How often we take for granted the improvements of today and overlook the far-going difference between not only the physical changes of the last forty years but our equally astonishing mental progress.

Refinements have followed on the heels of improvement so rapidly during the past two or three decades that people no longer hesitate to accept new ideas as did this old man of 1870. Having not only abandoned but forgotten the “old sorrel nag”, we drive our high-powered, high-speed motors with little or no thought to the electrically operated bell or the blinking pendulum lights that serve as present-day warnings at grade crossings. We take for granted our paved, well-drained, properly marked highways that are equipped with an elastic chain link life net—forgetting entirely the ruts, the mud, the heavy dusts, or the dangerous wooden guard rails of yesterday. Catching up with the string

of cars ahead of us we fret and fume at the truck that leads the procession and which temporarily slows our thirty-six-mile speed to a more leisurely thirty-seven-mile gait; forgetting the while that twenty-seven miles an hour was fully four times as fast as it was possible to travel a few short years ago.

Accustoming ourselves to speed and convenience we pass by such splendid examples of traffic engineering as the one shown here, and give little or no thought to the men who took the pains and spent the money to separate the sheep from the goats—who gave each mode of travel: steam, electric, or gasoline, their own rights-of-way.

Additionally, when some more far-seeing individual prophecies flood lights for our main highways to encourage night travel—the eventual elimination of grade crossings—the widening of our paved roads to permit the segregation of slow and rapid traffic—or perchance explains how one engineer now has a newly perfected electric light, which, if placed where it can stare endlessly across the road, will count all the cars and register whether they be open or closed jobs—we raise our eyebrows and say, “Is that so?” and pass on to the subject of golf.

Little by little the time honored characteristic of human nature to refuse to accept anything that disrupts the even tenor of established ways is being broken down. In spite of our short memories and lack of expressed appreciation for the things science and engineering have brought, our mental progress is as great and as important as the progress in physical equipment. We are becoming more and more content to leave it to the engineer to see that we “reach home alive”.



Concrete pavement near Wolhurst on State Road No. 1, showing how sixteen grade crossings are being eliminated between Denver and Colorado Springs by the State Highway Department.

Motorists Demand U. S. Road Fund

“COMPLETION of many important national highways has been unnecessarily prolonged as a result of the failure of the house of representatives to join the senate in overriding the presidential veto of the Colton-Oddie bill, appropriating \$3,500,000 annually for the next three fiscal years for building highways through federal lands in eleven public land states of the West.”

This statement was issued by national headquarters of the American Automobile Association in the form of notice to congress that it will continue this fight in December and that “car owners everywhere are thoroughly aroused because of the delay that failure of this bill will cause in the completion of the transcontinental highways.”

Senator Oddie, of Nevada, and Representative Colton, of Utah, have already announced that they will re-introduce their measure as soon as congress convenes in December, and demand that the government bear its fair share of the road building burden in an area in which it owns 160,000,000 acres of nontaxable lands.

“The action of the house in sustaining the President’s veto,” says the national motoring body, “cannot fail to have a serious detrimental effect on the unification of our national road system, since, without equation of this character, the early completion of important links in main east and west highways is entirely impossible.

“In addition to this phase, such roads as the Colton-Oddie bill made provision for are of vital importance in protecting 600,000,000,000 feet of standing timber, a great national resource, from the ravages of fire, by making it possible for fire-fighting forces to penetrate the forests.”

Indications that western motorists in particular are deeply resentful at the action of the house is seen in the flood of telegraphic protests that have been filed with the A.A.A. from its members in the far west.

The national motoring body says that speeding up of road construction in the public land states is sorely needed, since the federal government has failed to see that highway improvement on its land keeps pace with that in adjoining states.

“These roads are deplorable, and as congress ignored these needs and failed to act, the subject will again be a paramount topic at the forthcoming A.A.A. conference in Cincinnati, and a program will be adopted to see that western states receive fair treatment from the federal government,” the statement asserts.

Reason for Roads

Two billion dollars a year is the estimate of the National Conference on Street and Highway Safety of traffic losses in the United States—including deaths, injuries, property damage, lowered land values.

Abolish all carelessness, which is impossible, and there still will be a staggering financial toll. The great case is lack of streets and highways built and equipped for the amount of traffic that exists.

A billion dollars annually now is being spent for streets and roads. That sum will have to be increased to match the progress of the motor vehicle. Not only will it counteract most of the traffic losses, but it also will advance economic and social solidarity.—Missouri Roads.

Road Films Distributed Free

"WHEELS OF PROGRESS" is the title of a new educational motion picture produced for free distribution by the United States Department of Agriculture. The film compares the highway transport conditions of 30 years ago with those of today and shows the tremendous strides that have been made toward rapid and individualized transit as a result of road improvement and the development of the motor vehicle.

Old-timers will chuckle over the road and street scenes of the nineties. The sedate young society belle in chip bonnet, puffed sleeves and trailing skirts paying afternoon calls in her victoria. Bicycle girls in bloomers and tam-o'shanters—new women they were called—and the more serious male devotees of the wheel in their caps and sweaters. Working men walking to their places of employment, their full dinner pails swinging. High-hatted and frock-coated big-wigs of business entering a marvelous new eight-story skyscraper. The farmer with his truck-laden wagon on his way to the city on market day.

And the first suggestion of a change! The farmer's somnolent progress is disturbed by a snorting, plunging monstrosity, a '98 automobile—accent on the third syllable, if you please—and there is re-enacted the turbulent little scene of familiar memory to those who lived in those wonderful days at the turn to the century. The tooting horn; the shying horse; the irate driver; and the exchange of lurid compliments as the "motor car" passes in a cloud of dust.

The wheel of progress is turning, and as the picture proceeds it turns faster and faster. The sedate young lady of the nineties is now a modern, short-skirted matron who brings her sport-model roadster to a stop before a spacious suburban home and trips lightly up the steps. The workman enters his small closed car at his comfortable little suburban home and quickly reaches the factory in the congested city. The farmer also has learned to drive and his home twenty miles from the city is less than an hour's ride.

"Everywhere everybody rides" reads one title, and then the picture shows the variety of services performed by motor vehicles—from the spotless car of the President of the United States at the White House to the dilapidated machines of a band of gypsies encamped at the side of a road. The various uses of motor trucks, including the fire engine, are also shown.

"Wheels of Progress" is an entertaining and instructive film that will enliven any motion picture program. It is one reel in length and requires less than fifteen minutes to show. It is one of the educational films prepared for the Bureau of Public Roads by the Office of Motion Pictures of the Department of Agriculture.

Other films illustrate the methods of constructing the various types of Federal aid roads, and show the spectacular and hazardous engineering work on the western national forest roads. A special series of films, recently issued, and described in detail below, pictures the superb scenic attractions of the national parks and the difficulties encountered by roadbuilders while constructing motor-ways into these mountainous areas.

Other films show the progress of highway research and tests during the past decade.

All of these motion pictures are furnished free of charge, except for the regular transportation cost which the borrower is expected to pay both ways. They are available to the general public, as well as to state highway departments, road organizations, automobile clubs, colleges, schools, churches, theatres, and other agencies. In all cases it is necessary that a reliable person assume responsibility for such charges, and for the safe-keeping, proper use, and prompt return of the films, all of which are of standard theatrical width.

Applications for permission to borrow the films should be addressed to the Office Motion Pictures, Extension Service, United States Department of Agriculture, Washington, D. C. Applications should be made as far in advance as possible, and should specify several alternative choices of subjects and dates. The period of loan requested should be no longer than is necessary. Schedules of proposed showings, or other definite information indicating the use proposed for the pictures, should accompany the application.

A brief description of the road films which are now available for distribution, and the time required for showing, is as follows:

The films under this heading show representative methods used in constructing Federal aid roads.

Modern Concrete Road Construction—1 reel, 995 feet, fifteen minutes.

Mixed Asphalt Pavements—1 reel, 889 feet, thirteen minutes.

Building Bituminous Roads — 1 reel, 771 feet, twelve minutes.

Brick—From Clay to Pavement—1 reel, 1,001 feet, fifteen minutes.

What About Macadam?—1 reel, 883 feet, thirteen minutes.

Granite Block Paving—1 reel, 706 feet, eleven minutes.

Forest Road Building

These scenic films were made on sections of completed forest roads in the mountainous areas of the national forests of the west. They show the difficulties encountered during their construction.

Roads to Wonderland—1 reel, 848 feet, thirteen minutes. Scenic forest roads in the Mount Hood and Crater Lake National Forests in Oregon, and in the Yosemite National Park in California.

Highroads and Skyroads — 1 reel, 903 feet, fourteen minutes. A selected series of construction scenes and scenic views of national forest roads in the western states.

Around the West by Forest Roads—1 reel, 981 feet, fifteen minutes. Examples of forest roads built by the Bureau of Public Roads in California, Colorado, Oregon and Arizona.

Building Forest Roads—1 reel, 948 feet, fifteen minutes. Construction scenes with men and machinery on the national forest roads in the west.

Roads from Surf to Summit—1 reel, 872 feet, thirteen minutes. Scenic wonders of the national forests in the Pacific Northwest: Lake Crescent, Mount Baker, and Mount Rainier in Washington; Crater Lake and the Mount Hood Loop road, in Oregon.

The Road Goes Through—1 reel, 911 feet, fourteen minutes. Methods that are commonplace to the western road builder make a thrilling picture.

(Continued on page 16)

NEWS OF THE MONTH

Current Events in the Field of Highway Engineering and Transportation—State, County and Municipal Activities

On June 1 the State Highway Department paid to the H. C. Lallier Construction Co. the sum of \$84,000 for work done on concrete paving between Tomah and Palmer Lake. This is the largest monthly estimate ever paid to a contractor by the department. At the same time the department paid to Frank Hoffman, a \$31,000 estimate for work done on his ten-mile grading and graveling contract west of Kremmling on Muddy Pass. Hoffman is now storing gravel for spreading as soon as the grading on his project is finished. He expects to complete the project before snow flies.

The paved highway between Denver and Colorado Springs will be completed and open to travel before September 1. This is three months earlier than the contract specifies, according to highway officials.

Unprecedented speed in laying concrete of the last 17-mile stretch has been made in recent weeks. Traffic will be turned on the stretch between Tomah and Larkspur the middle of July. This work is being done by H. C. Lallier Co. The 17.5 miles of pavement to complete the highway between Denver and Colorado Springs is in two contracts, the largest ever let by the highway department. H. C. Lallier and J. Fred Roberts, both of Denver, have the contracts.

O. J. Dorsey has sub-contracted the crushing of gravel for the 8-mile project between De Beque and Grand Valley from Fred Kentz, contractor. This work is now progressing with greater speed. For a time the work was dragging heavily, and in order to speed up the project the Dorsey crusher was installed on the job.

With the completion of the gravel surfacing between De Beque and Grand Valley, there will be a continuous gravel road, eighty miles in length, between De Beque and Meeker. Plans are now being made to grade and gravel six miles north of Meeker, connecting the latter town with the oil fields. This is all Federal aid work. H. L. Jenness, division engineer with headquarters at Glenwood Springs, is in charge.

Much-needed improvements are now being made on the North St. Vrain road leading to Estes Park by the commissioners of Larimer County. The work consists of widening five miles of the road south of the village. The county also has surfaced with crushed rock ten miles of the Big Thompson canyon highway. The crusher will be kept busy for another month. A fine all-weather road is being constructed.

The commissioners of Larimer County are to be congratulated upon these improvements. They merit the approval of every motorist traveling these roads.

On July 4 there will be a celebration in Hot Sulphur Springs and Parshall. It will be a double-barreled affair—Independence Day and the occasion of the opening of the new bridge which spans the Colorado River at the west end of Byers Canyon. This handsome structure was constructed by the State Highway Department as a part of the Byers Canyon project. State, Federal and county officials will participate in the ceremonies.

W. A. Colt & Son, contractors of Las Animas, Colo., have been given a contract for the grading of ten miles of the new Mosca Pass highway west of Gardner. This is the first project to be started on the proposed Mosca Pass highway, which leads to the San Luis Valley from Gardner. Work on the project is now under way. The bid of Colt was \$34,552 for the completed job.

On June 7 the highway department awarded a contract to Edward Selander, Fort Morgan contractor, for the construction of five miles of concrete pavement west of Fort Morgan. Selander is allowed 110 working days to complete the project. This project is located on State

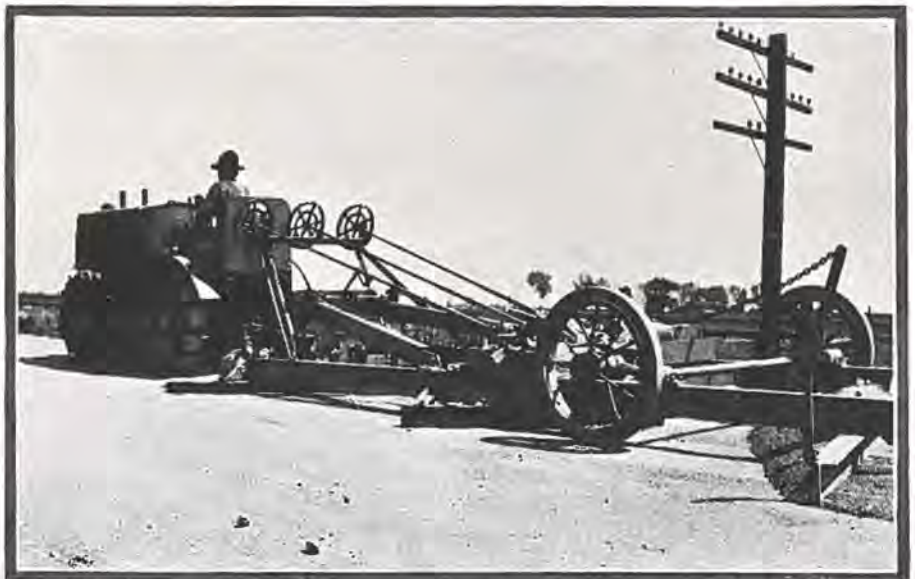
Road No. 2, and forms a link in the trunk route between Sterling and Greeley. Selander's bid was \$2.12 per square yard on the concrete.

As a result of the recent flooding of a large portion of the state highway in Glenwood Canyon, plans are being made for raising the road to a point where it will be above the reach of flood waters. It is said the road will be raised from three to five feet where it was flooded.

The Pueblo Mountain Park, near Beulah, was opened for the summer season on June 10. Roads in the vicinity of the park were put in first-class condition by the Pueblo city highway department.

Surveys are now being made for the improvement of the state road north of Craig, leading to Wamsutter, Wyo. The distance will be shortened and many bad turns eliminated. This is one of the important roads of northwestern Colorado. The work will be done under the supervision of the State Highway Department.

A contract has been made with A. R. Mackey, Sterling contractor, by the board of county commissioners of Logan County for the construction of a mile and a half of new road near Powell. A new drainage ditch to relieve a seepage condition also is a part of the contract.



One of the State Highway Department's new maintenance outfits, consisting of Caterpillar Twenty and Adams two-wheel road drag, taking the wrinkles out of the road near Nunn in Weld county.



Snow removal scenes in Eastern Colorado. Left—Showing crew at work in Sedgwick county. Right—Bucking snow in the town of Sedgwick. Circle—Clearing road west of Durango in La Plata county.

Work was started on May 30 on 6.6 miles of new road on the Pueblo-Walsenburg highway in the southern part of Pueblo County. H. C. Lallier Const. Co. are the contractors working for the State Highway Department. It is a Federal Aid project. The work will start about two miles north of Crowe and will extend into Greenhorn. Several bad turns and two or three steep grades will be eliminated. Two concrete bridges will be built. The entire project will be gravel-surfaced.

The Federal forest highway department has asked for bids on three important road projects in Colorado. One of the projects when finished will complete the new road between Echo Lake and Idaho Springs. There remains a section of 6.34 miles of earth grading and drainage work to be done, just outside of Idaho Springs.

Another project calls for construction of five miles of graded road on Willow Creek Pass highway between Granby and Rand. The section to be improved begins at the top of the pass, running toward Granby. It connects with a splendid highway already constructed by the forest department on the north side of Willow Creek Pass into Rand. The third project is for surfacing of 6.9 miles of the Bear Lake road in Rocky Mountain National Park.

To prepare for the increased travel on the Echo Lake road, Denver city officials have doubled the capacity of the municipal lodge at Echo Lake. Capacity is now 20 dining guests and 50 over night. The lodge will be the half-way point in a circle drive trip through the municipal mountain parks to Echo Lake by way of Bergen Park. Abe Willey is in charge of the lodge.

Plans for the construction of a new road between Portland and Florence are under way. Two and one-half miles of grading and gravel surfacing are included in the project. An appropriation of \$60,000 was included in the 1928 budget for this work. The project includes two bridges, one a 70-foot steel structure over Hardscrabble Creek, according to James D. Bell, division engineer. The new road will follow the present route for a short distance and take a new course, eliminating the present sharp turns and steep grades.

Steam shovel operations have been resumed on Wolf Creek Pass. Removal of rock slides is the first work to be undertaken. Considerable widening also will be done. The shovel will move from the west slope to the east slope this summer. Frank McQueary has taken charge of the work as foreman. Another state steam shovel will work all summer on the Blue Mesa road in Gunnison County.

San Miguel County has purchased a General excavator for use in the widening of Dallas Divide between Placerville and Ridgway. The road will be widened to 24 feet, and will be graveled. The work is being done in co-operation with the State Highway Department. The county also is operating a tractor and large grader over its roads leading from Telluride to Lizard Head.

The new South St. Vrain highway to the Boulder-Larimer County line from Allens Park towards Longs Peak Inn, was officially opened on June 15. The new road is considered one of the finest mountain drives in Colorado. The grading of the road was done by Contractor Luke E. Smith last fall, and now a large force

of men is graveling the finished grade. The growing popularity of the South St. Vrain highway into Rocky Mountain National Park is expected to draw a large tourist travel this way during the summer months.

The paving at Larkspur is now open to traffic. Motorists also are using the short stretch through the town of Palmer Lake. Paving of the stretch leading into Monument is now under way. This will be thrown open to travel about July 15.

Kiowa and Otero Counties are improving the Kansas-Colorado boulevard from La Junta to the state line.

Another co-operative road is the new one which opens the Red Rock oil district, just completed, through the joint efforts of Otero and Las Animas Counties.

Plans have been completed by the State Highway Department for a \$50,000 project west of La Veta in Huerfano County. The road will be altered slightly and graveled.

Work is to start soon on a new stretch of highway north of Buena Vista. It will be entirely on the west side of the railroad tracks.

Only one railroad grade crossing between Pueblo and La Junta, on the Santa Fe Trail, will remain when the new subway is built about two miles east of Manzanola. The underpass is part of a paving job of one and one-half miles for which plans have been drafted by the State Highway Department. Work is expected to start soon. The Swink grade crossing was recently replaced by the new subway. The Salt Creek crossing near Pueblo is now the only one on the 65-mile stretch.

Federal Aid Procedure

(Continued from page 8)

the body of the estimate, but which are of substantial improvement to the project and have been investigated and approved by the bureau, unless approved by the bureau during construction they are ineligible for federal participation. Maintenance inspections are next in line.

Just because a project has been completed and the federal government has paid its proportionate share of the cost of construction, does not mean that the state's responsibility has ceased. The state has agreed in the project agreement to adequately maintain the project, and should they fail to do so, the government has full recourse. The Federal Aid Highway Act on this point reads as follows: "That should any state fail to maintain any highway within its boundaries after construction or reconstruction under the provisions of this Act the Secretary of Agriculture shall then serve notice upon the State Highway Department of that fact, and if within ninety days after receipt of such notice, said highway has not been placed in proper condition of maintenance, the Secretary of Agriculture shall proceed immediately to have such highway placed in proper condition of maintenance and charge the cost thereof against the federal funds allotted to such state, and shall refuse to approve any other project in such state, except as hereinafter provided."

It is customary to definitely visit each completed project at least twice a year to determine that the project is being properly maintained. These inspections report directly upon structures, ditches, shoulders and the roadway proper. As in construction inspection, action on

any improper maintenance must be taken up through the district engineer.

1929 Road Show in Cleveland

The American Road Builders' Association will hold its 1929 Convention and Road Show in Cleveland, Ohio, during the week of January 14, 1929.

The American Road Builders' Association received invitations from 11 of the largest cities in the country, and after each one was given careful consideration, it was decided that the facilities at Cleveland came nearer meeting the requirements than any other city.

Since the 1928 Road Show extensive additions to the Cleveland Public Auditorium have been made and with these additions the convention programs and road show may be held simultaneously in the Auditorium.

A survey of the 1928 Road Show held in Cleveland last January shows that the approximate value of the 452 carloads of exhibits was in excess of \$2,368,000. The estimated capitalization of the exhibitors represented was \$1,250,000,000. Over 22,000 road builders were in attendance.

Meet President

During the meeting of the American Road Builders' Association, held in Washington on May 11, a delegation of approximately 40 visiting officials were received by President Coolidge. The delegation was headed by President Babcock and President-elect Compton. United States Senator Lawrence C. Phipps accompanied the officials to the White House.

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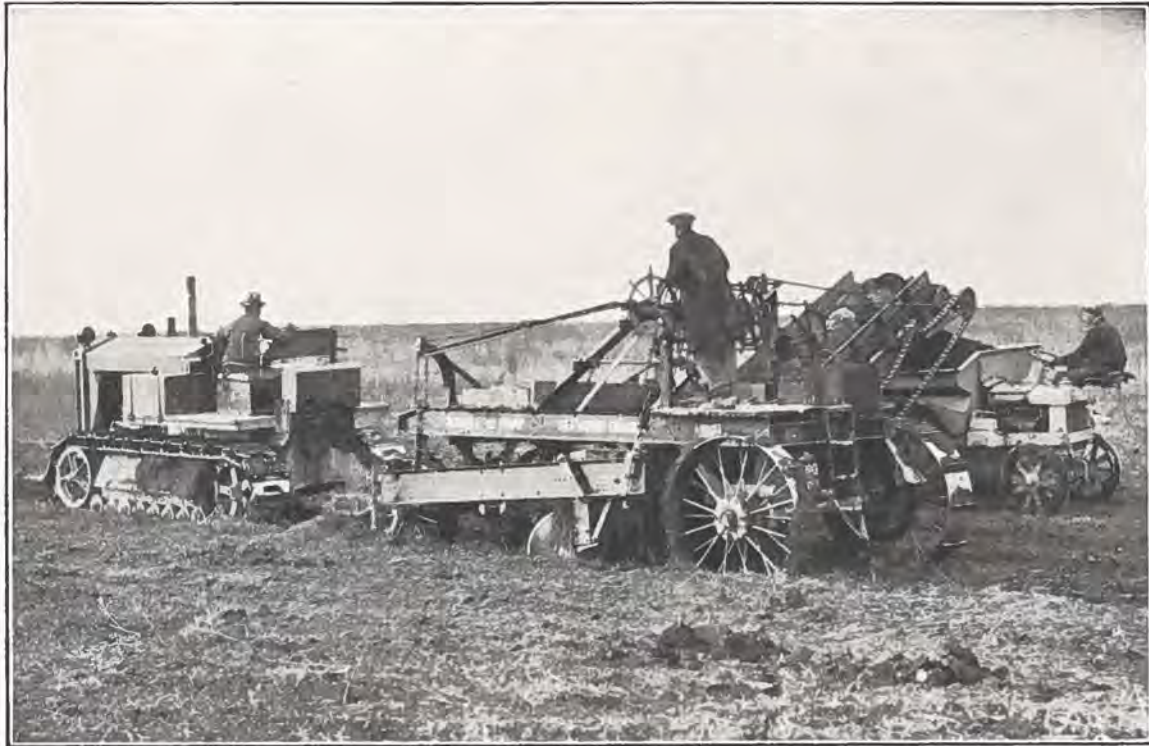
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Liberty Trucks & Parts Co.

Sugar Building, 16th and Wazee Streets

•• Denver, Colorado

Road Films Distributed Free

(Continued from page 11)

Miscellaneous Road Building

Crossing the Great Salt Desert—1 reel, 980 feet, fifteen minutes. Terrors of the pioneers abolished by the construction of the famous Wendover Cut-off across the Great Salt Desert in Utah.

Roads for All America—6 reels, 6,021 feet, one and one-half hours. Visit of the United States delegation to the first Pan-American Road Congress at Buenos Aires in Argentina. Shows the reception of the Pan-American Highway Commission by President Coolidge, the Panama Canal, types of South American highways, scenes of general interest, and leading men, including the Presidents of Panama, Peru, Chile, Argentina, Uruguay, and Brazil.

Road Building in the United States—2 reels, 1,784 feet, twenty-seven minutes. Methods of building the various types of highways in the United States as seen by the Pan-American Highway Commission on a tour of this country.

A Highway of Friendship—2 reels, 1,796 feet, twenty-seven minutes. Reception of the Pan-American Highway Commission by federal officials in the national capitol and by the officials of the various western and southern states.

Wheels of Progress—1 reel, 926 feet, fourteen minutes. An attractive educational film showing the horse-drawn traffic of 1897 and the improvement in transportation made by the automobile and better roads.

National Park Roads

These national park roads are being built by the Bureau of Public Roads for the National Park Service of the Department of Interior.

Roads in Our National Parks—1 reel, 875 feet, thirteen minutes. Scenes of roads in Glacier National Park in Montana, Rocky Mountain National Park in Colorado, Mount Rainier National Park in Washington, in the Grand Canyon of the Colorado, and in Yosemite National Park in California.

The Men Who Build the Roads—1 reel, 983 feet, fifteen minutes. Shows the life of the engineer, contractor, workmen, camp cook and others while constructing the Glacier National Park road in Montana.

A Road Out of Rock—1 reel, 866 feet, thirteen minutes. Hewing a road out of solid rock in the famous "Garden Wall" in the Glacier National Park, in Montana.

Rocky Mountain Park Roads—1 reel, 815 feet, twelve minutes. Construction scenes and completed sections of scenic road in the great tourist resort of Colorado.

New Roads in Mount Rainier—1 reel, 589 feet, nine minutes. Scenes in Mount Rainier said by John Muir to be the noblest fire-mountain-volcano that ever blazed like a beacon along the Pacific Coast.

Yosemite's New Roads—1 reel, 652 feet, 10 minutes. The construction of a concrete road into the celebrated scenic attraction of California.

Highway Research

Impact of Traffic on Roads—1 reel, 861 feet, thirteen minutes. Tests made by the Bureau of Public Roads to determine the effect of the pounding of motor-vehicle wheels on road surfaces.

The Bates Road Tests—1 reel, 994 feet, fifteen minutes. The story of one of the most important road tests in history, and its conclusion—the thickened-ledge design of pavement.

Planting a cross by the roadside for every person killed in an automobile accident in the last ten years, would mean a cross almost every three miles, according to a statement by the American Automobile Association. The death toll in the last ten years has been 175,000 and there are 600,000 miles of improved highways.

If the death toll continues at the same rate as in 1927, there would be more than half a million people killed in the next twenty years. The statement urges that there be a national effort on a co-ordinated basis to prevent automobile accidents.

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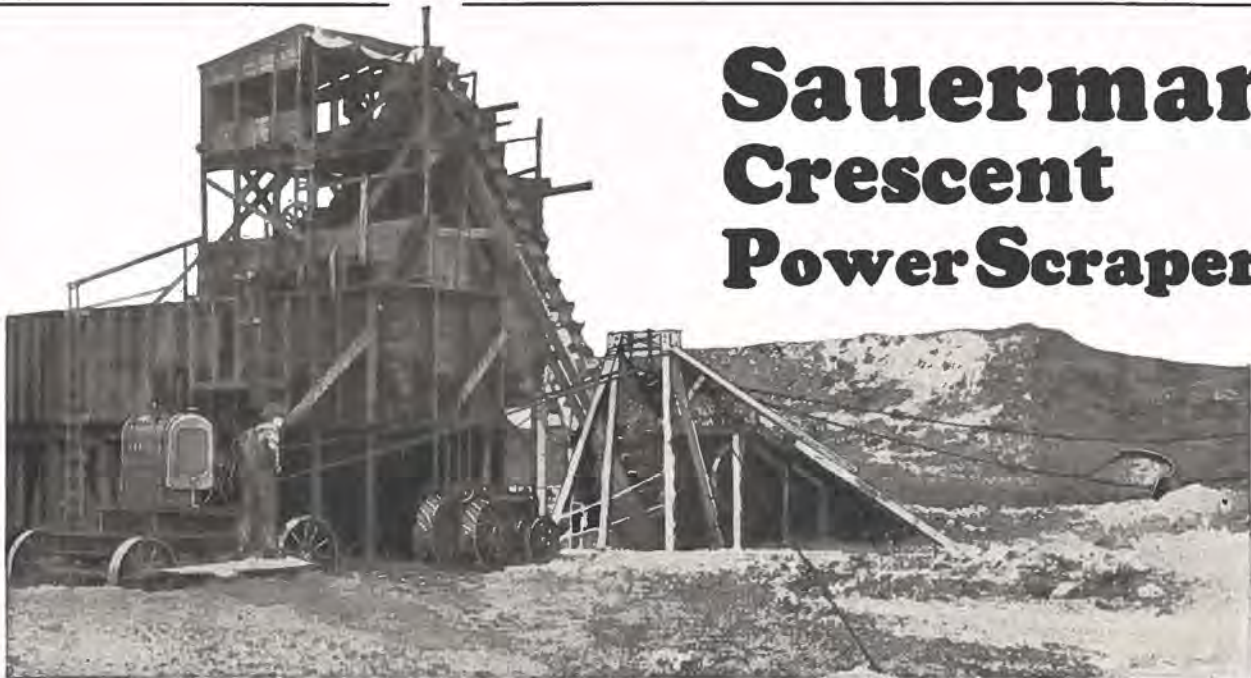
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New Highway Equipment and Materials

Ray Corson has returned from a four weeks' trip to Virginia. He is again on the job as sales manager of the Wilson Machinery Co. He was accompanied by his wife and daughter. Only two blow-outs on the entire 4,000-mile drive. The first day home he sold two Blaw-Know inundators.

Business was very brisk with the Wilson concern during the month of June, according to Harry P. Wilson, president. L. A. Russell of the Koehring Company, and J. M. Burns of the Barber-Greene Company were visitors during the month.

A new Insley excavator, Type R, is announced to the local trade by Wilson. It is extra heavy and full revolving; has one-shot lubrication and hydraulic brakes.

An improved Western motorgrader for 2-ton Caterpillar and Cletrac tractors also is announced. Catalogs on these may be had for the asking of the Wilson company.

Louis L. Clinton, president of the Clinton & Held Company, Denver Caterpillar agents, was a delegate to the International Rotary convention held in Minneapolis on June 19-23. Before leaving he took orders for two Sixties. The day after he left A. J. Held, his partner, sold another. A LaPlant-Choate bulldozer was another order taken. This was two for the month.

Harry H. Huddle, sales manager of the H. N. Steinbarger Company, made a trip over the territory the week of June 18. He reported several Russell grader sales. Also a gravel crushing plant went to a Wyoming contractor.

"Still going strong," is the way Richard Carlson, general manager of the Liberty Trucks & Parts Co., expressed himself after a return from a trip to southern Colorado. Two Cletrac sales were the result. R. B. Hankins and Royal W. Leach are now traveling Colorado and Wyoming for the Liberty concern. Sale of truck parts during the month of June were the largest in the history of the concern, said Carlson.

"And still they go," said Elton Fair, Adams grader sales agent in Colorado and Wyoming. He reported the largest business of the year. This included a carload of grader blades to the Colorado Highway Department. A half dozen Adams leaning wheel graders also were delivered during June.

Ingersoll-Rand Company, of 11 Broadway, New York, has just completed the sixth addition of its popular 140-page two-color book entitled, "100 and 1 Ways to Save Money with Portable Compressors." In this book the company has embodied comparative cost data on its portable air compressors and air-operated tools (rock drills, paving breakers, clay diggers, back-

fill tampers, grinders, hoists, riveting hammers, chippers, metal drills, etc.). The information has been put together in handy-reference, cross-index form. In most cases, figures are presented on a man-hour basis so that they can be readily applied to local conditions in any part of the world. Free copies may be obtained by writing to Ingersoll-Rand Company, 11 Broadway, New York City, or any of its local branches in any part of the world.

A 32-page condensed catalog of Gallion road machinery is now being distributed to contractors and road officials in all parts of the United States.

This catalog illustrates and describes briefly the complete Gallion line of large and small rollers, motor graders and drawn graders, of both leaning wheel and straight wheel types, as well as road drags, stone spreaders, belt conveyors and other equipment. A copy of this catalog will be sent promptly on request.

The Iowa Manufacturing Co., makers of Cedar Rapids one-piece gravel-crushing plants has added an airplane to its business-getting staff. The plane is a six-passenger Stinson-Detroiter, and is the same type as was used by Ruth Elder, George Haldeman and Captain Wilkins in their recent epoch-making flights. It has a cruising radius of from 750 to 1,000 miles, with a top speed of 128 miles per hour. Passengers ride in luxury, as the heated, ventilated full-vision cabin is furnished with six individual padded wicker chairs. Running water and toilets provide additional comforts for passengers. George Meffley, general sales manager of the H. W. Moore Equipment Co., western agents for the Iowa concern, expects the Cedar Rapids plane in Denver before snow flies. "Of course, we'll take our friends for a ride," says George.

The H. W. Moore Equipment Co. held a sales conference in Denver during the week of May 11. The meeting lasted four days and was attended by W. Guy Frazee, secretary of the Iowa Manufacturing Co., of Cedar Rapids; Frank S. Remy, of the Hughes-Keenan Co., and R. S. Stewart, of the Gallion Iron Works, all concerns represented by the Moore company in the Rocky Mountain territory. All field men of the Moore firm attended the conference.

The merger of two well-known manufacturers of concrete and construction machinery, the Construction Machinery Company of Waterloo, Ia., and the Marsh-Capron Company of Chicago, has been announced by H. B. Lichty, president of the Construction Machinery Co. The amalgamation of these two long-established organizations, it is stated, has been effected for the purpose of bringing about

the economies of common management rather than for the elimination of either organization. Both lines of equipment are to be continued as in the past and the sales and service organizations of the two old companies will remain intact. The long established sales and service policies of both companies will be continued as in the past without change and careful attention will be given to the export field as has been done heretofore.

The new arrangement will enable the manufacture of a complete line of tilting and non-tilting equipment under a single executive organization. Co-operation and the exchange of information between the two engineering staffs of the old companies is expected to bring about decided economies and advantages.

After being superintendent of Pueblo County roads for almost eight years, Charles D. Stepp resigned June 1 to become a candidate for sheriff. Stepp started out in road work 19 years ago when he established one of the first convict road camps in the state's history. The camp was started east of Pueblo on the Santa Fe Trail. Stepp remained with the state until 1921 when he took over the road work in Pueblo County.

O. G. Smith, road commissioner, is now actively in charge of superintending the road work. H. H. McDowell, Pueblo, Colorado Springs and Lamar contractor, is assisting Smith.

Pouring of concrete on five miles of road between Colorado Springs and Fountain was started early in June. Engineers expect to have plans approved and work started soon on paving of another five miles of road north of Pueblo.

With funds appropriated by the Alamosa Chamber of Commerce, workmen on June 1 started work on a roadway to the San Isabel sand dunes, 32 miles northeast of Alamosa. The work consists principally of grading and building a route that avoids rocky passages.

The Aguilar-Trinidad paving will be completed and opened to traffic by mid-summer, the contractor states.

Pueblo County, co-operating with the secretary of state, has appointed Charles J. Grundy as county motor vehicle inspector. The highway fund will be enriched \$10,000 through the proper licensing of motor vehicles which have in the past escaped because of the lack of proper inspection, it is stated.

F. A. project No. 279-D was accepted by the United States Bureau of Roads on May 31. This project is the new pavement entering the town of Morrison and eliminates one of the worst traffic "bottle necks" in the state.

State Highway Department Financial Statement, May 31, 1928

BALANCE, DECEMBER 1, 1927

State Treasurer.....	\$1,334,675.24
County Time Warrants	4,439.15
Total Balances..	\$1,339,114.39

RECEIPTS

Half Mill Levy.....	\$ 427,113.49
Internal Improvement	49,300.00
Gasoline Tax	1,181,354.93
U. S. Government...	791,279.36
Highway Receipts...	22,163.05
Total Receipts..	\$2,471,210.83
Total Balances and Receipts.....	\$3,810,325.22

DISBURSEMENTS

Federal Aid Projects..	\$ 640,604.90
State Projects.....	204,458.03
Maintenance	162,037.72
Maintenance Equipment and Repairs..	365,364.28
Property and Equipment	13,183.68
Surveys	4,293.00
Road Signs and Traffic Census.....	2,053.42
Administration	53,991.42
Total Disbursements	\$1,445,979.45

BALANCES, MAY 31, 1928

State Treasurer.....	\$2,344,731.62
County Warrants....	19,614.15
Total Balances..	\$2,364,345.77
Total Disbursements and Balances.....	\$3,810,325.22

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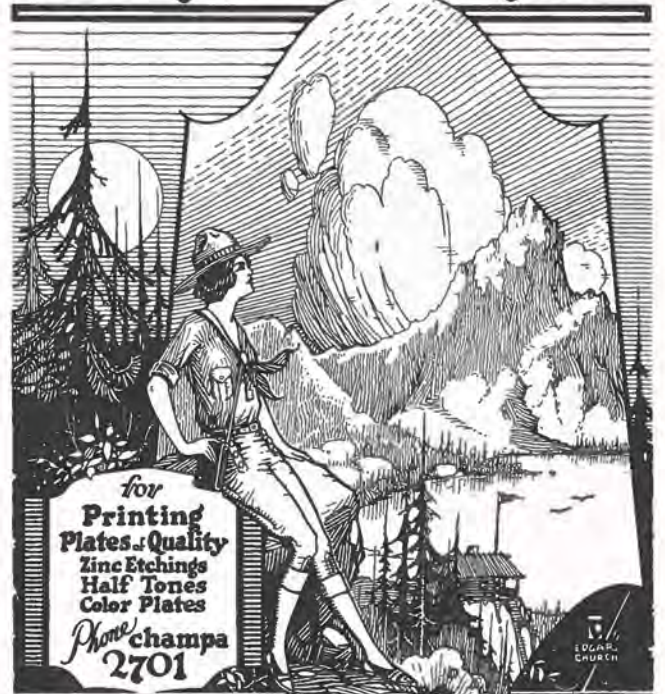


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BUS LINES SHOW LARGE GAIN IN RECENT SURVEY

That the growth of motor bus lines throughout the United States can safely be listed among the transportation phenomena of the country is evidenced by a review of the number of bus lines. The widespread use of buses has closely followed the betterment of highways and most of the expansion in lines has occurred within the last five years. This huge new transportation agency has grown from a few scattered routes to a service now covering 270,000 miles of highways. That the service will witness still further enlargement is indicated by the map which shows that some parts of the country are now well served by buses, but that other sections where highway

improvement has been slower, are only beginning to feel the need for this popular transportation.

It might be assumed that many communities not now served by buses do not and will not require additional bus lines by reason of excellent rail service or a heavy registration of privately-owned motor vehicles. The survey shows, however, that such states as California, Ohio, Indiana, Michigan and others where motor vehicle registration per capita is high and railway lines plentiful now have a close network of bus lines. Much the same enlargement of bus routes may be expected in every state.

A tabulation of steam railway bus operation as of July 1 reveals that 53 railways, about half of which are Class I carriers, are operating 822 motor buses.

Forty-four railways operate buses in line service, about two-thirds supplement their train service and the remainder in the replacement of it. The aggregate mileage of steam railway bus lines is 7,724. These figures show that co-ordination of railway and highway service is being effected by the logical agencies of such co-operation, the railroads themselves.

Engineers and public officials allied with road building are being called upon to keep this new transportation agency in mind in designing and planning highway construction. Bus transportation directly effects paved highways for it is these highways first attract bus lines and which serve as main line routes. Paved highways must be designed and built to accommodate more and heavier private motor vehicles and trucks.

