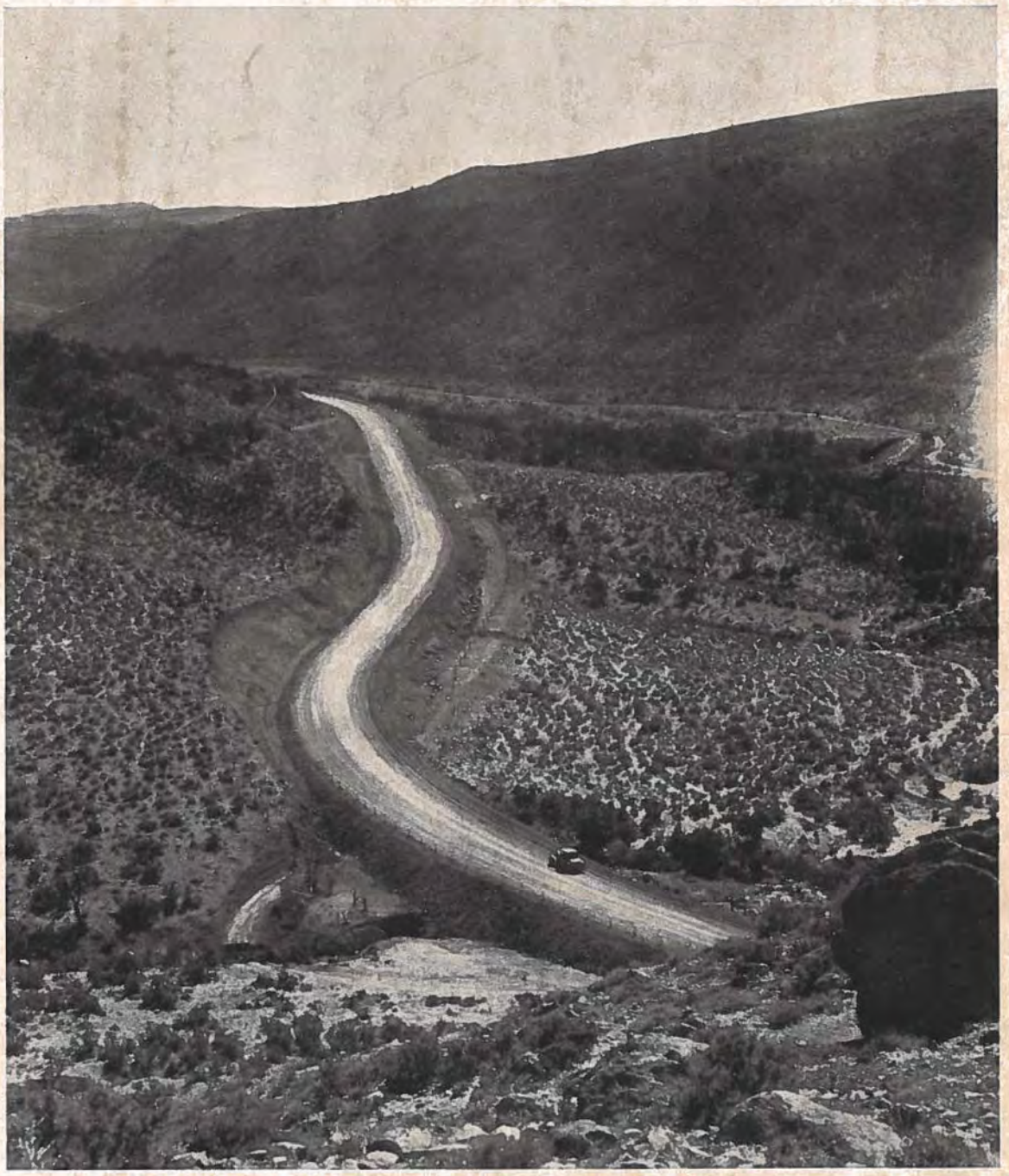
COLORADO HIGHWAYS



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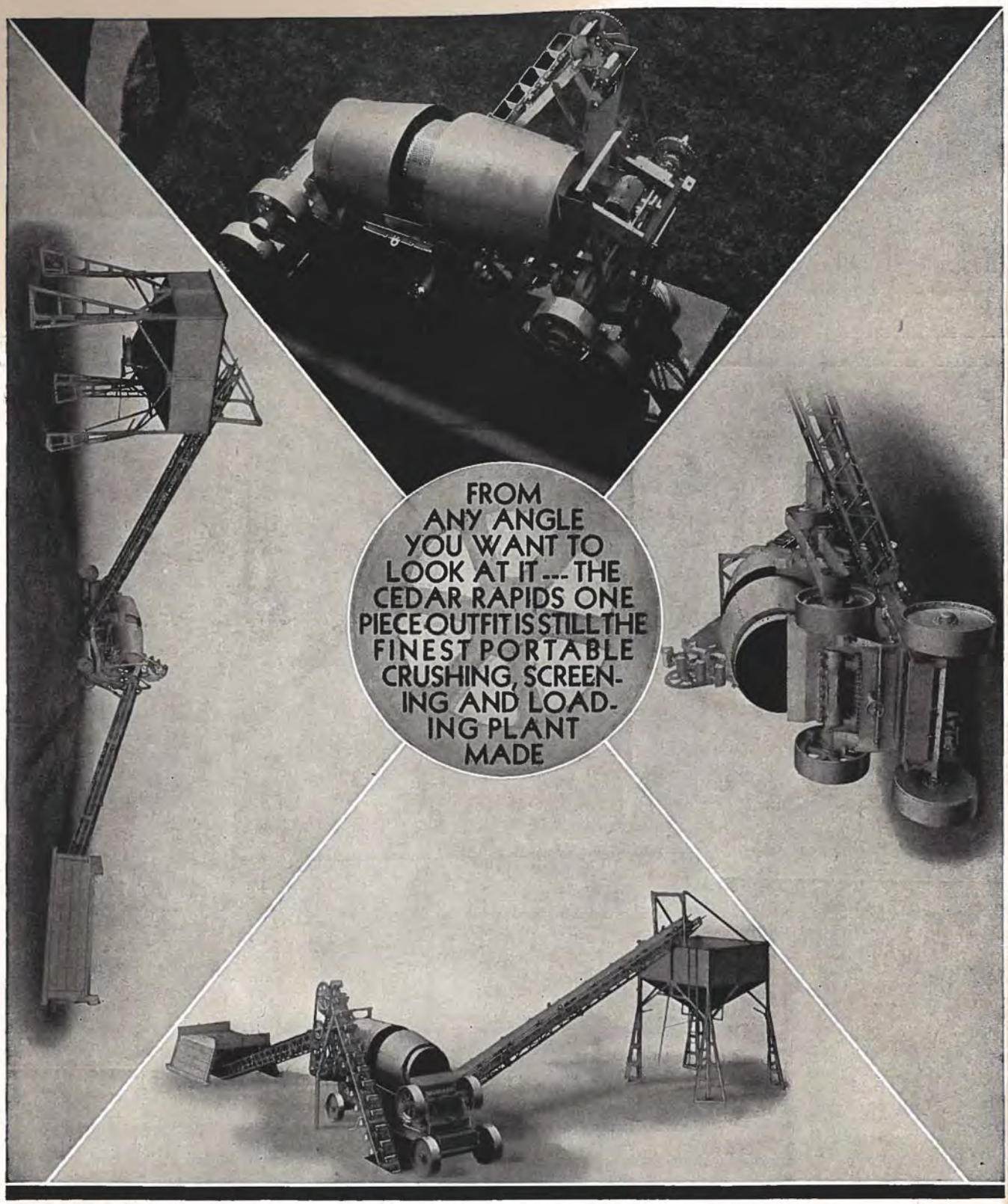

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Our Cover Picture

ON THE cover of this month's Colorado Highways we print a picture of the new U. S. highway located east of Montrose over Cerro Hill, recently completed by the Colorado highway department with Federal Aid co-operation. This improvement eliminates one of the worst stretches of highway on the Western Slope. In another section of this month's issue is a picture showing the condition of the old road in wet weather. Photo by U. S. Bureau of Public Roads.

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Colorado Highways
"BETTER ROADS"
VOLUME XI. JANUARY, 1932 NUMBER 1

The 1931 *Highway* Program

BY OLIVER T. REEDY, Senior Assistant Engineer, State Highway

WHATEVER the so-called depression in other activities, nothing of the kind has been n evidence during the current sea-on where highway construction is oncerned. This is true not only of olorado, but of every state in the Jnion.

On account of the acute unemployment situation, Congress increased the annual $75,000,000 Federal Aid Fund to $125,000,000 hrough a bill which was approved n April 4, 1930. The date upon which the Federal Aid money became available was also advanced everal months. This additional appropriation increased Colorado's apportionment from $1,380,000 to $2,-16,000.