PLANS SUBMITTED FOR APPROVAL TO U. S. BUREAU OF PUBLIC ROADS

Proj. No.	Length	Type	Location
F.A.P. 2R No. 7	1.227 mi.	Pav't & Overhead R. R. Crossing	South of Aguilar
F.A.P. 2R No. 8	1.633 mi.	Pavement	Aguilar, south
F.A.P. 271-C	2.430 mi.	Gravel Surfacing	West of Portland
F.A.P. 282-AH	.....	River Protection Work	South of Craig
F.A.P. 282-E	6.421 mi.	Gravel Surfacing	North of Meeker
F.A.P. 208-B	0.519 mi.	Gravel Surf. & Overhead R. R. Crossing	Clifton
F.A.P. 251-C	4.509 mi.	Concrete Pavement	East of Boulder
F.A.P. 277-C	4.363 mi.	Concrete Pavement	North of Pueblo
F.A.P. 233-C	3.661 mi.	Graded	North of Ouray
F.A.P. 298-B	2.414 mi.	Gravel Surfacing	North of Pagosa Springs

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
F.A.P. 134-B	3 mi.	Gravel Surfacing	Vona
F.A.P. 144-C	4 mi.	Gravel Surfacing	Nothwest of Fort Collins
F.A.P. 149-A	5 mi.	Gravel Surfacing	North of Agate
F.A.P. 147-B	6 mi.	Gravel Surfacing	South of Cortez
F.A.P. 97-R	.....	Bridge	East of Lamar
F.A.P. 290-C	.....	Bridge	North of Lamar
F.A.P. 242-B No. 2	9 mi.	Gravel Surfacing	West of Fruita
F.A.P. 258-G	3 mi.	Gravel Surfacing	West of Cerro Summit
F.A.P. 266-D	5 mi.	Gravel Surfacing	South of Bonadad
F.A.P. 272-D	1 mi.	Pav't & R. R. Underpass	Manzanola
F.A.P. 282-H	5 mi.	Gravel Surfacing	North of Rifle
F.A.P. 292-B	3.5 mi.	Graded & R. R. Overhead Crossing	South of Minturn
F.A.P. 295-D	2 mi.	Gravel Surfacing	North of Antonito
F.A.P. 262-I	4 mi.	Gravel Surfacing	South of Russell
F.A.P. 299-D	4 mi.	Gravel Surfacing	West of Delta

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1928

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R5	Bet. Trinidad and Aguilar	1.959 mi.	Paving	W. A. Colt & Son	\$ 72,122.50	82	2-R5
2-R No. 6	South of Aguilar	2.75 mi.	Pavement	W. A. Colt & Son	93,000.00	33	2-R No. 6
138-A	North of Kremmling	10.916 mi.	Grading	F. L. Hoffman	201,262.80	22	138-A
144-B	Northwest of Fort Collins	3.201 mi.	Gravel Surfacing	White & LaNier	44,000.00	60	144-B
145-A	West of Glenwood Springs	3.807 mi.	Gravel Surfacing	Winterburn & Lumsden	53,227.90	96	145-A
145-B	West of Glenwood Springs	1.051 mi.	Surfacing	Winterburn & Lumsden	42,389.72	45	145-B
147-A	In Ute Mt. Reservation, S. of Cortez	15.896 mi.	Surfacing	E. J. Maloney	119,100.10	8	147-A
210-B2	De Beque-Grand Valley	7.507 mi.	Gravel Surfacing	Fred Kentz	37,475.00	82	210-B2
242-B	W. of Mack at E. Salt Wash	Tmbr. Bridge & Gravel Approaches		Hinman Bros. Const. Co.	13,996.40	0	242-B
247-C	Swink	0.8 mi. Conc. Pav. & R.R. Underpass		J. Finger & Son	62,559.58	76	247-C
253-C	West of Milner	4.502 mi. Surfacing		Mountain States Con. Co.	88,108.40	0	253-C
254-C2	S. W. of Hot Sulphur Springs	Superstr. of Bridge & Approaches		Northwestern Constr. Co.	131,202.45	82	254-C2
254-D	Parshall-Hot Sulphur Springs	3.013 mi. Gravel Surfacing		Hinman Bros. Const. Co.	37,124.18	95	254-D
258-E2	Cimarron-Cerro Summit	1.487 mi. Gravel Surfacing		Hinman Bros. Const. Co.	32,377.70	19	258-E2
258-F	Gunnison-Sapineto	5.639 mi. Surfacing		Hinman Bros. Const. Co.	100,968.50	22	258-F
266-C	De Beque and N. Mex. State Line	2.401 mi. Surfacing		Salle Const. Co.	32,499.80	55	266-C
275-C3	E2 G3 Palmer Lake-Pring	4.602 mi. Concrete Paving		J. Fred Roberts & Sons C.C.	114,079.65	49	275-C3 E2 G3
275-E	North of Monument	0.926 mi. Grading and Underpass		F. L. Hoffman	41,905.20	100	275-E
275-F3	G2 Tecmah-Palmer Lake	12.894 mi. Concrete Paving		H. C. Lallier C. & E. Co.	292,309.95	51	275-F3 G2
277-B	South of Colorado Springs	4.860 mi. Concrete Paving		J. L. Busselle & Co.	131,202.45	14	277-B
279-F	North of Baileys	3.444 mi. Graded		J. Fred Roberts & Sons	126,000.00	30	279-F
282-D	North of Meeker	2.864 mi. Gravel Surfacing		Winterburn & Lumsden	42,165.00	96	282-D
282-F	So. of Craig on S. H. No. 13	2.17 mi. Surfacing		Gardner Bros. & Glenn	49,063.00	3	282-F
286-BR1	S. of Wyoming-Colo. State Line	14.474 mi. Gravel Surfacing		A. R. Mackey	38,978.00	0	286-BR1
286-C	Between Greeley and Eaton	5.566 mi. Paving		New Mexico Const. Co.	126,360.35	0	286-C
287-A3	W. of Ft. Morgan on S. H. No. 2	3.55 mi. Concrete Paving		Edw. Selander	90,749.50	0	287-A3
287-A4	West of Fort Morgan	5.087 mi. Paving		Edw. Selander	120,505.80	0	287-A4
287-D1	Two mi. E. of Kersey on S. H. 2	0.921 mi. Grading		White & LaNier	14,046.40	88	287-D1
288-A2	Bet. Merino and Brush	9.741 mi. Paving		Edw. Selander	245,043.50	80	288-A2
292-A	North from Minturn	6.417 mi. Grading		H. C. Lallier Constr. & Eng. Co.	92,571.80	91	292-A
295-C	La Jara-Antonito	5.284 mi. Surfacing		Pople Bros. C. C.	29,414.60	24	295-C
296-C	N. of Greenhorn on S. H. No. 1	6.606 mi. Surfacing		H. C. Lallier Const. & Eng. Co.	115,466.80	4	296-C
300A	Bet. Chattanooga & Red Mt.	2.277 mi. Grading		Winterburn & Lumsden	59,480.80	20	300-A



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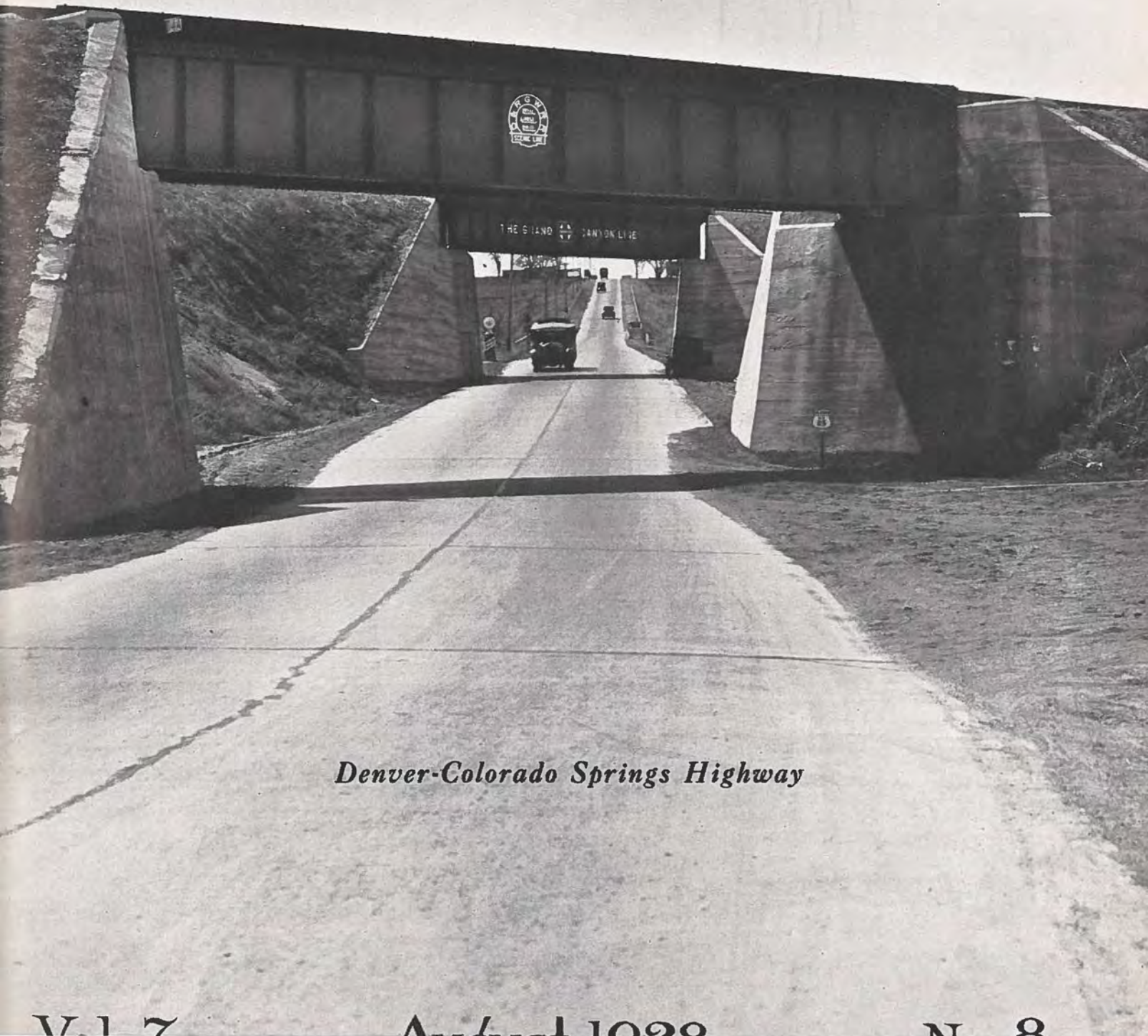
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Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
 Denver, Colorado

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 State Highway Engineer.

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Articles on the subject of road building and highway development in Colorado are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible.
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tainers, Patrols, Drags, Elevating Graders, Dump Wagons, Wheeled Scrapers, Fresnoes, Drag Scrapers, Plows, etc.

Our Cover Picture

One of the six new underpass crossings, constructed on the Denver-Colorado Springs concrete highway, is shown on the cover of the August issue of COLORADO HIGHWAYS. With the completion of the last link of pavement between the capital city and the Springs the State Highway Department engineers eliminated thirteen grade crossings, several of which have been scenes of automobile accidents costing a score of lives during the past few years.

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Colorado Highways

"BETTER ROADS"

VOLUME VII.

AUGUST, 1928

NUMBER 8

Ceremonies Mark Opening of Denver-Colorado Springs Pavement

COLORADO motorists now drive over an unbroken ribbon of cement pavement stretching from Denver to Colorado Springs, a distance of 73 miles.

On Thursday, August 9, the new pavement was thrown open to traffic. As 2,000 spectators cheered, Miss Ruth Hooper, daughter of the mayor of Castle Rock, broke a slender blue ribbon that blocked the pavement and then with a bottle of mineral water officially christened the new highway.

The opening ceremony took place at Palmer Lake, midway between the capital city and the Springs.

As a half-dozen airplanes soared overhead, old "Dusty Roads" was burned in effigy. There were 1,200 automobiles in the line of parade. The Littleton band furnished music for the ceremony, and officials of Denver, Colorado Springs, Castle Rock and Palmer Lake made speeches.

Soon after the breaking of the ribbon by Miss Hooper, first traffic was started over the new pavement. The first persons to make the trip over the cement were Denver and Colorado Springs officials.

That Colorado some day would be linked together by solid bands of cement which would encircle the state was the declaration of speakers who addressed the crowd. Several spoke in favor of the \$60,000,000 road-paving program which will be voted on at the general election this fall.

A delegation of Denver officials and citizens attended the ceremonies in automobiles, forming a parade at the state capitol nearly a mile long. En route delegations from Littleton, Sedalia, Castle Rock and Larkspur joined the motoreade until the procession extended for a couple of miles. The northern delegation was met at



Scenes at opening of the Denver-Colorado Springs pavement, celebrated with elaborate ceremonies at Palmer Lake on August 9, attended by officials and prominent citizens from all parts of the state. Views show a stretch of the new road, the burning of "Dusty Roads" and Miss Ruth Hooper christening the new concrete highway with a bottle of Manitou ginger ale.



One of the many floats which participated in the big parade staged at the opening of the Denver-Colorado Springs concrete highway. Reeve Burton, president of the Colorado Springs Chamber of Commerce, and Mayor Benj. F. Stapleton, of Denver, principal speakers at ceremonies.

Palmer Lake by citizens of Colorado Springs, Monument and Palmer Lake.

The last cars to travel the dusty highway between Larkspur and Palmer Lake arrived during the cremation of "Dusty Roads." The crowd cheered as a just fate was dealt to this bugbear of motorists.

Russell Law, president of the Colorado Springs Auto Club, introduced the speakers. Reeve Burton, president of the Colorado Springs Chamber of Commerce, was the first speaker. He was introduced as an ardent advocate of good roads.

"With the opening of this final link of pavement between Denver and Colorado Springs, there'll be no more detours between the two cities to dam progress," Mr. Burton declared. "And that goes the other way round, too," he continued. "There'll be no more d—n detours to cause motorists to cuss. We must continue our fight to get more and better roads throughout Colorado, roads without detours, roads without dust. Then the tourists will come; we won't have to spend huge sums of money sending them invitations to come."

Mayor Benjamin F. Stapleton of Denver was the next speaker. He pledged the support of Denver in continuing to improve state highways.

Other speakers on the program were: W. G. Schweigert, president of the Motor Club of Colorado; Mayor H. G. Hooper of Castle Rock, Mayor Judd of Palmer Lake, and O. C. Hoffman, president of the Board of County Commissioners, Littleton.

The first car in the procession of more than 1,200 that journeyed over the new pavement from Palmer Lake to Larkspur contained Mr. and Mrs. Spencer Penrose, Mr. and Mrs. Harold Dodge and Mr. and Mrs. A. B. Clark, all prominent in Colorado Springs. Other prominent citizens of both cities followed until the last of the autos assembled for the occasion had passed over the ribbon of concrete.

The Denver-Colorado Springs paved highway is the fourth longest stretch of unbroken cement pavement in

the world. Many other paved roads are longer, but these roads are broken up with asphalt or other pavement.

The new pavement to the Springs includes a total of sixteen Federal Aid projects, the first of which was started December 22, 1917, and was completed one year later. The projects were from one to thirteen miles in length. Thirteen dangerous "main line" railroad crossings were eliminated during the course of the paving. On the new highway there are seven underpasses and one overpass. Six crossings were eliminated by realignment of the road.

With the exception of the short strip between Denver and Littleton, the pavement is eighteen feet in width, and was laid in accordance with the highest standards of the Bureau of Public Roads.

There were seventeen miles in the new strip of pavement opened on August 9. This was in two contracts, H. C. Lallier Const. Co. being the contractors on 12½ miles, while the J. Fred Roberts Const. Co. paved 4½ miles. The two projects included three railroad underpasses, which were constructed in 1927 under separate contracts.

The average cost of the new pavement was \$32,000 per mile, while the average cost of the underpasses was \$40,000 each. The contracts of the Lallier and Roberts projects called for completion not later than December 1 this year. Both were finished four months ahead of schedule, Lallier breaking all previous records in Colorado for the pouring of state highway concrete. The projects were started April 1.

With the completion of the Denver-Colorado Springs paving, the system of pavement between Fort Collins, Greeley, Denver and the Springs is now completed. Work is now under way for the completion of the last link of pavement between Boulder and Denver. The contractor expects to finish this work before freezing weather sets in.

In another thirty days it is expected that another

(Continued on page 11)

The Good Roads Amendment

By FINLAY L. MACFARLAND, Chairman, Good Roads Bureau, Rocky Mountain Motorists, Inc.

THE campaign for the realization of a completed system of improved highways throughout Colorado has passed the first milestone through the filing of a petition which will put a good roads amendment on the ballot this fall. This amendment does not require a bond issue, rather it is an increase in the gas tax from three to five cents, which will enable the state of Colorado to issue road notes up to \$10,000,000 a year for six years. This will give the State Highway Department a total of \$60,000,000 to be spent in completing the highway program throughout the state.

Practically every civic organization is back of this movement. It has been endorsed by the Denver Automobile Dealers Association, the State Association of Commercial Organizations and the State Association of Real Estate Men. Rocky Mountain Motorists, Inc., have sponsored this movement from its inception.

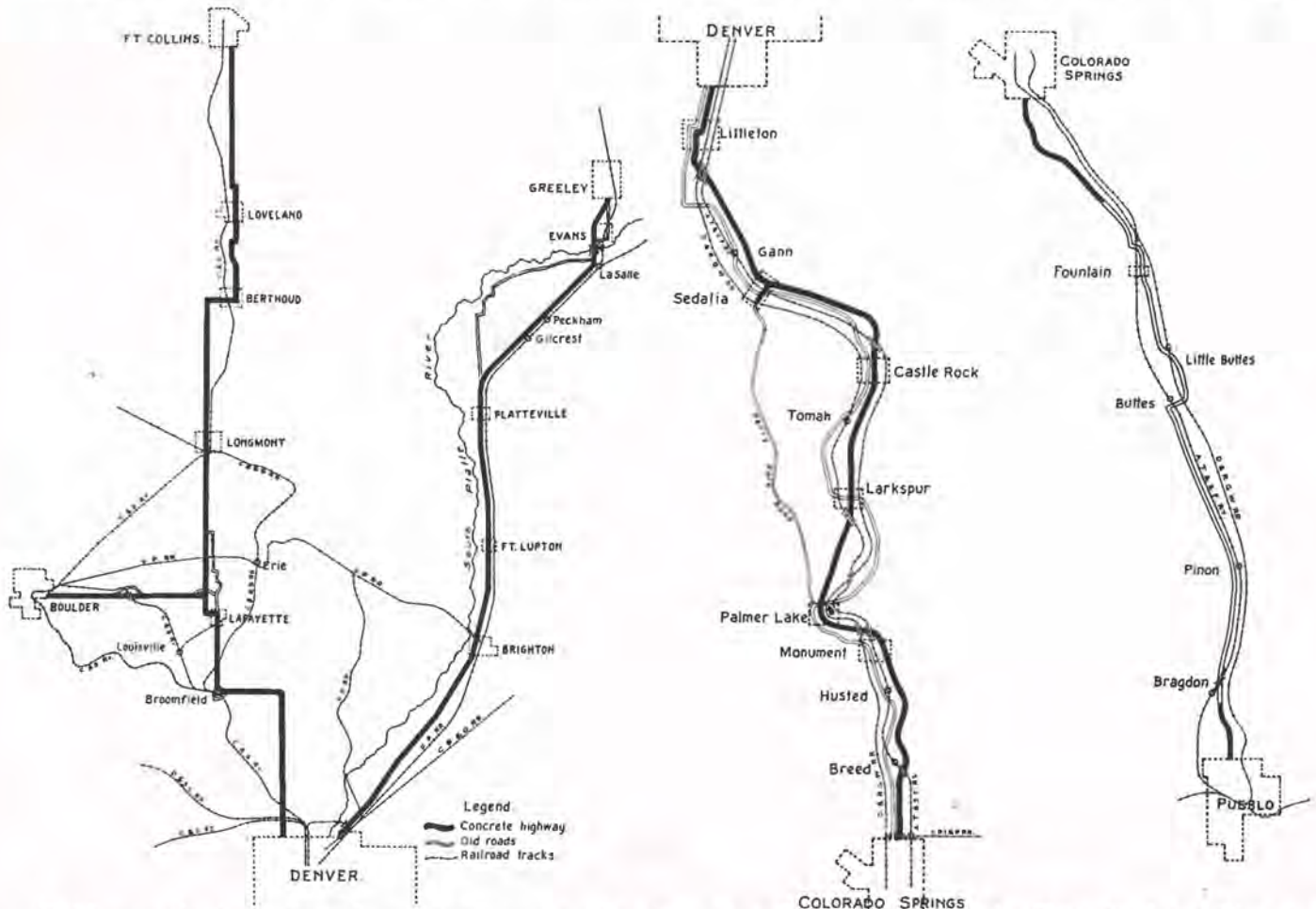
Of the \$60,000,000 to be raised, not one cent is to be spent for roads in Denver, although 26 per cent of the money will be raised by that city.

The plan, as outlined, is to increase the sale tax on

motor fuel two cents a gallon, and with the funds so raised as security, issue road notes as may be required, up to \$10,000,000 a year, for six years, a total of \$60,000,000. This may seem like a large sum of money, but not when compared with what other states are doing.

California is spending this year \$78,000,000, divided between the counties and the state; Illinois, \$57,000,000; Alabama has voted a \$25,000,000 bond issue; Iowa has let contracts for 650 miles of paving, and will ask its people to vote on a \$100,000,000 bond issue at the next election.

We are opposed to a bond issue; we are opposed to a property tax of any kind to pay for the building of roads. Six states now have a five-cents-a-gallon fuel tax, eleven states have a four or four-and-a-half-cents-a-gallon fuel tax, and the automobile travel in those states has increased very materially since they improved their roads. Arkansas, for example, was authorized to issue \$13,000,000 worth of notes a year for the building of roads for four years, a total of \$52,000,000, in a state with only half the area of Colorado, and last year



Sketch maps showing sections of concrete pavement on the north and south highways of Colorado. Three stretches of this system are now under construction—i. e., a five-mile link between Boulder and Lafayette; five miles south of Colorado Springs and four and one-half miles north of Pueblo. The remainder of the pavement shown in black is completed. Improvements now under way will be completed this fall.

the state issued one hundred and fifty thousand guest tags to visitors, while Colorado issued less than twenty thousand.

We are losing our tourist business because we are not keeping pace with other states in building roads. Colorado has more to offer than any other five states in the Union, and with good roads we should have from 200,000 to 250,000 visiting vehicles every year, which would help very materially in paying off the proposed road notes.

Every motorist is paying a mud tax or a dirt tax at the present time, and receiving no benefit; on the contrary, it costs him two to two and a half cents a mile more to run his car than if he had good roads over which to travel. An automobile will average six thousand miles a year. If he averages twelve miles to the gallon of gasoline, he will burn five hundred gallons of fuel, and the two cents extra will cost him \$10.00 a year. By government tests, he will save two cents a mile on good roads; so, for his \$10.00 expenditure above what he is now paying, he would save \$110.00, which is a pretty good investment for anyone to make.

We believe it is only a question of educating the people of Colorado to an understanding of the fact that we are not asking for a bond issue; that we are opposed to a property tax; that the entire issue of sixty millions can be paid in less than fourteen years by the gasoline sales tax; that the motorist who uses the roads will pay for the building and maintenance of the roads; and our present expenditure for maintenance will about equal the interest which we will have to pay on the road notes; then the people will vote for it without any hesitation, particularly the farmer, who can get his produce to market for one-half what he has to pay when hauling goods to town over poor roads.

A Plan to Complete Colorado's Main Highway System

1. Without a bond issue.
2. Without a property tax.
3. Revenue to be derived from adding 2 cents a gallon to tax on fuel.
4. Only those who use the roads will pay for the roads.
5. Issue as required, road notes secured by fuel tax to the amount of \$10,000,000 a year for 6 years.
6. This will give us 3,800 miles of hard-surfaced or well-graveled roads, reaching all over the state.
7. \$10,000,000 a year distributed for labor and material.
8. The entire issue will be paid in less than 14 years, BY THE MOTORIST.
9. The motorist today pays \$10.00 in maintenance of car and tire wear for each extra dollar he will pay for this increased tax on gasoline.
10. The funds now accruing to county commissioners will not be changed.
11. Farmers can get their produce to market for one-third of what it now costs.
12. Farmers will not pay tax on fuel used in tractors or stationary engines.
13. Last year the Secretary of State issued less than 20,000 guest tags; Arkansas issued 150,000, and we have many times the attractions that Arkansas has, but Arkansas has been spending \$13,000,000 a year on roads to be paid from a 5-cent gas tax.
14. Eighteen states now have a 4, 4½, or 5-cent gas tax which goes to pay for roads.
15. With good roads through Colorado, we should have 200,000 visiting cars annually, which would pay about 25 per cent of the total cost.
16. Other states are proving this plan successful and getting the tourists.

Recent Progress in Road Oiling

By WALTER N. FRICKSTAD, Highway Engineer, U. S. Bureau of Public Roads

THE subject of bituminous oil treatment of fine crushed rock and gravel roads, with its promise of not only conserving material, but improving service to the public, has attracted such attention that it falls into discussion whenever a small group of western highway authorities gather together.

During 1927, Oregon, the western pioneer in the recent revival of interest in bituminous treatment, extended treatment of its highway system by 380 miles to a total of 950 miles. The surface method was used generally, but a series of experiments was undertaken as described hereafter. Oregon now has roads of this character more than four years old and has full confidence in their durability and usefulness.

The tendency in Oregon in 1927 was toward a heavy road oil for the second application, which involved a thicker covering of stone chips and brought less complaint from the traveling public concerning damage to automobiles driving through fresh oil. It is difficult to appraise the merits of these modifications until the end of next summer. The prophecy is ventured that the roads will not be as smooth as when treated with light oil exclusively, but the amount of repairing may be substantially reduced.

California in 1927 treated approximately 600 miles

of road. Both methods, surface treatment and oil mixing, were used, apparently with equal confidence under the respective appropriate conditions. Some of the work was placed upon important highways and was frankly temporary in nature, but has been eminently successful.

California is now undertaking some oil plant mixing projects as described below.

Utah and Nevada during 1927 were added to the states undertaking oil treatment, the former with 30 miles and the latter with 5 miles. The work was in excellent condition in the middle of the spring, and its behavior during 1928 will be observed with great interest.

Idaho, which had previously used the surface method, undertook oil mixing upon 70 miles. Reports to date show excellent results.

Wyoming "oil mixed" one long project with Wyoming asphaltic oil. The highway department, having had rather unsatisfactory experience with paraffin base oils, is preparing to observe the condition of the recently treated project during the summer before undertaking an extended program.

Colorado is putting in sixteen miles of the penetration type of oil road this year, while New Mexico already has laid twelve miles and has another stretch of ten miles under construction.

All of the other states in the western region have indicated an interest in the use of bituminous oils, and with one or two exceptions, are planning to begin or continue this type of work during 1928. Many county highway organizations and a few cities are also planning similar work.

The experimental work in Oregon alluded to above has to do with heavy road oil and heavy tar. Three types were tried, classified by the highway department as "skin coat," $\frac{1}{4}$ -inch to $\frac{5}{8}$ -inch in thickness; "penetration," $\frac{1}{2}$ -inch to $1\frac{3}{8}$ inches in thickness, and a "road mix," $\frac{3}{4}$ -inch to $2\frac{1}{2}$ inches. The two methods first listed are efforts to solve the old problem of applying a thin coat of heavy oil and stone chips to a previously constructed roadway.

The Oregon "penetration" is similar to methods applied with great success in Riverside and San Bernardino Counties on concrete, and sometimes upon gravel. Careful selection of material and the most expert, painstaking supervision and workmanship have been found necessary in these counties. It is one of the most difficult classes of oil treatment.

The third class of experiments in Oregon, designated as "road mix," differs from the work of the same name in California, in the use of clean crushed rock with fines removed and the use of heavy road oil (90-95%) or heavy gas tar. A prime coat is first applied to the base, the coarse aggregate is added, and the principal application of oil is spread. The rock and oil or tar are then mixed with a blade grader until the rock is well coated. The material is then spread and rolled, a seal coat applied, a small quantity of fine chips spread, and the whole then rolled again. In some cases an additional application of oil with more stone chips has been added. The result resembles penetration macadam, but the methods are quite different from those generally accepted. The blade mixing is not different in principle, however, from the harrowing which was commonly done in California between applications of oil in the earlier days of that type of construction.

The cost of work like that in Oregon can only be estimated, as the experimental sections were too short to furnish reliable data. A report by the Oregon state highway department, which describes the work in detail, estimated the respective costs as follows:

Thickness, $\frac{3}{8}$ -inch skin coat, cost per square yard, 10 cents; $\frac{3}{4}$ -inch mat, 20 cents; $1\frac{1}{2}$ -inch mat, 35 cents; $2\frac{1}{4}$ -inch mat, 55 cents.

As before stated, California has recently specified and awarded contracts on what may well be called an "old plant mix wearing surface." The largest project of this character is 118 miles on the Coast Route between Santa Monica and Oxnard. The project now stands graded and the contract provides for laying a temporary surface 24 feet wide, part of which will be 4 inches thick, compacted measurement, all of fine crushed rock mixed with oil. The remainder will have 3 inches of oil-mixed material on a 3-inch fine crushed rock base. It is assumed that paving will be required shortly, and this described surface is purely for the purpose of carrying traffic while the earth is consolidating. The significant items of the contract are: 42,000 tons of fine crushed rock at \$2.79 per ton; furnishing 8,000 barrels of medium grade fuel oil at \$1.50 per barrel, and mixing 34,000 tons of surfacing material at 35 cents per ton. The contract prices are fairly balanced but are well below the engineer's estimate. For mixing the material the engi-

neer estimated 55 cents per ton, and bids ranged from 25 cents to 43 cents. The contract price for mixing only is approximately \$1,000 per mile for a 24-foot roadway and 7 cents per square yard for 3-inch or 4-inch compacted thickness. Reduced to 2 inches of compacted thickness and 18-foot width, the prices would become 4 cents per square yard and \$420 per mile. If the material were mixed on the road, the cost would range from one-third to two-thirds of the foregoing amount, and the spreading of the oil would add something more. It may, therefore, be said, if these prices are representative, that plant mixing costs \$150 to \$200 per mile more than road mixing for an 18-foot surface 2 inches thick. The uniformity of the plant mixture, a quality difficult to obtain under present field methods, may well justify that much extra cost.

The traffic on projects already treated varies so widely that there may be some confusion as to the appropriate field within which oil treatment should be used. Some projects are carrying several thousand vehicles per day. It is true that the width of surface on these projects is generally greater than the normal two-lane width, but it should be emphasized that treatment under such heavy traffic was undertaken as a temporary or emergency matter, usually to furnish service to the public during the period of consolidating fills.

One of the first projects treated by the mixing method was in the Imperial Valley, where the excessive traffic had destroyed much of the surface material. To add to the difficulties, the subgrade was in many places poorly drained. Oiling was undertaken to save what rock remained and to carry traffic until funds could be gathered for more substantial construction. The expected has happened in that an appreciable percentage has broken and the maintenance costs have been rather high. The state's course in this emergency is beyond criticism, but the case illustrates that oil treatment is not a magical process in lieu of satisfactory subgrade and adequate thickness of rock. Until the contrary is demonstrated by several years of observation, the normal field for oil treatment, aside from emergencies, is that heretofore held by fine crushed rock or gravel. Research has indicated that the limit of traffic for the economical construction and maintenance of fine crushed rock ranges from 300 to 600 vehicles per day, in arid or semi-arid territory, depending upon the character of the stone and binder, and perhaps runs as high as 1,000 vehicles per day for ideal material in humid territory. It would seem wise to apply the same limits to oil-treated roads for the present, remembering, however, that climatic influences are reversed.

On the other side of the story, what is the minimum traffic that justifies oil treatment? The answer depends upon the cost of the treatment as against the unit value of the untreated material destroyed by traffic; also upon the consideration we should give to purse and comfort of the vehicle operator. Is oiling justified when traffic reaches 100 vehicles per day, or should the figure be 250 or more? Should we undertake any new project without making provision for oil treatment? These questions need not be answered definitely until more roads carrying heavy traffic are treated, but thought must soon be given to the subject.

In deciding whether a given project is adequately installed for oiling, width of surface is one of the factors. It has been said that oiling should not be attempted upon a surface less than 18 feet or 20 feet in width. This is undoubtedly a good working rule.

NEWS OF THE MONTH

Current Events in the Field of Highway Engineering and Transportation—State, County and Municipal Activities

John F. Donovan, for eight years division engineer of District No. 1, has been appointed assistant superintendent of maintenance. He works out of the Denver office and is first assistant under Robt. H. Higgins, the general superintendent. Donovan travels the entire state and is now engaged in making a general survey of maintenance on the Federal Aid system, which is now being handled by state forces. The work which he formerly handled in Division No. 1 as district engineer is being taken care of temporarily by the Denver engineering office.

Chris O'Neil, of Platteville, has been awarded a contract by the state highway department for the construction of a small steel bridge over the Arickaree River, near Cope, on State Highway No. 102. O'Neil's bid was \$7,099 for the completed structure. The contract includes 61,000 pounds of structural steel and 360 lineal feet of steel cable and clips.

C. L. Wilder, of Denver, is contractor on a concrete cribbing project near Central City, on State Road No. 119.

Work has been started by J. H. Miller & Co. on their concrete paving contract between Lafayette and Boulder, consisting of 4,509 miles of standard cement pavement. The contract bid was \$150,263. Miller & Co. have agreed to finish the project in 120 working days. The contract involves the pouring of 47,620 square yards of concrete, the bid price of which was \$2.03. Completion of this project will mark the closing of the last link of dirt road between Denver and Boulder.

The department has let a contract to J. Fred Roberts & Sons for the construction of 4.71 miles of 18-foot standard pavement north of Pueblo. Work is now under way by the contractor. An effort is being made to finish the project before winter sets in. This is the first pavement laid north of Pueblo. Heretofore all pavement projects in this district have been laid on the Santa Fe Trail in the Arkansas Valley. Additional paving projects between Pueblo and Colorado Springs are being planned by the department. Two years ago five miles of concrete was laid south of the Springs, and J. L. Busselle & Co. are pouring five additional miles south of the present pavement. Roberts' bid on the Pueblo project was \$120,789. His bid on the concrete was \$1.85. There are 46,170 square yards in the project. Seven other contractors submitted bids.

Harry A. Roush, St. Paul, Minn., contractor, has been given a contract by the department for the construction of an overhead crossing over the D. & R. G. W. Railroad tracks between Grand Junction and Palsade in Mesa County. Work is

now in progress. His bid was \$59,568. The largest item in the bid was \$22,156 for 76,400 cubic yards of borrow excavation. The unit bid was 29 cents.

At a meeting of the State Highway Advisory Board held August 8, B. B. Allen, of Silverton, was elected chairman to succeed Peter Seerie, of Denver, who was named vice-chairman, for the ensuing year. Two new members of the board, E. G. Middelkamp, of Pueblo, and William Weiser, of Grand Junction, recently appointed by Gov. William H. Adams, attended the meeting.

Work of constructing a new state highway to the summit of Loveland Pass is progressing at the rate of 300 feet a day. The contracting firm of Luke E. Smith & Co., handling the project, has two crews working in an effort to complete the project by September 15. The Loveland Pass highway has been the dream of both eastern and western slope residents for a decade. As funds become available the road will be extended to Dillon, a distance of sixteen miles from the summit.

A large maintenance force has been put to work on the Pueblo-Walsenburg highway in an effort to get this heavily-travelled road into smooth condition. The enlarged crew is using heavy equipment recently acquired by the department.

The new state gravel-surfacing project between Crowe and Greenhorn on State Road No. 1 is nearing completion by the H. C. Lallier Construction Co.

J. S. Pyeatt, president of the Denver & Rio Grande Western Railroad, has announced that \$25,000 will be used to advertise the Million-Dollar highway from

Ouray to Durango in eastern and southern states next year. This statement followed a trip made by Mr. Pyeatt over the scenic highway the middle of July.

Ed. H. Honnan, of Colorado Springs, has been awarded a contract by the U. S. Bureau of Public Roads for the construction of five miles of new roadway between Echo Lake and Idaho Springs. His bid was approximately \$90,000.

The State Highway Department of New Mexico is now making a survey of the highway between Shiprock and the Colorado state line to connect up with the link of road now being built across the Ute Reservation by the Maloney Construction Co. for the Colorado department. The road will be surfaced in New Mexico as Federal Aid funds become available.

A contract has been awarded to J. Finger & Son for the construction of two and one-half miles of gravel surfacing between Portland and Florence in Fremont County. Finger's bid was \$54,843. The project includes two bridges, one a 70-foot steel structure over Hardcastle Creek. The new road will follow the present route for a short distance and take a new course, eliminating the present sharp turns and steep grades, according to James D. Bell, division engineer.

The State Highway Department now has a crew at work surveying a new direct route between Stonewall and San Luis, over the Sangre de Cristo Range. The state and country are spending jointly \$40,000 this year on widening the road west from Trinidad to Stonewall. The surveys for the new 31-mile road will be completed this year, ready to start construction next season.

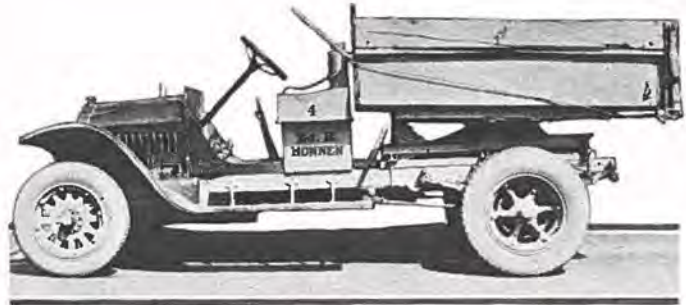


Heavy duty gasoline shovel used by Contractor Luke Smith on new road being constructed by State Highway Department over Loveland Pass.

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New Highway Equipment and Materials

June and July machinery sales were far above normal, according to Denver road equipment dealers. Several of the firms handling highway maintenance and construction machinery have added to their lines, and generally the distributors report satisfactory business. Several large state highway projects have been put under way during the past month as well as sizable county and city jobs, necessitating the purchase of considerable equipment by the successful bidders.

Galion grader sales were good last month, with several of the new motor patrol machines delivered, according to George Meffley, general sales manager of the H. W. Moore Equipment Co. Mr. Meffley also reported the delivery of several Cedar Rapids one-piece crushing plants to counties and contractors. This firm recently received a shipment of Baker maintenance machines. Two of them have been put in operation on county maintenance. Unlike most of the machines of this type, the Baker maintainer is mounted on four wheels, which is said to have certain advantages.

Harry P. Wilson, president of the Wilson Machinery Company, made a tour of the western slope during the month of July. He combined business with pleasure, taking his son and daughter with him. He says fishing and business were both good, as evidenced by his order book and some snapshots of the son with a string of speckled beauties.

One of the new Barber-Greene loaders for use on a Wyoming gravel project; a Koehring 10-S mixer and five Austin-Western graders were among the deliveries made during the month by the Wilson firm.

A miniature movie theater is one of the interesting features of the salesrooms of the H. W. Moore Equipment Co. John Moore is the master of ceremonies. Movies of the equipment handled by the Moore concern in operation on jobs in this territory are shown, with all of the trimmings of a regular movie house.

Six Cletrac tractors of various sizes were delivered to farmers in this territory during the month by the Liberty Truck and Parts Co., according to Richard Carlson, sales manager. Two of the "100" models also were registered on the order book. An unusual rush of orders for truck parts also was reported.

The largest volume of business in the history of the concern was the report made by L. L. Clinton, of the Clinton & Held Company, "Caterpillar" tractor distributors. Four 60's and five smaller models were among their sales.

Two super-mogul Russell graders and a large volume of contractors' equipment were reported by Herbert N. Steinbarger. He states that his sales on Rex mixers were far heavier than those for the corresponding month last year.

Sales of Mack trucks in the construction field have been much better than was expected, according to H. W. Acason, branch manager of the Mack International Motor Truck Corporation. Fifteen of the heavy duty Macks shared in the records established by H. C. Lallier on the Castle Rock-Palmer Lake state highway paving project. "Our volume of sales in this territory has been unprecedented," he said. "There is every evidence that our business for the year will far exceed any previous twelve months."

The new Adams Grader No. 14 sets a new mark in the construction of heavy duty graders to work to capacity behind the most powerful tractors. This grader is said to be the most powerful grader ever built, the easiest handled and the most practical of all big graders because of distinctly new features.

A new method of frame construction used in this machine is said to have exceptional strength and rigidity. In addition to other cross-bracing, four large tubular cross members are riveted between the two heavy frame beams by means of heavy flanged castings. These are located at the front, rear and near the two frame bends. It is claimed that this construction prevents frame twisting or weaving so that the ends of the blade are held to a smooth, steady cut—no rocking or riding over hard spots.

This absolute frame rigidity is made practical by using a large ball and socket joint in the front truck instead of a fifth wheel. The front truck has entire freedom of movement to ride over rough ground without subjecting the front end of the frame to any twisting strains. This construction makes a very strong connection without any lost motion whatever—a construction which has proved highly successful in other models of Adams graders. It also places the draft point very low so that the machine holds well to the ground.

A set of four books covering different phases of industry have just been published by the Caterpillar Tractor Co., San Leandro, Calif., and Peoria, Ill. The titles are: "Caterpillar" Power for Public Utilities"; "Caterpillar" Power for Factories"; "Caterpillar" Power for Mines and Quarries"; "Caterpillar" Power for Railroads, Warehouses and Docks." They are completely illustrated with action

photographs gathered from "Caterpillar" jobs throughout the world. Write to the San Leandro, Calif., headquarters or call at your local dealer in "Caterpillars" for free copies.

The Heil Co., Milwaukee, Wis., has issued Bulletin H. C. 1, which fully illustrates and describes their improved hand hoist dump unit. One of the big features claimed for a Heil Hand Hoist is the fact that it provides two different crank socket operations. When the operator is dumping an unusually heavy load he can use the low gear socket, thereby minimizing the physical effort necessary to perform the operation. If, on the other hand, he is dumping light materials, or if he has the load partly raised, he can switch his crank to the direct gear socket and complete the operation in several turns.

The Koehring Company, Milwaukee, Wis., manufacturers of pavers, mixers, gasoline shovels, cranes, draglines, etc., has issued a bulletin describing the Koehring Subgrade Planer which should interest all road builders. A hidden source of paving contractors' losses lies in incorrect preparation of the subgrade. A cut in depth in excess of the specification requires an increasing amount of concrete for which the contractor receives no pay and quickly amounts up into thousands of dollars. The manufacturers claim that the Koehring Subgrade Planer finishes the subgrade accurately to the proper contour, insuring the correct thickness of slab at all times, without excess or deficiency of concrete.

Six thousand cars made the trip between Denver and Colorado Springs every day in June according to a highway census report just released. This is more than ten times as many as made the trip twelve years ago.

The highway traffic between the two cities has become a real problem and there is a continual demand for the widening of the roads as well as the establishment of new highways.

For many years the highway commission has conducted the census tests in order to determine the most economical type of surfacing for state highways. Only \$35,000 has been appropriated this season for the work so that the reports this year will be less extensive than in former years.



A new heavy blading machine recently placed on the market by the J. D. Adams Company.

Ceremonies Mark Opening of Denver-Colorado Springs Pavement

(Continued from page 4)

five miles of pavement south of Colorado Springs will be opened to traffic. Construction of five miles of pavement north of Pueblo has been started. Plans for the remaining 25 miles between these two points are now in course of preparation.

The construction of pavement between the Springs and Pueblo will be carried forward as fast as funds will permit, according to Maj. L. D. Blauvelt, state highway engineer. The end of 1930, however, will probably see the entire stretch under paving contracts.

Colorado has now more than 300 miles of concrete and asphalt pavement, all but about 20 miles laid under the present highway administration. Future plans of the department call for the paving of the entire distance between Colorado Springs and Trinidad. This is the main artery of travel through the state, and carries something like 75 per cent of all highway traffic in the state.

The traffic between the Springs and Trinidad has now become so great that it is nearly impossible to keep the present gravel surfacing in smooth condition. Reduced maintenance costs through paving would in a few years pay the expense of pavement, to say nothing of the savings to motorists in operating costs over the route.

Reduced passenger and freight rates already have been announced by bus lines and truck companies operating between Denver and Colorado Springs as a result

of the opening of the new concrete pavement between these two points.

Establish Tandem Maintenance

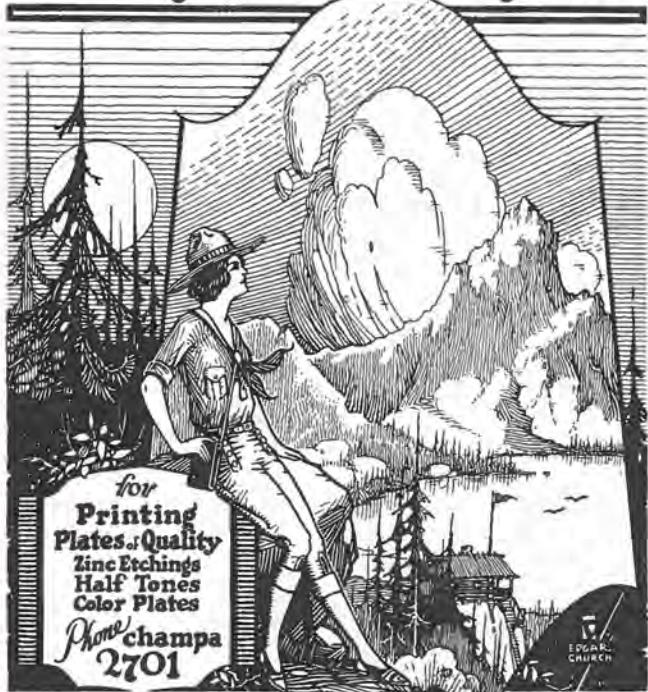
Tandem maintenance has proved its superiority over ordinary methods on gravel and earth roads of New Mexico. Results obtained in the Training School District and elsewhere offer convincing proof of the effectiveness of the "tandem" method.

Briefly, "tandem" maintenance is described as follows:

Two units of equipment are used in tandem, one following closely behind the other, the two spaced at such an interval that approaching traffic may turn out for the front machine on the right, passing the second unit on the left. The purpose of this tandem arrangement is to completely cover the road from shoulder to shoulder in one operation, thus giving maintenance to the full width of the roadbed and at the same time cleaning it of any rock, ridges of earth, sand or debris of any nature that might furnish a hazard to traffic. The scheme necessarily provides for the casting of the loose material from one shoulder directly across to the opposite shoulder instead of casting from both shoulders toward the center, as is ordinarily done in maintenance operations.

The direct advantage of this plan is twofold: First, it results in a flat crown roadbed which is generally ad-

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mitted to be the proper design for fast-moving automobile traffic. Second, it eliminates absolutely the ridges of loose earth, rock, sand and debris that are of necessity left in the center of the roadway when only one machine is in operation upon a patrol until the operator is able to make his return trip. Breakdowns, bad weather or other adverse conditions may delay this return trip several days.

The "tandem" method of maintenance affords a complete covering of the roadbed on a single trip through a

finished road as the operators proceed. A double covering is made on a complete round.

The equipment adapted for this type of maintenance may consist of a 5-ton tractor with an 8-foot grader provided with right and left extensions, this unit to be followed with a motor grader equipped with a 12-foot blade or some standard type of maintainer or drag equipment. The main idea is to arrange the two units in such a manner that they will have sufficient blade capacity to fully cover the roadbed.