In many of the states, in fact a majority of them, the accumulation f funds is progressive throughout he year, and hence it is impossible o launch a heavy program early in he season, therefore making it impracticable to take advantage of the dditional Federal Aid by meeting he state's proportion, and putting it mmediately to work at building oads and supplying men with jobs.

Congress met this situation by assing what is known as the Emergency Advance Fund Bill, which as approved on December 20, 930. This bill provides an additional $3,000,000 to be used on forest oads; $3,000,000 to be used on projcts through public lands; and $80,-00,000 to be loaned to the states in rder to meet their Federal Aid alotments. This is to be returned to he government by equal annual deuctions from future Federal Aid llotments extending over a period f five years.

It so happened that Colorado's hare of the Emergency Fund, $1,-07,832, equalled almost exactly the accumulated amount of Federal Aid we had been unable to accept in previous years because of insufficient state funds. Thus the highway budget was about $3,000,000 above normal, amounting in all to about $9,800,000, permitting a construction program of about $7,680,000. The average annual construction expenditure for the previous five years was about $3,494,000.

It is self-evident that if the Emergency Fund was to be effective in relieving the unemployment situation, it must be put to use as early as possible. The first bill before Congress called for its expenditure before July 1, 1931, but the states were able to show that on account of the winter season interruption to construction work, it would be impracticable to meet this condition, and the date was advanced to September 1, 1931.

The Highway Department of Colorado promptly organized its forces to take advantage of its additional funds, and completed preparation of projects and letting of construction contracts at a rate considerably more than double the program in a normal year, and at practically no increase of expense for administration.

Our citizens and visitors have at the end of the season approximately 400 miles of new road improvements up to Federal Aid standard, and between 3,000 and 4,000 men have been given employment. This does not take into account any of the government forces or of men employed on forest roads or national park roads. Moreover, it is estimated that a road-building project gives employment indirectly to two additional men for each one actually working on the job, so that the vigorous road program has been of some real moment.

A section of the newly completed concrete paved roadway leading south from Trinidad in Las Animas County. Photo by U. S. Bureau of Roads.

Road Work *Quickest Way* to Give Jobs

MONEY appropriated by Congress for unemployment relief can be put to work more readily in road building than in any other way, and at the same time give the widest distribution of the funds, according to Charles D. Vail, state highway engineer.

All emergency relief funds appropriated to Colorado during 1931 were expended prior to September 1. As a result approximately 2,500 men were given employment for a period of five months. Mr. Vail points out that this is not always true of funds appropriated by congress for other public works. In some instances work has not started on projects for which money was appropriated more than a year ago.

At the beginning of the year the Government appropriated $85,000,000 for emergency unemployment relief road work. It was set aside on the condition that the states receiving the money should expend same before Sept. 1, 1931. It is said that every state carried out this provision of the law.

At the same time work was started on the vast $700,000,000 construction program of the Federal Government. On Nov. 5th, President Hoover announced that a total of 131 buildings had been completed at a total cost of $41,934,969. Sixteen buildings were completed during the months of September and October.

On Nov. 1 there were 270 buildings in construction by contract, at an estimated cost of $229,772,700. In September and October, 41 contracts were let with a total value in excess of $48,000,000.

On the same date there were 240 projects in which sites had been selected and on which plans are now under way of a total estimated cost of $141,947,923.

At the present time it is estimated that 100,000 men are directly or indirectly employed on the building program of the government.

It is estimated that the $85,000,000 emergency unemployment road fund made it possible for the 48 states to employ an average of 5,000 men each, or a total of 240,000 men, for a period of five months during last construction season.

The members of the American Association of State Highway Officials adopted resolutions offering to co-operate in carrying out any federal plans for further unemployment relief, but in view of the condition of the federal treasury, it was decided not to urge Congress to appropriate any additional funds for federal aid.

However, word received from members of Colorado's delegation in Congress, indicates that additional funds will be appropriated for unemployment relief in road work.

"We will be more than pleased to co-operate with the government in every way to see that the greatest possible number of men is put to work as soon as possible, and at the same time see that full value is obtained for the money expended on road construction," Mr. Vail said.

Gov. W. H. Adams and members of the highway advisory board expressed themselves in a like manner. It was stated that final approval of the 1932 highway budget would be held in abeyance a reasonable length of time awaiting the action of Congress on emergency road bills now before the house.