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
F.A.P. 144-C	4 mi.	Gravel Surfacing	Northwest of Ft. Collins
F.A.P. 97-R	.....	Bridge	East of Lamar
F.A.P. 290-C	.....	Bridge	North of Lamar
F.A.P. 272-D	2 mi.	Paving and R.R. Underpass	Manzanola
F.A.P. 282-H	5 mi.	Gravel Surfacing	No. of Rifle
F.A.P. 292-B	3.5 mi.	Graded and R.R. Overhead Crossing	So. of Minturn
F.A.P. 295-D	2 mi.	Gravel Surfacing	No. of Antonito
F.A.P. 299-D	4 mi.	Gravel Surfacing	W. of Delta
F.A.P. 248-B	2 mi.	Gravel Surfacing	So. of Buena Vista
F.A.P. 259-A	4 mi.	Gravel Surfacing	W. of Sargents
F.A.P. 258-H	3 mi.	Gravel Surfacing	W. of Sapinero
F.A.P. 262-J	3 mi.	Gravel Surfacing	N. W. of La Veta

PLANS SUBMITTED FOR APPROVAL TO U. S. BUREAU OF PUBLIC ROADS

Proj. No.	Length	Type	Location
F.A.P. 149-A	4.716 mi.	Sand Surfacing	S.W. of Deertrail
F.A.P. 242-C	6.014 mi.	Gravel Surfacing	N. W. of Trinta
F.A.P. 258-G	2.885 mi.	Gravel Surfacing	W. of Cerro Summit
F.A.P. 266-D	4.111 mi.	Gravel Surfacing	So. of Bandad
F.A.P. 262-I	4 mi.	Gravel Surfacing	So. of Russell
F.A.P. 134-B	3 mi.	Sand Surfacing	E. and W. of Vona

PLANS ADVERTISED FOR BIDS

Proj. No.	Length	Type	Location	Date Bids Opened
F.A.P. 295-B	2.414 mi.	Gravel Surfacing	No. of Pagosa Springs	Aug. 22, 1928
F.A.P. 2R No. 7	1.224 mi.	Paving	So. of Aguilar	Aug. 22, 1928
F.A.P. 2R No. 8	1.633 mi.	Paving	Aguilar So.	Aug. 22, 1928
F.A.P. 286-BR No. 1	.....	Oil for Surfacing	No. of Nunn	Aug. 22, 1928
F.A.P. 147-B	4.833 mi.	Gravel Surfacing	So. of Cortez	Aug. 28, 1928
F.A.P. 282-AR	.....	600 ft. of River Protection Work	So. of Craig	Aug. 28, 1928
F.A.P. 293-C	3.663 mi.	Gravel Surfacing	No. of Ouray	Aug. 28, 1928
F.A.P. 287-D No. 2	0.921 mi.	Paving	E. of Kersey	Aug. 28, 1928

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1928

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R5	Bet. Trinidad and Aguilar	1.959 mi.	Paving	W. A. Colt & Son	\$ 72,122.50	93	2-R5
2-R No. 6	South of Aguilar	2.75 mi.	Pavement	W. A. Colt & Son	93,000.00	85	2-R No. 6
138-A	North of Kremmling	10.916 mi.	Grading	F. L. Hoffman	201,262.80	40	138-A
144-B	Northwest of Fort Collins	3.201 mi.	Gravel Surfacing	White & LaNier	44,000.00	86	144-B
145-A	West of Glenwood Springs	3.807 mi.	Gravel Surfacing	Winterburn & Lumsden	53,227.90	100	145-A
145-B	West of Glenwood Springs	1.051 mi.	Surfacing	Winterburn & Lumsden	42,389.72	80	145-B
147-A	In Ute Mt. Reservation, S. of Cortez	15.896 mi.	Surfacing	E. J. Maloney	119,100.10	22	147-A
208-B	E. of Grand Junction	0.507 mi.	Gravel & R.R. Grade Separation	Harry A. Rousch	59,568.00	0	208-B
210-B2	De Beque-Grand Valley	7.507 mi.	Gravel Surfacing	Fred Kentz	37,475.00	100	210-B2
242-B	W. of Mack at E. Salt Wash	.....	Tmbr. Bridge & Gravel Approaches	Hinman Bros. Const. Co.	13,996.40	48	242-B
247-C	Swink	0.8 mi.	Conc. Pav. & R.R. Underpass	J. Finger & Son	62,559.58	100	247-C
251-C	E. of Boulder	4.000 mi.	Pavement	J. H. Miller & Co.	150,263.60	0	251-C
253-C	West of Milner	4.502 mi.	Surfacing	Mountain States Con. Co.	88,103.40	27	253-C
254-C2	S. W. of Hot Sulphur Springs	.....	Superstr. of Bridge & Approaches	Northwestern Constr. Co.	48,203.50	89	254-C2
254-D	Parshall-Hot Sulphur Springs	3.013 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	37,124.18	96	254-D
258-E2	Cimarron-Cerro Summit	1.487 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	32,377.70	62	258-E2
258-F	Gunnison-Sapinero	5.689 mi.	Surfacing	Hinman Bros. Const. Co.	100,968.50	45	258-F
266-C	Durango and N. Mex. State Line	2.401 mi.	Surfacing	Salle Const. Co.	32,499.80	80	266-C
275-C3 E2	G3 Palmer Lake-Pring	4.602 mi.	Concrete Paving	J. Fred Roberts & Sons C. C.	114,079.65	100	275-C-3 E2 G3
275-E	North of Monument	0.926 mi.	Grading and Underpass	F. L. Hoffman	41,905.20	100	275-E
275-F3 G2	Tomah-Palmer Lake	12.894 mi.	Concrete Paving	H. C. Lallier C. & E. Co.	292,309.95	92	275-F3 G2
277-B	South of Colorado Springs	4.860 mi.	Concrete Paving	J. L. Busselle & Co.	131,202.45	42	277-B
277-C	N. of Pueblo	4.363 mi.	Conc. Pavement	J. Fred Roberts Sons C.C.	120,789.25	0	277-C
279-F	North of Baileys	3.444 mi.	Graded	J. Fred Roberts & Sons	126,000.00	53	279-F
282-D	North of Meeker	2.864 mi.	Gravel Surfacing	Winterburn & Lumsden	42,165.00	100	282-D
282-E	N. of Meeker	6.421 mi.	Gravel Surfacing	Luke E. Smith & Co.	88,384.20	0	282-E
282-F	So. of Craig on S. H. No. 13	2.17 mi.	Surfacing	Gardner Bros. & Glenn	49,063.00	26	282-F
286-BR1	S. of Wyoming-Colo. Line	14.474 mi.	Gravel Surfacing	A. R. Mackey	38,978.00	21	286-BR1
286-C	Between Greeley and Eaton	5.566 mi.	Paving	New Mexico Const. Co.	126,360.35	8	286-C
287-A3	W. of Ft. Morgan on S. H. No. 2	3.55 mi.	Concrete Paving	Edw. Selander	90,749.50	0	287-A3
287-A4	West of Fort Morgan	5.087 mi.	Paving	Edw. Selander	120,505.80	4	287-A4
287-D1	Two mi. E. of Kersey on S. H. 2	0.921 mi.	Grading	White & LaNier	14,046.40	100	287-D1
288-A2	Bet. Merino and Brush	9.741 mi.	Paving	Edw. Selander	245,043.50	77	288-A2
292-A	North from Minturn	6.417 mi.	Grading	H. C. Lallier Constr. & Eng. Co.	92,571.80	93	292-A
295-C	La Jara-Antonito	5.284 mi.	Surfacing	Pope Bros. C.C.	29,414.60	71	295-C
296-C	N. of Greenhorn on S. H. No. 1	6.606 mi.	Surfacing	H. C. Lallier Constr. & Eng. Co.	115,466.80	35	296-C
300-A	Bet. Chattanooga & Red Mtn.	2.277 mi.	Grading	Winterburn & Lumsden	59,480.80	56	300-A

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Articles on the subject of road building and highway development in Colorado are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible.
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Our Cover Picture

The picture on this month's Colorado Highways gives a glimpse of the country through which the new Black Mesa Highway, now being constructed by the Colorado Highway Department, will pass. The view was taken near Hotchkiss, and shows a section of State Road 92, which runs from Sapinero to Delta, via Maher, Crawford, Hotchkiss and Austin. The new road being constructed by the state will improve a route which was used by the Indians and later by the pioneers who settled the Western Slope country. For a number of miles after leaving Sapinero the road follows along the rim of the famous Black Canyon of the Gunnison River. The new road will be of standard width and grade.—*Photo by the Denver Tourist Bureau.*



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COLORADO'S LARGEST ROAD MACHINERY HOUSE

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Editorial Comment

SHIPPERs and consumers are beginning to feel the effect of good roads in Colorado. Following the completion of the paved highway between Denver and Colorado Springs bus and truck companies announced a reduction in rates.

It has been found that good roads in this state have had a tendency to hold freight rates down where there might otherwise be an inclination to raise them.

"Ten or fifteen years ago roads were such that this factor of competition would have been impossible," said a road official in commenting upon the new truck rates. "If farmers and other shippers do not want to pay the rates fixed by the railroads, they can ship by truck. In fact, it is said that the railroads would prefer to have some of the short haul business go to the trucks.

"The situation, however, emphasizes the need of speeding up the improvement of our trunk roads. If we want to get the full benefit of this new competition, we must make the trunk roads permanent, all-year highways."

Incidentally, the truck lines add to the revenues of the highway department. Trucks in commercial transportation over regular routes or between fixed terminals pay a license fee of 5 mills per ton mile. In addition they pay a truck license fee, and on top of that must pay three cents a gallon on all the gasoline they use.

FOR the year 1927 there were 23,385 trucks registered in Colorado. Up to June 30, this year, there were 20,041 trucks of all classes registered. A 20 per cent increase is expected for the full year of 1928.

Total collections of the motor vehicle department for 1927 totaled \$1,600,221. On June 30 the department had collected \$1,640,164, according to Secretary of State Armstrong. Much of the increase for this year is due to the increased truck license fees. For instance, a 5-ton truck license now costs as high as \$135, where the fee was formerly \$50.

Approximately \$75,000 will be collected this year from operators of passenger busses and trucks through the State Utilities Commission. This sum will be divided equally between the highway department and the various counties.

One-half of the moneys collected by the motor vehicle department from license fees is used for the retirement of state road bonds issued several years ago. Through the increased number of cars registered each year these

fees show an increase of approximately 10 per cent per year.

When all truck highways are adequately improved, we may expect to realize much greater benefits from the competition which they make possible, and also get a large revenue from the bus and truck lines for the state highway fund. But this revenue will not come in until after the roads are built. Advocates of the proposed \$60,000,000 road program contend it would be good business to anticipate some of these revenues.

APPROXIMATELY 270,000 motor vehicles have been or will be licensed in Colorado this year. Let us presume each Colorado licensed vehicle travels this year an average of 3,000 miles, a low figure. Then the total licensed will travel 810,000,000 miles during the year.

On a basis of a speed of 33 miles per hour, tests in several states have shown that the cost of gasoline and tires over a rough road used in experiments was \$35.10 per thousand miles for an average four-cylinder car loaded. The cost for the same car running at the same speed over a paved highway was found to be \$12.80 per thousand miles.

Let's boost it \$2.30 to \$15.10 per thousand, just for easy figuring. Then there is a saving of \$20.00 per thousand miles on the smooth roads. At that rate, Colorado motor vehicle drivers on the 810,000,000 miles, paid over sixteen million dollars extra because they had to travel over rough roads. They did the same last year and years before, and will probably do it for a few years more.

"Yet a lot of folks shy at any proposal to increase the road fund of the state. Study the issue squarely and one must be convinced that we have been doing some mighty poor financing," said a good roads booster. "It's about time the rough roads were pumping a little sense into us."

Reduced maintenance costs on the paved roads constructed under the proposed good roads program to be voted on by the electorate in November, it is claimed by road officials, will offset the interest to be paid on the paving certificates.

Thus the motorists of the state will receive the full benefit of the saving they will make in the reduced operating costs of their cars in traveling over paved highways.

Black Mesa Road Under Construction

CONSTRUCTION of a new highway over the Black Mesa from Sapinero to Delta has been started by the state of Colorado.

A steam shovel, owned by the Highway Department, having completed its work on the Blue Mesa Road, has been moved over to the new Black Mesa project, and is now throwing dirt along the new survey. This work is being done in keeping with an old agreement made by citizens of the district through which the new highway will run.

Advocates of the construction of the Black Mesa project claim that this new road is "destined to be one of the world's most scenic and useful mountain highways." The steam shovel is working near Sapinero on the first link of the survey. The road leaves the main Pikes Peak Ocean-to-Ocean Highway at Sapinero, and follows along and under the rim of the Black Canyon of the Gunnison River; passes around the point of the Black Mesa to Crystal Creek, where it will connect with State Highway No. 92, which runs through the rich North Fork Valley of the Gunnison River to the city of Delta, where it again connects with the main P. P. O. O. Highway.

The Black Mesa road will serve all the rural communities as well as the towns and cities of Paonia, Hotchkiss, Crawford, Maher, Austin, Cedaredge, Delta, Montrose, Olathe, Grand Junction, Sapinero, Cebolla, Iola and Gunnison.

The first town touched after leaving Sapinero is Maher, and then comes Crawford and Hotchkiss, where it connects with State Road No. 135, which runs from Hotchkiss, through Paonia, Bardine, Redstone and Carbondale to Glenwood Springs. For the first twenty miles after leaving Sapinero, there is considerable heavy excavation work to be done. This can all be handled by steam shovel. The new road has been dedicated as State Road No. 92.

Officials of the State Highway Department have given assurances that the work on the new highway will be pushed as rapidly as funds will permit.

Pioneers of the Western Slope and road engineers who have examined the location of the new Black Mesa

Highway, say that it will be a forward step in solving winter travel problems across the Rocky Mountains, as the new road will serve as one of two connecting links with the Cochetopa Pass, which is one of the few all-winter passes.

Many years ago, before the Blue Mesa Road between Sapinero and Montrose was started, there was a contest between the advocates of the Blue Mesa project and those who favored the Black Mesa project, to see which of these two projects would be constructed first.

This contest resulted in a deadlock, as each project had sufficient strength to block the other. After all parties saw that the continuation of the deadlock was retarding the progress of the entire Western Slope, an agreement was reached whereby the Blue Mesa Road would be built first.

This agreement was reached at a conference held in the old Congress Hotel in Pueblo, and it was drawn up in writing and signed by the interested parties. The Blue Mesa was constructed first because it serves the largest territory. At present the work on the Blue Mesa has practically been completed. It is now being gravel surfaced.

A portion of the new Black Mesa Road lies within the United States Forest, and officials of the government have agreed to construct the road within the boundaries of the Forest Reserve, in accordance with an agreement that the state

take care of the construction outside of the reserve.

A large majority of the old pioneers of the Western Slope country have a very warm place in their hearts for the Black Mesa Road, because most of them went into that country in the early days over the Black Mesa Indian Trails. It is along the route followed by the Indians that the new road will be constructed. All road engineers know that while the Indians had no instruments for surveying a road, they were uncanny in their capacity for selecting routes that would get them through the country at all seasons of the year.

For several miles the new road follows the north rim of the Black Canyon, giving a good view of the

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Curecanti Needle, midway of the Black Canyon of the Gunnison, is an isolated sharp spire of rock, near which the new Black Mesa Highway will be constructed.



The new Federal Aid bridge, which spans the Colorado River near Parshall. This bridge forms a part of the Byers Canyon project, recently opened to traffic. It is one of the many improvements being made in Colorado along the Victory Highway.

Nomadic Americans

PROBABLY more than 40,000,000 American car owners will take the family car this summer and point its nose toward some spot the family has been reading or thinking about all winter. Some of these spots will be thousands of miles from home, others will be but a few hours' drive from the front walk. But averaging these trips by and large these nomadic car owners will spend along the way some \$3,500,000,000 in exchange for chicken dinners, waffles, gasoline, oil, repairs and broken springs.

Year by year the horde grows more numerous. Year by year the family trip lengthens out from a few miles to a few hundred and then a few thousand. As more and more families become acquainted with the pleasure in motoring carefree along our highways, trips increase in length, time on the road lengthens from days to weeks, and money spent mounts from a few dollars to several hundred.

In the old countries, motor touring is confined largely to two classes of tourists—those who drive from town to town and live in hotels, and those who set out for some distant point and drive swiftly to their destination.

In this country, however, the classifications are more numerous and by the same measure more interesting. There are those who desire to visit some park, city, relative, etc. Maps are consulted and a route which it is hoped will give the most comfort and least trouble is planned. The trip is a matter of getting to the end

of the journey as quickly, but as interestingly, as possible. Then there is the motor tourist who has in mind several things to see and plans his tour to take in as many cities and points of interest as possible within the time limit. He may camp by night or patronize hotels along the way. He may cook most of his meals on a portable gasoline stove, or eat from lunch counters and hotel restaurants. Regardless of how he lives, he leaves many dollars behind him as he goes along. Another tourist is the true nomad who travels hither and yon across the land, by good roads and bad, spending weeks or months on tour. And there is the short tour traveler who makes many trips during the year, but is the freest spender since he has income to boost up his expenditures between trips.

But all of these tourists are becoming road wise. No longer are they content to travel from point to point without regard to the road. Trips are planned today with the condition of the road always to the fore and in most instances with the determination to stick to pavement as far as possible.

This road-mindedness can be capitalized. The travel bureau, or city, or historic spot desiring to attract tourists can point out how good its roads are and how easy it is to get there. Towns and cities are recognized as touring centers on the basis of the paved roads leading into and out of them. Even national parks and whole states enjoy favorable tourist patronage because of a large mileage of paved roads.

How Autos Are Distributed Among Different States

THERE is one car for every 4.38 persons in Colorado. Kansas tops the list, however, with one automobile for every 2.9 persons. In point of car numbers New York, which is also the largest state in population, heads the list, while Colorado ranks twenty-seventh.

Naturally, one would find the greatest increase in registration during 1927 in the Empire State and such is the case. Colorado, in point of increase, ranks fifteenth. Cars have increased in 1927 over 1926 more rapidly in North Carolina than in any other state. Colorado, with an increase of 8.0 per cent, is eighth on the list.

In only two states have registrations decreased. Both of these are in the south, one is Florida and the other Arkansas. With one car to every 4.38 persons Colorado ranks eighth in the number of cars per population.

The National Automobile Chamber of Commerce presents a table showing the number of cars registered in each state, the numerical increase, the percentage of increase and the number of persons per motor car. The increase in registrations in 1927 over 1926 for the whole United States was 1,125,922, bringing the total number of cars and trucks in this country up to 23,127,315, an increase of 5.1 per cent over the preceding year.

There is now one car for every 5.12 persons, or practically one car for every family, in the country. Below is the car registration by states and the rank of each state together with the numerical increase in registrations for each state.

TABLE I
Registration for 1927

1	New York	1,937,918
2	California	1,693,195
3	Ohio	1,570,734
4	Pennsylvania	1,554,915
5	Illinois	1,438,985
6	Michigan	1,154,773
7	Texas	1,111,407
8	Indiana	813,637
9	Iowa	704,203
10	Wisconsin	698,289
11	Massachusetts	614,359
12	Missouri	682,419
13	New Jersey	712,396
14	Minnesota	646,682
15	Oklahoma	503,126
16	Kansas	501,901
17	North Carolina	430,499
18	Florida	394,734
19	Washington	384,583
20	Nebraska	373,912
21	Virginia	337,607
22	Georgia	300,635
23	Tennessee	294,567
24	Kentucky	285,621
25	Connecticut	281,521
26	Maryland	270,935
27	Colorado	268,492
28	Louisiana	255,000
29	West Virginia	245,819
30	Oregon	244,572
31	Alabama	243,539
32	Mississippi	218,043
33	Arkansas	206,568
34	South Carolina	199,635

35	South Dakota	169,552
36	Maine	163,623
37	North Dakota	160,701
38	Rhode Island	118,014
39	Montana	112,735
40	District of Columbia	111,680
41	Idaho	101,336
42	New Hampshire	96,009
43	Utah	93,976
44	Arizona	81,047
45	Vermont	79,527
46	New Mexico	59,291
47	Wyoming	51,955
48	Delaware	47,124
49	Nevada	25,776
Total U. S.		23,127,315

TABLE II
Numerical Increase

1	New York	122,484
2	Pennsylvania	99,731
3	California	92,720
4	Ohio	90,488
5	Illinois	68,482
6	Texas	61,538
7	New Jersey	60,981
8	North Carolina	45,452
9	Indiana	41,311
10	Wisconsin	36,007
11	Michigan	35,988
12	Missouri	27,865
13	Georgia	23,167
14	Washington	21,304
15	Colorado	19,879
16	South Carolina	18,446
17	Connecticut	18,286
18	Maryland	18,083
19	West Virginia	17,983
20	Alabama	17,609
21	Minnesota	16,397
22	Louisiana	15,500
23	Virginia	14,993
24	Tennessee	14,928
25	Mississippi	12,843
26	Maine	12,137
27	Oregon	11,004
28	Kansas	10,625
29	Montana	8,777
30	Utah	8,596
31	Arizona	7,365
32	Rhode Island	7,268
33	Nebraska	7,139
34	New Hampshire	7,008
35	Idaho	6,576
36	Vermont	6,464
37	Iowa	5,205
38	New Mexico	4,295
39	Kentucky	4,064
40	Massachusetts	3,917
41	Oklahoma	3,188
42	North Dakota	2,879
43	Delaware	2,290
44	Wyoming	2,072
45	Nevada	1,762
46	South Dakota	1,322
47	District of Columbia	183
48	Florida	-6,828
49	Arkansas	-2,851
Total U. S.		1,125,922

Naturally, the state that has the most population should have the greatest number of cars. Consequently, the fact that New York heads the list in car registrations is not surprising. Pennsylvania, which is the second largest state in population, ranks fourth in car numbers, being preceded by California and Ohio, which respectively rank seventh and fourth in the population column. In numerical increase, however, Pennsylvania is number two. Colorado is state number 33 in population, 27th in car registration and 15th in numerical increase.

A comparison of the registrations and numerical increase will not only prove interesting, but as car sales, to a certain extent, reflect economic conditions one can gather some idea of the prosperity which obtained in each commonwealth. The decrease in car registration in Florida, no doubt, is largely due to the slump in real estate and the general business conditions of that state.

The best index of economic conditions will be found in Table No. 3, which presents the percentage of increase in car registration over 1926. The average increase for the country is 5.1. Delaware, which is the 31st state in the table, shows an increase of 5.1 per cent. Thirty states show an increase of from 5.3 per cent to 11.8 per cent. The states falling below the general average of the country are largely agricultural commonwealths. Massachusetts, the 46th state, is probably the only exception. On the other hand, many of the southern states like North and South Carolina show a tremendous increase.

Table No. 4 gives the average car ownership in each state. The 25th state is Illinois with an average of one car for every 5.81 persons. An examination of the first twenty-five states out of the forty-nine states shows that more cars are owned per population in the agricultural states than in the industrial states. In fact, unless one considers Ohio an industrial state, the first 25 states rely wholly on agriculture as their basic industry. Car ownership, on the other hand is more sparse in the southern than in the northern states. The nine states ranking lowest are all south of the Mason-Dixon line. The only southern states ranking above the twenty-fifth are Florida, Texas, Arizona and Missouri. The scarcity of cars in the southern states may be generally attributed to the large colored population of that territory. The study of the tables presented will no doubt disclose many other interesting comparisons.

TABLE III
Percentage Increase

1	North Carolina	11.8
2	South Carolina	10.2
3	Utah	10.1
4	Arizona	10.0
5	New Jersey	9.4
6	Georgia	8.4
7	Montana	8.4
8	Colorado	8.0
9	Maine	8.0
10	New Hampshire	7.9
11	West Virginia	7.9
12	Alabama	7.8
13	New Mexico	7.8
14	Vermont	7.4
15	Nevada	7.3
16	Maryland	7.1
17	Connecticut	6.9
18	Idaho	6.9
19	Pennsylvania	6.9
20	Rhode Island	6.6
21	Louisiana	6.5

22	Mississippi	6.2
23	Ohio	6.1
24	Texas	5.9
25	Washington	5.9
26	California	5.8
27	New York	5.7
28	Wisconsin	5.4
29	Indiana	5.3
30	Tennessee	5.3
31	Delaware	5.1
32	Illinois	5.0
33	Oregon	4.7
34	Virginia	4.6
35	Missouri	4.2
36	Wyoming	4.2
37	Michigan	3.2
38	Minnesota	2.6
39	Kansas	2.2
40	Nebraska	1.9
41	North Dakota	1.8
42	Kentucky	1.4
43	South Dakota	0.8
44	Iowa	0.7
45	Oklahoma	0.6
46	Massachusetts	0.6
47	District of Columbia	0.2
48	Florida	-1.7
49	Arkansas	-1.4
	Total U. S.	5.1

TABLE IV
Persons Per Motor Car

1	Kansas	2.96
2	California	2.99
3	Iowa	3.72
4	Nevada	3.79
5	Oregon	3.98
6	Nebraska	4.07
7	Florida	4.09
8	Colorado	4.38
9	North Dakota	4.42
10	Michigan	4.49
11	Indiana	4.51
12	South Dakota	4.55
13	Minnesota	4.75
14	Washington	4.78
15	Wisconsin	4.79
16	Vermont	4.81
17	Ohio	4.88
18	Wyoming	5.29
19	New Hampshire	5.45
20	Oklahoma	5.47
21	District of Columbia	5.50
22	Texas	5.58
23	Arizona	5.75
24	Missouri	5.75
25	Illinois	5.81
26	Maine	5.96
27	Maryland	6.00
28	Delaware	6.38
29	New Jersey	6.39
30	Idaho	6.45
31	Utah	6.47
32	New Mexico	6.80
33	Connecticut	6.85
34	Massachusetts	6.90
35	New York	7.03
36	Rhode Island	7.12
37	Pennsylvania	7.18
38	North Carolina	7.42
39	Montana	7.53
40	West Virginia	7.79
41	Virginia	8.82
42	Louisiana	8.95
43	Mississippi	9.12
44	Tennessee	9.23
45	Kentucky	9.91
46	South Carolina	10.27
47	Arkansas	11.01
48	Alabama	12.01
49	Georgia	12.07
	Total U. S. Cars	5.86
	M. V.	5.12

Stop, Look and Listen!

DURING the past ten years 20,427 persons have been killed and 57,625 seriously injured in highway grade crossing accidents on major steam railroads. The figures do not include grade crossing accidents occurring on smaller steam railroads or on electric and oil lines.

These figures were made public today by the American Road Builders' Association as part of its national highway safety campaign. The association points out that while the number of fatalities has increased steadily since 1918, the comparative number of deaths has been decreased. In 1918 a total of 1,852 persons were killed in these accidents as compared with 2,371 in 1927. In 1927 there were .94 persons killed per 10,000 motor vehicles as compared with 1.84 persons in 1918.

The decrease in highway grade crossing fatalities has been the result of educational measures undertaken by railroads and co-operating organizations. The American Road Builders' Association declares: "A continued reduction is dependent upon the practice of caution on the part of motor vehicle drivers. Courtesy and caution are the two fundamentals which will eventually bring a noteworthy decrease in all types of highway accidents.

"The two major factors which will contribute toward better conditions at the railroad grade crossings are crossing elimination and individual education. There are approximately 207,000 unprotected grade crossings on major steam railroads alone. It is economically impossible for the complete elimination of these crossings within the very near future. It is possible, however, to eliminate the most dangerous crossings and at the same time continue the education of the motoring public in the value of courtesy and caution when approaching these hazards.

"It is a regrettable fact," the American Road Builders' Association continues, "that 238 persons were killed at grade crossings last year as a result of running into the side of moving trains. This demonstrates the gross negligence on the part of some drivers when approaching dangerous crossings. Most inexcusable deaths result from attempts to beat trains to a crossing or approaching at a high speed where the view is obstructed in some degree."

The association urged highway departments and railroads to continue the elimination of grade crossings as fast as economic conditions permit.

"More important," the association adds, "is the practice of the simple code of courtesy and caution on the part of every individual. The engineer of a steam locomotive is virtually powerless to avert an accident when a motor car obstructs the right-of-way. The avoidance of accidents is the duty of the driver of the motor car."

In summarizing grade crossing conditions on major steam railroads, the American Road Builders' Association stated that at the beginning of 1927, there were 206,533 unprotected crossings in the United States. Six thousand one hundred and forty-eight crossings were protected by gates, 7,760 were guarded by watchmen, 6,421 had both audible and visible signals, 5,308 were guarded by audible signals only, and 2,204 had visible

signals only. Of the 235,138 grade crossings in the United States, only 27,747 had any kind of protection.

The above figures do not include crossings located on electric, gas or oil railroads, or on steam railroads of second, third and fourth grades.

Minnesota Maintenance Costs

Maintenance of unpaved trunk highways in Minnesota cost from \$523 to \$2,187 per mile in 1927, according to figures given out by C. M. Babcock, state highway commissioner. The figures, he explains, show the money spent, but do not show the actual cost of gravel road maintenance.

He furnishes the following figures on the expenditures per mile of unpaved road in 1927:

Traffic 150 to 200 cars per day.....	\$ 523.25
Traffic 201 to 429 cars per day.....	554.87
Traffic 429 to 625 cars per day.....	580.89
Traffic 626 to 875 cars per day.....	623.40
Traffic 876 to 1,250 cars per day.....	717.87
Traffic 1,251 to 1,750 cars per day.....	1,490.24
Traffic 1,751 to 2,250 cars per day.....	2,187.18

Maintenance of the paved roads, which carried an average of more than 2,000 cars per day, cost \$351.89 in 1927. This was a little higher than in previous years and higher than the allotment for 1928. Snow fall heavier than normal made the cost of snow removal higher. A large proportion of the pavements were new and the heavy rains increased the shoulder repair item. After pavements are a couple of years old, so that shoulders are compacted and grass-grown, expense for shoulder repair decreases.

Even though the maintenance of paved roads was higher than in the average year, it was \$171 per mile less than the maintenance of gravel roads carrying only one-tenth as much traffic.

Trunk highways in Minnesota are maintained by state forces. This is the first year of state maintenance in Colorado. An efficient system of cost accounting has been installed by the Colorado department and at the end of the year a statement of costs in this state will be issued.

Heretofore, this has been impossible due to the fact that maintenance work has been in the hands of the various counties.

BOETTCHER BUYS SAN LUIS SOUTHERN

Charles Boettcher, president of the Colorado Portland Cement Company and his associates, have purchased for \$50,000, through foreclosure sale, the San Luis Southern Railroad.

The plan of the new owners is to rehabilitate the line and equipment so that operation may be resumed in the spring.

They further plan to extend the road by building a branch to San Luis, the center of a rich agricultural district, and by constructing an extension from the present terminus near the state line to Questa in New Mexico.



1—When Indian Summer lures through color-tones in Western Colorado. 2—Flaming trees and purple haze make for autumn days on Fall River Pass. 3—Adventure's book holds memory of Minnehaha of the Aspens. 4—White-masted ships of Cloudland sail dreamily through the haze of Indian Summer. 5—Like the maize of Indian days, corn today is king, at whose altar the lowly pumpkin kneels. 6—The way to adventure in the Rockies.

Photographs by Denver Tourist Bureau.

Indian Summer

BY WARREN E. BOYER

When burnished gold of the sinking sun is caught by the lowly pumpkin and in the shock of corn, it's Indian Summer in Colorado. The harvest over, the tiller of the soil smokes his pipe of peace, as did the Indian, then restlessly longs for refreshing adventure in the high Rockies.

Automobile Accidents at Railroad Crossings

By HOMER D. HOWARD,
Locomotive Engineer for the Illinois Central Railroad
for Forty-six Years.

I CAN assure you it gives me great pleasure as a locomotive engineer to co-operate with the American Road Builders Association in a convention of highway education and safety. I am interested in this great problem, being a railroad engineer for the last 46 years, now running the finest train in the world—the "Panama Limited" on the Illinois Central. I see accidents, or near-accidents every day with 22,330,000 automobiles in the United States, and over 3,000,000 miles of highway, every year adding more. The yearly toll of accidents has become a national concern. In 1926 there were 233,000 railroad grade crossings in the United States; during this year 2,460 persons were killed in highway grade crossing accidents; 202 killed and 1,430 injured due to drivers running into the side of engines or cars.

Engineers have to serve many years of apprenticeship, pass rigid examinations every two years and keep qualified before they are given charge of a train, transporting human lives. The carelessness of these drivers are fast destroying the nerves of all our engineers, who in the discharge of their duties are forced to sit in their cabs and helplessly watch the locomotive plow into an automobile loaded with men, women and children. Words cannot express the horrible sensation upon the engineer, because in such a case an engineer is a man with human feelings. I believe there should be some physical and mental qualifications for drivers established by law and the unfit weeded out. They imperil your lives on the highways and OUR lives at grade crossings. Examine them every time they have an accident, suspend their license, pending an investigation. If you have never seen anyone killed by a train you do not realize what a terrible thing it is. With the 233,000 highway crossings at grades on railroads the menace of accidents is terrifying. All railway crossings are dangerous; there is no exception to this statement, no matter what safeguards are used—all are liable at some time to get out of order. When a man goes upon a railroad track he knows he goes to a place where he will be killed if a train comes upon him before he is clear of the track. The train cannot stop; he must not rely on hearing the train, but must stop and get out of the vehicle and make sure it is safe to cross. Such are the words of Justice Holmes of the United States Supreme Court, in making a decision. I want to tell you that if you can get the people that run these automobiles to come up to a railroad crossing under control so that they can stop easily, they won't get hurt and we will not have many accidents. They will have to cut out this speeding at railroad crossings and realize that the law requires them to stop and they will stop.

The right to drive any motor vehicle upon a public highway should rest solely upon possession of a license issued under strict regulations, revocable for causes such as incompetency, recklessness, repeated violations of safety, and intoxication. I wish to call your attention to the terrible accident of Engineer Glen E. Duffy, of the Pennsylvania Railroad, living in Terre Haute, Ind. He drives a limited train and for 25 years had never had

an accident, and on a fatal Sunday his train struck a motor car, killing four, and a little later down the road it struck another, killing nine more. He picked the bodies of three little children from his locomotive pilot.

Sunday was his day of dread, and so it is with all of us. Many of our engineers lay off on Sundays, fearful of these horrible grade crossing accidents. There is always the possibility of a bad wreck of the train itself, with more than a chance the engineer, as well as the passengers, will meet with a sudden, horrible death. If the automobile goes under the locomotive, a derailment is almost certain. In 1926, 27 derailments occurred, killing 59 enginemen and injuring 138 passengers.

Those of you who have never had the opportunity of riding in a locomotive cab cannot have the slightest conception of the high tension of an engineer's nerves. Nearly every paper you pick up you see where the life of some human being has been crushed out.

The careless or reckless motorist who gets himself killed at a crossing and exposes the train to the hazard of a costly and terrible wreck is hindering the commerce and welfare of his country.

The man who runs through a crossing gate, ignores warning signals, disregards flagmen and violates all the rules for protecting his own safety, the safety of others and the train itself, is not a good citizen.

The motorists who race with trains and try to beat them over crossings should know our mountain type engines are guaranteed to run 90 miles per hour, if we were allowed to step on them.

Let's all get together and respect the trains' right of way and proceed without hindrance. Let's stop and think about the rights of others and by hearty co-operation make all railway crossings safe for everybody. We do not want to kill people at crossings—it is not a pleasant thought to have with you every minute you are out on your run.

Imagine all of you are engineers and firemen and are taking a little trip with me to Centralia, the end of my run, and you can see what they actually do. It is a rare thing when you get an opportunity of this kind to ride on the engine of the Panama Limited. Nobody but a general superintendent can give you this permission, but I am going to take you with me today.

We are leaving Champaign with a clear track, a solid Pullman train, with the best locomotive on the Illinois Central, and expect to make about 60 miles per hour. WE ARE OFF! with the bell ringing and will whistle for about 300 street and highway crossings on the trip.

At the Dunlap crossing north of Savoy a conductor pulls the air on the train. We stop and find our fellow citizen, who is well known, has run his automobile into the rear portion of the train, hit the last part of the truck on the observation car. After stopping and on investigation we find that he and his family thought the Panama Limited train was so beautiful, and while talking about it, stepped on the gas. No one was hurt. The wheels on his machine were broken, and he said he would



One of the six railroad underpass crossings constructed under the supervision of the state on the Denver and Colorado Springs paved highway. Several persons were killed at the crossing which this underpass eliminates. During the past seven years more than sixty dangerous railroad crossings have been eliminated in Colorado by the construction of underpasses such as that pictured above, or through realignment of the roads.

pay the damage. However, the Illinois Central set the observation car out at Carbondale, estimated at a loss of \$300 for the use of the car and inconvenience of our passengers.

At Pesotum an automobile full of people come from behind an elevator and cross the track just ahead of the train, barely escape being struck.

At Arcola the school is just out and the children run across just ahead of the fast train, under the crossing gates.

At Humboldt an automobile loaded with people stalls on the south crossing. A man jumps out and pushes the car back off the track a few feet. A narrow escape.

At Dorans an oil truck containing about 600 gallons of gasoline pulls across ahead of us and escapes by a few feet. If we had hit this 600 gallons of gasoline it surely would have caught fire from the firebox and burned us all up, and the train also. This was a very bad experience.

Two miles south of Dorans, on the country road, a man with a big car tries to make the crossing ahead of us and stops with the two front wheels on the track. It being up-grade on the crossing, and he lets brake off, the car slides back about two feet and he escapes, but we stop the baggage car right at the crossing. The baggage-man asks him why he did this, and he says he has as good a right on this crossing as we have. The baggage-man motions for me to come back. I go back to see what he wants. I said to the man: "What did you do this for?" and he answers: "To beat you over the track, but I lost my nerve—I should have been killed, and I am much obliged to you." We accept his apology and proceed.

At Effingham a crowd of young people have a close call. They come up from fireman's side and we only miss them about 20 or 30-feet. After crossing over they stop to wave at us as we pass by.

At Edgewood, on double track, a long freight train

is on the other track, the caboose nearly over the main street crossing. We whistle loud, but one automobile crosses and just pulls over the track by 4 or 5 feet. *Another narrow escape.*

At Odin an automobile truck from Salem, coming from the east, parallels the road for about 300 yards. Now the fireman will give us a signal to blow the whistle, and we blow the whistle loud and set the brakes in full emergency. The truck crosses ahead of us, but we catch the rear wheels with the pilot and kill one young man and injure another. We are delayed here 30 minutes putting the injured person in the baggage car and leaving the body of the other man in charge of the coroner and undertaker.

We are now arriving at Centralia, nearly one hour late. We see a street car passing over ahead of us and reduce our speed to about 15 miles per hour, and then a Ford coupe, with a man and wife, stalls on Broadway crossing, but we stop the train about 20 feet from them. The man has the brakes set so hard on the car that it takes five or six men to push the car off the track. We get a nice write-up in the Centralia paper for not killing them.

This is just what happens to an engineer on these fast trains, and do you wonder when an engineer observes an automobile coming towards the track that he immediately begins to get nervous? DO YOU WANT ME TO BRING YOU BACK? No! No! NO!

Louis I. Emerson, Secretary of State, says:

"The grade crossing accident is, in almost every instance, due to carelessness. Through the co-operation of the railroads, the Interstate Commerce Commission, and the Federal Bureau of Roads a check was recently made on more than 1,000,000 automobiles as they crossed railroad tracks, and a large percentage of the drivers were found to be guilty of extreme recklessness, including failure to observe crossing warnings, failure to reduce

(Continued on page 19)

NEWS OF THE MONTH

Current Events in the Field of Highway Engineering and Transportation—State, County and Municipal Activities

H. C. Lallier Const. Co., of Denver, were successful bidders for the construction of an overhead railroad crossing and 1.224 miles of concrete pavement located three miles south of Aguilar on State Road No. 1. The project includes 42,100 cubic yards of borrow fill, and 13,110 cubic yards of concrete paving. The contractor agrees to complete the job in 120 working days. Lallier bid \$2.20 per yard on the concrete, and 22c for the borrow. This project connects with other paving completed and under construction between Trinidad and Aguilar. It will eliminate a bad grade crossing when completed. The total bid price was \$66,990.

Engler & Teyssier, Durango contractors, have been awarded a contract for the construction of 2½ miles of gravel surfacing north of Pagosa Springs on State Road No. 10. Their bid was \$38,426. Eighty working days are required for the job. This project connects with other work being carried on by the state highway department on Wolf Creek Pass, eliminating a bad stretch of roadway when wet.

The Gilmore Oil Co., of Los Angeles, has been given a contract to furnish 230,000 gallons of asphaltic oil for use on Federal Aid project No. 286-B. This project is a "turn-over" oil job sixteen miles in length on State Road No. 1 in Weld County, located north of Carr to the Wyoming state line. The oiling process will start about September 20.

C. V. Hallenbeck, Rifle contractor, was the low bidder for the construction of 3.663 miles of grading on State Road No. 19, north of Ouray. This project connects with the work previously completed on the "Million Dollar Highway," and will eliminate the steep grades and sharp turns now encountered north of Ouray. Hallenbeck's bid for the completed job was \$62,997. There is 22,100 yards of rock excavation on the project, this being the largest item, on which he bid a unit price of \$1.10.

The S. & S. Const. Co., of Greeley, was the successful bidder for the construction of one mile of concrete pavement located east of Kersey on State Road No. 2. Their bid was \$25,269 for the completed job. The largest item in the project is 11,870 square yards concrete pavement, on which the low unit bid was \$1.97.

Hinman Bros. Const. Co., of Denver, were low bidders on 750 feet of rock-filled bulkhead bank protection for the Yampa River bridge south of Craig on State Road No. 13. The total bid was \$11,925.

Work has been started by E. J. Maloney, Madison, S. D., contractor, on

five miles of gravel surfacing located south of Cortez in Montezuma County on State Road No. 106. Maloney's bid for the work was \$59,447. The largest item in the bid was 10,180 cubic yards of gravel surfacing, on which Maloney bid \$1.25. The price includes drainage structures and one small bridge.

C. A. Sweitzer, Arvada contractor, has been awarded a contract for the construction of two bridges on State Road No. 96, located six miles west of Pueblo. One of the bridges will be a 135-foot I beam structure with approaches at Rock Creek, while the other consists of a double 10 feet by 3 feet double culvert and approaches at Boggs Creek. Sweitzer's bid for the two structures was \$14,976. These projects are located on the Rye-Beulah road, which connects Pueblo with the San Isabel National Forest.

A large crew of workmen are now engaged by Tobin & Maloney in gravel surfacing the new roadbed constructed across the Southern Ute Indian reservation in Montezuma County, south of Cortez. Twenty trucks are a part of the equipment being used. This new road connects with a recently completed gravel highway constructed by the New Mexico highway department north from Gallup, through Shiprock, to the Colorado state line.

Steps toward construction of one of the most beautiful approaches to any city in the country have been started by the Boulder post of the American Legion in plotting the Road of Remembrance, running east from Boulder to the junction of the Boulder paved road with the Lincoln Highway. Where weeds and grass

now grow along the side of the road, varicolored hollyhocks and red poppies will blossom. Plans also call for the planting of evergreen trees along the length of the highway, which will all be paved by next year. Six miles of the pavement is now under construction by the state highway department.

Plans have been completed for the construction of eight miles of gravel surfacing south and west of Mack on U. S. Highway No. 50, in Mesa County, near the Utah state line. This eliminates the worst stretch of road in that section.

Improvement of New Mexico's section of Cumbres highway has been started. The one-yard shovel employed on this work was unloaded at Antonito, Colo., and sent overland to the work. When the work is completed the roadbed will be 24 feet wide with 30-foot curves. This new road will give another route to the Mesa Verde National Park, via Durango. From Chama south the road connects with a through route to Santa Fe.

The Ward-Peaceful Valley and Gold Hill roads in Boulder County are now open to traffic. The scenic trip available to motorists over Gold Hill is considered one of the best short trips in that region. All stiff grades of the old road have been eliminated.

An experimental mile of "oil process" highway has been laid north of Alamosa. If the experiment proves a success plans call for the paving with oil of the remaining seventeen miles between Alamosa and Monte Vista.

Showing modern equipment being used by the State Highway Department in rebuilding shoulders of roads destroyed by heavy rains in southern part of the state.



Six miles of the Golden Rod Highway, south and east of Brush, has been completed by Morgan County. Grading on six more miles on same road is now under way. This is the main-traveled road between Brush and Wray in Yuma County.

J. Finger & Son, Denver contractors, have been awarded a contract for the construction of 1,633 miles of concrete paving through the town of Aguilar in Las Animas County on State Road No. 1. There will be 17,155 square yards of concrete pavement in the project. Finger's bid was \$2.20 per square yard on the concrete. The total cost of the project will be \$66,600. With the completion of this project the total mileage of pavement north of Trinidad will be twenty miles. As funds become available the pavement will be extended further north into Wal-senburg.

At the present time the state highway department is expending approximately \$30,000 daily in the construction of good roads. A total of \$6,607,164 was available at the beginning of this season for construction of Federal Aid and state projects. Contracts for scores of state projects have been let and the work is in full swing in every section of the state. More than a dozen state and Federal Aid projects have been let on contracts during the past month.

A recommendation that Colorado's traffic laws be revised in accordance with the national safety code compiled by the Hoover committee of the U. S. Department of Commerce will be made to the next general assembly. A special committee has been at work on the code for several months. Increase of the speed limit on Colorado roads to 45 miles per hour is one of the features of the new code. Colorado's limit is now 35 miles per hour on plains roads.

Much interest among all classes of motorists has been aroused over the proposed \$60,000,000 road program which is to be voted on at the November general election. The money to be raised from the issuance of road certificates will be repaid from revenues derived from gasoline and motor vehicle fees. The proposal has received favorable consideration from a majority of the vehicle owners.

The bus and gas taxes from trucks and busses operating under permits from the State Utilities Commission total \$45,000 the first six months of the year. Fifty per cent of the collections went to the state highway fund, the other half to the various counties.

J. R. Cheney, division engineer, made an inspection trip over the oil roads in New Mexico in August. He believes the new oil method which is being used on two projects in the San Luis Valley will prove a success. He points out that it eliminates the dust nuisance and that water rolls off the road the same as it does a duck's back.

With the end of the present season thirteen miles of pavement west of Fort Morgan toward Greeley will be completed. Edw. Selander, contractor, has already started work on a five-mile project west



View of Hot Sulphur Springs, showing old wooden bridge over the Colorado River which was abandoned when the new road was constructed through Byers Canon. Bridges such as these are rapidly being replaced with modern steel structures all over the state.

of Fort Morgan. The new paving will give a continuous ribbon of paving from thirteen miles west of Fort Morgan, to Sterling, by way of Fort Morgan and Brush.

The highway department expects to complete sixty miles of concrete pavement this season on various main highways. This is the largest amount of such hard-surfacing that the state has ever undertaken in one year and the cost of this work will run well over two million dollars. Other work is being done in proportion.

Bondad Hill is no more. This difficult stretch of road between Durango and Aztec, New Mexico, has been improved by grading. The Salle Const. Co. is finishing up on 2½ miles of the new project.

Ed. Honnen, Colorado Springs contractor, is turning dirt on the last stretch of new road to be located between Idaho Springs and Echo Lake in Clear Creek County. The new road connects with the Mt. Evans road at Echo Lake.

Experiments with rock asphalt, a new road material from Utah, is being made at the East Eighteenth Avenue entrance to City Park, Denver. The rock is crushed before shipment. When placed on the ground it is cold pressed, instead of heat pressed.

Two and one-half miles of new paving between Hillrose and Brush has been opened to travel and Sterling is now connected with forty-six miles of highway paving on the route to Greeley. The paving is continuous from Sterling to a point four miles west of Fort Morgan, with the exception of a small stretch at the railroad crossing at Beta and another stretch of three miles from the Camden railroad crossing into Brush. Plans for

the paving of these stretches are already under way.

The new steel bridge over the Colorado River below Hot Sulphur Springs, located at the west end of Byers Canon, is now open to traffic. This is one of the best structures of its kind on the state highway system.

SEVENTH ASPHALT PAVING CONFERENCE TO BE HELD IN NEW ORLEANS

At a recent meeting of the Board of Directors, held in Chicago, New Orleans was chosen as the city in which the Seventh Annual Asphalt Paving Conference, a nation-wide convention of asphalt chemists, engineers, producers, distributors, salesmen and contractors, as well as public officials interested in studying the latest methods evolved in constructing street and road pavements, will be held during the week of December 10, this year. New Orleans was selected over a number of other cities which campaigned for the meeting for nearly six months, including Havana, Montreal, Detroit, Atlantic City, Philadelphia, Cleveland, Minneapolis, Chicago and West Baden, Ind.

The American Association of Asphalt Paving Technologists and The Asphalt Association, as well as other organizations, will hold their annual meetings in New Orleans in connection with the conference. It is expected that from one thousand to fifteen hundred engineers and federal, state, county and city road officials, as well as asphalt producers, contractors and machinery manufacturers will attend. The program will consist of discussions extending over a period of several days and will relate to the latest, most effective and most economical methods evolved for the construction of the several types of asphalt paving.

FROM THE PRESS AND THE PEOPLE

HIGHWAYS SHOULD BE PATROLLED

This writer is no crank about the matter of speeding on the highways, but narrowly averting an accident on a mountain road, just wide enough for one way traffic, calls again to our mind the advisability of more police supervision of the highways.

Perhaps a state constabulary is not a popular thing. We haven't had enough people killed by reckless, drunken driving. Not enough bank robbers, murderers and other criminals have been able to elude posses, but if more of the kind is what we need, we may be of good cheer, as the list is being added to every day.

There are a number of points upon which we have not been able to find ourselves in accord with the ideas of our recent governor, Oliver H. Shoup, but the maintenance and development of a state constabulary is not one of those points. If ever a man was right about anything, Oliver H. Shoup was one hundred per cent right in holding forth for a mounted police organization to patrol the roads of Colorado. Call them state constabulary, enforcement officers, or whatever you may like, a police force of some kind on the state highways has already become a practical necessity, and the need for such an organization is growing every day.—Durango Democrat.

BENEFITS OF GOOD ROADS

In good roads, as in so many other ways, the United States leads the world. The splendid, safe highways that are common to us, would in many other countries be considered miracles. We can cross entire states, and go from coast to coast, without encountering dangerous roads.

No public investment pays better. A city with good streets is an attraction to industry and homeseekers; our mountain and country highways, aside from their more practical uses, are a constant invitation to investigate new parts. We have come to depend on these good roads and they are now necessities of business and pleasure.

Plans are being made for a highway from this country to South America, to be the longest in the world. The possibilities of such a connection are enormous in building international good-will, in making it easy for foreigners to see and understand the United States, and for us to do the same.

Good roads bear the same relation to a nation as the arteries do to the human body; they give us life and national health, industrially and physically.—Canon City American.

HIGHWAY CONTRACTORS RESPONSIBLE

The supreme court of the state recently handed down a decision which holds that contractors on highway construction are responsible for accidents, even if the automobile driver is careless, if dangerous places in the road work are not

marked. It seems obvious that the court was right in reversing a lower court and so holding.

The circumstances of the case were unusual. It was shown that the driver of the automobile invited a friend to accompany him. The driver was traveling at an excessive speed and was not watching the road. In the accident which resulted the passenger was killed.

The accident occurred on the Denver-Colorado Springs highway, which for years has been a very troublesome one to motorists. Numerous paving contracts have been under way and even the most cautious driver was likely to find himself in the midst of a construction gang or mired on a detour. The contractors were Lanier, Selander & White, well known in this district and who have done notably good work on state paving contracts. One of their construction crews, according to the evidence, failed to place the required red lights and other warning signals.

Highway contractors are under heavy responsibility.—Sterling Advocate.

PLAN TO COMPLETE HIGHWAY EXPLAINED

This will give us 3,800 miles of hard-surfaced or well-traveled roads, reaching all over the state.

Ten million dollars a year distributed for labor and material.

The entire issue will be paid in less than fourteen years, by the motorist.

The motorist today pays \$10.00 in maintenance of car, and tire wear for each extra dollar he will pay for this increased tax on gasoline.

Last year the secretary of state issued less than 20,000 guest tags; Arkansas issued 150,000, and we have many times the attractions that Arkansas has, but Arkansas has been spending \$13,000,000 a year on roads to be paid from a 5-cent gas tax.

Eighteen states now have a 4, 4½ or 5-cent gas tax which goes to pay for roads.

With good roads through Colorado, we should have 200,000 visiting cars annually who would pay about 25 per cent of the total cost.

Other states are proving this plan successful and getting the tourists.—Boulder Camera.

TRAFFIC CONTROL NEEDED

The numbers of automobiles are increasing amazingly. Notwithstanding all the complaints there may be about dull business and hard times engineered by the political "outs," the saturation point in automobile markets appears to be a myth. The registration of automobiles gains from year to year out of all proportions to the increase of population.

There are, however, the same old streets for the new people and the new cars. Year by year and month by month the regulation of traffic becomes a greater problem. Notwithstanding this fact, some progress is being made. Gradually, out of all the confusion of varied plans and local effort without co-ordination, there is evolving something of a standard of regu-

lations. If the motorist knows and observes the rules, he is comparatively safe, both in the physical and the legal sense.—Sterling Advocate.

S40 HIGHWAY IS IN SPLENDID CONDITION

Never before has the S40 highway been in such splendid condition as it is at the present time, with its graveled surface and good high grades. The tourists coming over it say that it is the best they have traveled. There are less than twenty miles of this highway that is not graveled between Salina, Kansas, and Denver, and this small stretch is being put in shape just as fast as the districts can get at them. The travel over S40 in recent days is proof that our road is the best direct route between Kansas City and Denver. It is the straightest, smoothest and fastest.—Cheyenne Wells Record.

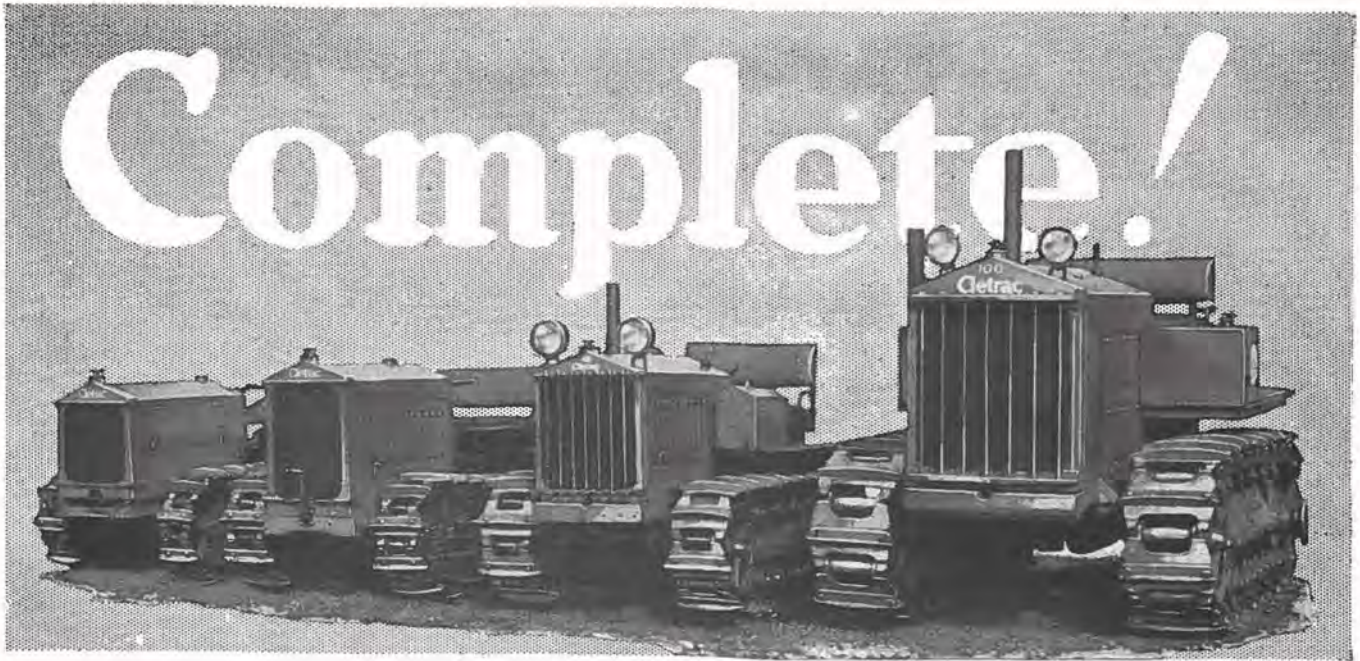
We are beginning to brag that we have the finest highway system in the world. This may be true, but still we have the greatest mileage of highways to build and maintain, so the bragging is not of much use, until every interstate highway in the country shall have been built to a high standard of perfection, with a permanent and competent maintenance plan in operation. As far as this part of the country is concerned, its highways are a long ways from being completed. We must see that the eastern states, that have secured theirs already are kept informed of our lack of roads until we get what is needed. We should keep before our eastern congressmen this fact and see that the Colton-Phillips Bill or another equally pertinent to the isolated sections of the country become a law.—Monticello Record.

GOOD ROADS YEAR IN COLORADO

The public pays for good roads, whether it gets them or not, and if that fact could only be impressed, the problem would be ended. People would demand value for every dollar spent. It is on this basis that a new highway construction program has been drawn up and is now being presented to voters.

Colorado got a good start in modern road-building, then quit. Meantime, other states, realizing the dollars and cents savings made possible by permanent highways, went ahead. These latter states now have fairly well-completed highway systems. Colorado has a patch work. Yet the real burden of cost falls on the state. It is paying for modern highways as certainly as others, but others have the highways and Colorado has not.

Money spent on hard-surfaced roads is not an extravagance; on the contrary, it is an economy. More money in the end is paid out trying to maintain natural roads than would be paid for hard-surfacing. At the same time every motorist pays an added amount for maintenance and operation of his car over poor roads. The savings permanent highways make possible will more than pay for their construction.—Brush Tribune.



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HIGHWAY DEPARTMENT'S NEW "NAIL PICKER" AN INTERESTING MACHINE

The highway department, with the co-operation of H. R. Andrew, of the Spring & Forging Company, of Roswell, has developed a very interesting and a very useful machine—an electro-magnet "nail picker." It is the first machine of this character to be constructed in New Mexico.

The machine consists of an electric generator connected with a powerful electro-magnet mounted on a truck. The magnet is suspended about six inches from the ground; it is operated by a Ford engine. This machine may be operated with efficiency at a speed of 8 to 10 miles per hour.

The initial test run of the new "nail picker" was made between Roswell and Dexter, 16 miles distant. On this trial round trip the magnet picked up 70 pounds of tacks, nails, screws, bolts, horse-shoes, pieces of broken springs and other metal, all of which is potential puncture material. It is believed fully 90 per cent of the causes of tire punctures can be removed from the roads by this machine. B. F. Kelly, highway district engineer at Roswell, estimates that the entire 5,042 miles of highways in New Mexico under maintenance might be cleared of this objectionable material at a cost of approximately \$2,500.00. It would require four or five months for one such machine to cover the entire mileage maintained. The cost of operation is 50 cents per mile of road covered. A double trip is necessary to completely clear the whole roadway.

Some idea of the power of the magnet may be gained from tests made of its drawing capacity. The magnet lifted a 12-foot grader blade weighing sixty pounds. A man standing on either end of the blade proved insufficient to completely pry the blade from the magnet. One man's strength was not enough to remove from the magnet a piece of 2"x2" bar iron weighing about ten pounds.

On a recent trial in Roswell, the machine is said to have removed everything of metal from the streets except the manhole covers. It is humorously suggested that small steel bridges must be thoroughly anchored and pipe lines buried deep before the "nail picker" may safely pass over the road.

The machine was constructed and the truck equipped by the Spring & Forging Company and the attendant electrical work performed by the Bonney-Danenberg Electrical Company, both of Roswell.

U. S. TO PLAY HOST TO EUROPEAN ROAD BUILDERS IN 1930

Leading highway officials from all parts of the world are coming to the United States in 1930 to study American methods of road improvement and road use, according to word brought back from the recent sessions of the International Road Commission at Paris, by Thomas H. MacDonald, chief of the United States Bureau of Public Roads and chairman of the Highway Education Board.

Mr. MacDonald went to France as head of the official delegation representing the American government at the road meeting. He later made an investigation into phases of highway development in many

of the countries of western Europe and in the British Isles.

Aside from Mr. MacDonald, members of the United States delegation to the International Commission were H. H. Rice, treasurer of the National Automobile Chamber of Commerce, Pyke Johnson, executive director of the Highway Education Board, and H. H. Kelly, commercial attache, representing the Department of Commerce.

An American committee will be named soon to take charge of the work of preparation for the congress.

The North Carolina of today, with a population of 2,897,000 ranks eighth in the mileage of hard-surfaced roads which includes 2,026 miles of concrete. Largely through an intensive good roads program that would do justice to a larger state, North Carolina has perhaps garnered more prosperity proportionately than any other like community. In the 12-year period from 1914 to 1926 the value of this state's output increased 263 per cent against an average national growth of 158 per cent.

North Carolina's roads are self-sustaining. Last year the gasoline tax and automobile licenses brought in almost double the amount needed to pay the interest and sinking fund of the bonds. Bonds outstanding in that state total almost \$115,000,000. Consequently the well-planned highway development program in North Carolina is not a burden on the taxpayers.

The value of this stimulated motor travel is difficult to ascertain, yet evidences of greater progress in public welfare are seen on every hand. For instance, North Carolina has risen from a way down on the list to third in school transportation. Ninety thousand children are transported daily by 2,317 buses to and from consolidated schools, which themselves were made possible by improved roads. Again, diversified farming has come in, perhaps for the first time swelling the lean pocketbook of the one-crop planter of old.

ABOUT 22 PER CENT OF HIGHWAYS IN U. S. ARE IMPROVED

Recent surveys of the highway system in the United States, reveal interesting facts concerning their condition.

Approximately 22 per cent of the highways are improved in some degree. The total mileage in the country is estimated at 3,001,825, while the improved roads total 666,000 miles.

The total mileage includes all roads open to public travel, and includes many roads in the sparsely populated and traveled parts of the country. Practically all arterial highways are improved to a high degree and transcontinental traffic is well provided for, there being several excellent highways from coast to coast.

The majority of important secondary roads throughout the country are improved, and are under constant care of state or local maintenance departments.

MEXICAN ROAD CONGRESS

Elaborate plans are being completed in Mexico for the opening of the second National Road Congress of Mexico, according to Charles M. Upham, secretary-director of the American Road Builders' Association, who is in that country arranging for the event. President Calles will formally open this congress of road engineers and officials of approximately twenty nations. Under President Calles' administration the good roads movement in Mexico has made excellent progress. The American Road Builders' Association, through its Pan-American division, has accepted an invitation to participate in the Road Congress and will invite engineers and officials from all sections of the United States to be present. The sessions will open on October 3 and continue through October 6. The governors and delegates from all Mexican states will be present, as will official representatives of other Latin-American nations.

CHURCHES TO AID BIG SAFETY CAMPAIGNS

The American Road Builders' Association recently appealed to all churches, Sunday schools and religious organizations of the United States to join in a national movement to combat highway accidents. Religious societies were asked to emphasize the need for courtesy and caution among motorists and pedestrians of the country.

Last fall the association in co-operation with the Federal Council of Churches of Christ in America appealed directly to 25,000 ministers to assist in the highway safety movement. Thousands of the ministers responded either by preaching sermons from the pulpit or by broaching the highway safety problem in Sunday schools or allied religious meetings.

"Ministers and Sunday school officials are not asked to replace religious programs with highway safety programs," the American Road Builders' Association explained. "The problem of highway safety is in a large measure a moral problem, however, since the elimination of the characteristics of discourtesy and selfishness on the part of motorists and pedestrians is of great importance, such problems may be indirectly introduced into the church.

"The study of highway safety in Sunday schools is particularly appropriate since approximately 7,400 children of school age were killed last year in highway accidents. These accidents may be greatly reduced by urging the practice of the simple principles of courtesy and caution among the children who attend Sunday school.

The Federal Council of Churches of Christ in America recently adopted a resolution condemning the loss of life in highway accidents and urging appropriate divisions of the church to take action which might tend to reduce the number of these accidents.

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New Highway Equipment and Materials

John H. Jay, president of the Iowa Manufacturing Co., makers of Cedar Rapids one-piece crushing and screening outfits, was a visitor in Denver during the month of August. He was the guest of George Meffley, general manager of the H. W. Moore Equipment Co. Mr. Jay will bring the new Cedar Rapids airplane to Denver in November. He expects to make flights to different parts of Colorado. An open invitation to state and county road officials and contractors to ride in the plane has been sent out.

Harry P. Wilson, president of the Wilson Machinery Co., made a trip to the western slope during the month. His order book showed good results.

A stock of Baker snowplows for use on Cletrac and Monarch tractors has been put in by the H. W. Moore Equipment Co. These plows are equipped with reversible hand and mechanical lift blades.

The following sales were reported during the month by the Wilson Machinery Co.: 3 Monarch tractors, model 75; 3 Senior Austin Rip Snorter graders; 1 Austin 8-foot grader; 1 Barber-Greene 42 loader; 1 Buckeye ditcher; 4 10-s Koehring mixers; 1 7-s Koehring mixer; 6 Wonder mixers; 1 Western elevating grader; 3 Bay City truck winches; 1 C. H. & E. diaphragm pump; 1 25-ton steam locomotive; 1 Little Western grader; 1 Western screening plant; 3 Littleford asphalt heaters and 2 Rawls highway mowers

Richard Carlson, sales manager of Liberty Trucks & Parts Co., reported the sale of five new model Cletracs, including two model No. 100" machines. Three of these machines were sold to Colorado ranchers. Demand for truck parts also continued to be heavy, he said.

L. R. Shallenberger, president of the Colorado Culvert & Flume Co., of Pueblo, reports the largest business in the history of the concern for this year. This company makes a leader of Keystone Copper-Steel culverts and flumes. Their sales thus far for 1928 have run over 25 per cent ahead of last year, according to Mr. Shallenberger. Shipments have been made to every state in the western territory.

The painstaking care with which Commander Richard E. Byrd is equipping his Antarctic expedition is evidenced by the choice of two model 40 Cletrac tractors, according to Richard Carlson, of the Liberty Trucks & Parts Co. These machines are equipped with the new Cletrac patented enclosed cabs.

The Chain Belt Company has started work on a new manufacturing building on its 59-acre tract at 39th and Orchard Streets, Milwaukee. The Chain Belt Company are makers of Rex mixers and con-

veyors, the latter being manufactured in a separate plant located in Cleveland. The stock of this concern was recently listed on the Chicago stock exchange.

Elton T. Fair Company has sold four of the new Adams No. 14 graders to the state highway department of Wyoming. These graders are of the new heavy duty 12-foot combination scarifier and grader type carrying entirely new methods in frame construction as well as new ideas in mechanical design of blade control.

The Pioneer Construction Co. is using two Indiana 3-ton on its Willow Creek Pass project, located between Granby and Rand in Grant County. They were purchased through the Liberty Trucks & Parts Co.

C. O. Perrine, sales research engineer with the Caterpillar Tractor Company, has just been appointed general sales manager of the Killefer Manufacturing Corporation. His duties began August 1. Mr. Perrine has been with the Caterpillar Tractor Company for the past seven years and has an intimate knowledge of road and street building, excavating, farming, hydraulic engineering and contracting. He has been selected by the Killefer Company after a careful search for the best equipped man in the field.

J. D. Adams & Co., of Indianapolis, who now hold sole selling rights in the United States and Canada on Stroud elevating graders and dump wagons, have issued a new catalog describing this equipment in detail and giving some interesting performance data. This well gotten up catalog will be of real interest to dirt movers. In writing, ask for Catalog No. 28-S.

Combining Trackson performance with International strength and reliability, the Trackson McCormick-Deering is an outstanding development in crawler power units.

It represents the best individual efforts of the International Harvester Company and the Trackson Company, each specialists in its own particular lines, to produce a master crawler tractor.

With the background of years of experience in the tractor and equipment field, the engineers of these two companies have put their best knowledge and skill into the Trackson McCormick-Deering. They have anticipated the needs of every heavy-duty user of crawler tractors, and in combining the Trackson Full-Crawler with the McCormick-Deering Industrial Tractor they have provided a 3½-ton unit that has tremendous power and strength without being cumbersome; that is economical in original price as well as in operation and maintenance costs; and that will work in any ground conditions without loss of traction or

The T. L. Smith Company, of Milwaukee, manufacturers of Smith Mixers and Pavers, are distributing a new 72-page catalog covering their full line.

Included in the catalog are eleven full page views in color showing Smith Mixers in service on some of the outstanding construction projects, such as the Cascade Tunnel, Jordan Dam, Goodrich Tire Plant, Exchequer Dam, Chicago Sewage Disposal Plant and the Memorial Bridge at Gadsden, Alabama. Other pages are devoted to the description of the various sizes from the small 2½ cubic foot mixer to the world's largest mixer with a batch capacity of 4 cubic yards.

The patented Smith End-to-Center Mixing Action is fully described as are the other structural advantages.

The Galion Iron Works & Mfg. Co. announces the completion of a new addition to their plant at Galion, Ohio, a brick and steel building, 90x340 feet.

The factory at Galion is the world's largest road machinery plant and the company maintains branches throughout the United States with representatives everywhere.

The Galion Company manufactures a complete line of road-building machinery including rollers in all sizes; One-Man Motor Patrol Graders for application to five different tractors and Straight and Leaning Wheel Graders in sizes to meet all requirements.

With the entire plant working twenty-four hours a day and the new building, modernly equipped with the latest machinery, the company is in a position to handle their rapidly increasing business.

The Huber Manufacturing Company, Marion, Ohio, has issued a new catalog on Huber rollers, giving a lot of interesting information on their machines and what they can do. All important features are covered in detail. The Huber roller is made in 5-ton, 7-ton, 10-ton and 12-ton sizes, designed for macadam work, for rolling subgrade, and for rolling sheet asphalt. A scarifier attachment, of course, is supplied.

The Galion Iron Works & Mfg. Co., Galion, Ohio, has issued a new catalog showing its complete line of road machinery. While it shows the entire line and gives a lot of pertinent information on each machine, the user is urged to apply for more detailed information that is available.

Jaeger Machine Co., Columbus, Ohio, has published a 40-page catalog No. T-28, describing its tilting type mixers. Illustrations are given of the various models, and also of the important machine details, such as water measuring tanks, special wheels, batch counters, drums and automatic skip shakers.

Automobile Accidents at Railroad Crossings

(Continued from page 11)

speed to a point where the car could easily be controlled, driving under gates which were being lowered, and trying to beat trains to the crossings after warning whistle had been sounded."

Wherever there is a "Stop" sign at a grade crossing in Illinois and many states, the automobile operator is required *by law* to bring his car to a stop and look both ways before proceeding over the track. I venture to say that if this law had been strictly observed, not a single person would have been killed at a grade crossing because of collision between train and automobile during the past year. Of course, you are expecting me, as a railroad man, to point out to you some remedy. I think the remedy lies largely in a campaign of education from the first grade in our schools to the college boys.

Report and investigate all accidents where personal injury is involved so as to determine standard of competency of the driver.

See that advance warning signs are properly maintained at crossings.

Require school busses and oil trucks to stop before passing over railroad tracks.

The prevention of building unnecessary highway crossings over railroads.

The elimination of state highway crossings by viaducts or subways wherever possible.

The enactment of stringent laws requiring a proper standard of qualifications, like railroad men submit to. When this is done we will weed out a large army of present-day drivers that can't see a train, much less the crossing; so deaf they could not hear the roar of a can-

non, much less the locomotive's whistle; mental defects, not knowing the rules of highways; and last but not least, remove from the steering wheel the drunken drivers who are adding to the slaughter of human beings.

Let every one of us when we go from here talk SAFETY when we have a chance, because down in our hearts we don't want to see or hear of any human being hurt or killed, if by giving a single word of caution we can be the means of checking this nervous dread that lurks with every engineer's work and thereby save many lives. Do some personal work among your friends—BE CAREFUL, DON'T RUSH OR RACE.

Black Mesa Road Under Construction

(Continued from page 4)

Curecanti Needle, which is the official emblem of the Denver & Rio Grande Western Railroad. The new road also passes along the rim just above the famous Chipeta Falls, named after Chief Ouray's favorite wife. Chipeta, who was a great friend of all the early white settlers, is buried at Chief Ouray's old home near Montrose.

The beginning of construction on the Black Mesa Road marks a new epoch in the history of Colorado, and especially the Western Slope country, and is, at the same time, the beginning of a full realization of one of the fondest dreams of many of the pioneer citizens of that section.

The new work is being carried on as a state project. The surveys have been made by engineers under the direction of John J. Vandemoer, division engineer, while the actual construction is in the hands of the Maintenance Department, under Robert H. Higgins, with George Toupain in charge of field operations.

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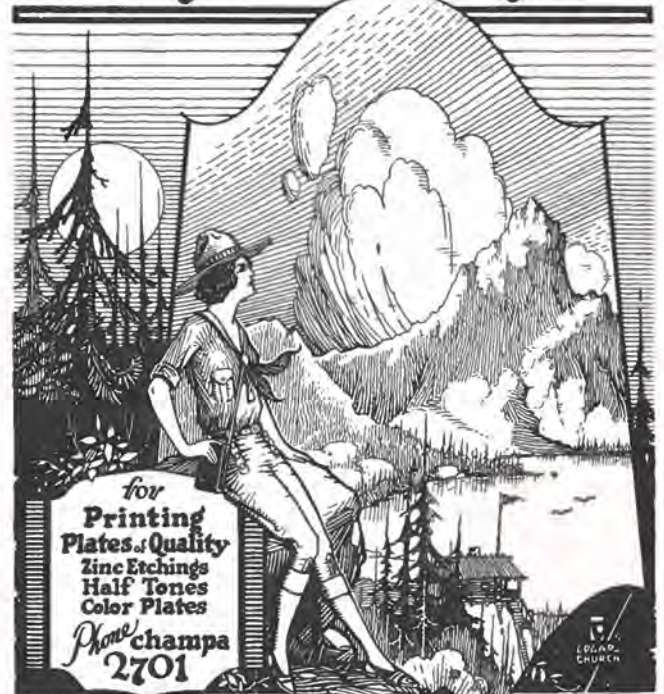
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Photo Engraving

A speed of twenty-two miles per hour permits the maximum capacity of a crowded highway, according to investigations made by the Pennsylvania department of highways. If all drivers maintained this speed, it would be possible for 1,696 vehicles to pass a given point in one hour on a one lane highway. If the speed is increased, it becomes necessary for the vehicles to stay farther apart and the capacity of the road is decreased. If the vehicles go slower and closer together, the capacity of the road also decreases.

Road machinery developed during the last few years will make it possible to build 10,000 more miles of hard-surfaced roads, or 31,000 miles of other good roads, in 1929, with the same money, than would have been possible with the machinery and methods used a few years ago, it is estimated by the American Road Builders' Association. The newest machinery will be shown at the road show to be held in connection with the association's annual convention, in Cleveland, Ohio, January 14 to 18, 1929.

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
F.A.P. 68-R	2 mi.	Oiled Gravel Surfacing	North of Buena Vista
F.A.P. 97-R	.....	Bridge	East of Lamar
F.A.P. 150-A	6 mi.	Gravel Surfacing	West of Craig
F.A.P. 248-B	2 mi.	Gravel Surfacing	South of Buena Vista
F.A.P. 258-H	3 mi.	Gravel Surfacing	West of Sapinero
F.A.P. 259-A	4 mi.	Gravel Surfacing	West of Sargents
F.A.P. 262-J	3 mi.	Gravel Surfacing	Northwest of La Veta
F.A.P. 272-D	2 mi.	Concrete Pav't & Underpass	Manzanola
F.A.P. 279-G	0.5 mi.	Bridge and Approaches	Baileys
F.A.P. 282-H	5 mi.	Gravel Surfacing	North of Rifle
F.A.P. 292-B	3.5 mi.	Graded & Overhead R. R. Crossing	South of Minturn
F.A.P. 295-D	2 mi.	Gravel Surfacing	North of Antonito
F.A.P. 299-B	4 mi.	Gravel Surfacing	Northwest of Delta

PLANS SUBMITTED FOR APPROVAL TO U. S. BUREAU OF PUBLIC ROADS

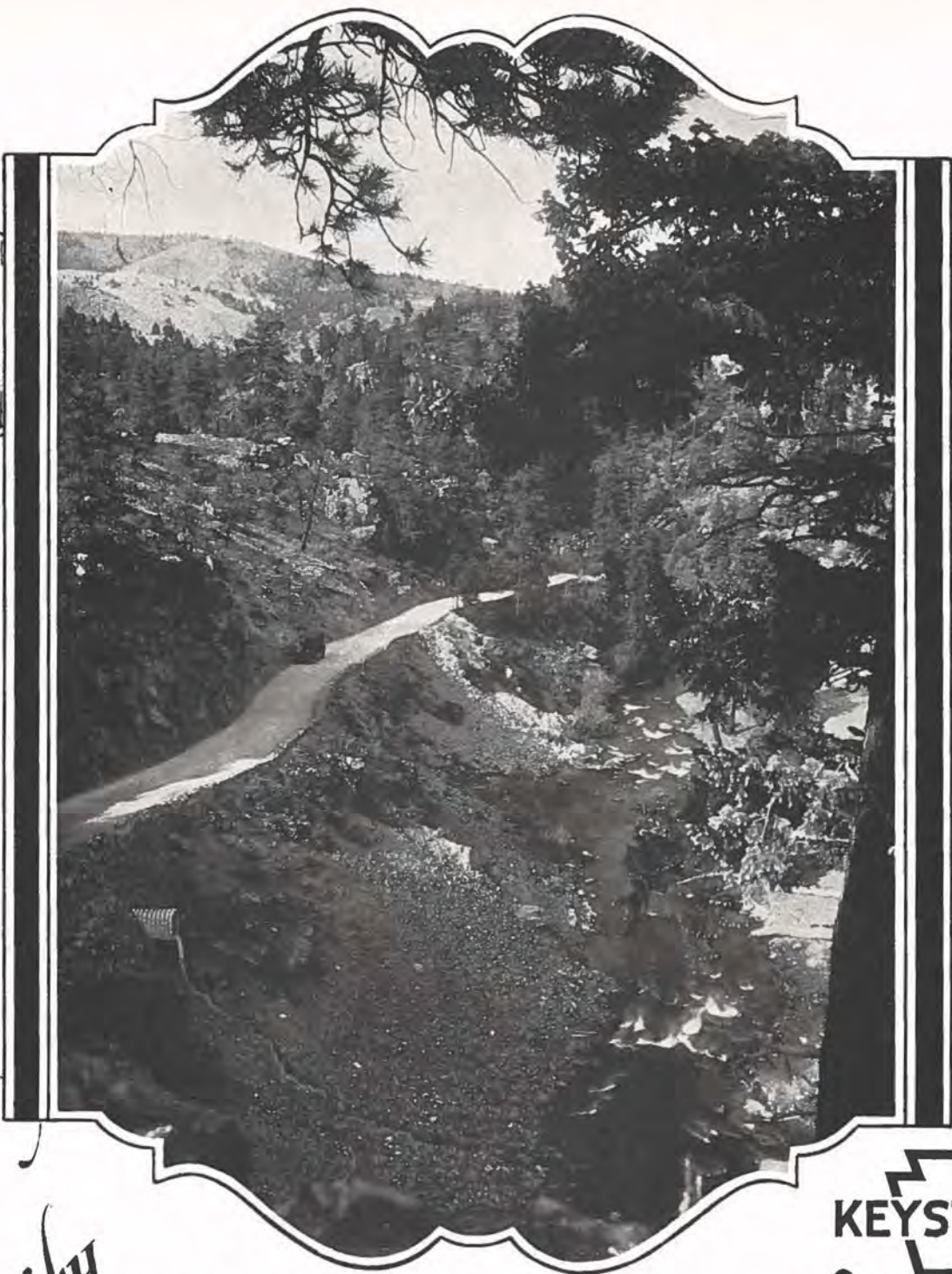
Proj. No.	Length	Type	Location
F.A.P. 134-B	3,352 mi.	Gravel Surfacing	East and West of Vona
F.A.P. 144-C	2,934 mi.	Gravel Surfacing	Northwest of Fort Collins
F.A.P. 149-A	4,716 mi.	Gravel Surfacing	South of Deertrail
F.A.P. 290-C	0,464 mi.	Bridge and Paved Approaches	North of Lamar

PLANS ADVERTISED FOR BIDS

Proj. No.	Length	Type	Location	Date Bids Opened
242-C	6,011 mi.	Gravel Surfacing	Northwest of Fruita	September 21, 1928
266-D	4,111 mi.	Gravel Surfacing	South of Bondad	September 21, 1928
262-I	4,034 mi.	Gravel Surfacing	South of Russell	September 25, 1928
258-G	2,885 mi.	Gravel Surfacing	West of Cerro Summit	September 25, 1928

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1928

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R5	Bet. Trinidad and Aguilar	1,959 mi.	Paving	W. A. Colt & Son	\$ 72,122.50	100	2R-5
2-R No. 6	South of Aguilar	2,75 mi.	Pavement	W. A. Colt & Son	93,000.00	100	2R- No. 6
2-R7	South of Aguilar	1,224 mi.	Paving	H. C. Lallier Const. & Eng. Co.	66,990.60	0	2-R7
2-R8	Aguilar, South	1,633 mi.	Paving	J. Finger & Son	66,660.00	0	2-R8
138-A	North of Kremmling	10,916 mi.	Grading	F. L. Hoffman	201,262.80	55	138-A
144-B	Northwest of Fort Collins	3,201 mi.	Gravel Surfacing	White & LaNier	44,000.00	90	144-B
145-A	West of Glenwood Springs	3,807 mi.	Gravel Surfacing	Winterburn & Lumsden	53,227.90	100	145-A
145-B	West of Glenwood Springs	1,051 mi.	Surfacing	Winterburn & Lumsden	42,389.72	92	145-B
147-A	In Ute Mt. Reservation, S. of Cortez	15,896 mi.	Surfacing	E. J. Maloney	119,100.10	34	147-A
147-B	South of Cortez	4,833 mi.	Surfacing	E. J. Maloney	59,447.44	0	147-B
208-B	E. of Grand Junction	0.507 mi.	Gravel & R.R. Grade Separation	Harry A. Rousch	59,568.00	28	208-B
210-B2	De Beque-Grand Valley	7,507 mi.	Gravel Surfacing	Fred Kentz	37,475.00	100	210-B2
242-B	W. of Mack at E. Salt Wash	Timbr. Bridge & Gravel Approaches		Hinman Bros. Const. Co.	13,996.40	89	242-B
247-C	Swink	6.8 mi.	Conc. Pav. & R.R. Underpass	J. Finger & Son	62,559.58	100	247-C
251-C	E. of Boulder	4,000 mi.	Pavement	J. H. Miller & Co.	150,263.00	16	251-C
253-C	West of Milner	4,502 mi.	Surfacing	Mountain States Con. Co.	88,108.40	52	253-C
254-C2	S. W. of Hot Sulphur Springs	Superstr. of Bridge & Approaches		Northwestern Constr. Co.	48,203.50	89	254-C2
254-D	Parshall-Hot Sulphur Springs	3,013 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	37,124.18	100	254-D
258-E2	Cimarron-Cerro Summit	1,487 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	32,377.70	92	258-E2
258-F	Gunnison-Sapinero	5,689 mi.	Surfacing	Hinman Bros. Const. Co.	100,968.50	61	258-F
266-C	Durango and N. Mex. State Line	2,401 mi.	Surfacing	Salle Const. Co.	32,199.80	84	266-C
271-C	West of Portland	2,430 mi.	Surfacing	J. Finger & Son	54,843.40	0	271-C
275-C3 E2	G3 Palmer Lake-Pring	4,602 mi.	Concrete Paving	J. Fred Roberts & Sons C. C.	114,079.65	100	275-C3 E2 G3
275-E	North of Monument	0,926 mi.	Grading and Underpass	F. L. Hoffman	41,905.20	100	275-E
275-F3 G2	Tomah-Palmer Lake	12,894 mi.	Concrete Paving	H. C. Lallier C. & E. Co.	292,309.95	100	275-F3 G2
277-B	South of Colorado Springs	4,860 mi.	Concrete Paving	J. L. Busselle & Co.	131,202.45	84	277-B
277-C	N. of Pueblo	4,363 mi.	Conc. Pavement	J. Fred Roberts & Sons C. C.	120,789.25	20	277-C
279-F	North of Baileys	3,444 mi.	Graded	J. Fred Roberts & Sons	126,000.00	61	279-F
282-AR1	South of Craig	600 ft.	River Protection Work	Hinman Bros. Const. Co.	11,925.00	0	282-AR1
282-D	North of Meeker	2,864 mi.	Gravel Surfacing	Winterburn & Lumsden	42,155.00	100	282-D
282-E	N. of Meeker	6,421 mi.	Gravel Surfacing	Luke E. Smith & Co.	88,384.20	7	282-E
282-F	So. of Craig on S. H. No. 13	2,17 mi.	Surfacing	Gardner Bros. & Glenn	49,063.00	55	282-F
286-BR1	S. of Wyoming-Colo. Line	14,474 mi.	Gravel Surfacing	A. R. Mackey	38,978.00	43	286-BR1
286-C	Between Greeley and Eaton	5,566 mi.	Paving	New Mexico Const. Co.	126,360.35	38	286-C
287-A3	W. of Ft. Morgan on S. H. No. 2	3,55 mi.	Concrete Paving	Edw. Selander	90,749.50	13	287-A3
287-A4	West of Fort Morgan	5,087 mi.	Paving	Edw. Selander	120,505.80	87	287-A4
287-D1	Two mi. E. of Kersey on S. H. 2	0,921 mi.	Grading	White & LaNier	14,046.40	100	287-D1
287-D2	East of Kersey	0,921 mi.	Paving	S. & S. Const. Co.	25,269.80	0	287-D2
288-A2	Bet. Merino and Brush	9,741 mi.	Paving	Edw. Selander	245,043.50	100	288-A2
292-A	North from Minturn	6,417 mi.	Grading	H. C. Lallier Constr. & Eng. Co.	92,571.80	94	292-A
292-C	North of Ouray	3,661 mi.	Grading	C. V. Hollenbeck	62,997.80	0	292-C
295-C	La Jara-Antonito	5,284 mi.	Surfacing	Peple Bros. C. C.	29,414.60	87	295-C
296-C	N. of Greenhorn on S. H. No. 1	6,606 mi.	Surfacing	H. C. Lallier Constr. & Eng. Co.	115,466.80	80	296-C
298-B	North of Pagosa Springs	2,414 mi.	Surfacing	Engler & Teyssier	38,426.00	0	298-B
300-A	Bet. Chattanooga & Red Mtn.	2,277 mi.	Grading	Winterburn & Lumsden	59,480.80	78	300-A



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What's the one thing that can be said of a Keystone Culvert—once it's installed? Just this—it's a culvert you can forget, because it is Built to Serve, Satisfy and Survive.

Interested in that kind of a culvert?

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They're Judging Tractor Values by These

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\$3625⁰⁰

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F.O.B. SPRINGFIELD, ILL.



Monarch "50" pulling heavy 10-ft. grader with scarifier attachment in front of blade. Send for descriptive folders that give all details of the Monarch "50" and "75".

WHEREVER track-type tractors are used, Monarchs are winning whole-hearted approval. Point by point, tractor buyers are measuring values — and finding that in Monarchs they secure substantial promise of steady service and unusually low maintenance cost. In the Monarch "50" and in the "75", tractor buyers find they can buy more power under all soil conditions at the lowest price per drawbar horse

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Complete lubrication at every essential point—easy accessibility to all parts — quick adjustment of clutches and track tension — unusually high road clearance. These are Monarch features you'll want to know more about. Complete details are given in a new folder. Write for a copy.



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NEVER mind the blizzard that yesterday threatened an old-fashioned blockade!

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Big buses run on a regular schedule. Pleasure and business proceed as usual. The community that owns a “Caterpillar” track type tractor has disowned fear of the Snow Bogy!

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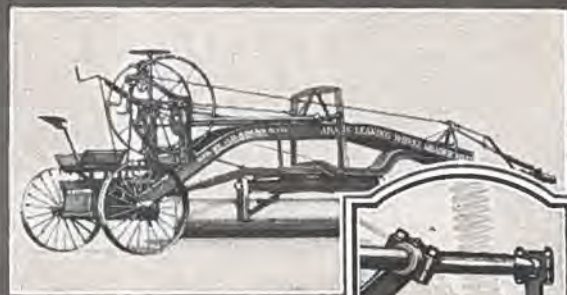
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M. W. BENNETT, Editor

Articles on the subject of road building and highway development in Colorado are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible.
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Our Cover Picture

THIS month's cover picture of Colorado Highways gives a view of the new highway recently completed near Rifle on State Road No. 4 in Garfield County. It forms a link in the transcontinental U. S. Highway No. 40-S, leading from Leadville over Tennessee Pass via Glenwood Springs to Grand Junction. It is a very popular route with tourists, and through the snow-removal program instituted by the state on Tennessee Pass, is used throughout the year.—Photo by Denver Tourist Bureau.