"The emergency funds given Colorado in 1931 came at a most o portune time," Engineer Vail sa "The increased amount of work d ing the past year gave us oppor nity to go a long ways toward cat ing up with the traffic needs, wh has shown a big increase during t past few years.

"The records of the departme show that we accomplished m work per dollar in 1931 than in a previous year. Several of the la est projects ever handled by the partment were completed during t year and our engineering costs, b in the field and in the Denver he quarters, have been lower than e before.

"Employment given to seve hundred additional men has a been an important feature of t program."

On Dec. 1st, the Colorado Depa ment had expended $7,077,030.75 Federal Aid construction projects total of $896,961.75 on new St road projects, and $1,524,936.01 maintenance. The construction co pleted during 1931 included 350 mi of gravel surfaced roads, 53 miles concrete pavement; 14 miles of gra ing and structures and 16 miles oil process surfacing.

BEFORE—Showing condition of old state road over Yellow Jacket hill betwee Durango and Pagosa Springs during wet weather. Photo by U. S. Bureau of Road

1931 Road *Progress in* Division No. 3

BY J. R. CHENEY, Division Engineer

IN looking over construction results of this department for the year 1931, some progress can be noted toward the accomplishment of the present objective, namely the surfacing of the main artery of travel through the San Juan Basin.

The volume of work budgeted for the Basin was somewhat above normal, due to the extra funds allotted to the states by the Federal government to help the unemployment situation. The volume of construction money expended during a single season was also high, due mainly to the short time limit placed by the government on expenditure of the emergency funds.

Three Federal Aid projects were placed under contract, two of which were completed, and the third is well along toward completion.

One project on Yellow Jacket Divide begins at the La Plata-Archuleta county line, and extends five miles east. This was bid at $67,000 and let to the local firm of Wood-Morgan-Burnett Construction Company. The second project starts approximately two miles west of Bayfield and extends into and through the town, connecting two previously built projects. It closes the unsurfaced gap between Durango and Bayfield. Included in this project are two new steel bridges over the Pine and Little rivers at Bayfield. It was bid in at $98,000 and let to the J. H. Miller Construction Company of Denver. This work is shut down for the winter, but construction is well along and the work can be brought to completion probably in thirty days when reopened in the spring. The third job, at Hesperus, is five miles long, and closed the last unsurfaced gap between Durango and Mancos. It was let to J. Finger & Son of Denver on a bid of $86,000. Shortly after starting work Finger sold his plant and turned over the contract to Grant Shields.

In addition to these three strictly basin projects, a 4-mile section was completed on the east side of Wolf Creek Pass, below Twin Bridges, and another 2-mile section just above Twin Bridges was let, but the heavy snowfall has prevented the contractor from getting his plant in to the job.

In addition to the above, five small projects were built with state funds.

AFTER—Showing a section of the new Federal Aid highway over Yellow Jacket hill recently opened to traffic. This can be traveled in any sort of weather. Photo by U. S. Bureau of Roads.

A piece of narrow grade at Montelores, below Rico, was widened.

A connection was made from Northdale, west of Dove Creek, to the state line, to connect with a recently completed new project in Utah.

A section of grading was started between Dolores and Lewis.

Another graded section was completed between Mancos and Cortez.

A section was graded and surfaced by maintenance forces near the Ranger Station between Pagosa and the foot of Wolf Creek.

This covers the construction program for the Basin. Roughly, an equal volume of work was handled in the San Luis Valley.

In the absence of the Assistant Superintendent of Maintenance, Mr. J. R. Shea, it is fitting that I should add a word on the activities of that branch of this organization, which is charged with the upkeep of the transportation system, and the flow of traffic. Through the season of heaviest traffic they retard the inevitable disintegration of all surfaces subject to traffic wear, and maintain all structures. During the present winter, under unusually severe storm conditions, they have kept open to traffic all the important traffic lanes in the Basin.

Plans also have been completed for the construction of four and one-half miles of new roadway and underpass, located west of Strasburg on U. S. Route No. 40. When finished early next summer this project will complete the grading and gravel surfacing of this route from Denver to River Bend, a short distance west of Limon.

Work on seven and one-half miles of gravel-surfaced roadway south of Alamosa was completed in December by the Mountain States Const. Co., contractors. J. R. Cheney was the division engineer in charge of the work.

A section of the newly completed Federal Aid highway located east of Montrose, Leading to Cerro hill. Photo by U. S. Bureau of Roads.