No Lost Motion in ADAMS Graders!

ADAMS Graders are *protected for life* against lost motion in the blade control! Every joint and bearing is machine finished, Alemite lubricated, and adjustable for wear. Close fitting, machine-cut and enclosed lift gears, ball and socket lift links, machined reversing circle, and ball and socket mold-board connections hold the blade to a clean, steady cut, *always*—no wobble, no jumping or chattering. This finer design and construction throughout enables ADAMS Graders to do better work and give more years of un-interrupted service than cheaper built machines. ADAMS Graders are more economical in the long run, *always*. Write for catalog.

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Complete Stock Carried for Immediate Shipment

The Adams line includes graders in 6½, 7, 8, 10 and 12-foot blade lengths, Scarifier Graders, Motor Graders, Road Main-



tainers, Patrols, Drags, Elevating Graders, Dump Wagons, Wheeled Scrapers, Fresno, Drag Scrapers, Plows, etc.

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PAVEMENT of portland cement concrete adds a lasting distinction to any street. On fashionable boulevards or busiest commercial arteries its true, rigid surface remains unmarred by traffic year after year—*indefinitely*. No concrete pavement has ever worn out.

When the concrete street *must* be cut through for underground piping or conduits it may be quickly and easily patched with no unsightly blemishes left to mar its even surface. Thus concrete provides a pavement of *enduring* beauty.

Firm, rigid, unyielding concrete is the ideal paving material—the engineer's answer to the challenge of modern traffic. It requires little maintenance. And it is the safest street, wet or dry.



For further information about concrete roads or streets, write

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Pavements Save Missouri's Cash

(AN EDITORIAL)

By E. E. DUFFY

THE high cost of neglecting to build roads is forcibly pointed out in Missouri's annual highway commission report. In 1920, during the height of the bad roads era in that state, the limited mileage of improved highways saved the motorist only 97 cents yearly on the average. In 1927, after the completion of a goodly portion of Missouri's sensible road plan, the saving per vehicle owner through lowered automobile operating costs was \$74.59, or more than \$50,000,000 to all motorists.

But the story gets more interesting when it is related that in 1920 the Show-Me motorist was paying \$7.11 in motor vehicle taxes with a very small comparative return, while in 1927, with gas and vehicle taxes averaging \$21.29, the return, because of improved highways was three and one-half times. By spending more money on a really comprehensive and all-embracing road system Missouri accomplished a tangible road saving.

The motor-car owning public in Missouri, through the passage of a \$60,000,000 bond issue which speeded up the highway program three years, has been saved \$100,000,000 in that period, states the report. That is to say, if the roads had been neglected for these three years the extra travel cost would have amounted to that enormous figure. This is difficult to realize since motor operating expenses are taken for granted by the average driver. Yet Missourians, and others, may still recall those

days when sturdily built flivvers, etc., racked themselves to death in one or two seasons, and gasoline had but a dozen or so miles a gallon in it at best.

Consequently, Missouri is possessed of an appreciable mileage of improved roads, including 1,500 miles of concrete, and at the same time has increased the actual wealth of the state by an enormous but unknown degree, for it is impossible to place an accurate value on travel comfort, trade stimulation, and the increased well-being brought about by such highways.

Interest payments on the bond issue in that state have been met easily by license fees and the gas tax without recourse to tax levy. Already ten million dollars of the bonds have been retired with the remainder to be taken up by 1947.

Missouri is facing an odd situation right now. At the fall election the citizenry will vote on an additional highway bond issue of \$75,000,000 for the further extension of good roads and good roads profits. The odd part about it is that the adoption of the bond issue will not increase the motor license fees, gas tax or personal property taxes one whit, while, if the bond issue is rejected, the taxes will remain the same—and the extended mileage of improved roads will be considerably lessened.

Taking advantage of present resources, through the bond issue medium, has enabled Missouri to replace high cost roads with high type roads.

Federal Aid in Colorado During 1928

TWENTY-FIVE road projects have been constructed with Federal Aid in Colorado during 1928. With weather permitting, more than a dozen will be out of the way before the end of November, according to state road officials.

Up to September 30, the highway department had accepted as completed from the contractors, thirty miles of standard 18-foot concrete pavement; forty miles of gravel surfacing and twenty-two miles of grading. Also there has been completed two important steel and concrete bridges during the year.

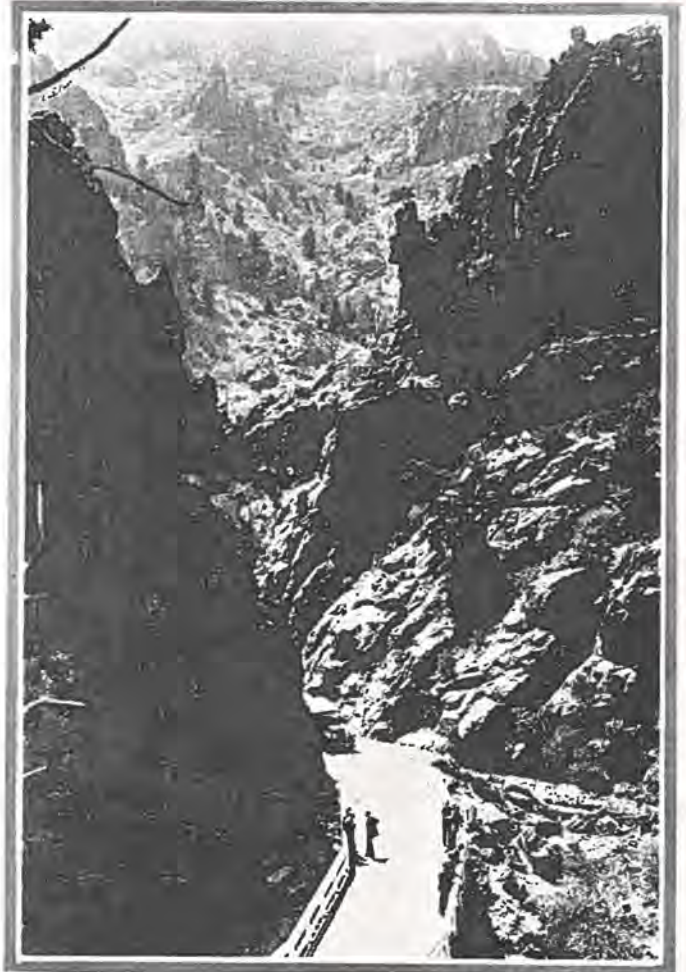
Twenty-eight Federal Aid projects are now in course of construction. These projects include cement pavement, gravel surfacing and grading projects. Plans have been submitted to the United States Bureau of Public Roads for six additional projects. With the exception of a large bridge to be located at Lamar, these projects all call for gravel surfacing.

The drafting department has eleven projects on which plans are being worked out. These include a bridge east of Lamar; a new railroad underpass at Manzanola, and an overhead railroad crossing south of Minturn, as well as six miles of gravel surfacing west of Craig.

Among the important projects completed by the department this season include: Seventeen miles of pavement between Tomah and Monument on the Denver-Colorado Springs highway; nine and three-quarter miles of concrete pavement between Merino and Brush; three miles of concrete pavement between Las Animas and Fort Lyon; five miles of pavement south of Colorado Springs, and five miles of pavement south of Aguilar.

The department also has completed seven and one-half miles of gravel surfacing, located between De Beque and Grand Valley, on the main road from Glenwood Springs to Grand Junction. Four miles of gravel surfacing west of Glenwood Springs also has been completed.

A handsome new bridge structure over the Colorado River at the west end of Byers Canyon has been accepted from the contractor. A new railroad underpass west of Swink has been completed and opened to traffic. This underpass eliminates one of the most dangerous railroad crossings on the Santa Fe Trail in the Arkansas Valley. Plans are under consideration by the department to eliminate others as fast as funds become available. The Manzanola underpass is the next to be constructed. The department has also completed seven miles of oil-treated roadway in the San Luis Valley. Five and a quarter miles of this new type pavement is located north and south of Romero, near Antonito. A stretch of roadway, nearly two miles in length, has been treated with oil north of Alamosa.



Phantom Canyon, one of Colorado's scenic drives that attracts hundreds of visitors each summer.

Construction is now under way on sixteen miles of the new type oil pavement south of the Wyoming line on State Road No. 1. This treatment consists of an oil mixture which is worked in with the gravel, forming a smooth surface, looking something like asphalt pavement. For light traffic it is said to be very fine. Of course, on the roads carrying traffic of over 1,000 cars per day, heavier type of pavement must be used.

The oil treatment, which is being used by the Colorado department, has been found very successful in other states. However, the work being done here is more in the nature of an experiment at the present time.

During the past year the department completed the concrete pavement into the town of Morrison, thus eliminating one of the worst traffic bottle-necks in the state. This quarter of a mile of pavement was probably one of the most important contracted this year from a traffic standpoint. Traffic counts have shown as high as 10,000 cars per day passing over this piece of roadway.

Projects on which work is now under way include: three miles of pavement south of Aguilar; four miles of pavement east of Boulder; four and one-half miles of pave-

ment north of Pueblo; three and one-half miles of pavement west of Fort Morgan; six miles of pavement north of Greeley; and one mile of pavement east of Kersey.

Grading and gravel surfacing projects on which contractors are working at the present time include: twenty-one miles south of Cortez; eleven miles west of Kremmling; six miles located between Gunnison and Sapinero; one and one-half miles located between Cimarron and Cerro Summit in Gunnison County; six and one-half miles north of Greenhorn on State Road No. 1; two and one-half miles north of Pagosa Springs; two and one-

quarter miles between Chattanooga and Red Mountain on the Million Dollar Highway; and six and one-half miles north of Minturn.

The cost of the projects thus far completed by the department this year total \$1,950,338. The total cost of the concrete pavement was \$1,000,778 with an average of \$28,593 per mile. This average cost is equal to costs announced by departments of adjoining states and is less than some of the others.

The following table shows the list of projects completed by the Colorado department to date:

No.	Length	Type	Location	Cost	Contractor
2-R6	2.76 mi.	Concrete Pavement	South of Aguilar	\$ 98,159	W. A. Colt
2-R5	2 mi.	Concrete Pavement	South of Aguilar	75,024	W. A. Colt
144-B	3.25 mi.	Gravel Surfacing	North of Fort Collins	47,768	White & Lanier
145-A	3 mi.	Gravel	West of Glenwood Springs	74,926	Winterburn & Lumsden
145-B	1 mi.	Gravel	West of Glenwood Springs	46,628	Winterburn & Lumsden
157-A	4 mi.	Graded	Buena Vista-Leadville	55,511	E. H. Honnen
210-B2	7.5 mi.	Gravel Surfacing	De Beque-Grand Valley	45,255	Fred Kentz
242-B		Timber Bridge	Salt Wash-Fruita-Mack	14,565	Hinman Bros.
247-C	0.777 mi.	Railroad Underpass	West of Swink	63,493	J. Finger & Son
254-C		Steel Bridge	Byers Canyon	48,203	Northwestern Construction Co.
254-D	3 mi.	Gravel Surfacing	Parshall	37,124	Hinman Bros.
258-D	4.5 mi.	Gravel Surfacing	Iola-Cebolla	61,798	H. C. Lallier
265-B	3.75 mi.	Gravel	East of Durango	60,143	Engler & Tessier
266-C	2.5 mi.	Gravel	South of Durango	35,749	Salle Construction Co.
275-F	10 mi.	Grading	South of Castle Rock	145,143	J. Fred Roberts
275-F3	12.75 mi.	Concrete Pavement	Tomah-Palmer Lake	292,309	H. C. Lallier
275-C	4.5 mi.	Concrete Pavement	Palmer Lake-Monument	114,079	J. Fred Roberts
279-D	0.261 mi.	Concrete Pavement	East of Morrison	26,000	M. E. Carlson
282-D	2.75 mi.	Gravel	North of Meeker	52,262	Winterburn & Lumsden
287-D2	1 mi.	Grading	East of Kersey	14,250	White & Lanier
288-A	9.75 mi.	Concrete Pavement	Merino-Brush	306,743	Edw. Selander
290-D	3 mi.	Concrete Pavement	Las Animas-Fort Lyon	88,464	W. A. Colt & Son
292-A	6.5 mi.	Graded	West of Minturn	92,571	H. C. Lallier
295-C	5.25 mi.	Gravel Surfacing and Oil	North of Antonito	38,000	Pople Bros.
297-A	3 mi.	Gravel Surfacing	East of Palisade	16,171	O. J. Dorsey



A view of the east slope of the world-famous Wolf Creek Pass road, which scores of motorists over the state are asking to be improved as soon as possible. This road forms a direct route to the Mesa Verde National Park.

North Carolina Builds Roads and Prospers

IT has been said that people do not build good roads when they are prosperous, but that they prosper when they build good roads. This seems to be true of North Carolina, which undertook an intensive road-building campaign a few years ago. That state has 2,026 miles of concrete. Besides paving, North Carolina has surfaced many thousands of miles of other state and local roads.

In twelve years North Carolina's output of all products has increased 263 per cent, against an increase of 158 per cent for the nation. Registration of automobiles, which is one evidence of prosperity, increased 190 per cent from 1921 to 1927. In the same period it increased 121 per cent in the whole United States. Registration in 1927 was 11.8 per cent higher than in 1926, the largest percentage of increase in any state in the union.

Highway improvements were made largely with borrowed funds. North Carolina has \$115,000,000 of state highway bonds outstanding, but gasoline and auto taxes bring in double the amount required for sinking fund and interest every year.

An increase in the gasoline tax from 4½ to 5 cents a gallon took effect in Virginia in March. This makes six states that collect a nickel a gallon on gasoline for good roads, but even this toll amounts to only one-quarter cent a mile for many cars. It is insignificant compared to the tolls which were changed when private toll roads existed. These were usually three cents a mile for a team and wagon, and frequently more.

Seven states collected more than ten million dollars through the gasoline tax in 1927, according to figures collected by the U. S. Bureau of Public Roads. California took in \$22,467,000, Ohio \$19,910,481, Pennsylvania \$17,296,333, Texas \$15,650,841, Michigan \$14,260,564, and Indiana \$10,133,568, each on a three-cent levy. Florida, with a five-cent tax, collected \$10,980,000. Total revenues from gas taxes in the United States in 1927 were \$258,838,813.

The British government has recently established a higher gas tax than any of the states. The tax is four pence (eight cents), and the distributors added four pence and one farthing to the price, the farthing being to cover the cost of collection.

The people of Missouri will vote on a \$75,000,000 state highway bond issue this fall. The matter will be put before the voters through an initiative petition. Missouri authorized a \$60,000,000 highway bond issue not long ago and made extensive road improvements, including a large amount of paving. If the second bond issue is authorized, it is expected that Missouri will have a completed primary road system by 1934. Advocates of the bond issue point out that the license and gas taxes will remain the same, whether the bond issue passes or not. If it passes, the car owners will get more good roads right away; if it does not pass, they will not get the roads, but will pay the license and gas tax just the same.

The highway department of Illinois will spend \$57,000,000 for construction in 1928. The department plans to build 1,135 miles of pavement, grade 386 miles of

highway and build 171 bridges. Besides this, Cook county will construct 177 miles of concrete pavement.

More than forty-four million persons, over a third of the nation, took vacation motor tours during 1928 and spent the staggering sum of three and a half billion dollars, according to preliminary estimates of this year's motor tourist business made by the National Touring Bureau of the American Automobile Association.

The A. A. A. estimate for 1928 is based on a detailed study of figures for the 1927 season, with an allowance of 10 per cent increase for this year, which is about the normal annual growth in the gigantic industry of motor touring over the past few years.

Approximately forty million people, in ten million cars, took to the winding ribbons of paved highways and into the byways for their vacations last year, the national motoring body declares.

"One of the most impressive and important features of the motor tourist business in 1927," says the A. A. A., "was the trend away from the tourist camps and toward the hotels and tourist homes catering to motorists. The latter enjoyed a heavier business than in the previous year, despite weather conditions that somewhat handicapped the annual vacation movement. In this trend, amounting to an increase of twelve per cent in business, is seen a clear indication of the position of the resort hotel as a permanent fixture in the rest and play life of the motorists.

"The figures for last year show that 29,000,000 people in 7,250,000 cars patronized hotels and tourist homes. On the basis of last year's figures, the total of this class of motorists should soar to 32,000,000 this year.

"Figuring four people to a car and allowing each occupant an expenditure of \$7.50 a day, for an average period of ten days, the army of motorists patronizing hotels and resorts would spend nearly two and a half billion dollars in 1928."



View of new Willow Creek Pass highway, which is being improved by the U. S. Bureau of Roads.



Gentle slopes of Mount Lady Washington rise gracefully toward the Great Divide in Rocky Mountain National Park.



There's a fascinating ribbon of romance that motorists delight in using to take them through Big Thompson Canyon on the way to Estes Park

Washington, the Immortal, Nature-Carved in Rockies

By WARREN E. BOYER

IN the Colorado Rockies, far from the grassy slopes of Mount Vernon, the memory of George Washington has been perpetuated through erosion. Here nature has chiseled a rock profile of his likeness, even to his powdered wig.

From his rock pinnacle, the Father of his Country looks down into Big Thompson Canyon, where thousands of travelers are shuttled by motor to Estes Park.

The immortal Washington is not alone in this wondrous setting. The very canyon into which he gazes leads upward toward Mount Lady Washington, not far away, in Rocky Mountain National Park.



Rock profile of George Washington, the Father of his Country, atop the granite wall of Big Thompson Canyon.



Standing at attention as did troops under Washington in the Revolutionary War, awaiting the word of the commander, are the granite sentinels of the Rockies.

Maintenance of Secondary Type Roads

By W. F. ROSENWALD*

Maintenance Engineer, Minnesota Department of Highways

IF we could be assured that the volume and nature of traffic on our roads would not change, the problem of maintaining them would be very much simpler than it now is. It would be comparatively easy to work out efficient methods with satisfactory equipment, and when once organized one could sit back and see the work go on without further worries. But, instead of having such a condition, we are confronted with an ever-increasing volume and weight of traffic, and in addition to this the users of the highways are becoming ever more insistent on greater comfort and better service. The result is that the maintenance of roads is an ever-changing problem, requiring new methods and new operations as the traffic demand increases.

This constant change and its effect is much more evident on the secondary or cheaper type of roads which are surfaced with stone, gravel, sand-clay, etc., than on the higher type paved roads. Usually, the capacity of the secondary type road is constantly being taxed to the limit, which necessitates the working out of some relief which will serve until a higher type of road can be constructed. This condition is in many instances successfully met with a systematized progressive improvement or development, with occasional results which ultimately approach the serviceability of the highest types.

After all, the real purpose of all our operations is to provide the public with a serviceable road, and with the

* Abstract of a paper delivered at Fourteenth Annual Purdue Road School.

Mr. Rosenwald is recognized as one of America's leading authorities on road maintenance, and it is with the thought that some of the methods mentioned in his paper might be applicable to a large number of Colorado's roads, that the article is reprinted.

EDITOR'S NOTE.

constantly changing traffic, it is self-evident that the nature of the road must be changed, either by gradual betterment as the traffic increases or abruptly by construction when the road will no longer carry the traffic. Apparently, the most certain feature in our work is that the traffic will increase constantly.

The thoughts here expressed are the result principally of experience in Minnesota where the maintenance problem involves the upkeep of a

7,000-mile state-maintained road system of which 5,500 miles are gravel-surfaced; and a 12,000-mile county-maintained state aid system, of which 9,000 miles are gravel-surfaced also.

THE USE OF TRAFFIC COUNTS

To help us in meeting the constantly changing problems we have systematically taken a large number of traffic counts on the state-maintained system during the past seven years, and these indicate that our average rate of increase in volume of traffic is somewhere between 20 and 25 per cent per year. The counts are ordinarily taken at points between various cities and villages, so as to avoid the purely urban traffic.

The average daily traffic on the state-maintained system now is 940 vehicles per day, ranging from 144 as the low, to 6,895 as the average daily traffic on our heaviest-traveled road, with single days above 15,000.



Showing concrete road between Grand Junction and Palisade, in Mesa County, serving a rich farming community.



Molas Lake above Silverton, on the Million Dollar Highway, showing Sawtooth Range in background.

The average traffic on our pavements is about 2,103 vehicles per day, and on our bituminous-treated roads the average is 1,274 per day. From a rather careful analysis we have arrived at a figure of 580 per day as the economic limit of traffic on our untreated gravel roads, but we are actually carrying an average of 630.

REGRAVELING WORK

Regraveling work should be handled in the same manner as new construction. The best practice is to deposit the new material in windrows, either at one side or in the center of the road and to immediately spread it out with a blade machine, blading it entirely across the road and windrowing on the opposite side of the road all except a thin floating surface. This operation mixes the material thoroughly and gives a uniform product to work with. The material in this windrow is then gradually fed onto the road surface with the smoothing machines, and as fast as the traffic will warrant. This makes it easier to maintain the thin film of floating material on the road, which is so essential in holding a satisfactory surface.

In order to keep this thin film in place, it is necessary to blade it very frequently and as the volume of traffic increases the more frequent must be the blading. This method of applying surfacing material also makes for greater safety to the traffic, by avoiding the dangers of accidents caused by fast-moving vehicles suddenly striking deep and loose material. On new construction, our general practice is to place 1,200 to 1,400 cubic yards per mile in windrows and about 400 cubic yards in stock piles. On regraveling operations we ordinarily place about 400 to 600 cubic yards per mile, a part of which goes into stock pile.

Our patrol units place on an average of about 100 cubic yards per mile per year, principally from the stock piles which are placed at convenient intervals, usually not over a mile apart. With the truck units the stock piles can be placed at greater intervals, and more material hauled from pits.

In this connection, chatter bumps or rhythmic corrugations are usually mentioned. We do not consider them as anything serious but merely as an indication that the blading has not been frequent enough or severe enough, or that the equipment used is too light or weak.

From the standpoint of safety to traffic, and further to avoid concentrated travel in one track, we endeavor to maintain as flat a crown as possible. We prefer not to exceed a 6-inch crown in 30-foot width of roadway. Too coarse a size of stone or pebbles and an excess of fine sand must be avoided. All surfacing material should be screened. Our practice is to use a screen with openings $\frac{3}{4}$ -inch square, or 1-inch round. Gravel or stone, well-graded from 1-inch down to sand, is, of course, the ideal material, but, as a rule, we do not have much choice and are compelled to use material which may be available in the locality. Where the natural material does not have enough binding material, it is usually comparatively easy to add clay or other similar binder.

SOLUTION OF DUST PROBLEM

On roads where the traffic is too much for the untreated gravel and where the possibilities of paving are too far distant in the future, we are now rapidly extending bituminous treatments of both tar and oil.

We started to experiment with bituminous treatments on gravel roads in 1924. The experimental work has continued since and we are now getting good results from both tar and road-oil on roads which were originally not considered suitable for such treatment. At the present time 387 miles of bituminous-treated roads are being used to the satisfaction of the traveling public and definite methods of treatment have been established. The experimental work has not been dropped after the initial treatment but carried on further in the lines of maintenance and construction.

If waviness develops after the tar or oil has set up, the corrugations can be removed by cutting the ridges with a large blade. This operation should be performed on a hot day and the blade set to secure a shaving action.

A road thus improved costs about \$1,500 to \$1,800 per mile the first year. The second year the cost is about half that amount and in a good many cases the third year does not require any treatment.

It has been demonstrated that a road treated in this manner can be scarified and reshaped with very little cost and with very beneficial results. One patrol unit can easily patch and maintain twenty miles of road improved in this manner, provided the traffic is not much over 1,000 vehicles per day.

Good Roads Build Friendship

While sitting in the office the other day wondering what new thing to write about, the thought came to us that there really is nothing new that is newer than some angles of the public highway argument. Do you know, folk, we are only just beginning to realize the benefits of good roads? Why, only a very few years ago none of us even knew our own near relatives intimately. Most folk usually live some little distance from the great majority of their relatives, and when we had to make visiting trips on the train or over the old time road system, our visits were few, indeed, and we did not get to really "know" our own relatives. But how different it is now, with the road system that we enjoy. Why, we do not think it any hardship at all to get into our cars after the day's work is done and drive 75 to 100 miles to visit a few hours with relatives or friends, and then to drive back home again the same night. Yes, good roads cost a heap of hard-earned money, but who the deuce is anxious to go back to mud roads and the old phaeton?—Rushmore Enterprise.

Better Roads for Colorado

THE PLAN

The plan is to amend the Constitution so that the sum of not more than \$10,000,000 per year for six years may be used to complete Colorado's trunk highway system, and connecting roads; and thereby help develop our agricultural, mining and livestock industries, and connect our own road system with highways in other states so as to bring motorists to Colorado in increasing numbers.

THE MONEY IS TO BE RAISED UPON ROAD NOTES

The sum of money to be raised upon road notes; and, although a general obligation of the state will, under the bill, be repaid out of the revenue received from motor fuel sales tax, including a two cent increase, **NO LEVY OR LIEN UPON PROPERTY OF ANY KIND** is contemplated under this plan, and those who use the roads for driving will bear the cost, including visitors from other states, who, it is estimated, will pay at least 25% thereof. The Better Roads Program does not contemplate any change whatever in the amount accruing to the counties from gas tax for county road work, and retains the present exemption on gasoline used in agricultural implements on the farm.

INTEREST CHARGES LESS THAN MAINTENANCE

The excessive maintenance charges occasioned by the increased number of automobiles and their use of the public highways can only be reduced by building roads that will carry the traffic. **FIGURES DEMONSTRATE THAT THE INTEREST CHARGE ON PERMANENT ROADS IS LESS THAN THE COST OF MAINTENANCE ON DIRT AND LIGHT GRAVELED SURFACED ROADS.**

ESTIMATED 15% SAVING BY LETTING LARGE CONTRACTS

The saving occasioned by constructing roads on a large scale will be a substantial amount, estimated at 15% of the cost under limited road construction; thus further offsetting the 4½% road note interest charge.

SAVING IN CAR MAINTENANCE AND OPERATION COSTS

Further saving in car maintenance and operation costs ranging as high as two cents per mile would materially benefit road users.

LABOR BENEFITED

Road building contractors state that approximately 90% of the construction expense of roads is for labor and material; thus the Better Roads Program would return a substantial amount for labor in the state.

FURTHER ROAD IMPROVEMENT

The Better Roads Program permits further road improvement and extension beyond the trunk system specified, and contemplates the development of every road of importance in the state.

AVOID RETROGRESSION OF OUR STATE

The entrance of Colorado into the Better Roads Movement will mark a forward step in line with national activity in this connection. This plan is essential to reduce business transportation costs, increase comfort, convenience and pleasure for our citizens, and the standing of Colorado as a tourist state, and to absolutely avoid its retrogression.

STATE ASSOCIATION OF COMMERCIAL ORGANIZATIONS UNANIMOUSLY APPROVES BETTER ROADS PROGRAM

The Seventh Annual Meeting of the State Association of Commercial Organizations of Colorado closed a two-day session at Glenwood Springs on Saturday, September 8, at which meeting the Better Roads Program that will be voted on by the Colorado people at the November 6th election was the principal subject of discussion and was unanimously approved. (This association comprises 48 Chambers of Commerce in Colorado.)

VOTE "YES" ON THE BETTER ROADS PROGRAM ELECTION, NOVEMBER 6th

An Act to amend Section 3, Article XI, of the Constitution, authorizing the issuance of notes not exceeding \$10,000,000 in amount each year for six successive years, to be used in the construction and improvement of public highways; said notes to be payable out of the proceeds of an excise tax on petroleum products used in propelling motor vehicles.	YES	X
	NO	

THE PUEBLO COMMERCE CLUB

By

FRED A. SABIN,
FRANK S. HOAG,
PAT BYRNES.

ATTEST:

P. A. GRAY, Secretary.

SPECIAL PUBLICITY COMMITTEE

“We Pay for Good Roads whether we have them or not; and we pay MOST when we do not have them.” Let’s have them NOW.

Colorado’s Plan

1. Without a Bond Issue.
2. Without a Property Tax.
3. Revenue to be derived from adding 2 cents a gallon on tax of fuel.
4. Only those who use the roads will pay for the roads.
5. Issue as required, road notes secured by fuel tax to the amount of \$10,000,000 a year for 6 years.
6. This will give us 3,800 miles of hard surfaced or well graveled roads, reaching all over the state.
7. \$10,000,000 a year distributed for labor and material.
8. The entire issue will be paid in less than 14 years, **BY THE MOTORIST.**
9. The motorist today pays \$10.00 in maintenance of car and tire wear for each extra dollar he will pay for this increased tax on gasoline.
10. The funds now accruing to county commissioners will not be changed.
11. Farmers can get their products to market for one-third of what it now costs.
12. Farmers will not pay tax on fuel used in tractors nor stationary engines.

Last year the Secretary of State issued less than 20,000 guest tags; Arkansas issued 150,000, and we have many times the attractions that Arkansas has, but Arkansas has been spending \$17,000,000 a year on roads, to be paid from a 5-cent gas tax.

Eighteen states now have a 4, 4½ or 5-cent gas tax which goes to pay for roads.

With good roads through Colorado, we should have 200,000 visiting cars annually, whose owners would pay about 25% of the total cost.

Other states are proving this plan successful and are getting the tourists.

WHAT OUR NEIGHBORS SPENT LAST YEAR FOR ROAD CONSTRUCTION

Iowa, 43 million dollars.
 Kansas, 26 million dollars.
 Nebraska, 18 million dollars.
 New Mexico, 6 million dollars.
 Utah, 5 million dollars.
 Texas, 21 million dollars.
 California, 45 million dollars.
 Arkansas, 17 million dollars.
 Oklahoma, 25 million dollars.
 North Dakota, 9 million dollars.
 Wyoming, 4 million dollars.
 Missouri, 32 million dollars.
 Washington, 17 million dollars.
 Oregon, 19 million dollars.
 Michigan, 57 million dollars.
 Wisconsin, 41 million dollars.
 New York, 123 million dollars.

The amendment provides for the paving of the highways between Blanca and Del Norte, in the San Luis Valley; the highway between Montrose and Mack, and Grand Junction to Palisade, on the Western Slope; from Pueblo to Howard, and from Salida to Leadville; from Pueblo to the New Mexico state line; from Pueblo to the Kansas state line, on the Santa Fe Trail; from Colorado Springs to Limon; from Denver to the Kansas state line; from Greeley to the Wyoming state line; from Fort Collins to Wyoming state line, and from Greeley to Nebraska state line. It also provides for the gravel surfacing of the entire Federal Aid system in Colorado, not included in the paving proposals, as well as several hundred miles of state roads not included in the Federal Aid system.

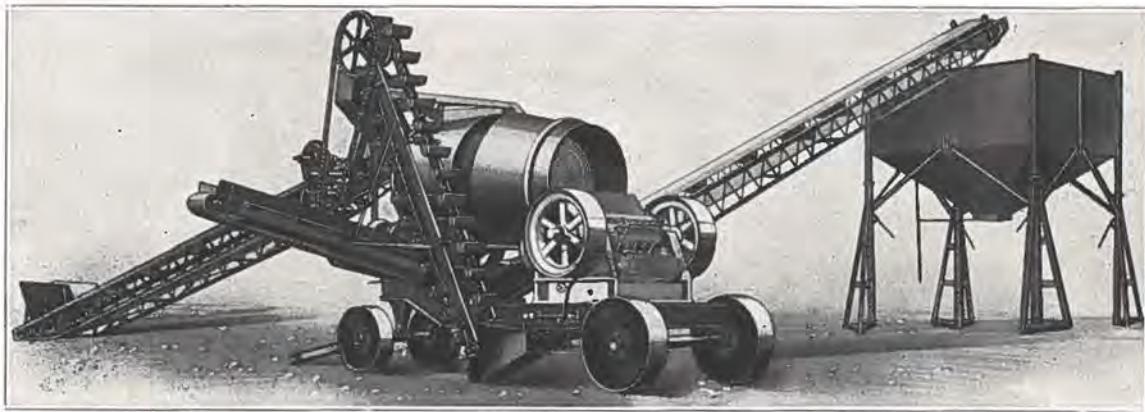
VOTE “YES” on the Good Roads Amendment

TELL YOUR FRIENDS

Cities—Counties—Contractors—State Highway
Departments have placed their stamp
of approval on the

“Cedar Rapids”

One Piece Outfit



Because it produces the best kind and type
of material at the least cost per cubic yard.

There are more “Cedar Rapids” one piece outfits producing the right kind of surfacing material than all others combined. We service them right, too. Ask any owner.

H. W. Moore Equipment Co.

DENVER

Colorado's Largest Machinery Distributors

Will You Fly With Us?



6 Place Stinson-Detroiter Airplane
of the Iowa Manufacturing Co.

Reading left to right: W. GUY FRAZER, Secretary and Chief Engineer; A. G. WALLACE, Advertising Manager;
JOHN H. JAY, President; HOWARD HALL, Vice-President and Treasurer; DAN E. HUNTER, Pilot.

THE CEDAR RAPIDS 6 place Stinson-Detroiter airplane of the Iowa Mfg. Co. (makers of the famous "Cedar Rapids" one piece crushing outfits) will be in Denver at the Denver Union Airport from Saturday afternoon, October 27, until all our friends and customers have had "plenty of air." You are cordially invited to fly with us at any time convenient for you. Just call South 9000 from your hotel or State Highway offices. We have transportation for you to and from the flying field.

H. W. Moore Equipment Co.
West Sixth Avenue and Acoma Streets, Denver

NEWS OF THE MONTH

Current Events in the Field of Highway Engineering and Transportation—State, County and Municipal Activities

A state highway patrol has completed the work of grading and ditching the road over Tennessee Pass, preparatory to winter drainage. The pass was one of the few kept open over the Continental Divide last winter, and it is expected, that, with the improvements made on the road-bed during the past summer there will be less difficulty of keeping the road clear of snow this winter. Equipment particularly adapted to snow removal will be used on the pass this year.

Members of the Rotary, Lions, Kiwanis and Commerce Clubs, of Pueblo, passed resolutions October 10, endorsing the proposed \$60,000,000 highway amendment. The Pueblans launched a vigorous campaign in behalf of the proposal.

A similar resolution endorsing the highway building plan was passed by the manufacturers bureau of the Denver Chamber of Commerce on October 17. Motorists organizations throughout the state, notably the Rocky Mountain Motorists and the Motor Club of Colorado, are backing the amendment to the limit.

Speakers favoring the amendment are pointing out that the paved roads which will result from the expenditure of \$10,000,000 yearly for six years will bring a stream of tourist traffic back through Colorado, and will stop the bitter criticism and adverse nation-wide advertising which this state is now receiving.

At the same time it is claimed that the expenditure of this money on road projects will create an unparalleled era of prosperity in Colorado. An analysis of the cost of concrete paving shows that labor receives for its share in the manufacture, production and construction phases, 52.4 per cent or a trifle more than one-half of the total cost of the work. The percentage of total cost of a mile of pavement going to the cement manufacturer is 10.46 per cent. Labor receives more than five times as much as the cement manufacturer from the construction of a mile of pavement.

The average cost of a mile of concrete pavement is \$28,184, and of this sum labor gets \$13,706.80.

Colorado now has about 350 miles of paved roads. Under the proposed \$60,000,000 construction program, the state will have within six years 1,200 miles of pavement and 4,200 miles of gravel-surfaced highways.

The state highway advisory board will meet on October 29, to hear from and consult with, the different county commissioners and others interested in the road program for the year 1929. The members of the board are: B. B. Allen, Silverton, chairman; Peter Seerie, Denver, vice-

chairman; William Weiser, Grand Junction; E. G. Middlekamp, Pueblo; M. A. Ege, Colorado Springs; W. G. Duvall, Golden, and Frank H. Blair, Sterling.

The 4½-mile paving project east of Boulder, which, when completed, will close the gap in the pavement between Boulder and Lafayette, is 50 per cent complete, according to a report of Clyde Walters, resident engineer. An underpass crossing of the C. & S. Railroad tracks will be constructed in 1929, eliminating a dangerous grade crossing on this road.

The project at Bondad Hill, located south of Durango, connecting with the road to Farmington, New Mexico, has been completed.

Oiling of the highway from Morrison to Evergreen is now under way. The work is being done by the city of Denver, under the supervision of F. J. Altvater, city highway commissioner. A new process of working an asphalt base oil into the gravel is being used. When completed, the oil sets, forming a surface resembling asphalt, engineers say. It is called the "mat treatment."

One of the most valuable contributions to the success of the Pikes Peak region is the recently completed paved highway between Colorado Springs and Denver, according to numerous business men of the city, including hotel proprietors, ga-

rage men and restaurant managers. Since the last unit of the paving was opened, traffic from Denver to Colorado Springs has been tremendously increased, it is said, the greatest increase being on Saturday, when many Denverites come to the region for the week-end.

The trip from Denver is now accomplished by many drivers in one hour and a half.

It is believed that the completion of the Pueblo paving, five more miles of which will be open to traffic next month, will also prove a valuable business asset to the community.—Colorado Springs Gazette.

Governor W. H. Adams journeyed to the western slope the last week in September on a tour of inspection of several new and proposed road projects. He was accompanied by Maj. L. D. Blauvelt, state highway engineer; Allen S. Peck, United States district forester; Sterling B. Lacey, state budget commissioner; Robt. H. Higgins, state maintenance superintendent; Louis A. Hamilton, locating engineer for the forest service; R. E. Cowden, state highway department locating engineer. The party was joined by William Weiser, state highway advisory board member from Grand Junction, and ex-Senator George West, of Durango, at Gunnison, for an inspection of the proposed Black Mesa route. The governor made the trip to get first hand information on the road situation in the western part of the state.



Treated timber bridge near Milner, one of many such structures being constructed by State Highway Department.

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Summary of Total Highway Expenditures 1927

State	Expenditures for Construction (includes Bridges)					Expenditures for Maintenance (includes Bridges)					Cost of Maintaining Highway Dept. Equipment etc. (not included elsewhere)	Total Township Road and Bridge Levy	Interest and Retirement of Bonds		Grand Total Highway Expenditures in State
	Federal Aid Highway System	Other State Roads	Total	County Roads	Grand Total Construction	Federal Aid Highway System	Other State Roads	Total	County Roads	Grand Total Maintenance			State	County (and other local)	
Alabama	\$4,090,373	\$3,807,658	\$7,898,032	No report	\$7,898,032	\$1,093,945	d	\$1,093,945	No report	\$1,093,945	\$321,911	No report	\$2,147,398	No report	\$11,461,288
Arizona	618,990	425,514	1,044,504	No report	1,044,504	712,510	\$182,815	895,325	No report	895,325	375,954	No report	No report	No report	2,315,783
Arkansas	7,511,389		7,511,389	No report	7,511,389	2,478,024		2,478,024	No report	2,478,024	251,359	No report	292,500	\$6,488,124	17,021,398
California*	8,212,157	1,700,000	8,212,157	a	24,642,096	4,164,721	1,000,000	5,164,721	a	5,164,721	1,044,610	No report	4,805,893		45,569,479
Colorado*	2,528,585	591,607	3,120,192	a	4,878,509	7,998,701	258,020	594,102	a	852,122	192,489	No t'nships	1,300,112	None	10,343,426
Connecticut*	2,645,748	4,982,527	7,628,275	No report	7,628,275	114,709	3,626,362	3,741,071	No report	3,741,071	1,409,634	No t'nships	No report		12,778,061
Delaware	843,950	1,171,673	2,015,623	427,000	2,442,623	64,784	97,178	161,962	\$600,000	761,962	128,149	No t'nships	700,670	593,142	4,026,548
Florida			20,841,307	No report	20,841,307			2,396,392	No report	2,396,392	250,709	No report	None	No report	23,488,409
Georgia	12,705,857	None	12,705,857	2,750,000	15,455,857	1,865,090	None	1,865,090	2,800,000	4,665,090	401,755	No t'nships	None	No report	20,522,703
Idaho	1,970,319	201,054	2,171,373	No report	2,171,373	557,471	140,163	697,634	No report	697,634	1,227,740	No report	151,466	399,000	4,647,213
Illinois	7,897,666	14,063,796	21,961,463	8,293,949	30,255,412	2,721,444	d	2,721,444	16,481,075	19,202,520	2,142,176	\$11,805,397	5,606,009	2,886,311	71,897,827
Indiana	10,838,887	None	10,838,887	3,941,930	14,780,817	2,918,099	d	2,918,000	8,390,762	11,308,771	1,041,413	9,080,094	None	No report	36,211,098
Iowa	16,341,641	None	16,341,641	7,630,681	23,972,322	3,743,210	None	3,743,210	5,060,384	8,803,594	141,225	8,908,826	801,768	1,140,015	43,867,853
Kansas	7,100,775	3,190,077	10,290,852	1,512,827	11,803,679	2,118,289	d	2,118,289	4,382,462	6,500,751	1,752,186	4,782,047	None	2,010,371	26,849,037
Kentucky	7,137,418	4,033,315	11,170,733	1,158,629	12,329,362	1,328,475	488,318	1,816,794	3,528,661	5,345,455	3,666,308	None	856,948	22,198,073	
Louisiana	5,777,158		5,777,158	No report	5,777,158	1,101,932	1,454,204	2,556,136	No report	2,556,136	No report	No report	No report	No report	8,333,295
Maine	3,128,607	3,226,326	6,352,933	No report	6,352,933	1,798,386	d	1,798,386	No report	1,798,386	630,697	3,624,691	1,014,305	No report	13,421,013
Maryland	1,233,042	2,797,897	4,030,939	No report	4,030,939	d	3,785,013	3,785,013	No report	3,785,013	No report	No report	No report	No report	7,815,952
Massachusetts*	4,795,012	3,189,182	7,984,194	3,785,050	11,769,244	449,345	1,187,526	1,636,871	1,500,498	3,137,370	298,014	No report	1,048,257	No report	16,252,887
Michigan	6,677,844	8,412,619	15,090,463	a	16,402,877	31,493,140	4,511,839	d	4,511,839	a	4,511,839	252,922	4,082,059	6,650,002	57,837,500
Minnesota	9,102,556	4,250,137	13,352,693	5,644,852	18,997,575	4,610,889	2,713,797	7,324,686	a	7,324,686	150,000	7,439,099	3,973,848	None	37,885,209
Mississippi	2,800,000		2,800,000	1,500,000	4,300,000	566,500	1,699,500	2,266,000	2,266,000	4,532,000	166,300	2,129,000	No report	No report	11,127,300
Missouri	15,743,649		15,743,649	13,472,940	29,216,589	3,224,411		2,224,411	No report	2,224,411	1,005,128	No report	5,136,025	No report	32,441,000
Montana*	1,184,507	None	1,184,507	No report	1,184,507	174,268	None	174,268	No report	174,268	e	2,327,510	None	No report	3,686,286
Nebraska	5,158,051	138,754	5,296,805	6,231,540	11,528,346	2,231,164	99,743	2,330,907	2,039,963	4,370,870	143,683	1,622,138	None	253,809	17,918,848
Nevada	1,472,869	5,187	1,478,057	1,478,057	3,031,121	28,613		331,735	427,537	759,272	41,439	No t'nships	130,097	115,955	2,524,823
New Hampshire	902,012	653,774	1,555,787	1,500,000	3,055,787	450,000	813,482	1,363,482	1,500,000	2,863,482	427,307	No report	No report	No report	3,290,789
New Jersey	3,366,622	19,662,310	23,028,932	9,048,993	32,077,926	1,577,637	276,661	1,854,298	5,155,715	7,010,013	e	No report	2,872,175	12,983,368	54,943,484
New Mexico			2,976,849	a	500,000	3,476,849	1,002,722	1,002,722	a	1,002,722	636,427		472,904	None	5,588,904
New York	13,000,000	3,242,373	16,242,373	29,000,000	45,242,373	670,978	19,106,858	19,787,836	4,000,000	23,787,836	9,834,092	30,000,000	4,620,000	9,200,000	122,684,302
North Carolina	13,902,375	6,951,187	20,853,562	No report	20,853,562	1,499,962	1,929,846	3,429,538	No report	3,429,538			4,990,903		29,274,094
North Dakota	4,013,025	4,013,025	2,393,408	6,406,433	855,197			855,197	647,722	1,502,919	176,513	1,331,426	None	None	9,417,292
Ohio	2,129,651	8,787,268	10,916,919	15,000,000	25,916,919	13,552,434	d	13,552,434	7,000,000	20,552,434		e	None	12,000,000	58,469,353
Oklahoma			9,744,681	2,300,000	12,044,681			2,192,797	10,000,000	12,192,797	878,758	No report	No report	No report	25,116,236
Oregon*	2,478,912	1,011,194	3,490,107	3,000,000	6,490,107	2,469,419	647,161	3,116,581	3,500,000	6,616,581	403,537	No t'nships	3,263,215	2,352,852	19,126,295
Pennsylvania			17,598,462	3,930,517	21,528,979			14,970,604	No report	14,970,604	69,694,506	No report	7,800,447	No report	53,994,537
Rhode Island*	1,914,643	530,072	2,444,715	283,219	5,172,649	514,638	291,594	806,232	527,083	2,139,547	181,486	No report	303,618	108,715	7,906,015
South Carolina	5,804,614	4,266,235	10,070,849	1,500,000	11,570,849	1,300,000	883,329	2,183,329	1,500,000	3,683,329	423,021		None	None	15,677,200
South Dakota	2,627,279	51,872	2,679,151	3,022,202	5,701,353	1,179,873	1,903	1,181,776	1,206,359	2,388,135	150,100	1,936,804	242,243	None	8,331,732
Tennessee	9,646,326		9,646,326	No report	9,646,326	4,117,336	d	4,117,336	No report	4,117,336	2,373,491	No report	136,148	None	16,273,303
Texas*			12,816,361	No report	12,816,361	8,280,571	d	8,280,571	No report	8,280,571	330,722	No report	None	No report	21,427,654
Utah	1,725,977	354,128	2,080,105	410,000	2,490,105	796,085	d	796,085	719,146	1,515,231	98,009	No t'nships	773,900	516,410	5,393,655
Vermont			2,515,304	400,000	2,915,304	1,386,215	d	1,386,215	600,000	1,986,215	178,796	a			5,080,315
Virginia	4,207,674	5,959,303	10,166,977	10,000,000	20,166,977	4,426,023	d	4,426,023	No report	4,426,023	394,833	No report	No report	No report	24,887,835
Washington	5,166,957	147,520	5,314,477	3,728,142	9,042,619	2,114,830	134,840	2,249,670	5,479,411	7,729,081	134,980	334,606	None	377,013	17,618,299
West Virginia	7,012,912	6,185,737	13,198,649	8,650,000	19,848,649	1,494,414	677,563	2,171,978	2,728,942	4,900,920	566,162	2,369,837	4,372,481	3,952,740	36,010,790
Wisconsin	13,804,000	3,747,000	17,551,000	6,018,000	23,569,000	2,848,000	1,662,000	4,510,000	2,315,000	6,825,000	3,680,000	4,820,000	None	3,670,000	41,564,000
Wyoming	1,609,139	187,602	1,796,741	a	870,825	2,667,566	421,270	299,797	721,067	721,067	72,896	No t'nships	391,825	46,500	4,084,254
Totals & Averages	240,827,169	117,924,898	423,545,035	201,828,016	627,817,769	94,068,160	43,822,368	156,560,055	94,356,720	250,870,887	46,671,526	103,349,109	61,530,266	66,601,275	1,149,353,477

*Federal Aid System and State System are identical. *Fiscal year ending Nov. 30, '27, except Texas and Maryland, Sept. 30, '27; Connecticut, Montana, California, June 30, '27, Iowa, December 1, '27.
 a—Includes maintenance or included under construction. b—includes also, registration motor vehicles, traffic control, State awards c—Under State supervision only. d—Maintenance on State Roads not separated. e—Included under Construction and Maintenance. f—Included under County roads. g—includes State Aid, license refunds, etc. h—includes 2½ million special assessment districts. i—includes reconstruction. j—includes rights-of-way.

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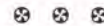
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ILLINOIS SHATTERS WORLD'S PAVING RECORD

A world's record in pavement building was recently established by Illinois, when in one week 70.68 miles of concrete pavement were laid, state highway records show. These roads are 18 and 20 feet wide.

This mileage exceeds the previous best week's construction by more than seven miles. One hundred concrete paving mixers are at work on Illinois state projects. Several are capable of placing more than a one-mile strip in seven days.

The efficiency and thoroughness of modern road building is evidenced by a comparison with pavement building of ten or fifteen years ago. Then a single mile of hard-surfaced road frequently required a month for construction.

Illinois hopes also to establish a new season's record. This state now holds the world's best mark of 1,229 miles of hard-surfaced roads, built in 1924.

Paved roads used by approximately 500 vehicles per day cost the vehicle owner but 1.73 cents per mile. This is approximately the cost which the motor vehicle owners must pay for the privilege of having paved road to travel over instead of an ordinary dirt road. These figures are arrived at by the *Maine Motorist* in the following manner:

"A concrete pavement today costs about \$27,000 per mile. Grading, draining, fencing, etc., bring the cost of the completely improved road to about \$35,000 per mile, the actual cost depending upon the locality where it is built and the amount of grading required. At 6% the yearly interest charge on this total cost is \$2,100, the sum which must be put aside each year to replace the pavement at the end of twenty years is \$907. Maintenance may be estimated at \$200 a year. The total yearly cost of a mile of modern concrete is estimated at \$3,207.

"If an average of only 500 vehicles per day passes over the mile of improved pavement, the cost is then only 1.73 cents per vehicle per mile."

In the early days of the republic, public road building funds were meager and the people so poor that the Commonwealth could not assume the burden of road building. During this period private companies built and maintained turnpikes for which service they were authorized to charge a toll for the use of the road. A schedule dated June 14, 1796, for the first turnpike completed in New Hampshire charged 1c per mile for every 10 sheep or hogs and 3c per mile for wagons, stages and conveyances drawn by horses. This toll charge is approximately twice what the modern motor vehicle owner bears for his share of the construction and maintenance expense of the modern concrete road.

DRAGGING GRAVEL ONTO ROADS AT INTERSECTIONS

In a paper presented at the recent Purdue Road School, A. H. Hinkle, Superintendent of Maintenance of the Indiana State Highway Commission, calls attention to the need for more careful dragging of county roads at intersections with the state gravel highway. At this point a high place is frequently found, which is sufficient to produce quite a bump to the high speed traffic going over it.

Mr. Hinkle states that an examination into the cause of the building up of these high places shows that they are principally caused by the drags or graders at the intersection and permitting the loose gravel in front of the blades to be deposited upon the state road. Frequently this gravel contains sod and silt from the roadside which acts as a binder and causes the loose material to "set up" quickly. This is done many times during the year at an intersection and results in building up a high place in the state road which cannot always easily be cut down, and if cut down to the proper grade soon appears again from succeeding draggings.

GRAVEL LOSS TOTALS \$800 PER MILE

Gravel lost by being torn from the roadbed on an important traffic route and blown, or thrown, into the side ditches represents a money value of probably not less than \$800.00 per mile, according to the estimate of N. M. Isabelle, Maintenance Engineer of the Wisconsin State Highway Commission.

In addition to the loss occasioned by the lost material, there is also the dust nuisance which has to be contended with in heavy traffic seasons. Iowans also will wonder somewhat at the caution expressed by the Wisconsin engineer to the Wisconsin people that their supply of gravel is being rapidly depleted. Iowans have considered that Wisconsin has unlimited quantities of good gravel road material.

"Experience has shown," says Engineer Isabelle, "that when the traffic reaches 500 or more vehicles per day there is an annual loss of material, on the surface of a graveled road, of at least one inch. In some cases it reaches an inch and a half or more, depending upon the traffic. A one-inch loss on an 18-foot road is equivalent to a loss of approximately 400 cubic yards of material per mile, which at an estimated cost of \$2.00 per cubic yard on the road, is about \$800.00."

"ROAD BOOTLEGGERS" BEWARE

Truck and bus owners who bootleg the use of the state highways are being rounded up by the Colorado state public utilities commission and the various counties who have joined in the campaign against illegal transportation of freight and passengers on the state roads.

The new truck and bus bill which became effective in August, provides that all commercial carriers must first obtain from the utilities commission a certificate of public convenience and necessity. The commission has granted several hundred and rejected many applications. Railroads, county officials and other interested persons and firms are given opportunities to pass on the applications also.

The new bill stipulates that only licensed carriers may function within the state and that after the certificate fee is paid a regular payment of revenue must be made monthly. It is estimated that the monthly revenue from the motor lines operating at present will amount to about \$10,000, to be divided between the counties and the state highway department for highway purposes.

Operators of the lines must carry ample liability insurance against accidents, property damage and loss of life. Regular schedules must be maintained. All carriers must come to a stop at rail crossings, observe traffic regulations and otherwise operate within special as well as common regulations.

SNOW REMOVAL IN MICHIGAN

Last winter the State of Michigan cleared the snow from 5,7.5 miles of highway at a total cost of \$302,474 or \$53.02 per mile. The snow removal program for 1928 is expected to include a much larger mileage than that of a year ago.




Hauling beets on the Fort Collins-Denver paved highway—larger loads at less expense.

STATE HIGHWAY DEPARTMENT
Financial Statement—September 30, 1928

BALANCE DECEMBER 1, 1927	
State Treasurer	\$1,334,675.24
County Time Warrants	4,439.15
Revolving Fund	1,500.00
Total Balance	1,340,614.39
 RECEIPTS:	
Half Mill Levy	\$ 700,111.13
Internal Improvement	59,700.00
Gasoline Tax	2,242,354.93
U. S. Government	1,408,005.15
Highway Receipts	36,790.86
P. U. C. Bus Licenses	22,510.74
Total Receipts	4,469,472.81
Total Balance and Receipts	\$5,810,087.20

DISBURSEMENTS:	
Federal Aid Projects	\$2,378,933.03
State Projects	473,017.11
Maintenance	676,533.69
Maintenance Equipment and Repairs	468,690.06
Property and Equipment	22,874.48
Surveys	11,006.69
Road Signs and Traffic Census	6,210.45
Administration	93,795.40
Compensation Insurance	8,000.00
Total Disbursements	4,139,060.91
 BALANCE SEPTEMBER 30, 1928	
State Treasurer	\$1,642,847.47
County Time Warrants	18,678.82
Revolving Fund	9,500.00
Total Balance	1,671,026.29
Total Disbursements and Balance	\$5,810,087.20

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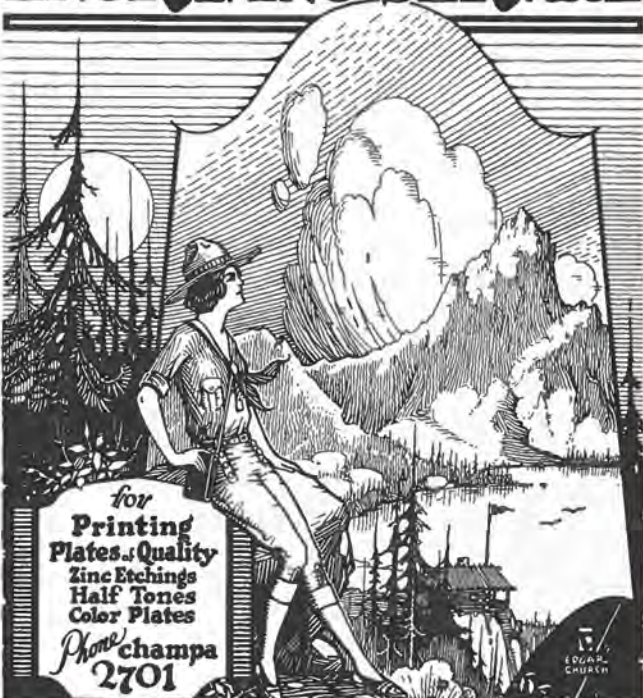


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A new six-mile stretch of highway between Minturn and Gore Canyon has been completed by the state. The new road eliminates many curves and two railroad crossings.

A survey for a two-way highway on easy grade from Estes Park to the summit of Milner Pass has been made by the United States Bureau of Public Roads. Actual construction of this road, it is said, will depend upon attitude of the next Colorado assembly on the Estes Park jurisdiction question, which has been the subject of controversy for some time. The new road will be nineteen miles in length and will cost approximately a half mil-

lion dollars. For scenic beauty the route is said to be unsurpassed.

Since September 15, 1927, Edw. Selander, Fort Morgan contractor, has laid 20½ miles of concrete pavement on state roads, a record for one contractor in a single season in Colorado.

On October 6, the last batch of concrete was poured on an 8½-mile project west of Fort Morgan. There was a grand jubilee as the last cement was dropped into the forms. Every man present placed his hat in the concrete or had it placed there by his pals. In all, 26 "katys" went into the road and were covered with cement.

The contracts, which have been finished, add 8½ miles of pavement to the project west of Fort Morgan, making a total pavement distance of 13½ miles. Traffic is now moving over the newly-completed project. Work on the job began July 16.

Weather conditions permitting the concrete pavement being constructed by J. Fred Roberts & Sons, located north of Pueblo, will be opened to traffic some time in December. The length of the project on which work is now progressing at a rapid pace is a trifle less than five miles.

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
F.A.P. 68-R	2 mi.	Oiled Gravel Surface	North of Monte Vista
F.A.P. 97-R	.....	Bridge	East of Lamar
F.A.P. 150-A	6 mi.	Gravel Surfacing	West of Craig
F.A.P. 248-B	2 mi.	Gravel Surfacing	South of Buena Vista
F.A.P. 258-H	3 mi.	Gravel Surfacing	West of Sapinero
F.A.P. 262-J	3 mi.	Gravel Surfacing	Northwest of La Veta
F.A.P. 272-D	2 mi.	Concrete Pavement & R. R. Underpass	Manzanola
F.A.P. 279-G	0.5 mi.	Bridge and Approaches	Baileys
F.A.P. 292-B	3.5 mi.	Graded & Overhead R. R. Crossing	South of Minturn
F.A.P. 295-D	2 mi.	Gravel Surfacing	North of Antonito
F.A.P. 299-B	4 mi.	Gravel Surfacing	Northwest of Delta

PLANS SUBMITTED FOR APPROVAL TO U. S. BUREAU OF PUBLIC ROADS

Proj. No.	Length	Type	Location
F.A.P. 134-B	3,352 mi.	Gravel Surfacing	East and West of Vona
F.A.P. 144-C	2,934 mi.	Gravel Surfacing	Northwest of Fort Collins
F.A.P. 149-A	4,716 mi.	Gravel Surfacing	South of Deertrail
F.A.P. 57 Reopened	0,464 mi.	Bridge and Paved Approaches	North of Lamar
F.A.P. 259-A	3,350 mi.	Gravel Surfacing	West of Sargents
F.A.P. 282-H	4,808 mi.	Gravel Surfacing	North of Rifle

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1928

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R5	Bet. Trinidad and Aguilar	1,959 mi.	Paving	W. A. Colt & Son	\$ 72,122.50	100	2R-5
2-R No. 6	South of Aguilar	2.75 mi.	Pavement	W. A. Colt & Son	93,000.00	100	2R-No. 6
2-R7	South of Aguilar	1,224 mi.	Paving	H. C. Lallier Const. & Eng. Co.	66,990.60	0	2-R7
2-R8	Aguilar, South	1,633 mi.	Paving	J. Finger & Son	66,660.00	0	2-R8
138-A	North of Kremmling	10,916 mi.	Grading	F. L. Hoffman	201,262.80	65	138-A
144-B	Northwest of Fort Collins	3,201 mi.	Gravel Surfacing	White & LaNier	44,000.00	100	144-B
145-A	West of Glenwood Springs	3,807 mi.	Gravel Surfacing	Winterburn & Lumsden	53,227.90	100	145-A
145-B	West of Glenwood Springs	1,051 mi.	Surfacing	Winterburn & Lumsden	42,389.72	92	145-B
147-A	In Ute Mt. Reservation, S. of Cortez	15,896 mi.	Surfacing	E. J. Maloney	119,100.10	62	147-A
147-B	South of Cortez	4,833 mi.	Surfacing	E. J. Maloney	59,447.44	0	147-B
208-B	E. of Grand Junction	0,507 mi.	Gravel & R.R. Grade Separation	Harry A. Rousch	59,568.00	50	208-B
210-B2	De Beque-Grand Valley	7,507 mi.	Gravel Surfacing	Fred Kentz	37,475.00	100	210-B2
242-B	W. of Mack at E. Salt Wash	Tmbr. Bridge & Gravel Approaches		Hinman Bros. Const. Co.	13,996.40	100	242-B
247-C	Swink	0.8 mi. Conc. Pav. & R.R. Underpass		J. Finger & Son	62,559.58	100	247-C
251-C	E. of Boulder	4,000 mi.	Pavement	J. H. Miller & Co.	150,263.60	40	251-C
253-C	West of Milner	4,502 mi.	Surfacing	Mountain States Con. Co.	88,108.40	75	253-C
254-C2	S. W. of Hot Sulphur Springs	Superstr. of Bridge & Approaches		Northwestern Constr. Co.	48,203.50	100	254-C2
254-D	Parshall-Hot Sulphur Springs	3,013 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	37,124.18	100	254-D
258-E2	Cimarron-Cerro Summit	1,487 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	32,377.70	95	258-E2
258-F	Gunnison-Sapinero	5,689 mi.	Surfacing	Hinman Bros. Const. Co.	100,968.50	78	258-F
266-C	Durango and N. Mex. State Line	2,401 mi.	Surfacing	Salle Const. Co.	32,499.80	100	266-C
271-C	West of Portland	2,430 mi.	Surfacing	J. Finger & Son	54,843.40	7	271-C
275-C3 E2	G3 Palmer Lake-Pring	4,602 mi.	Concrete Paving	J. Fred Roberts & Sons C. C.	114,079.65	100	275-C-3 E2
275-E	North of Monument	0,926 mi.	Grading and Underpass	F. L. Hoffman	41,905.20	100	275-E
275-F3 G2	Tomah-Palmer Lake	12,894 mi.	Concrete Paving	H. C. Lallier C. & E. Co.	292,309.95	100	275-F3 G2
277-B	South of Colorado Springs	4,860 mi.	Concrete Paving	J. L. Busselle & Co.	131,202.45	94	277-B
277-C	N. of Pueblo	4,363 mi.	Conc. Pavement	J. Fred Roberts & Sons C. C.	120,789.25	63	277-C
279-F	North of Baileys	3,444 mi.	Graded	J. Fred Roberts & Sons	126,000.00	69	279-F
282-AR1	South of Craig	600 ft. River Protection Work		Hinman Bros. Const. Co.	11,925.00	0	282-AR1
282-D	North of Meeker	2,864 mi.	Gravel Surfacing	Winterburn & Lumsden	42,155.00	100	282-D
282-E	N. of Meeker	6,421 mi.	Gravel Surfacing	Luke E. Smith & Co.	88,384.20	22	282-E
282-F	So. of Craig on S. H. No. 13	2,17 mi.	Surfacing	Gardner Bros. & Glenn	49,063.00	84	282-F
286-BR1	S. of Wyoming-Colo. Line	14,474 mi.	Gravel Surfacing	A. R. Mackey	38,978.00	61	286-BR1
286-C	Between Greeley and Eaton	5,566 mi.	Paving	New Mexico Const. Co.	126,360.35	80	286-C
287-A3	W. of Ft. Morgan on S. H. No. 2	3.55 mi.	Concrete Paving	Edw. Selander	90,749.50	90	287-A3
287-A4	West of Fort Morgan	5,087 mi.	Paving	Edw. Selander	120,505.80	87	287-A4
287-D1	Two mi. E. of Kersey on S. H. 2	0.921 mi.	Grading	White & LaNier	14,046.40	100	287-D1
287-D2	East of Kersey	0.921 mi.	Paving	S. & S. Const. Co.	25,269.80	23	287-D2
288-A2	Bet. Merino and Brush	9,741 mi.	Paving	Edw. Selander	245,043.50	100	288-A2
292-A	North from Minturn	6,417 mi.	Grading	H. C. Lallier Constr. & Eng. Co.	92,571.80	95	292-A
293-C	North of Ouray	3,661 mi.	Grading	C. V. Hollenbeck	62,997.80	9	293-C
295-C	La Jara-Antonito	5,284 mi.	Surfacing	Pope Bros. C. C.	29,414.60	100	295-C
296-C	N. of Greenhorn on S. H. No. 1	6,606 mi.	Surfacing	H. C. Lallier Constr. & Eng. Co.	115,466.80	63	296-C
298-B	North of Pagosa Springs	2,414 mi.	Surfacing	Engler & Teyssier	38,426.00	8	298-B
300-A	Bet. Chattanooga & Red Mtn.	2,277 mi.	Grading	Winterburn & Lumsden	59,480.80	88	300-A

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Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
 Denver, Colorado

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L. D. BLAUVELT,
 State Highway Engineer.

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Our Cover Page

A stretch of the new pavement completed by the State Highway Department during the past summer located near Palmer Lake, on the Denver-Colorado Springs highway, is shown on the cover of this month's issue of COLORADO HIGHWAYS.

A count shows a 20 per cent increase in traffic over this road since the pavement was opened to use. This increase has been particularly heavy on week-ends. Use of the new pavement also has caused an increased demand on the part of the motoring public for the construction of hard-surfaced roads in the state.



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PHONE TABOR 1361



We Will Do Our Best

"The people have spoken.

"We will do the best we can with the funds available."

Thus spoke Maj. L. D. Blauvelt, state highway engineer, in commenting upon the defeat of the \$60,000,000 good roads amendment at the November election.

"We believe that the people of this state will agree that the state highway department has made a very creditable showing with the funds that have been available during the past eight years.

"An honest effort has been made to give the people a dollar's worth of roads for every dollar that has been expended. This policy of the department will be continued, and we will endeavor to make our dollars go just as far as possible in improving the roads of the state.

"This department takes pride in what has been accomplished."

Under the present administration of the highway department over 300 miles of hard-surfaced roads have been constructed. Nearly 1,000 miles of roads have been gravel-surfaced.

The eastern and western portions of the state have been brought closer together through the construction of new highways over the Continental Divide. An effort will be made to keep several of our pass roads open for travel throughout the coming winter. This is an innovation started last year on Tennessee Pass.

It was hoped that the good road amendment would be approved by the voters of Colorado, because it is generally conceded that more money spent in building new roads will mean less money spent on car repairs. It seems good logic that so long as more cars are produced and bought, the

more good roads will be needed by those who buy the cars. The tax the driver pays toward road improvement he should consider in the light of transportation expense in the same category as money expended on gas, oil and other motoring necessities.

To say that the motorists of this nation collectively travel 100 billion miles yearly does not mean a great deal to the individual in this age of big figures. But let each person ascertain the mileage made each year in his own community by multiplying the number of cars by 5,000, the expected yearly mileage. A community with 10,000 motor vehicles will pile up a mileage of 50 million miles in twelve months. If the automobile operating costs can be reduced a cent or two a mile through the provision of better road surfaces, the yearly saving will be \$500,000 or \$1,000,000. This is \$50 to \$100 per car owner.

Despite the fact that there is now one automobile for every sixth person, traffic is getting heavier. Our reports show a ten per cent increase each year on an average road. Economists declare that an automobile registration of 30,000,000 vehicles may be expected shortly.

This means one thing. More good roads will have to be built, for these millions of motorists will insist on permanent roads, not only for comfort's sake but economy's sake.

The sum of \$3,000,000 will be spent on Colorado's state roads during 1929 for new construction. This total was reached at a meeting of the state highway advisory board on November 10. The 1929 budget will be formally drawn up at a meeting early in December and submitted to Governor Adams for approval.

It is said the new budget will provide \$1,400,000 for maintenance.



Showing a stretch of the newly completed oil processed highway near Romero in Conejos County.

Photo by Patrolman Cummings.

Colorado's First Oil Processed Road Completed

By W. J. WALSH

COLORADO completed its first oil processed road September 22, 1928. The road was constructed as a Federal Aid project and is located between Romero and Antonito in Conejos County. The project is five and three-tenths miles long and the width of treated surface is eighteen feet. The contract for grading, drainage and surfacing was let to the Pople Brothers Construction Company. The oil processing was done by the Colorado State Highway Department.

The method of oil treating this road is known as the surface mixing process and should not be confused with some earlier methods in which oil is applied to the hard, compact road surface and allowed to penetrate. In the mixing process as used on this project the compact surface was first loosened to a depth of three inches. Oil was applied to the loose material at the rate of one and one-half gallon per square yard in three applications of one-half gallon each. Each application of oil was immediately followed by a disc harrow which partially mixed the oil with the road surfacing. Traffic could then travel over the oiled road without the spattering of oil on vehicles.

After discing the material was bladed into windrows and turned from side to side of the road until all particles were thoroughly coated with oil and the material was of uniform color and texture. The mixture was then spread to the standard road cross section and allowed to compact under traffic. The surface received daily maintenance until thorough compaction was obtained.

The oil used was a medium fuel oil containing between sixty and seventy per cent asphalt and was applied uniformly under pressure at a temperature between 135° F. and 150° F. Very careful attention was given to the quality of oil placed.

The general appearance of the finished road is that of an asphaltic concrete pavement. The surface is clean and dustless and in riding smoothness is equal to that of the best pavements.

This type of road is not intended to replace the higher types of pavement and too much should not be expected from it. It is recommended as an intermediate type between the ordinary gravel surface and the expensive pavements and should give excellent service on roads carrying from 500 to 1,000 vehicles per day. It is further suggested as a first stage construction to a more rigid pavement pending the settlement of fills on newly constructed roads.

If traffic does not exceed 1,000 vehicles per day maintenance costs should be low for this type of surfacing. A two-man patrol should cover fifty miles or more and the cost should not exceed \$300.00 per mile. Maintenance should consist of prompt patching of small breaks in the surface with premixed material as rapidly as they occur. The addition of more oil is rarely needed and is often harmful, but should the material be too fat and excessive bleeding occur the surface should be sanded.

For some years past the need in the San Luis Valley for an improved type of surfacing over the ordinary crushed gravel has been sorely felt. Due to a dry climate

combined with high winds and a medium heavy traffic the problem of conserving the fine road metal and binder in the gravel road is a serious one. This type of surface wears rapidly under traffic and highway authorities are becoming seriously concerned at the mounting cost of renewing the road metal. The cost of operating vehicles upon these untreated surfaces is rather high and the dust nuisance is very annoying and is becoming dangerous. Also there is the discomfort of corrugations, loose gravel and chuck holes.

Traffic in this section is not heavy enough to justify the expenditure of large sums for the more expensive types of pavement. The present problem is that of improving the surface of the travel road at a minimum expense in order that the benefit may be quickly and widely distributed over a large mileage. Recognizing the objectionable features of present practice and convinced of the necessity of developing a satisfactory type of highway surface intermediate between the ordinary gravel surface and the expensive pavement types Colorado is following the recent practice of other western states in adopting the oil mixing process to gravel surfaced roads.

The first essential to success with the oil mixing process is the character of the material to be treated. The material should carry sufficient inert fines to fill all voids. The oil itself, while being a binding agent, should not be used as a substitute for mineral binder, but rather should be regarded more in the light of a conserving agency. Light asphaltic road oil will not bind clean coarse material. The surfacing should carry sufficient

mineral binder to insure a compact surface without the addition of oil, but the presence of heavy clay binders are objectionable. Clay or adobe binders do not mix readily with the oil and they are inherently unstable and have high moisture carrying capacities and are constantly changing in volume.

The texture of the material should be uniform; that is, results of surface treatment will be poor if portions of the road are porous while other portions are impervious. Minor irregularities will disappear in the processing if the full width of roadway is worked in one operation, but large sections of irregular grading require careful treatment.

On the Antonito-Romeo project the oil was applied with an Etnyre distributor mounted on a five-ton Pierce Arrow truck. A Towner disc harrow pulled by a Caterpillar Thirty was used for the discing operations. Three eight-foot blade graders pulled by Cletrac Thirties were used for the processing. A light six-foot blade grader pulled by a rubber-tired Fordson was used for maintaining the finished surface and a Case steam boiler was used for heating the oil in the tank cars.

The cost of oil treating this project was approximately \$1,900 per mile. Roads have been similarly treated in localities where the cost of oil is low for as little as \$1,200 per mile. With a highly-trained, well-equipped organization future work in Colorado can probably be done at a cost of from \$1,500 to \$1,700 per mile where the project is accessible to a railroad siding and when the maximum haul does not exceed five miles.



View illustrating some of the difficulties of highway maintenance in Colorado.



A short tunnel on the Canon City-Salida highway, or Rainbow Route, in Fremont County. Photos by H. P. Wilson.



A stretch of protected road on Colorado's Million Dollar Highway, located on Cascade Divide in San Juan County. From the edge of the protection to the bed of the canon it is 800 feet. Photo by B. B. Allen.

Progress on Federal Aid Roads, 2d District

THE following report of the state highway department shows the work done on the highways in Delta, Gunnison, Mesa, Montrose, Ouray and San Miguel Counties in the past seven years, and the work that is to be done in this territory leading to the completion of the Federal Aid system. This report was prepared by state highway engineer J. J. Vandemoer, and was given at the meeting of county commissioners from the Second Commissioners District held in Delta on October 22.

Delta County

In Delta County the Federal Aid system includes 26 miles, when it is all improved, up to Federal Aid standards.

Of this 26 miles, there are completed, up to date, 19 miles.

This still leaves seven miles to be completed in this county, the contract for a portion of which will be let within a few weeks.

This contemplated project will include the improvement of what is known as "fool's hill," which will be widened, straightened and surfaced.

This will still leave a few miles of Federal Aid improvements yet to be completed in Delta County.

Gunnison County

In Gunnison County, the Federal Aid system includes 84 miles when it is all improved, up to Federal Aid standards.

Of this 84 miles, there are completed, up to date, 27½ miles or 33 per cent.

This still leaves 56½ miles of strictly Federal Aid road to build.

Of this 56½ miles, 11½ miles have been partially improved on Monarch Pass by forest service funds and 10 miles have been partially improved on the Blue Mesa by state and county funds.

This will then leave 35 miles of road in this county in need of grading and graveling, in order to complete the system.

Of this 35 miles, five miles will be improved under Federal Aid standards within the next year, leaving 30 miles yet to be provided for.

Mesa County

In Mesa County, the Federal Aid system includes 105 miles when it is all improved, up to Federal Aid standards.

Of this 105 miles, there are completed or under contract up to date, six miles of concrete and 40 miles of gravel surfacing.

This makes a total of 46 miles of completed Federal Aid highway in this county at this time.

This still leaves 59 miles yet to be completed.

In other words, the Federal Aid system is 44 per cent complete in this county.

When the Clifton crossing viaduct is completed this year, this Federal Aid highway will have no grade crossing from Cisco, Utah, to Gypsum, Colorado, a distance of approximately 200 miles.

Montrose County

In Montrose County, the Federal Aid system includes 52 miles when it is all improved, up to Federal Aid standards.

Of this 52 miles, there are completed or under contract up to date 10 miles, or 20 per cent.

This still leaves 42 miles in this county to improve, up to Federal Aid standards, of a 26-foot width road bed and a six-inch gravel surfacing.

Ouray County

In Ouray County the Federal Aid system includes 38 miles when it is all improved, up to Federal Aid standards.

Of this 38 miles, there are completed up to date 15½ miles, or 40 per cent.

This still leaves 22.5 miles to complete the Federal Aid system in this county.

The above 15½ miles also include the most expensive section to improve in the state.

Summary

Summing it all up, it is interesting to note that up to date the counties of Delta, Gunnison, Mesa, Montrose and Ouray include at this time a total Federal Aid mileage of 305 miles.

Of this 305 miles, 118 miles, or about 39 per cent are either completed or under contract at this time.

It has taken about seven years to improve 39 per cent of our highways, so at the present rate of improvement it will take from 10 to 11 years to complete the Federal Aid system in the above counties.

State Projects

In regard to state projects, Delta County is gradually getting some gravel surfacing between Austin and Hotchkiss, and we hope it will be possible to continue this improvement.

Gunnison County has about a mile of her Black Mesa improvement completed.

Mesa County has completed the widening of 10 miles of the Plateau Canon road.

Ouray County is getting some much-needed gravel surfacing on Dallas divide, and San Miguel County is also getting a substantial road built from the top of Dallas divide toward Placerville.

Road Bonds Set Calendar Ahead

By E. E. DUFFY

FATHER TIME is being taken by the forelock in road building as he never was before. The "pay as you go" method of building highways is being supplemented by the "pay as you ride" policy which carries with it refinements that mark the modern automobile as compared with the high wheeled auto buggy of the whip-socket era.

State road bonds worth \$240,000,000 were authorized November 6 as follows: Iowa, \$100,000,000; West Virginia, \$35,000,000; Louisiana, \$30,000,000; Missouri, \$75,000,000.

Next year portends to be a banner period for highway issues with Texas now seriously considering the passage of a \$300,000,000 issue with which to put a crimp in the vast mileage of unsurfaced, heavily-traveled roads there.

Other states considering bond issues are Georgia, Mississippi, Alabama and Minnesota.

Since 1916, states have passed road issues totaling \$1,159,836,000, while from 1919 until this fall, counties voted issues amounting to \$985,417,000. Several counties passed issues November 6, including that of Will County, Illinois, for \$1,750,000 and that of Armstrong County, Pennsylvania, for \$1,500,000.

Installment buying, for such it is, has proven to be as desirable to the conduct of government as to individuals who pay for radios, automobiles, washing machines, and so on, by means of future earnings. Bond issues bring large sums of money with which highway improvements are immediately constructed so that the motorist and taxpayer, usually the same person, may save money directly in car operating costs, and indirectly through lowered road upkeep costs paid out of state funds.

Road bond issues are usually financed entirely by gasoline tax revenues and motor license fees. Highway economists point out that where motorists pay out from 9 to 15 dollars in gasoline taxes per year, based on an average use of 300 gallons, the actual return to the

motorist through highway benefits will exceed this several times over.

By "paying as you ride" highway conveniences of a decade or so hence are available for current use and at no greater cost, for poor roads cost from one to three cents more a mile to drive over. The saving possible here more than offsets that bugaboo, interest on bonds.

Missouri had but nine miles of concrete rural roads in 1920. At the end of 1927, seven years later, Missouri motorists were riding on 1,532 miles of concrete and hundreds of miles of graveled highways which will be paved as soon as her progressive program permits.

The two great Missouri cities, St. Louis and Kansas City, although 250 miles apart, are connected with a ribbon of concrete that is shorter by 20 miles than the shortest railroad line.

Through foresight and careful financing of no additional burden to taxpayers and motorists, Missouri is using roads that otherwise would not have been built for many years, if at all.

In the early fall of 1921 Missouri voters authorized a bond issue of \$60,000,000 to be financed with automobile registration fees. The program outlined called for ultimate hard surfacing and maintenance of 7,640 miles of primary and secondary roads, about seven per cent of the entire Missouri road system.

During 1925 a gasoline tax of two cents per gallon was placed in effect and this revenue of about \$5,000,000 yearly when added to the \$8,000,000 income from license fees, gave the state \$13,000,000 for road betterment. The yearly income has since grown to about \$14,500,000. This has placed Missouri in such an excellent financial condition that an additional highway bond issue for \$75,000,000 has been adopted.

Farm-to-market roads are to be given specific attention in the augmented program under the new \$75,000,000 bond issue. It is the plan of the Missouri State Highway Commission to spend \$40,000,000 on at least 5,000 miles of these supplementary roads by 1937. A striking note of modernism is included in the plan which contemplates the widening and building of

parallel routes around St. Louis and Kansas City so that these big markets will be easily accessible to the farmers.

In days gone by Missouri was known for her corn, mud roads and mules. Missouri plans to keep the corn and mules.

Evidence is to be found on every hand that the road problem is being solved. The Iowa State Highway Commission has just announced that road builders in that state have been wiping out dirt roads at the rate of six miles a day.

With 600 miles of first class pavement completed by August 31, it is believed that Iowa will have added a total of 700 or more miles of pavements to the primary system when the current road building is finished. This will exceed the best previous year's achievement by 375 miles. Iowa dirt and mud, so say the citizens, will in the future raise corn instead of Cain.

Illinois is now engaged in establishing a new world's record in highway building. At the conclusion of the current road building season Illinois will have completed 1,200 or 1,300 miles of concrete rural roads of an average width of 18 feet. This will give the state a total hard surfaced mileage of well over 7,200 miles.

Although fortunate in the possession of Chicago, a city of three million people, Illinois would never have accomplished this achievement without sagacious financing. In 1918 a \$60,000,000 bond issue was made effective for the construction and maintenance of main state thoroughfares. In 1924 an additional bond issue of \$100,000,000 was passed for the further improvement of state highways. The annual income from the license fees—Illinois has no gas tax as yet—of from \$12,000,000 to \$14,000,000 provides for the retirement of the last of these bonds in 1948. Surplus highway income, money not necessary for bond retirement, of about \$2,750,000 yearly, is also applied to state highway construction and maintenance.

It would have been folly for Illinois with her vast farming population, with her tremendous actual and potential agricultural wealth, to have continued on the pay-as-you-go plan with its safety, true enough, but also with its delay and the inefficient piecemeal construction that goes with year to year purchasing.

With all America awakened to the wisdom of labor-

saving devices, which in effect means time and money saving devices, it is obvious that the citizens who use these modern appliances in their own private businesses will not be content with the operation of their community government on the same old principles and with the same old methods that characterized the days of the one-hoss shay. The efficient progressive state is the state equipped with the best of modern offerings. Certainly there is no better way of advancing citizenship and well being than through the construction of good roads and—well take a look at Illinois a few short years ago when Governor Edward F. Dunne denounced the roads of his state as follows:

"The loss to farmers because of inaccessible primary markets, and the abnormal expense of transportation due to bad roads, must be considered as a contributing cause of the high cost of living. In some Illinois counties highways are impassable to ordinary loads a full third of the year."

Illinois road authorities now agree that if the state had built roads without bond issues, the spreading or buttering, of the yearly highway income over the several thousand miles included in the state system and on the most needed of the secondary roads, only a few hundred miles of first pavements would be in existence where there are now nearly seven thousand. For the most part Illinoisians would be motoring over roads that could better be termed "high cost" roads rather than high type roads. "High cost" roads are those that require heavy maintenance each year and insidiously collect sizeable tolls from the frequently unsuspecting motorists in the form of extra wear and tear on the car, the rapid wearing away of tires, and excessive gasoline requirements.

As the matter now rests Illinois is possessed of a highway system that would be the pride and joy of any state in the union. The motorist and the taxpayer, who in most cases coincide, have felt no additional burden.

The bond issue plan, then, as practiced by Illinois, Missouri, North Carolina and many other states, is ideally adapted for the early improvement of these roads that do carry the most vehicles.

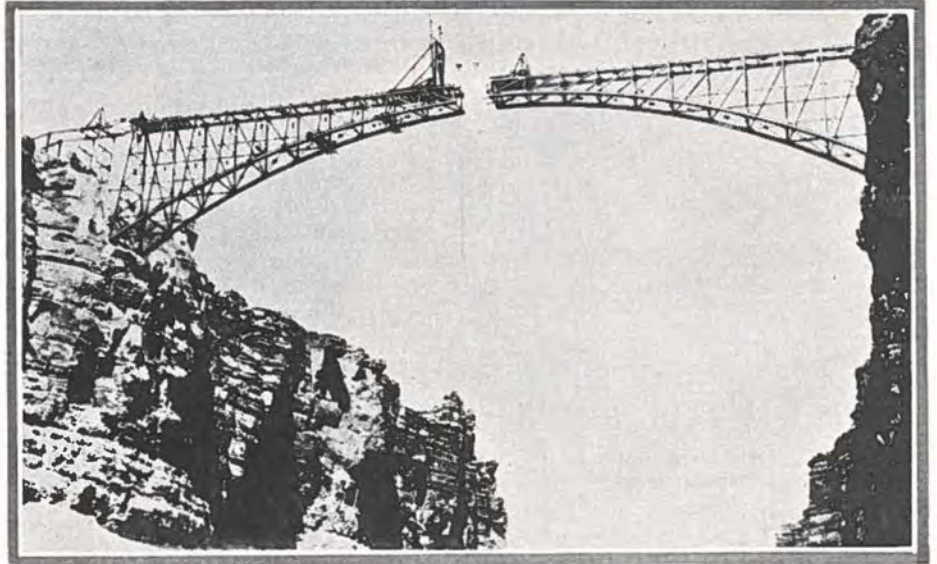
The heavily traveled dirt and gravel roads must go for they constitute about the most expensive non-luxury gnawing at the taxpayer-motorist's pocket book.



One of Colorado's heavy-duty maintenance outfits working on State Road No. 10, near Durango, in La Plata County.

Closing the Span of the New Grand Canyon Bridge

By R. A. HOFFMAN,
Bridge Engineer



THE closing of the two great halves of the 616-foot arch span bridging the Grand Canyon of the Colorado may be said to have marked a milestone in the history of highway construction in Arizona. The placing of the pins at the center of the span, an event successfully accomplished in a few hours, was awaited with much anxiety by the engineers and contractors alike. Two hundred thousand dollars' worth of structural steel, representing many months of labor, hung as it were by a thread, as the giant jack screws lowered the steel onto the pins. It may safely be stated that this point in the construction having been passed, all hazards are past and the job is as good as done.

The completion of this project by the Arizona State Highway Department, opens a new route, a new land of scenic wonder to the tourist and citizens of the state. It will be a fairly comfortable trip even on the present road. So much has already been said about the wonders of the country north of the Colorado in the states of Arizona and Utah that it would be useless to emphasize it further.

We look next to the strategic position of this bridge—the only one across the Colorado River in a stretch of approximately 600 miles—between the junction of the Green and Grand Rivers, the beginning of the Colorado proper, and the bridge at Topoc, Arizona. When we consider that this is the only crossing between those points either by highway or railroad, we can visualize the extreme importance of this route, the only north and south route through Arizona connecting this state with Utah and points north. For this reason it is possible to predict the early completion of a modern highway through this section of the country.

It may be well at this time to review a few major points in the design of this structure, as some slight changes have been made in the dimensions since the publication of the first article in *Arizona Highways*, "Bridging the Grand Canyon of Arizona."

The Canyon, at this point the narrowest neck in the whole stretch of the Canyon, is 585 feet from rim to rim with vertical wall to a depth of 450 feet below the rim. These walls are of solid Kaibab limestone, a

very hard and durable rock, very suitable for the foundation of the type of bridge selected.

Location surveys and a visual inspection of the foundation indicated that a span of 600 feet would be adequate. Not entirely satisfied, however, it was requested that a party be sent out to make preliminary excavations to determine definitely the nature and extent of some of the fissures exposed on the surface. A small party under the direction of M. H. Hasler, then general bridge foreman for the department, made sufficient excavation to determine the solid foundation. The expense incurred in this preliminary work was well worth while, for as a result of this work the span was increased to 616 feet and very little time was lost in making the design. Such a change later would have been costly.

The total length of the structure is 834 feet, consisting of a main deck arch span of 616 feet, two 84-foot pin connected deck spans on the Fredonia (north) side and one 50-foot of the same type on the Flagstaff side. The rise of the arch is 90 feet, the height from shoe pin to deck 103 feet, and the overall height of bridge about 115 feet. A reinforced concrete roadway 18 feet clear between curbs is provided for the entire length with concrete curbs on the approach spans and built up steel curbs on the arch to decrease the dead load.

Complete specifications and plans for the bridge, including stress sheets, general detail of the arch and approaches and the general details of the back ties down to the point of anchorage were prepared in the bridge department of the Arizona State Highway Commission under the direction of the writer.

On account of the 130-mile haul of material it was advisable to consider the structure as a whole, including the tie back details as a means of using this otherwise waste material in the finished structure. Thus the approach spans were designed as pin connected deck spans and the anchorage or tie back eye-bars so designed as to be used for the tension chords and diagonals of these spans.