Many New *Highways for* Western Slope

WORK for hundreds of men was provided by the highway construction and maintenance program carried out by the State Highway department in District No. 2 during the year just ended, according to John J. Vandemoer, division engineer.

In Mesa county five projects were completed. These included two projects through DeBeque canon, the Fruita to Loma project, a project from Mack to the state line, and a new bridge near Johnson's Corner. Total cost of these projects was $584,449.

Construction of the Fruita and Mack projects marked the completion of a standard Federal Aid highway from Grand Junction to the Utah state line. The celebration for Western Colorado and Eastern Utah held the latter part of September was a fitting celebration for the completion of these projects and many others in the western part of the state.

Although all of the projects in Mesa county were not started during the closing year, all of them were completed during that time. At the close of 1931 all of the projects started last year are nearing completion except those which were forced to close because of severe weather. On these projects, operations will be resumed as soon as weather conditions permit.

Montrose county has also profited in road construction during the past year. On the grading and graveling project from Montrose to the Gunnison county line toward Cimarron $55,299.86 was expended. This project has just been completed. Construction of a concrete box culvert to carry the Stumpy creek drainage in Montrose county cost $9,301.05 but the work on this project will not be completed until next season. Another project west of Montrose which includes grading and graveling of 5.8 miles of highway cost $107,027.30.

A portion of the state road from Gunnison east to Parlin is being graded at a cost of $184,503.40. The work will not be completed until this season.

The new bridge on the dese northwest of Delta on the Gra Junction-Delta highway was erect at a cost of $8,690.05. The ne bridge is a great addition on th Delta road, for at this wash duri almost every storm cars were he up for hours and after every seve storm, the bridge had to be partial rebuilt.

As well as the federal aid projec there are many state projects th were built in the past year or a under construction. These projec include the surfacing of highway b tween Cedaredge and the top Grand Mesa, and several other i portant highways in Delta count Money has also been allowed for state project to improve the Dougl pass road although thus far no wo has been done. Improvements a being made on the roads in Hinsda San Miguel, Saguache, Montro Ouray, Gunnison and Rio Blan counties.

Work has been done on the hig way at Whitewater by the state

(Continued on page 28)

U. S. Spends *Huge Sum on* Forest Roads

BY COL. ALLEN S. PECK, U. S. Regional Forester

NATIONAL forest road construction had its best season during the year just past. The entire appropriation for forest highways for the whole country in 1931 was $12,500,000, of which $3,000,000 was an emergency appropriation to relieve unemployment. Out of these funds $1,168,000 was spent in Colorado.

Among the more important roads on the forest highway system which were improved during the past season are the Berthoud Pass and Rabbit Ear sections of U. S. Highway No. 40-N. The Berthoud Pass road has been built to a fair standard for several years, but, owing to the enormous volume of traffic using this road, it was deemed best last year to start on a reconstruction program and bring the road up to the point which will be permanently satisfactory and adequate to take care of the large volume of traffic that can be foreseen.

Two construction contracts were in operation during the past season on the reconstruction of this road, and $211,500 was spent on it. One contract was completed and the other probably will be finished some time after the first of next July.

Recommendations for next year's construction work include $95,000 for surfacing and an oil top finish for 17½ miles, 10 miles on the west side and seven and one-half on the east. Later on it is expected that a similar treatment will be given the 13 miles which now are under reconstruction.

On the reconstruction of the Rabbit Ear Pass road $164,350 was spent last season. A five and one-half-mile section still is in need of improvement to extend the present work to the western forest boundary, where it will connect with the work being done by the state highway department. An allotment of $140,000 was included in the recommendations to take care of this work during the coming season.

Other roads of importance, particularly to the people of Denver and Central Colorado, are the Jarre Canon, Six-Mile Creek, South St. Vrain and Nederland-Ward highways.

A section of the Jarre Canon project between Deckers and Sugar Creek Hill has been improved by the bureau of public roads of the department of agriculture with day labor, with an expenditure of approximately $24,000. Eight and six-tenths miles of road between Deckers and Buffalo were completed last season, with an expenditure of about $184,000.

Approximately 10 miles of the project remain to be completed and $60,000 has been included in the recommended program for next year to take care of another five-mile section.

The Stanley Hill section of the South St. Vrain road, extending toward Estes Park from Raymonds, was completed at a cost of $34,700. It is hoped to be able to oil surface a considerable length of this important road during next season. This will not only eliminate dust and make a better driving surface, but will protect the investment already made in the road and reduce maintenance.