It is the intention to deal chiefly with the erection up to and including the closing of the arch. The excavation work in which about 14,000 cubic yards of rock was

removed was started on the Fredonia (north) side on January 13, 1927, and completed March 23, when the crew and equipment was moved to the south side. These moves were accompanied by difficulties in moving the compressor and other equipment across the ferry and up over the "dug-way." It was almost impossible to work both sides at the same time without two independent crews and, therefore, all work of one class was completed on each side before moving to the other. The excavations for both sides were completed by November 19, 1927, and work started on the concrete for the arch pedestals on the Flagstaff side.

The Flagstaff pedestals were poured up to within eight inches of the seat for the steel shoes by March 9, 1928, and the crew moved to the Fredonia side. These pedestals were finished by April 5.

During the week ending March 13, 1928, the Kansas City Structural Co. moved in a crew and started excavating for the tunnels and shafts for the Flagstaff anchorage. It was during this same week that the first car of steel and equipment arrived in Flagstaff and the subcontractor on the haul (Moore & Sons of Clarkdale, Arizona) hauled the first steel.

It may be stated that on this particular job the hauling was considered to be one of the most important features and the success of the entire job depended in a great measure upon the success of this contractor's work. A haul of 130 miles over a modern highway would have been an everyday occurrence, but here was a job which required much forethought and a thorough knowledge of the country. One hundred and thirty miles of road through sand washes, up and down steep grades and over rolling and uneven roads—a fairly easy trip for a light car but many who saw the road were skeptical.

The contractor wisely selected two trucks combining great power and flexibility, one a six-wheel truck

of 12-ton capacity driving on the four rear wheels and the other a four-wheel truck of 5-ton capacity and of the same make. All were mounted on pneumatic tires with duals on all rear wheels. These trucks, with a two-wheel "dolly trailer," comprised the major equipment for the haul. Some of the steel sections for the bottom chord weighed approximately ten tons each and as much as eighteen and twenty tons were hauled with ease in one load on the six-wheel truck and trailer.

Fortunately very little rainy and bad weather was encountered, the only delay being a snow blockade for a few days in the pass just outside of Flagstaff.

Shipment of the cars of steel from Kansas City to Flagstaff was arranged so that the arrival was timed to fit the truck haul and in this way there was no delay of crowding at the transfer yard at Flagstaff.

The hauling of about 1,100 tons of structural steel was practically completed in four months, with the exception of the two bottom chords at the center, which will be mentioned later.

The huge steel shoes with the 15-inch diameter steel pins were set on the Flagstaff side on April 16, 1928. The first two panels of the arch, the toggles and ties to the anchorage, were then placed and riveted. These were adjusted for line and elevation by jack screws set in the base of the shoe and the eight inches of grout poured on May 10. Two weeks were allowed for the grout to cure before erection proceeded.

The eleventh panel, completing the Flagstaff side of the main arch, was in place and riveted by June 15. It was during this week that one of the steel workers lost his life—falling from the top chord of the bridge to the water 460 feet below. True to tradition the other four workers of this crew quit after the death of their comrade and a new crew had to be secured. The other crews remained on the job and went to work again the next day.



Airplane view of new highway bridge across the Grand Canyon near Lee's Ferry, Arizona, which will be thrown open to traffic in the near future. Completion of the structure will mark the closing of the last gap in a great north and south highway through Utah and Arizona. Photos by courtesy Arizona Highway Commission.

At this point of the work the first half of the bridge was standing out over the river a distance of 308 feet, a huge cantilever without support except at the back shoes and the tie back. On the end of this cantilever a tower was erected and a cable-way erected to the Fredonia side for transferring the steel and equipment to that side.

The shoes on the Fredonia side were set July 12 and grouted in place August 2, with two points of the arch in place.

During the time of setting these shoes and the tie backs it was discovered that one of the screws of the toggles (the last one to be assembled) did not work easily in the nuts. All the rest had been tried and found to work smoothly and easily. In trying to free the movement of this screw the threads were stripped and a new screw had to be ordered from Kansas City. This was made of a slightly different design than the original in order to place it after the work had progressed beyond the point at which the screws and toggles were to have been placed.

Work continued to the fifth panel, the new screw and assembly arrived and were placed August 18.

The tenth panel of the north side was in place by August 31 and the final measurement was taken for the eleventh panel which was left in the shop for drilling the pin holes in order to allow for any corrections necessary.

It was considered advisable to add five-eighths of an inch to one chord and one and one-quarter inches to the other. The additional five-eighths inch on both sides was added after carefully checking the span across the top, although the question is raised here as to whether the means used, a chain and plumb line, for such heights and distances, is more accurate than the original triangulation survey; and this error, if such existed, of five-eighths inch in 616 feet was negligible even on a structure of this type. The additional five-eighths inch, making one and one-quarter inches added to the down stream chord, was advisable to place the pins at exactly the same elevation; compensating, in other words, for discrepancies in fabrication.

These last two chords were set and riveted by the evening of the 11th of September. On the morning of the 12th all was in readiness for the lowering of the two 308-foot cantilevers, together forming the great arch of 616 feet.

The lowering operation was much less of a task than had been anticipated. About five hours of the morning of the 12th were consumed in arranging lines. The toggle bars were spread with a six-inch diameter compression screw with shoulder threads having a pitch of one-fourth inch. The upper ends of these screws were designed with a 5-foot diameter sheave on which four or five turns of five-eighths inch cable were wrapped and attached to the drum of the hoisting engine through a set of rope blocks, thus exerting a tremendous pull on the circumference of the sheave.

The toggle bars, 11 feet 4 inches center to center of end pins, were arranged in the form of a parallelogram with the 6-inch screw in a vertical position on the short diagonal, the points of the long diagonal being connected to the top chord of the arch. The maximum stress in this chord during erection was 680,000 pounds tension, and the resulting compressive stress in the



A stretch of oil processed road northwest of Alamosa, recently completed under state supervision. Photo by J. W. Walsh.

screw amounted to 208,000 pounds at the maximum extension or open position of the toggle at the time of starting the operation. The maximum open position of the toggle was seven feet and the minimum position two feet, allowing five feet for closing. The resulting maximum displacement of the top chord pin at the toggle was about twelve inches.

The screws on the Flagstaff end were started about 11:00 A. M., and that half of the arch lowered nine inches at the crown before starting the other (north) end. Some trouble was encountered in starting the screws on the north and they were not in operation until about 2:00 P. M., and this side was lowered to the same elevation at the crown as the Flagstaff side and from this point on all four screws were operated simultaneously, keeping the pin holes in perfect alignment and elevation at all times, until both sides were bearing on the pin at 5:30 P. M.

An interesting feature of the operation at this time was the fact that the contraction of the steel, due to the falling temperature at this hour of day, was so rapid that it required continuous operation of the screws to keep the toggles from again taking the load off of the center pins. The operation was continued on three of the screws until nearly 9:00 P. M., in order to keep sufficient slack to allow for temperature.

The following day the erection traveler was dismantled and the work of setting floor beams and approach spans was started.

In a future article to be published the writer will attempt to conclude the construction of this work with interesting features of the approach spans and concrete floor, dealing particularly with the erection material as it was used in the finished structure.

BAD ROADS KILL DEVELOPMENT

Good roads are a productive investment. Where roads are bad, development of adjacent territory is slow, if indeed, there is not retrogression.

Good roads enhance values and promote business generally. They mean improved transportation facilities and the means for getting about quickly and conveniently.—Jordan People's Weekly.

Trucks Demand Best Highways

HAULING goods and produce by motor truck has become such a business in the United States that communities can no longer afford to build highways that will not bear the full traffic burden economically.

Farmers, for instance, have increased their market radius from that not-so-long-ago period when ten miles was a good day's hauling distance for two or four horses, to the present, when loads weighing two or three times as much may be carried fifty miles or more over good roads by motor trucks.

Quickness in transportation means money to the farmer in more ways than one, as this instance cited in a recent report of the Interstate Commerce Commission indicates. A farmer in Minnesota notes that when his poultry shipments are made by rail there is a shrinkage in weight of five or six pounds per crate. Delivery by truck, accomplished quickly over the fifty-mile highway leading to Minneapolis, brings a shrinkage of only one pound.

Trucking by motor is such a new thing, comparatively speaking, that for the most part there is ignorance of its extent. In many communities the bulk of short haul shipments is made by motor truck. An analysis of shipping between Columbus and 30 Ohio cities, according to the Interstate Commerce Commission report, shows that for hauls of less than 20 miles about 85 per cent of the total is by truck. For longer distances, truck hauling naturally decreases, but up to 30 miles trucks absorb more than half of the business.

The importance of the motor truck is emphatically stressed in the business of hauling live stock to market. Three and a third million hogs were carted by motor

truck in 1925 to 15 markets, slightly more than one-tenth of all shipments. Also, 6 per cent of the sheep, more than 12 per cent of the calves, and 4.5 per cent of the cattle traveled de luxe on rubber tires to these markets. In Indianapolis in 1913 only 4.5 per cent of the hogs coming into market were shipped by truck; in 1923, one-third.

This tremendous industry of using the public highways for trucking the nation's produce must be given prime consideration in planning future road programs. Substantial roads that will not succumb to heavy pounding truck wheels must be built by each community so that it may not only compete on an even basis with its neighbor, not only so that the individuals actively engaged in hauling may profit, but also in order that the public itself may attain the full advantages that go with cheap and rapid transportation. Motor trucks are here to stay; roads should be built to carry them.

Denver—Maps showing the status of Federal Aid roads in Colorado have been completed by the government. These maps have been prepared by the U. S. Bureau of Public Roads. From these the motorist may now know just where he will have to travel over gravel roads, sand-clay, bituminous, concrete or brick roads. The maps cover every state in the Union.

Denver—On December 1, Herbert Fairall, state treasurer, will retire \$50,000 of the six million dollar highway bond issue authorized in 1923. Three million two hundred thousand dollars worth of these bonds are now outstanding. They are being retired from the motor vehicle tax.



A beautiful stretch of state highway on the west slope of La Veta Pass, located in Costilla County, showing splendid condition resulting from efficient work of state maintenance crew. Photo by Patrolman Cummings.

The Pavement for Congested Streets



THINK of the traffic in your town twenty years ago. Not much of a problem then, was it? But today! Times have changed and the streets of yesterday—still the streets of today—are as obsolete as a 1907 motor car. Not only must our street pavements be made wider and still wider to accommodate growing traffic volume. They must be specially designed for durability, safety and uninterrupted use.

The concrete street is modern—developed, like the concrete road, specifically for motor traffic moving on rubber instead of steel. Resilience is built into the modern vehicle. Its roadway must be rigid, maintaining an even surface under impact, wear and temperature. The concrete street meets these requirements perfectly—and it is the safest pavement wet or dry.

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NEWS OF THE MONTH

Current Events in the Field of Highway Engineering and Transportation—State, County and Municipal Activities

Fort Collins—Cameron Pass became blocked with snow on November 2. This is one of the scenic routes over the Continental Divide in northern Colorado. It will remain closed until some time in May.

Gunnison—George Toupain, assistant state superintendent of maintenance, announces that state highway forces will co-operate in an effort to keep Cochetopa Pass road open for winter travel. A state maintenance crew will be put on the job at an early date.

Cortez—Plans are now under way for an extension of the new road extending to the Ute Indian Reservation. The new project will connect up with the link the Maloney Construction Co. is now building between the Casey Corner and the Reservation.

Boulder—Pouring of concrete on the five-mile stretch of pavement east of here has been completed. A 2,000-foot strip has been left open for the construction of an underpass crossing of the C. & S. tracks next year. The project cost \$175,000 and means a through paved road from Boulder to the north and south Lincoln highway.

Denver—Maj. L. D. Blauvelt, engineer, and B. B. Allen, chairman of the state highway advisory board, attended the annual meeting of the American Association of State Highway Officials held in Chicago the week of November 12. A new transcontinental highway leading through Colorado was designated at this meeting. The new road will be known as U. S. Highway No. 30. The old Denver-Kansas City Airline forms a link in the highway in Colorado.

Denver—The state highway advisory board will meet in Denver on December 10, to make draft of the 1929 highway budget. It will be submitted to Gov. Adams for final approval.

Hayden—A. K. Langridge and a corps of surveyors have completed plans for a new road between Bear River and Mt. Harris. An effort will be made to start work on the project this winter. The road carries a heavy local traffic.

Glenwood Springs—With the acceptance of the last mile of the five-mile strip of highway from Glenwood to South Canon the project begun in March, 1927, and costing in the neighborhood of \$105,000, was finished on September 14. The completed stretch of road is graveled for eighteen feet, while the bed of the road is 26 feet wide. The construction by

Winterburn & Lumsden, of Grand Junction, is very fine, according to District Engineer H. L. Jenness.

Pueblo—Plans for the \$250,000 state highway bridge over the Arkansas River at Lamar have been completed. The bridge will be one of the longest in the state. Plans for an underpass and a mile of paving east of Manzanola also have been completed. The Santa Fe Railroad will defray part of the cost of the underpass.

Greeley—Four miles of "oil process," or bituminous oil treatment, has been completed south of the Wyoming state line on State Road No. 1. An additional ten miles of this road will be "oiled" next spring. Because of the rapidly increasing automobile traffic in the West, the highway maintenance problem is getting to be a serious one. Looking into the future, officials have decided that they must prepare for developing a road surface of a higher type than the present gravel surface, as cheaply as possible. The "oil process" with its promise of not only conserving material, but improving service to the public, has attracted wide attention.

Boulder—A group of local citizens improved the eight-mile link of road running from the corner of the Chautauqua grounds up Bluebell Canon on October 20. Otto Berger, was chairman of the committee in charge of the volunteer workers.

Alamosa—Active work has been started on a roadway from Monte Vista east to the sand dunes. The new connecting road to the famous dunes branches off the Ponca Pass highway, 14 miles north of Alamosa. Road crews from Alamosa, Saguache and Rio Grande Counties also are at work on the west slope of Mosca Pass. Construction of this new road on the east slope will be carried out by state highway forces.

Trinidad—Several local business men have become interested in a proposal to construct a toll road to the summit of Mt. Baldy, above Rye. The cost of the project would run into thousands of dollars. That the project is feasible has been determined by a preliminary survey.

Denver—On November 5 the state highway department opened bids on three Federal Aid projects as follows: F. A. No. 57; Phelps Bros., Fowler Colo., low bidder with \$8,888. Temporary bridge piers and abutments on Arkansas River north of Lamar, Prowers County.

F. A. P. No. 134-B; W. A. Colt & Son, Las Animas, low with \$32,605. Gravel surface, 3.3 miles east and west of Vona, Kit Carson County.

F. A. P. No. 149-A: Fred Kentz, Denver, low with \$26,004. Gravel surface 4.7 miles between Deertrail and Agate, Elbert County.

S. P. No. 726: C. L. Wilbur, Gunnison, low with \$7,546. Sixty-two foot log bridge and approaches at Parlin, Gunnison County.



Showing part of the modern equipment employed by the Mountain States Construction Co. in building five miles of new road west of Milner. Photo by A. J. Held.



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COUNTY OFFICIALS TO HOLD MEET DECEMBER 11 AT COLORADO SPRINGS

The annual convention of the Colorado Association of County Commissioners will be held in Colorado Springs on December 11, 12 and 13.

Addresses will be delivered by federal, state and county road officials. Various phases of construction and maintenance work in Colorado will be discussed.

The list of speakers includes: Maj. L. D. Blauvelt, state highway engineer; B. B. Allen, chairman of the state highway advisory board; June W. Johnson, district engineer, U. S. Bureau of Public Roads; and Col. Allen S. Peck, district supervisor, U. S. Forest Service.

The convention will be attended by many of the new commissioners elected at the November election. During the next two years, seventy new faces will be seen among the personnel of the commissioners of the sixty-two counties.

The sessions will be presided over by President Herman Emperius of Alamosa. T. W. Monell of Montrose is secretary of the association.

ROAD OFFICIALS ENJOY FLIGHTS IN BIG CEDAR RAPIDS PLANE

Officials of the Iowa Manufacturing Company of Cedar Rapids, Iowa, flying in their own airplane, "The Cedar Rapids," arrived in Denver on company business Saturday, October 27th, according to George Meffley, of H. W. Moore Equipment Co., the company representatives in this territory. It is the custom of the Iowa Manufacturing Company to use airplane transportation whenever possible, in order to give dealers and customers exceptional co-operation. He says that the Iowa Manufacturing Company is the first in its field to purchase an airplane for regular use.

"In this day and generation," says Mr. Meffley, "with everything being done on a time basis, it is necessary that every precious minute be saved. This is the policy of the Iowa Manufacturing Company, in co-operating with its representatives, to help make every moment count on all matters pertaining to highway construction."

The "Cedar Rapids" plane was named for the home of the Iowa Mfg. Co., known as exclusive builders of the Cedar Rapids Crusher and One-Piece Portable Outfits, and other rock, sand and gravel equipment. Those accompanying the plane were Messrs. John H. Jay, president, and Dan F. Hunter, pilot. Flights were made from the Denver Union airport.

More than a hundred road officials, engineers, contractors and county commissioners availed themselves of the invitation "to fly with us," extended by the H. W. Moore Equipment Co.

U. S. BUREAU STARTS DRIVE FOR BETTER CONCRETE PAVEMENTS

In a drive for better concrete, the U. S. Bureau of Public Roads, through Chief Thos. H. MacDonald, has laid down a new set of principles by which it is hoped that these results may be obtained.

These principles as sent out to the district engineers, briefly stated, are:

1. The abandonment of volumetric proportioning of aggregates and the adoption

of proportioning by weight as standard practice. Inundation will be recognized as a permissible alternate method for fine aggregate, but weighing is preferred.

2. Maintenance of the lowest water-cement ratio which, with the particular type, grading and proportions of aggregate used, and the methods of finishing employed, will produce a workable, dense and uniform concrete.

3. The scientific grading of coarse aggregate by combination of separated sizes in each batch in the proportions which will produce the maximum practicable density.

4. The abandonment of hand finishing methods in favor of machine finishing.

It is said that results of research and tests conducted by the bureau show that application of these principles will produce concrete of greater uniformity and increased strength, and the bureau will actively encourage their application in the future.

MOTOR CLUB OFFICIALS POINT WAY TO ROAD DEVELOPMENT

Highway needs of the West were expressed in resolutions adopted at the Fourth Annual Conference of the Secretaries and Executives of Western Motor Clubs, held in San Francisco in September.

Through these resolutions the leaders of organized motordom point out a way in which the Federal government may safeguard our natural wealth, develop natural resources, and make available to all the people the playgrounds of the nation.

The resolutions follow:

WHEREAS, There is great need for the improvement of highways across unappropriated public lands, and

WHEREAS, These lands belong to the Federal government and not the state wherein they are situated, and

WHEREAS, Many of the states are unable to bear the financial burden, or even a portion of it to construct said highways, and

WHEREAS, The so-called Oddie-Colton measure appropriating annually for three years \$3,500,000, and which passed the last Congress but which was vetoed by the President, would have, in part, at least, solved this perplexing problem, and

BE IT RESOLVED, By the Fourth Annual Conference of Western Motor Clubs that the Oddie-Colton measure be recommended for reintroduction in the forthcoming Congress and pressed to final enactment, with the reservation, however, that before so doing further consideration be given to having its provisions apply only to that part of the Federal Aid system traversing unappropriated public lands.

RESOLVED, That this conference favor the continuance of Federal Aid on at least an undiminished basis.

RESOLVED, By this conference, that in our opinion action should be started to have the Federal government recognize its obligation in maintaining at least the primary part of the Federal highway system traversing unappropriated public lands.

RESOLVED, That Federal appropriations for the improvement of highways within our National Parks and Monuments should be continued.

RESOLVED, That we favor increased Federal appropriations for the improvement of roads and trails in our National Forest areas.

NEWS OF THE MONTH

Fort Morgan—Eight and one-half miles of new Federal Aid pavement was opened for use west of Fort Morgan on November 6. The new pavement extends to Wiggins. It was laid by Edw. Selander, Fort Morgan contractor.

Greeley—A. B. Collins, district highway engineer, announced that surveys for all Federal Aid roads in northeastern Colorado have been completed. Future Federal Aid projects can be started without waiting for preliminary surveys. In the past this phase of the work has delayed projects for several weeks in a few instances.

Boulder—Fred Fair has completed a survey of a new road to Lindbergh Peak, taking off from the Maxwell Highway. Another survey has been made over Arapahoe Pass toward Monarch Lake on the west side of the Continental Divide. The estimated cost of these projects is \$300,000. The surveys were made for the Boulder county commissioners.

Gunnison—In the Gunnison Valley, 10 miles of gravel road was completed this past summer between Gunnison and Cimarron. This is an improvement which motorists hail with joy.

Sterling—A change in the Lincoln Highway east of Sterling so as to eliminate railroad crossings between Sterling and the state line just beyond Julesburg is under consideration by the state highway department. The plans of the department include the grading of the new road in 1929. Steps are being taken by county commissioners to obtain the necessary right-of-way.

Colorado Springs—Scratch the new paving on the Colorado Springs-Pueblo road off the list of projects. It has become an accomplishment in the full sense of the word. There is now ten miles of pavement south of the Springs on this road. Four miles of pavement north of Pueblo on the same road is now being traveled by motorists.

Fruita—The Hinman Bros. construction crew has started the graveling of the road from a mile east of Loma to two miles west of Mack. The work was started with a light force, but as the work gets under way the gang will be increased to two or three crews, working both from Loma and Mack. M. C. Hinman is in charge of the work. Completion of this project will eliminate the worst stretch of road between Grand Junction and the Utah state line.

Denver—Members of the highway advisory board, county commissioners and employes of the highway department, were entertained with airplane flights over Denver and vicinity the week of October 30. The plane, a six-passenger Stinson-Detroit, was brought to Denver by the Iowa Manufacturing Company, makers of Cedar Rapids crushers. John H. Jay, president of the concern, was in charge of the plane. While in Denver, Mr. Jay was the guest of George Meffley, head of the H. W. Moore Equipment Co., Denver agents of the Iowa concern.

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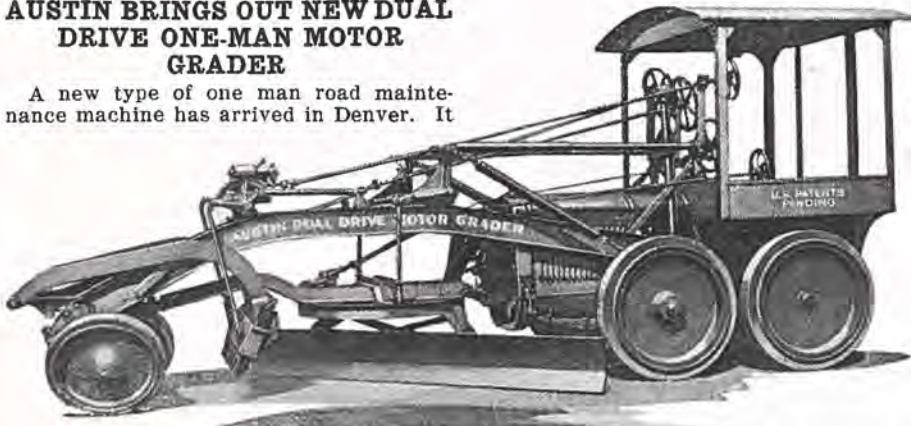
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New Highway Equipment and Materials

AUSTIN BRINGS OUT NEW DUAL DRIVE ONE-MAN MOTOR GRADER

A new type of one man road maintenance machine has arrived in Denver. It



is a product of the Austin Mfg. Co. and the Wilson Machinery Co. are Colorado agents. The new machine will be known as "The Austin Dual Drive." The makers claim it is a great improvement over previous models. With the addition of two wheels on the rear, the entire weight of the tractor is carried on its own four wheels, all of which are drive wheels. It is claimed the new grader increases the tractive effort, thus increasing its efficiency. It is also said to have the added advantage of being able to proceed over soft ground and get out of slippery, wet ground without sliding sideways or skidding into the ditch. There is also said to be less wear on the tires. The machine is now on display in the show rooms of the Wilson Machinery Co., 1936 Market Street, Denver.

NEW "CATERPILLAR" TEN IN PRE-VIEW TOUR

The "Caterpillar" Ten now making the pre-view tour of state fairs and exhibitions will undoubtedly be the most famous tractor as well as the most travelled one by the time it ends its American tour at the Convention and Road Show of the American Road Builders' Association at Cleveland in January. It will have travelled nearly 10,000 miles as well as having been seen by more than a million farmers, contractors, engineers, loggers, governmental officials and others interested in cost cutting methods for agriculture, road building, lumbering, etc.

Not only has the new Ten travelled far, but it has been inspected, unveiled and praised by celebrities from the corners of the world. At its initial appearance before the public at the California State Fair, September 1, it was unveiled by the daughter of Gov. C. C. Young at the time the Governor dedicated the new \$100,000 farm machinery hall. After a rush trip across the country by express, the little "Caterpillar" was given an unveiling at Springfield, Mass., by the mayor of New York City, acting for Governor Al Smith on Governor's Day at the Eastern States Exposition.

One of the new "Caterpillar" Tens is now being displayed by the Clinton-Held Co. in Denver.

MUCH INTEREST IN MEXICAN ROAD CONGRESS

In October was held the "Segundo Congreso Nacional de Caminas y Exposicion" which met with such huge success that immediate plans were made for a third and even greater exposition to be held in 1929.

The purpose of the Congress was the development of a system of highways for the Republic of Mexico, and this topic was the heart of many instructive lectures by the members participating.

Among the speakers were the Honorable President Calles, Ing. Octavio Dubois, president of the National Commission of Roads; Ing. Antonio Madrazo, director general; Ing. Julio Garcia, Ing. Leon Salinas, Ing. Jose A. Cuevas, director of the National Faculty of Engineering; Ing. Andres Ortiz, secretary of communications and public works; and Engineer Charles M. Upham, consulting engineer for the National Highway Commission.

Engineer Upham spoke on "The Roads a Country Should Have," and from his very wide past experience in the United States, was able to give a discourse on the subject of much interest.

There were many noteworthy exhibits

by manufacturers of road building and kindred materials. Among these was the exhibit of The California Corrugated Culvert Company, which was awarded a diploma of merit.

After the Congress the directors of the American Highway Builders Association, accompanied by many of the above members of the Road Congress, went on an excursion to Cuernavaca, State of Morelos, enjoyed a wonderful luncheon in the Jardin Borda; a trip through the beautiful gardens; through the old cathedral, built during the regime of Hernando Cortez in 1537; thence to the house once occupied by Senor Cortez and now the Municipal Palace; the ruins of an ancient pyramid that dates back to hundreds of years before either the Aztecs or Toltecs, then back over the new highway to Mexico City, 76 kilometers away.—Western Highways Builder.

CENTRALIZED LUBRICATION MAKES ITS BOW IN THE PAVING FIELD

Instant, central lubrication from the operator's platform has recently been installed as standard equipment on the Smith 27-E six-bag Paver, which enables the operator, by simply pressing a lever with his toe, to force lubrication simultaneously to the bearing surfaces in the machine.

Such a system is decidedly new for pavers and should be welcomed as a real advance step by paving contractors throughout the field.

One man is now able to do the work of thirty in a fraction of the time, and the ease with which this central system is operated not only insures perfect and consistent lubrication, but encourages frequent attention on the part of the operator.

Engineers feel that the installation of the system on the Smith 27-E will bring even smoother action and greater dependability to this already highly efficient machine.



Two Cletrac tractors were on board ship when Commander Byrd left America for the icy regions of the South Pole. These "Forties" are of standard design and are the same as carried in stock by the Liberty Trucks & Parts Co., Denver.

New York's Conduit Highway

NEW YORK is engaged in its greatest single highway project. This is a 40-foot wide pavement running through 11 towns on Long Island for a distance of 24 miles. The Conduit Boulevard, as it is called, constitutes the newest offering to "speed with safety," the demand of the motorist.

Highway builders have long ago determined that when the volume of traffic is around 500 cars per day, it is then economical to pave. To determine just when an 18-foot road should be made a four-lane highway is no more difficult. This should be done where travel becomes slow and accidents frequent. Technically, on a basis wherein all conditions are ideal, one traffic lane in each direction will carry 1,969 cars per hour in safety, according to the Pennsylvania Department of Highways, if the cars are driven at exactly 22 miles per hour—and if there are no cross roads or turn outs.

But to expect 1,969 motorists to be satisfied with a speed of 22 miles an hour is folly. Most motorists desire to go faster and a goodly number feel happier at a slower pace. Further, accidents occur on two-lane highways,

even at times when only a few cars are on the road. Where traffic is at all heavy, it is dangerous to pass cars proceeding in the same direction, for a two-lane pavement was built as a two-lane pavement and it cannot be stretched.

Edward N. Hines, of the Wayne County Board of Road Commissioners at Detroit, declares that 20-foot roads are no longer in the scheme of things in the Detroit area. Forty-foot roads with two lanes of cars travelling in each direction constitute sensible thoroughfares near cities, he asserts.

The forty-foot highway, under ordinary conditions, is capable of carrying at least twice as much traffic as a 20-foot roadway, and at a more rapid pace. During rush hours and on special occasions three lanes of traffic may proceed in one direction. Many communities have found that even the temporary three-lane road has a decided advantage over a two-lane, in that opportunity exists to pass the slow driver and give the public the speed it wants.

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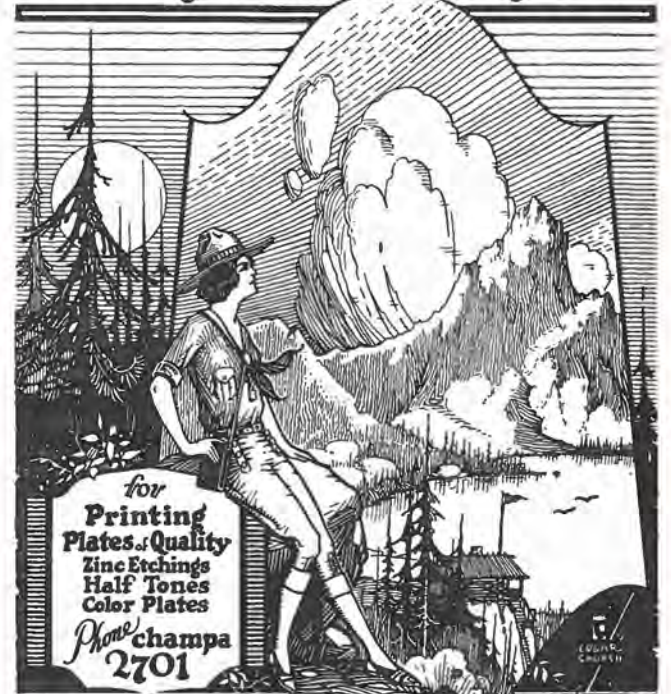
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PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
97-R		Bridge	East of Lamar
150-A	6 mi.	Gravel Surface	West of Craig
248-B	2 mi.	Gravel Surface	South of Buena Vista
262-J	3 mi.	Gravel Surface	West of Ojo
272-D	2 mi.	Pavement and R. R. Underpass	East of Manzanola
279-G	0.5 mi.	Bridge and Graded Approaches	Bailey
292-B	3.5 mi.	Graded	South of Minturn
295-D	2 mi.	Gravel Surfacing	North of Antonito

PLANS SUBMITTED FOR APPROVAL TO U. S. BUREAU OF PUBLIC ROADS

Proj. No.	Length	Type	Location
68-R	1.9 mi.	Oil Processed Gravel Surfacing	North of Monte Vista
57-R	0.464 mi.	Bridge and Paved Approaches	North of Lamar
258-H	1.098 mi.	Gravel Surfacing	West of Sapinero
282-H	6 mi.	Gravel Surfacing	North of Rifle

PLANS BEING ADVERTISED FOR BIDS

Proj. No.	Length	Type	Location	Date Bids Opened
259-A	3.350 mi.	Gravel Surface	West of Sargent	November 30, 1928
299-B	3.465 mi.	Gravel Surface	West of Delta	November 30, 1928

UNDER CONTRACT

Proj. No.	Length	Type	Location	Contractor	Approx. Cost	Per Cent
134-B	3.352 mi.	Gravel Surfacing	E. and W. of Vona	W. A. Colt and Son	\$ 32,605.00	0
149-A	4.716 mi.	Gravel Surfacing	S. of Deer Trail	F. Kentz Highway C. C.	26,004.36	0
242-C	6.011 mi.	Gravel Surfacing	N.W. of Fruita	Hinman Bros. C.C.	56,344.50	5
253-G	2.885 mi.	Gravel Surfacing	W. of Cerro Summit	Mountain States C. C.	68,640.60	4
262-I	4.034 mi.	Gravel Surfacing	S. of Russell	Mountain States C. C.	37,933.50	4
266-D	4.111 mi.	Gravel Surfacing	S. of Bondad	Engler-Teyssler & Co.	96,775.30	3

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1928

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R5	Bet. Trinidad and Aguilar	1.959 mi.	Paving	W. A. Colt & Son	\$ 72,122.50	100	2R-5
2-R No. 6	South of Aguilar	2.75 mi.	Pavement	W. A. Colt & Son	93,000.00	100	2R- No. 6
2-R7	South of Aguilar	1.224 mi.	Paving	H. C. Lallier Const. & Eng. Co.	66,990.60	23	2-R7
2-R8	Aguilar, South	1.633 mi.	Paving	J. Finger & Son	66,660.00	60	2-R8
138-A	North of Kremmling	10.916 mi.	Grading	F. L. Hoffman	201,262.80	75	134-B
144-B	Northwest of Fort Collins	3.201 mi.	Gravel Surfacing	White & LaNier	44,000.00	100	138-A
145-A	West of Glenwood Springs	3.807 mi.	Gravel Surfacing	Winterburn & Lumsden	53,227.90	100	144-B
145-B	West of Glenwood Springs	1.051 mi.	Surfacing	Winterburn & Lumsden	42,389.72	100	145-A
147-A	In Ute Mt. Reservation, S. of Cortez	15.896 mi.	Surfacing	E. J. Maloney	119,100.10	87	145-B
147-B	South of Cortez	4.833 mi.	Surfacing	E. J. Maloney	59,447.44	2	147-A
208-AR	E. of Grand Junction	0.507 mi.	Gravel & R.R. Grade Separation	Harry A. Rousch	59,568.00	65	147-B
210-B2	De Beque-Grand Valley	7.507 mi.	Gravel Surfacing	Fred Kentz	37,475.00	100	208-AR
242-B	W. of Mack at E. Salt Wash	Timbr. Bridge & Gravel Approaches		Hinman Bros. Const. Co.	13,996.40	100	210-B
247-C	Swink	0.8 mi. Conc. Pav. & R.R. Underpass		J. Finger & Son	62,559.58	100	242-B
251-C	E. of Boulder	4.000 mi.	Pavement	J. H. Miller & Co.	150,263.60	40	247-C
253-C	West of Milner	4.502 mi.	Surfacing	Mountain States Con. Co.	88,108.40	90	251-C
254-C2	S. W. of Hot Sulphur Springs	Superstr. of Bridge & Approaches		Northwestern Constr. Co.	48,208.50	100	253-C
254-D	Marshall-Hot Sulphur Springs	3.013 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	37,124.18	100	254-C2
258-E2	Cimarron-Cerro Summit	1.487 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	32,377.70	95	254-D
258-F	Gunnison-Sapinero	5.689 mi.	Surfacing	Hinman Bros. Const. Co.	100,968.50	90	258-E2
266-C	Durango and N. Mex. State Line	2.401 mi.	Surfacing	Salle Const. Co.	32,499.80	100	258-F
271-C	West of Portland	2.430 mi.	Surfacing	J. Finger & Son	54,843.40	14	266-C
275-C3 E2 G3	Palmer Lake-Pring	4.602 mi.	Concrete Paving	J. Fred Roberts & Sons C. C.	114,079.65	100	271-C
275-E	North of Monument	0.926 mi.	Grading and Underpass	F. L. Hoffman	41,905.20	100	275-C3 E2 G3
275-F3 G2	Tomah-Palmer Lake	12.894 mi.	Concrete Paving	H. C. Lallier C. & E. Co.	292,309.95	100	275-E
277-B	South of Colorado Springs	4.860 mi.	Concrete Paving	J. L. Busselle & Co.	131,202.45	100	275-F3 G2
277-C	N. of Pueblo	4.363 mi.	Conc. Pavement	J. Fred Roberts & Sons C. C.	120,789.25	79	277-B
279-F	North of Baileys	3.444 mi.	Graded	J. Fred Roberts & Sons	126,000.00	72	277-C
282-AR1	South of Craig	600 ft. River Protection Work		Hinman Bros. Const. Co.	11,925.00	4	279-F
282-D	North of Meeker	2.864 mi.	Gravel Surfacing	Winterburn & Lumsden	42,155.00	100	282-AR1
282-E	N. of Meeker	6.421 mi.	Gravel Surfacing	Luke E. Smith & Co.	88,384.20	36	282-D
282-F	So. of Craig on S. H. No. 13	2.17 mi.	Surfacing	Gardner Bros. & Glenn	49,063.00	84	282-E
286-BR1	S. of Wyoming-Colo. Line	14.474 mi.	Gravel Surfacing	A. R. Mackey	38,978.00	82	282-F
286-C	Between Greeley and Eaton	5.566 mi.	Paving	New Mexico Const. Co.	126,360.35	89	286-BR1
287-A3	W. of Ft. Morgan on S. H. No. 2	3.55 mi.	Concrete Paving	Edw. Selander	90,749.50	100	286-C
287-A4	West of Fort Morgan	5.087 mi.	Paving	Edw. Selander	120,505.80	87	287-A3
287-D1	Two mi. E. of Kersey on S. H. 2	0.921 mi.	Grading	White & LaNier	14,046.40	100	287-A4
287-D2	East of Kersey	0.921 mi.	Paving	S. & S. Const. Co.	25,269.80	71	287-D1
288-A2	Bet. Merino and Brush	9.741 mi.	Paving	Edw. Selander	245,043.50	100	287-D2
292-A	North from Minturn	6.417 mi.	Grading	H. C. Lallier Constr. & Eng. Co.	92,571.80	95	288-A2
293-C	North of Ouray	3.661 mi.	Grading	C. V. Hollenbeck	62,997.80	25	292-A
295-C	La Jara-Antonito	5.284 mi.	Surfacing	Poppe Bros. C.C.	29,414.60	100	293-C
296-C	N. of Greenhorn on S. H. No. 1	6.606 mi.	Surfacing	H. C. Lallier Constr. & Eng. Co.	115,466.80	75	295-C
298-B	North of Pagosa Springs	2.414 mi.	Surfacing	Engler & Teyssler	38,426.00	15	296-C
300-A	Bet. Chattanooga & Red Mtn.	2.277 mi.	Grading	Winterburn & Lumsden	59,480.80	88	298-B

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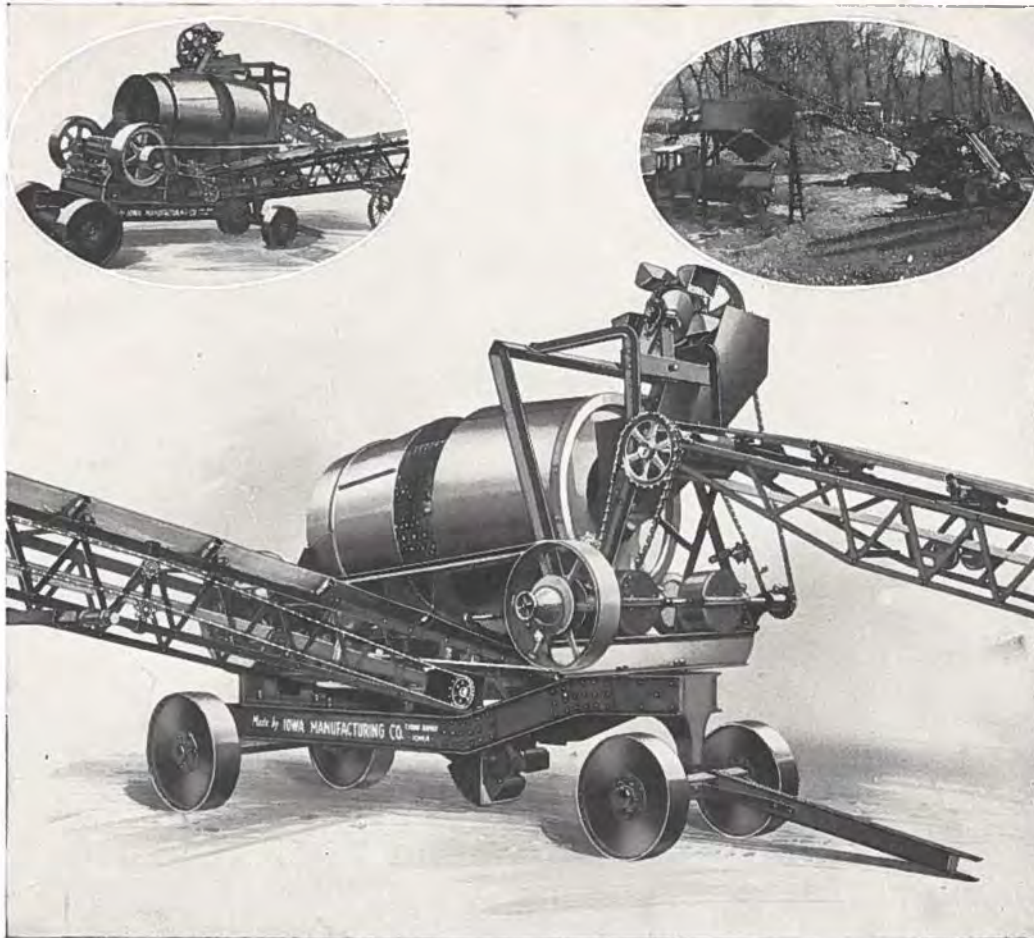
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tainers, Patrols, Drags, Elevating Graders, Dump Wagons, Wheeled Scrapers, Fresno, Drag Scrapers, Plows, etc.

Our Cover Picture

There is no other section of the Rocky Mountains that presents more inspiring and stupendous scenery than that in the Stonewall district. The photograph on the cover of Colorado Highways this month is of Goose Lake, with Trinidad Mountain directly above. Locally, this towering peak is known as "Warrior." The Colorado State Highway Department has surveyed and will construct a road from San Luis to Stonewall through this district and from it the grandeur of Trinidad Mountain will be seen. At Stonewall the new road will connect with one into Trinidad and also with one north to La Veta, opening to the motor tourist one of the grandest scenic trips in the state. The photograph is courtesy of the Denver Tourist Bureau and the photo-engraving is by the Burke-MacMillin Company, of Denver.

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CONCRETE



VOLUME VII.

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Christmas in the Mountains

Written for the Colorado Highways Magazine

by J. C. GLASSFORD

Mountains lie asleep in winter's slumber,
Forest glens are carpeted in snow;
Storms forget their rolling thunder,
Sunset paints each peak a ruddy glow;
Forests sparkle in their frosted beauty,
Sun clouds kiss the quaking asp's in play,
Evening brings a starry crest of glory,
Darkening night proclaims a closing day.

Silvery dawn awakens a new twilight,
Glory brightens every peak and hill;
Echoes bring the tread of unseen wise men,
Murmerings of brooks are softer still.
Memory brings to us a host of angels,
Softly down the slopes their carols ring,
"Unto you this day is born a Savior;
Lowly born, a Christ, a Lord and King."

"Joy unto the world and to the Highest,
Peace, good will on earth," the message ran;
Sunrise pierces dawn with sparkling sunbeams,
Melting from the view our caravan.
Mirroring streams reflect the heaven's beauty,
Pictures of the Christ Child fade away,
Leaving in our hearts that cherished something,
The spirit of His love for Christmas Day.



There now is a boulevard over Hoosier Pass. The picture is the highway in Summit County and to the right is the old wagon road. This is a study in contrasts.

Colorado Highway Department Completes Many Jobs in 1928

DURING the season of 1928 a larger amount of construction work was handled than in any year since the organization of the Colorado State Highway Department. It has been a specially favorable construction season, and considerable work was carried over from the previous year. This carry-over was necessitated by conditions unfavorable to completing the work last season. This condition does not apply to the current year, however, and a comparatively small amount of work will be carried over into 1929.

As would logically be expected a very considerable amount of the work has been done on the main north and south road running through the state and on nearby connecting roads. These are the highways upon which the traffic is the heaviest and on which the necessity for improvement is therefore the greatest.

The outstanding feature of the year has been the completion of the highway from Denver to Colorado Springs. This was accomplished by finishing the project between Tomah and Pring, a distance of about 17½ miles. The completion of this pavement eliminates 13 grade crossings between Colorado Springs and Denver, seven of these eliminations having been se-

cured by the construction of grade separation structures and six of them by relocation of the road.

Other points at which paving on this road has been done include a group of four projects south of Aguilar comprising a little under eight miles. Two of these projects are not quite complete. South of Colorado Springs a project comprising 4.9 miles was completed, making a stretch of about 10 miles on the road south of Colorado Springs towards Pueblo. One project was also completed north of Pueblo covering about 4.4 miles, and it is expected that during the coming season this work will be continued from both directions for a considerable distance. Between Greeley and Eaton 5.6 miles paving project has been constructed.

One of the most important small projects completed during the year is only slightly more than a quarter mile in length, but it has been very badly needed for some time and travelers up Bear Creek appreciate very much this little strip of pavement leading into and partially through the town of Morrison.

Boulder citizens are rejoicing over the finishing of a four-mile paving project on the Arapahoe road, which now completes the paved highway between the Uni-

versity City and Denver. Some of the more important graveling projects in this district include continuation of graveling on the road from Fort Collins to Laramie, amounting to an additional 3.2 miles, and also graveling of a portion of the Greeley-Cheyenne road, beginning at the state line and extending south for about 14½ miles. Oil processing has been begun on this piece of surfaced road and will continue the coming season. About 11 miles of the Fort Collins-Laramie road will also be oil processed during the coming season.

In the northeastern part of the state, along the Denver branch of the Lincoln Highway, several paving projects have been completed. These include a project of a little under 10 miles, between Brush and Merino, and two projects between Fort Morgan and Wiggins; also the paving of the highway in connection with the underpass structure near Kersey. This paving work has all been on the Federal Aid system. In addition to this in the northeast section of the state there have been a number of smaller state projects not on Federal Aid system, involving the expenditure of \$75,000 or \$100,000.

In the northwestern district about 30 miles of gravel surfacing have been completed this year, the principal projects being an 11-mile contract between Kremmling and Rabbit Ear Pass, a 4½-mile project between Milner and Bear River, and about 11 miles of work between Meeker and Craig. In addition to which, on the Federal aid system, there have been constructed a dozen or more state projects a month, the more permanent of which are improvements between Oak Creek and Sidney, a continuation of the work on Loveland Pass, work in Grand county from Granby north, in Jackson county in the neighborhood of Muddy Pass, and many other smaller projects.

In the central portion of the state west of the range considerable graveling work has been carried on over both the main highways, No. 4 crossing the range at Tennessee Pass, and No. 6 crossing the range at Monarch Pass. Some of the principal projects on the former are a 6.4-mile job north of Minter which has been needed very badly; two projects west of Glenwood Springs aggregating a little under five miles; between DeBeque and Grand Valley a project seven and one-half miles has been completed, and one northeast of Palisade (an old grading project) has been reopened and covered with gravel. The separated grade crossing near Clifton is practically completed. This grade separation has been under contemplation for several years.

West of Mack an important bridge across Salt Wash has been completed and approaches constructed. On the southerly road No. 6, the principal work has been in western Gunnison county and eastern Montrose county. Several projects have been under way involving about 12 miles. The smaller state projects number about 15 or 20, and involve \$60,000 or \$70,000.

In the southwestern district the biggest work is covered by two projects south of Cortez, totaling about 22 miles. The largest of these is across the Ute Indian reservation, and the smaller begins at the reservation line and extends towards Cortez. It is contemplated that this work will be continued into Cortez, and the New Mexico Highway Department is completing the work between Shiprock and the Colorado state line. Other important projects include a 5-mile graveling project between La Jara and Antonito, a 3.7-mile grading project north of Ouray, a 2½-mile grading project between Chattanooga and Red Mountain, and a project south of Durango. Work on another 2½-mile project north of Pagosa Springs has been commenced.



An example of what the state is doing for towns in Colorado. This photo shows the state paved highway in Eaton.

Winter Driving in Colorado

By J. C. GLASSFORD



Removing snow from Tennessee Pass

FORTUNATE indeed, are those who are able to take advantage of our splendid open state highways during the winter months. After a storm has passed and the maintenance patrol has seen to it that the snow plows or scrapers have cleared the highways, there comes the call of the open; so we step into one of our modern cars, with its heater, and are off on our way.

After passing the outskirts of our town, or city, we come into the new world, where King Winter sits enthroned. Here we find that the soft mellowness of summer has given way to the Frost King. The trees and shrubbery have lost their leaves, and in place of the leaves there now rests on the leafless brush a blanket of pure whiteness. From the wakefulness of Summer we have passed to the stillness and quietude of Winter. Instead of green sward, the mountains and foothills are covered with a mantle of virgin white. We really feel that we have indeed been transplanted into a new world.

Instead of the soft whispering of the trees there comes to our ears a murmuring—a murmuring caused by water falling with a new softness from a nearby spring. Here and there one finds new trails embedded in the snow. We follow them only to learn that there are tragedies in the lives of the animal kingdom as well as in our own. Then our sympathy goes out to the one that has been unfortunate, but almost before we can express our sympathy, one of the party exclaims:

“Oh! just look there.”

We look and find a frozen waterfall; great icicles like stalactites are hanging down. With the coming of noon day, crowns of snow have begun to soften; little rivulets form, trickling here and there. At birth they had heard the call of the ocean and were already seeking an outlet to the salten seas, only to be caught and firmly held in the grasp of winter, until a thaw or chinook would release them, to continue their downward journey.

While we stand entranced there comes the flash of wings; snow birds flitting here and there, seeking the seeds that Nature always reserves for them, to sustain them in their migratory flights.

Again we drive on, stopping here and there, to glance up some gulch or canyon.

We note the absence of the customary Summer haze, instead, overhead the skies are a perfect blue, while the mountains and hills are crowned with a diadem of pure white.

As we continued to gaze at the beautiful hills surrounding us there started to creep over their western slopes the softest tinge of red.

We, who know the mountains, then turned our car and were soon rolling homeward, over a now well-beaten highway. Here and there the shadows soon became darkness. Turning on our headlights we noted that they flashed here and there in golden waves. Again we seem to be transported into a new world; then comes a break in the mountains, where we can see the “setting sun dying in the Golden West.” Subconsciously, we now follow the well-beaten highway or trail, thinking, each in his own way, of the day’s wonderful drive, which had only been made possible by the care and attention given to the highways, by our own efficient organization, The Colorado State Highway Department.

PRIVATE TOLL BRIDGES SCORED BY T. H. M'DONALD

Privately owned toll bridges are condemned by Thomas H. MacDonald, chief of the United States Bureau of Roads. “This is a field from which the ‘shoestring’ promoter should be excluded,” he says in accusing private toll bridge interests of attempting to defeat legislation unfavorable to them and he adds:

“The public can finance and build at lower costs, and the largest bridge undertakings in the country today are being financed on the basis of their earnings. Two methods are being used: First, the municipal bond issues to be retired from earnings, and, second, revenue bonds issued against the earnings, but not a municipal obligation in the sense of adding to the constitutional indebtedness.”



Making an old railroad grade into a high class state highway. This photo shows the reconstruction of the Colorado Midland right of way in Garfield County near Catherine.

Advisory Board's Budget for 1929

The advisory board of the Colorado State Highway Department has completed the budget for 1929 and submitted it to Governor Adams for his approval. The governor has the authority to make such changes as he deems necessary.

As submitted by the board the budget provides for \$5,125,000 to be expended during the coming year. The largest item contained is \$495,000 of federal aid funds for grading and bridge construction of the 27 miles of highway between Colorado Springs and Pueblo.

An additional federal aid project includes \$370,000 for improvement of the highway adjacent to the Colorado river near Palisade. The budget as submitted to the governor discloses \$2,760,000 for federal aid projects in Colorado.

The Colorado-Pueblo stretch of highway is considered one of the most important that the state department has in hand, and with the work to be done in 1929 assures the completion of the work in 1930.

There is included in the budget funds for paving six miles of state highway west of Fort Morgan on what is known as the Greeley road, and another appropriation is for grading and gravel surfacing six miles of the Pueblo-Walsenburg highway.

As prepared by the board a sum of \$495,000 is appropriated for state construction projects, being that in which the state alone bears the cost. One of these includes \$35,000 for carrying the road to the summit of Mount Evans in the Denver Mountain Parks area. This expenditure will complete this scenic highway and it is predicted that the work will be finished during the coming summer.

In the exclusive state appropriation list is \$30,000 for extending the Loveland Pass road. Considerable interest has been manifested in this road which has been completed for a part of the distance and work has continued upon the project during 1928. Particular interest has centered in this road not only as a short cut to Leadville from Denver, but because it will connect with the present Leadville highway and opens a new tourist route across the state.

The advisory board estimates the total income for the coming year at \$5,125,000 and the distribution as follows:

Federal aid projects.....	\$2,760,000
Federal aid renewals.....	150,000
State projects	495,000
Maintenance of federal aid roads.....	1,400,000
Advance surveys	15,000
Compensation insurance	20,000
Traffic signs and census.....	30,000
Property and equipment.....	30,000
Contingent fund	100,000
Administration	125,000
	<u>\$5,125,000</u>

The estimate in revenue by the board for the budget follows:

From the half mill road levy.....	\$ 765,000
70 per cent of the 3-cent gas tax.....	2,900,000
Federal aid money from the government	1,380,000
Internal improvement fund.....	50,000
State's share of the bus tax.....	30,000
	<u>\$5,125,000</u>

Approval of \$240,000,000 for Roads

ELECTORS in November in the United States approved \$240,000,000 for highways. In only a few states were proposals for funds for good roads rejected at the polls, Colorado being among the number. With the slogan "Take Iowa Out of the Mud" that state voted \$100,000,000, leading all others in the movement. The vote in Iowa was about two to one for the proposition.

Voters in Missouri approved a \$75,000,000 bond issue by nearly 150,000 majority. This issue is intended to complete the state road program started in 1920 with a \$60,000,000 bond issue.

Louisiana adopted by a substantial majority \$30,000,000 bond issue and also voted for an increase from two to four cents for gasoline taxes.

West Virginia by a four-to-one vote approved a \$35,000,000 bond issue.

By a vote of five to one Kansas adopted a constitutional amendment authorizing the incoming legislature to establish a trunk highway system to be under the sole control of the state.

California, already famous for its roads, did not have a strict bond issue or tax before the voters, but the electors in that state approved an act increasing the license fees on commercial vehicles. The bill was passed by the legislature, but truck owners submitted it to the voters. The vote upheld the legislature by

two to one. The plan, it is said, will provide several millions of dollars revenue every year for state roads.

Pennsylvania defeated a bond issue, the opposition basing its fight on the contention that the state highway department had ample funds for carrying on the work. Colorado rejected the proposal for issuance of highway notes and to increase the gas tax from three to five cents.

Realization of the growing use of highways and rural roads by heavy trucks, busses and automobiles has come to these and other states. Highway builders are being forced to construct roads that will bear this traffic, which is showing surprising increase throughout the United States. In many of the states there were no bond issues or bills for an increase in gasoline tax. These questions in many of these states will come up in the form of bills in the coming legislatures, while some of them contemplate increase in cost of motor licenses.

Highways form the solution of the increasing motor traffic throughout the nation. The roadway of today is as important to commerce as steel rails. Bus travel and trucking are so widespread that pavements can no longer be designed without careful consideration of commercial traffic. Private motor cars are increasing rapidly, the prediction being that the 1928 production of motor vehicles in the United States will make a record.



Where the motorist may race a train, and without a grade crossing. The scene is in Grand County, showing the new state highway paralleling the Moffat railroad, shown along the side of the mountain. This is a graveled road between Byers Canon and Parshall.

Each year will see an increase, according to executives of motor plants.

Public need and demand for low-priced transportation has naturally brought about development of larger trucks and busses, while production of lighter commercial trucks is increasing rapidly, as the demand for this rapid transportation grows. These are facts that have been taken into consideration by the electors in voting so many millions of dollars for highway construction and improvements.

Some interesting and instructive statistics were brought out in the publicity for the good roads campaign in several states. A survey in Cook county, Illinois (Chicago), revealed that 54 per cent of trucks of five to seven and one-half tons capacity are loaded to impose a 12-ton burden on the road. Trucks traveling at high speed strike the road surface blows that may

be from two to ten times as great as actual deadweight burden divided among four or six wheels.

Many of the eastern states face the mud problem, which does not prevail to any great extent in Colorado and other western states. This is notable in Iowa and accounts for the determination of the voters of that commonwealth to "Take Iowa Out of the Mud" and vote \$100,000,000 for this purpose. Missouri may also be credited in the same position as Iowa. As a matter of fact every state east of the Missouri river and in the south face this mud problem.

Commercially, Colorado and other western states are building good roads to take care of the increasing business. The motor tourist today is an important factor and is recognized in these states that have voted bonds, and in the west the tourist is of prime importance. He goes where there are good roads.

Commissioners Ask Raise in Gas Tax

AN INCREASE in the gasoline tax from three to five cents was included in numerous recommendations made by the Colorado State Association of County Commissioners in the final three-day annual session ending in Colorado Springs December 13. The gasoline recommendation included a proviso that 20 per cent of the money collected from the tax be turned over to the counties.

A companion proposal provided that money derived from the half-mill road levy be returned to the various counties.

These and other recommendations were embodied in a number of resolutions which were adopted, among them the following:

That the Colorado State Highway Commission maintain Federal Aid roads without cost to the counties.

That counties maintain state highways and receive 50 per cent of the cost from the state highway department.

The association named a committee of five to confer with the state highway department on these propositions, and upon numerous other questions that came up for discussion.

One of the actions taken by the association was to go on record as opposed to the present primary law and to the old teachers pension. The convention also recommended federal aid for the Leadville fish hatchery.

Denver was selected for the annual meeting of the association in January, 1930, and the following officers were elected for the ensuing year: S. R. Riggs, Adams county, president; Raymond A. Miller, Strassburg, first vice-president; W. H. Bartell, Colorado Springs, second vice-president, and T. W. Monell, Montrose, was re-elected secretary and treasurer.

The convention was declared to be one of the most important held by the association, and during the three days there was a vast amount of business transacted and a number of important addresses were delivered.

I. C. C. URGES ALL RAILROADS TO AVOID GRADE CROSSINGS

The Interstate Commerce Commission has recommended that the railroads concentrate their attention and resources on doing away with dangerous grade crossings instead of spending further money on installation of train control devices. In the years 1923 to 1927, inclusive, there were 11,485 killed and 32,998 injured in grade crossing accidents. In the same period there were 1,484 killed and 18,788 injured in rail collisions and derailments. In other words there were more than seven times as many killed and nearly twice as many injured in crossing accidents as in accidents on the railroads. Any given sum of money, it is believed, will prevent many more accidents if spent on grade separations than if spent on railroad safety appliances.

TENNESSEE PASS KEPT OPEN BY STATE HIGHWAY FORCES

The State Highway Department is keeping Tennessee Pass open for travel this winter. Equipment used in this work includes the big rotary snowplow constructed in the shops of the department; one 10-ton

Holt tractor and snowplow, and two 6-ton Monarch tractors equipped with snowplows. The work is being carried out under the supervision of George Toupain, assistant superintendent of maintenance. The patrols on the pass operate from Leadville to Minturn. Other patrols with tractors and graders are operating from Minturn to Eagle and from Leadville to Buena Vista on the east slope of the pass.

SOUTHWEST ROAD SHOW CALLS FOR EQUIPMENT DISPLAY

The fourth annual southwest road show and school will be held in Wichita, Kan., February 26-March 1, inclusive, under the direct supervision of the Kansas State Highway Commission and the engineering department of the Kansas State Agricultural College. New highways, bridges, farm structures, irrigation projects and the like in the territory embraced by Wichita will call for a larger dependable supply of equipment, materials and accessories. The program calls for a very large display of modern equipment covering road building, maintenance, general construction, building machinery and the like.

Engineering Conference to be Held in Boulder Next Month

THE third annual highway engineering conference will be held at the University of Colorado January 24 and 25, 1929.

Representatives of the U. S. Bureau of Public Roads, the State Highway Departments of Wyoming, New Mexico and Colorado; the Colorado State Association of County Commissioners, the Colorado Municipal League, and others interested in the construction of good highways will participate in the conference. Engineers connected with these organizations and others interested in highway and highway traffic problems will present papers and discussions on many subjects which are peculiarly applicable to the Rocky Mountain states.

Highway problems of the Rocky Mountain states present features which justify separate consideration from that accorded to similar problems in other sections of the country. Large areas, great distances, sparsely populated regions and limited funds give highway problems in the Rocky Mountain region aspects different from those commonly encountered elsewhere in the United States. Conditions peculiar to this region require engineering and administration skill and ability of the highest degree in order to solve problems which in other localities might present no particular difficulty.

The great problem confronting highway engineers and administration in the Rocky Mountain region is to economically expend the relatively limited funds available so that a maximum of service may be rendered. Difficulties faced by highway engineers and administrators have not caused these men to evade responsibility; those conditions have developed resourcefulness which has brought about the introduction of many innovations.

Topics which will be presented and discussed include:

- Oiled Gravel Roads.
- Design and Control of Concrete Mixes.
- Subgrade Studies.
- Power Shovel Operation.
- Analysis of Maintenance Costs.
- Forest Service Roads.
- Economic Analysis of the 5-cent Gasoline Tax.
- Recent Developments in Highway Research.

Speakers will include:

W. C. Davidson, State Highway Engineer, New Mexico.

- Z. E. Sevison, State Highway Engineer, Wyoming.
- L. D. Blauvelt, State Highway Engineer, Colorado.
- E. B. Bail, New Mexico Highway Department.
- L. C. Campbell, New Mexico Highway Department.
- C. H. Bowman, Wyoming Highway Department.
- G. W. Marks, Wyoming Highway Department.
- O. T. Reedy, Colorado Highway Department.
- J. E. Maloney, Colorado Highway Department.
- F. H. Riebling, Colorado Highway Department.
- W. D. Ross, U. S. Bureau of Public Roads.
- A. S. Peck, U. S. Forest Service.

COURSE OF CONEJOS RIVER CHANGED TO PREVENT DAMAGE TO COLORADO STATE HIGHWAY

The Colorado State Highway Department has changed the course of a river to protect a highway. Straightening curves, carving out a large portion of a mountain, blasting a tunnel or building a bridge forms every day work for the department, but here is one place where it was necessary to alter a river.

In the San Luis valley near San Rafael the Conejos river is subject to floods. Fear has been expressed by the highway department that with the heavy snows this winter in the mountains, meaning excessive run-off in the spring and summer, that a flood of unusual proportions would sweep down the stream and cause it to change its channel.

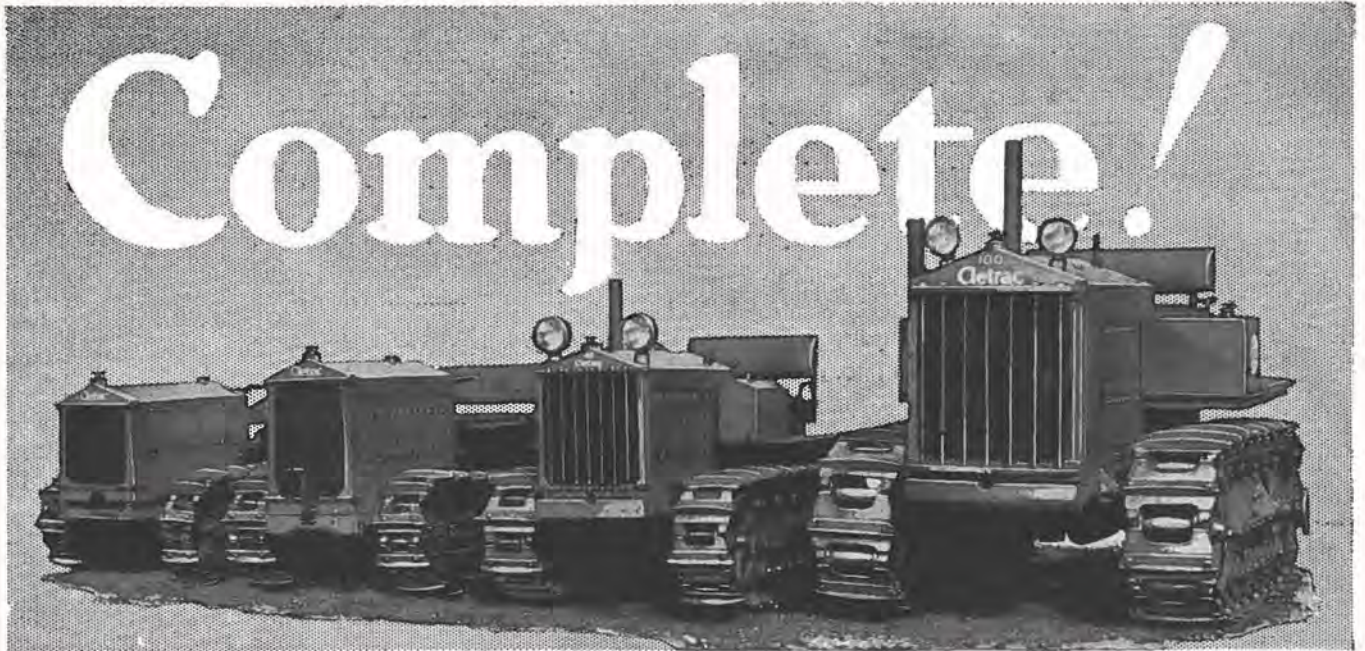
With this idea in mind the department has constructed a new course for the river that will prevent it from destroying a public highway and possibly adjacent property.

This work by the state highway department is only a part of the general improvements being carried out in San Luis valley. On the program for the coming season is graveling and oiling the road from Alamosa to Monte Vista and from Romero to Alamosa. This job will place two of the important highways in the valley in first class condition.

Importance of graveling and oiling roads is reported from the stretch between Antonito and Romero. For this five and two-tenths miles of road the upkeep from September to December was only \$8. The only time a grader went over the road was after a heavily loaded wagon with narrow tires had cut into the surface and a tractor with cleats and spikes had left impressions.



No slowing down for bridges on completed state highway projects. This bridge at Aspen is typical of construction of such structures on all Colorado state roads.



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NEWS OF THE MONTH

Current Events in the Field of Highway Engineering and Transportation—State, County and Municipal Activities

Colorado is credited with sufficient additional federal aid funds to meet the payments of \$2,627,641 on 189 miles of highway still under construction. This information is conveyed in the annual report of Dr. Thomas H. MacDonald, chief of the federal bureau of roads. He cites in his report that for the fiscal year 1928 a total of \$1,371,058 has been paid out by the government federal aid bureau for good roads in Colorado. Wyoming received \$1,106,907 and New Mexico \$1,417,762.

Boulder's "Road of Remembrance" was completed and opened in December, being a five miles of paved highway connecting the city with the main Denver-Fort Collins highway. Known as the Arapahoe Road, this entrance into Boulder is to be beautified and will form, it is proposed, the most attractive stretch of road in Colorado when finished.

Weld county commissioners will eliminate the reverse curve (letter S) north of the Nunn viaduct on the Greeley-Cheyenne highway. The county has bought the necessary right of way for the work.

Two recent federal aid projects for which bids were opened by the state highway commission were: To Ed. Honnen, Colorado Springs, for \$51,551 to build 3.350 miles of gravel surface road between Parlin and Sargent on state highway No. 6 in Saguache county; to Gardner Brothers & Glenn, Silt, for \$60,804.80 for 3.465 miles of gravel surfacing northwest of Delta on Highway No. 6 in Delta county.

Reports from Colorado Springs quote E. S. Keithley, supervisor of the Pike National Forest as stating that no funds for new roads in the forest are expected for the coming year. Present roads, of course, will be maintained.

The Longs Peak-Estes Park road from Allenspark into the national playground became snowbound in November, being one of the first of the favorite routes of tourists to be blocked for the winter. The Big Thompson and Poudre routes into the park are still open and will be kept open through the winter, according to reports.

El Paso county commissioners propose to widen the Ute Pass road as travel over that highway, part of the Pikes Peak Ocean-to-Ocean highway, in summer has reached a point of congestion for this stretch in the famous canon. The commissioners also propose new bridges and culverts on the Pikes Peak Highway between Ramah and Calhan; graveling ten miles of road to Canon City and various other improvements within the county.

Moffat county commissioners propose a new scenic route for tourists. Preliminary surveys have been made for a new road down Johnson's Draw to Yampa Canon, one of the most picturesque canons in Colorado. The scenery is reported by Craig citizens to be one of the grandest sections in the state.

The Colorado State Highway Commission announces that the Tennessee Pass highway connecting the eastern and western slopes of the Rockies will be kept open all winter. During the last season important improvements were made in Cranes Park, along Homestake Creek, near Avon and other places which will materially aid in keeping this main highway to Glenwood Springs and Grand Junction open throughout the winter.

Important improvements in the highway between Sterling and Sedgwick county line are proposed by the Logan county commissioners. The proposal is to straighten the road and change it so there will be no railroad grade crossings. This work would cover about 42 miles, all within Logan county. Plans also are considered for improving the Sterling-Holyoke road.

J. W. Johnson, district engineer of the U. S. Bureau of Roads, has recommended approval of plans for a federal aid project of 3.3 miles of gravel surfacing of the Salida-Gunnison road.

The U. S. Forest Service has announced that in the fiscal year of 1928, 192 miles of roads in the national forests in Colorado were completed, and 874 miles of trails also were finished.

More than \$500,000 will be spent on roads and highways in the Pueblo district in 1929, according to recent figures. This includes paving, grading and bridge building on the Colorado Springs-Pueblo state highway.

Portals of the Carlton tunnel on the highway between Leadville and Gunnison were boarded up for the winter early in November, marking the closing of one scenic route in Colorado. Heavy snows have blocked Independence, Hoosier and several other high passes in the state.

The Ridge Road, one of the famous scenic lines at Colorado Springs, has been closed and extensive improvements will be made in this road. It is one of the favorite motor routes into the Garden of the Gods. It is to be widened, curves are to be eliminated and it will be gravelled, according to reports. Traffic over this road between Colorado Springs and the Garden of the Gods in 1928 was the heaviest in history, according to reports.

La Jara county commissioners estimate that the available road fund for 1929 will be approximately that of 1928 despite the reduction of one-half mill levy for county road work.

It is expected that the \$60,000 budgeted for the Victory Highway east of Lay last year will soon be available, and a contract for this stretch of road soon will be made, it is said. The U. S. Bureau of Roads is checking the engineering data. This construction will carry the road farther west and possibly take it to the foot of Lay creek.

Actual measurement reveals there are 113 miles of paved road between Las Animas, in the Arkansas Valley, and the business district of Denver. The report was made by the State Highway Commission. With the completion of the Pueblo-Colorado Springs paving this mileage will be increased.

J. Fred Roberts, contractor, completed the last half mile of the five-mile stretch of paving north from Pueblo on the Colorado Springs road December 8.

Gunnison county commissioners are seeking funds for several improvements in view in that county. State aid is sought for a new bridge at Young's Hill, near Crested Butte; removal of the state bridge on the old state highway west of Gunnison to replace the state bridge north of the city and considerable grading and graveling in the county also is contemplated.

Boulder is agitating an inspiration point. It has been suggested that the Roberson property on the summit of Valmont hill, affording one of the marvelous views of the mountains and plains, be obtained by the city, a road built to it and that it be made a scenic point, similar to Inspiration Point in Denver.

Steeper grades, but fewer curves will feature future roads in the mountains of Colorado, according to Alan C. Peck, district forester of the U. S. Forest Service, in an address before the Colorado County Commissioners' Association in the annual convention in Colorado Springs. The forest service has completed a road building program for the coming 20 years, he said, and the proposal was to eliminate curves. "The steeper grade assures a straighter road," he asserted. Referring to requests the forest service refuses for roads from private property to connect with main roads he said the refusal was because "Our experience has been that a rough road constructed one year calls for an improved road the next and a still better one the year following," and it would be impossible for the service to carry on such a program.

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 Denver, Colorado

Auto Fatalities Increase in U. S.

AUTOMOBILES killed 2,260 persons in the United States during October, an average of 73 per day. These figures, just made public by the National Safety Council, are based on compilations from 93 cities and ten states, representing a total population of 52,000,000.

School children between the ages of 5 and 14 were the victims in almost one-fifth of all the cases.

A comparison of the combined totals for September and October shows a net increase of two and one-half per cent for the latter month. Despite this increase, however, each of October's 31 days witnessed one less fatality than each of September's 30 days.

The cities were hit hardest during October, showing a big jump over the preceding month. A noticeable decline in the rural sections, however, offset this upward trend among the municipalities.

October, however, shows a marked contrast to the records for the same month

last year, when 91 persons were killed every day by autos. This was the high month of last year and represented an increase of 5 per cent in daily deaths over September, 1927.

Ninety-three cities experienced a combined increase of 12 per cent from September to October. For 83 of these cities reports are also available, however, for October, 1927, and in this group 57 cities or 65 per cent of the total number either showed declines or no change.

Ten state motor vehicle bureaus reported declines in October which amount to 3 per cent for all states together. The larger reporting states, particularly New York and California, account for most of this decline.

The outcome of the 1928 auto fatalities as compared with the record for 1927, is problematical. In November 1, 1928, 20,500 people had been killed during the first ten months of this year. On November 1, 1927, 20,700 had been killed.

November and December figures for

this year may offset the 200 difference. National Safety Council statisticians, however, are hopeful that 1923 will show a slight decrease when the auto fatality books are closed for 1928.

BRIDGE STRENGTH IS SHOWN IN NORTH CAROLINA TEST

Strength of bridges being built by state highway departments was demonstrated recently by engineers. The building of a dam in North Carolina made it necessary to remove a state highway bridge, a quarter of a mile long with 17 spans, three of which were 146 feet long. Engineers of the U. S. Bureau of Public Roads seized the opportunity to make a test of the strength of the bridge. Two tanks, each as large as a small two-story house, were placed on one of the spans and water pumped in until the total weight reached 160 tons. At this point cracks began to develop but the bridge did not collapse. The test was repeated on other spans with the same result. The bridge was of a type similar to concrete arch bridges built in other states.

ROADS AND STREETS URGED BUILT TO CARRY HEAVY LOAD

Engineers advocate that residential streets carrying local traffic be designed to easily assume a load of four tons per rear wheel; business or other streets carrying heavy traffic, five tons; streets devoted entirely to heavy hauling, six tons. Highway engineers urge, in keeping with state load limitations, that rural pavements be built to easily carry four-ton wheel-loads. First class rigid rural pavements are capable of carrying such loads the year round. Less stable road surfaces, weakened by rains and thaws, gradually break down even under this reasonable load limit, oftentimes requiring excessive repairs and almost complete prohibition of heavy hauling.

CEMENT SHIPMENTS TOTAL 175,000,000 BARRELS IN 1928

Shipments of portland cement in 1928 will total 175,000,000 barrels, G. S. Brown, retiring president of the Portland Cement Association said in his annual address to the association at the meeting in Chicago in November. Reviewing business he stated that in the last 10 years

290,000,000 barrels of cement had been used in road and street paving. The meeting was attended by representatives of manufacturers who produce 90 per cent of cement shipped in the United States.

COCHETOPA PASS OPEN

Cochetopa Pass in the Cochetopa National Forest is to be kept open throughout the winter, according to advices received from the U. S. Forest Service. This pass is on one of the transcontinental highways crossing Colorado.

W. B. MARSHALL PROMOTED IN CHAIN BELT COMPANY

W. B. Marshall has recently been appointed sales manager of the contract engineering department of the Chain Belt Company, Milwaukee, Wis. He has been associated with the company since 1921, when he was graduated from the Sheffield Scientific School of Yale University. He entered its employ as a student apprentice and after several years work in the shops and foundries he was made secretary to the general manager and later spent some time in the Chicago office. In 1926 he returned to Milwaukee and was engaged in contract engineering sales work until his recent appointment.

DOBBIN RULED OFF STREETS IN MEXICO CITY

While most large cities still allow traffic in congested districts to be slowed down to the plodding walk of the dray horses, Mexico City has ruled Dobbin off the streets. The capital of Mexico has become one of the world's most completely motorized cities.

This results from a law that recently went into effect which forbids the use of any metal-tired vehicle on the city pavements. The metal shoes of a horse, of course, come under the ban. Public demand for the law grew out of heavy expense for upkeep of pavement which was said by engineers to be due to metal-shod hoofs and wheels. The speeding up of traffic is also sought.

**FOURTH ANNUAL
SOUTH WEST ROAD
SHOW and SCHOOL
WICHITA, KANSAS
Feb. 26-27-28-Mar. 1**



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Wichita, Kansas
February 26 thru
March 1, 1929

A Happy and Prosperous New Year

THAT line conveys what is in the heart of COLORADO HIGHWAYS to every reader, every advertiser, and to friends. The wish is expressed in the line that happiness, prosperity and health will be with all.

There is every indication that the coming year will fulfill this wish. Colorado and other western states are enjoying prosperity. Every avenue of human endeavor has been healthy throughout the closing year, and there is every ray of hope that 1929 will exceed 1928 for the general welfare of every citizen.

Colorado citizens see in the coming year a marked advance in highway construction and road improvement, opening better intrastate communications and thereby bringing the people into closer and friendlier contact; they see continued improvements in highways and roads already built that have become known the length and the breadth of the United States to attract increasing thousands to visit Colorado in the tourist season. It is evident that every line of business will be better in 1928; that mining will have a renewed lease on life; that agriculture and horticulture will keep in step with industry in progress and in greater development; that the livestock industry will

reach new high levels in production and in marketing.

Colorado faces the same optimistic future as is faced by neighboring states, and that means increasing interstate trade and prosperity. What is said of the West applies to all the United States. Today America stands far in the front of prosperous and contented nations, and executives of great business enterprises are firm in their convictions that an era of increased prosperity will mark 1928.

With these hopeful signs, coupled with the general prosperity of 1927, COLORADO HIGHWAYS feels safe in expressing its wish for a happy, contented and prosperous New Year to all.

FEDERAL AID ROADS COST \$205,043,734 IN 1928

For the fiscal year ending June 30, 1928, improvements were made on a total of 8,184 miles of Federal Aid system. The total cost of this 8,184 miles of initial construction and 2,014 miles of stage construction completed was \$205,043,734 of which the United States government paid \$88,056,984 or 43 per cent and the various states paid the balance. The largest disbursements were in Illinois, Kansas, Texas, Iowa, New York and Pennsylvania. Each of these states received more than \$3,000,000 from the government.

SIDNEY-BLACK HILLS ROAD TO BE GRADED NEXT YEAR

The Nebraska State Highway Department announces that the state highway from Sidney to the Black Hills will be graveled for its entire length through the state the coming year. This is the main route from Colorado via Sidney, Neb., to the Black Hills and is known as Highway No. 19 in Nebraska. This road was graded and improved for a large part of the way in 1927. The highway from Sterling, Colo., to Peetz connects with a road into Sidney.

COUNTY SUPPLIES
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STATE HIGHWAY DEPARTMENT

Financial Statement for the Year Ending November 30, 1928

BALANCE DECEMBER 1, 1927

State Treasurer	\$1,334,675.24
County Time Warrants	4,439.15
Revolving Fund	1,500.00
Total Balance	\$1,340,614.39

RECEIPTS:

Half Mill Levy	\$ 787,946.29
Internal Improvement	69,200.00
Gasoline Tax	2,665,354.93
U. S. Government	1,730,450.13
Highway Receipts	39,762.85
Bus Licenses	22,510.74
Cancelled Warrant	2.00
Total Receipts	\$5,315,226.94
Total Balances and Receipts	\$6,655,841.33

DISBURSEMENTS:

Federal Aid Projects	\$3,650,829.18
State Projects	665,702.10
Maintenance	917,286.63
Maintenance Equipment and Repairs	486,950.87
Property and Equipment	28,935.28
Surveys	31,119.17
Road Signs and Traffic Census	6,754.65
Administration	115,394.41
Compensation Insurance	13,029.99
Total Disbursements	\$5,916,002.28
BALANCE NOVEMBER 30, 1928	
State Treasurer	\$ 715,660.23
County Time Warrants	14,678.82
Revolving Fund	9,500.00
Total Balance	\$ 739,839.05
Total Disbursements and Balance	\$6,655,841.33

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
73-R	0.5 mi.	Overhead R. R. Crossing and Approaches	South of Minturn
97-R	.....	Bridge	East of Lamar
150-A	6 mi.	Gravel Surface	West of Craig
248-B	2 mi.	Gravel Surface	South of Buena Vista
272-D	2 mi.	Concret Pav't and R. R. Underpass	East of Manzanola
253-D	4 mi.	Gravel Surface	West of Steamboat Springs
255-H	2 mi.	Gravel Surface	West of Sapinero

PLANS SUBMITTED FOR APPROVAL TO U. S. BUREAU OF PUBLIC ROADS

Proj. No.	Length	Type	Location
57-R	0.464 mi.	Bridge	North of Lamar
68-R	1.9 mi.	(Gravel Surface (Oil Processed)	North of Monte Vista
282-H	7.029 mi.	Gravel Surfacing	North of Rifle
292-B	2.640 mi.	(Gravel Surfacing	South of Minturn
295-D	1.818 mi.	Gravel Surfacing (Oil Processed)	North of Antonito

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1928

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R5	Bet. Trinidad and Aguilar	1.959 mi.	Paving	W. A. Colt & Son	\$ 72,122.50	100	2R-5
2-R No. 6	South of Aguilar	2.75 mi.	Pavement	W. A. Colt & Son	93,000.00	100	2R-No. 6
2-R7	South of Aguilar	1.224 mi.	Paving	H. C. Lallier Const. & Eng. Co.	68,990.60	47	2-R7
2-R8	Aguilar, South	1.633 mi.	Paving	J. Finger & Son	68,660.00	80	2-R8
134-B	East and West of Vona	3.352 mi.	Gravel Surfaced	W. A. Colt & Son	32,605.00	15	134-B
138-A	North of Kremmling	10.916 mi.	Grading	F. L. Hoffman	201,262.80	79	138-A
144-B	Northwest of Fort Collins	3.201 mi.	Gravel Surfacing	White & LaNier	44,000.00	100	144-B
144-C	Bet. Fort Collins and Laramie	2.934 mi.	Gravel Surfaced	Bedford & Woodman, Inc.	37,911.35	0	144-C
145-A	West of Glenwood Springs	3.807 mi.	Gravel Surfacing	Winterburn & Lumsden	53,227.90	100	145-A
145-B	West of Glenwood Springs	1.051 mi.	Surfacing	Winterburn & Lumsden	42,389.72	100	145-B
147-A	In Ute Mt. Reservation, S. of Cortez	15.896 mi.	Surfacing	E. J. Maloney	119,100.10	92	147-A
147-B	South of Cortez	4.833 mi.	Surfacing	E. J. Maloney	59,447.44	50	147-B
149-A1	Between Deertrail and Agate	4.716 mi.	Gravel Surfaced	Fred Kentz H'ghw'y Const. Co.	26,004.36	5	149-A
208-AR	E. of Grand Junction	0.507 mi.	Gravel & R.R. Grade Separation	Harry A. Roush	59,568.00	78	208-AR
210-B2	De Beque-Grand Valley	7.507 mi.	Gravel Surfacing	Fred Kentz	37,475.00	100	210-2
242-B	W. of Mack at E. Salt Wash	Timbr. Bridge & Gravel Approaches		Hinman Bros. Const. Co.	13,996.40	100	242-B
242-C	West of Fruita	6.011 mi.	Gravel Surfaced	Hinman Bros. Const. Co.	56,344.50	20	242-C
247-C	Swink	0.8 mi.	Conc. Pav. & R.R. Underpass	J. Finger & Son	62,559.53	100	247-C
251-C	E. of Boulder	4.000 mi.	Pavement	J. H. Miller & Co.	150,263.60	89	251-C
253-C	West of Milner	4.502 mi.	Surfacing	Mountain States Con. Co.	88,108.40	96	253-C
254-C2	S. W. of Hot Sulphur Springs	Superstr. of Bridge & Approaches		Northwestern Constr. Co.	48,203.50	100	254-C2
254-D	Parshall-Hot Sulphur Springs	3.013 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	37,124.18	100	254-D
258-E2	Climatron-Cerro Summit	1.487 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	32,377.70	100	258-E2
258-F	Gunnison-Sapinero	5.689 mi.	Surfacing	Hinman Bros. Const. Co.	100,968.50	95	258-F
258-G	West Side of Cerro Summit	2.885 mi.	Gravel Surfaced	Mountain States Const. Co.	68,640.60	11	258-G
262-I	South of Russell	4.034 mi.	Gravel Surfaced	Mountain States Const. Co.	37,933.50	19	262-I
266-C	Durango and N. Mex. State Line	2.401 mi.	Surfacing	Salle Const. Co.	32,499.80	100	266-C
266-D	South of Bonad	4.111 mi.	Gravel Surfaced	Engler, Teyssier & Co.	96,075.30	9	266-D
271-C	West of Portland	2.430 mi.	Surfacing	J. Finger & Son	54,843.40	30	271-C
275-C3 E2	G3 Palmer Lake-Pring	4.602 mi.	Concrete Paving	J. Fred Roberts & Sons C. C.	114,079.65	100	275-C-3 E2 G3
275-E	North of Monument	0.926 mi.	Grading and Underpass	F. L. Hoffman	41,906.20	100	275-E
275-F3 G2	Tomah-Palmer Lake	12.894 mi.	Concrete Paving	H. C. Lallier C. & E. Co.	292,309.95	100	275-F3 G2
277-B	South of Colorado Springs	4.860 mi.	Concrete Paving	J. L. Busselle & Co.	131,202.45	100	277-B
277-C	N. of Pueblo	4.363 mi.	Conc. Pavement	J. Fred Roberts & Sons C. C.	120,789.25	90	277-C
279-F	North of Baileys	3.444 mi.	Graded	J. Fred Roberts & Sons	126,000.00	76	279-F
282-AR1	South of Craig	600 ft.	River Protection Work	Hinman Bros. Const. Co.	11,925.00	94	282-AR1
282-D	North of Meeker	2.864 mi.	Gravel Surfacing	Winterburn & Lumsden	42,155.00	100	282-D
282-E	N. of Meeker	6.421 mi.	Gravel Surfacing	Luke E. Smith & Co.	88,384.20	50	282-E
282-F	So. of Craig on S. H. No. 13	2.17 mi.	Surfacing	Gardner Bros. & Glenn	49,063.00	100	282-F
286-BR1	S. of Wyoming-Colo. Line	14.474 mi.	Gravel Surfacing	A. R. Mackey	38,978.00	93	286-BR1
286-C	Between Greeley and Eaton	5.566 mi.	Paving	New Mexico Const. Co.	126,360.35	89	286-C
287-A3	W. of Ft. Morgan on S. H. No. 2	3.55 mi.	Concrete Paving	Edw. Selander	90,749.50	100	287-A3
287-A4	West of Fort Morgan	5.087 mi.	Paving	Edw. Selander	120,506.80	100	287-A4
287-D1	Two mi. E. of Kersey on S. H. 2	0.921 mi.	Grading	White & LaNier	14,046.40	100	287-D1
287-D2	East of Kersey	0.921 mi.	Paving	S. & S. Const. Co.	25,269.80	88	287-D2
288-A2	Bet. Merino and Brush	9.741 mi.	Paving	Edw. Selander	245,043.50	100	288-A2
292-A	North from Minturn	6.417 mi.	Grading	H. C. Lallier Constr. & Eng. Co.	82,571.80	99	292-A
293-C	North of Ouray	3.661 mi.	Grading	C. V. Hollenbeck	62,997.80	45	293-C
295-C	La Jara-Antonito	5.284 mi.	Surfacing	Popie Bros. C. C.	29,414.60	100	295-C
296-C	N. of Greenhorn on S. H. No. 1	6.606 mi.	Surfacing	H. C. Lallier Constr. & Eng. Co.	115,466.80	83	296-C

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