Between Nederland and Ward extends one of the first forest highways to be improved. This is now found to be entirely inadequate to take care of present-day traffic and over $30,000 has been spent this past season by the bureau of public roads in improving this road by day labor. It is expected that $25,000 more will be devoted to continuing this improvement next season.

A contract covering about eight miles of the Willow Creek Pass road between Middle and North Parks, will, when completed, finish the grading of this road between the pass and Highway No. 40 below Granby. When funds are available, $70,000 will be spent for surfacing the improved sections on the east side of the pass. Sixty-four thousand dollars was devoted to a contract for improving the 4½-mile section of the Loveland-Fremont Pass road lying between Leadville and Climax. Another four-mile section will probably be improved next season.

(Continued on page 28)

This is what the old road pictured on page 6 looked like in wet weather. Yes, these days are gone forever. Photo by U. S. Bureau of Roads.

Officials *to Discuss* *County Tax* Problems

THE twenty-fourth annual convention of the Colorado State Association of County Commissioners will be held in Denver on January 20th to 22nd. Varied subjects to be discussed before the conference are expected to result in the largest attendance in recent years.

Among the subjects of vital importance to state and county government to be discussed include the old age pension laws; the pauper question; taxation, both state and county; tax redemptions; tax improvements in making assessments by the counties; road improvements; the new truck law, and activities of water commissioners.

The speakers will include: Governor Wm. H. Adams; Mayor George D. Begole of Denver; A. E. Palen, district engineer of the U. S. Bureau of Public Roads; Chas. D. Vail, Colorado Highway Engineer; State Senator Lee Knous; Dr. B. M. Rastall, executive vice-president of the Colorado Association, and others.

President Lynn Kennedy of Rifle will preside at all meetings. Fred O. Pearce of Adams County is secretary. The program for the three-day session as announced by Mr. Kennedy is as follows:

WEDNESDAY MORNING, JANUARY 20, 1932

9:30 Call to Order.
Registration of Counties.
Introduction of new members.
9:50 Invocation.....Rev. Earl C. Eppert
Edgewater Community Church, Edgewater, Colo.
10:00 Address of Welcome.....Hon. Geo. D. Begole
Mayor of Denver
10:10 Response .....Andrew Lindstrom
Chairman of Board, Summit County
10:20 Address.....Hon. Wm. H. Adams
Governor of Colorado
10:30 Reports.
10:45 Results of 1931 and Expectations for 1932 by the Colorado Association.....Dr. B. M. Rastall
Executive Vice-President
11:30 Address..... Clarence Werthan
Representative Rocky Mtn. Motorists, Inc., A.A.A.
Appointment of Committees.
Adjournment for Lunch.

AFTERNOON

2:00 U. S. Forestry Department, "Roads and Grazing"
.....Hon. Allen S. Peck, U. S. Forester
2:20 Federal Aid and Maintenance.....Hon. A. E. Palen
U. S. Bureau of Public Roads
2:40 Address.....Hon. Peter Seerie
Chairman State Highway Advisory Board
3:00 Address.....Hon. C. D. Vail
State Highway Engineer
3:20 Address.....Hon. J. E. Maloney
Engineer, State Highway Dept.
3:40 Address.....Hon. Robert Higgins
Supt. Maintenance, State Highway Dept.
4:10 Modern Methods of Construction and Maintenance of Streets and Highways....Hon. Albion K. Vickery
City Engineer for the City and County of Denver
8:30 Mr. and Mrs. John A. Crook at home to County Officials at 1801 York St., Denver, Colo.

THURSDAY MORNING, JANUARY 21, 1932

9:30 Call to Order.
10:00 Report of Legislative Committee..Judge V. H. Johns
Cheyenne Wells, Col
10:20 Old Age Pension Law, Report of County Attorneys Association....Thos. Hoffmire, Atty., Pueblo Coun
10:30 Our Association .....Lynn Kenne
Pres. State Assn. of County Commissioners, Rifle, Col
11:00 Pauper Question.....Dan Newberry, Hugo, Col
12 M. Adjournment for Lunch.

The convention to be guests of H. W. Moore Equipme Company at their office and warehouse, 6th and Acom Cars will be in readiness at 12 M. sharp.

AFTERNOON

2:00 Taxation.....Senator Lee Knous, Montrose, Col
2:45 Review of Recent Legislation.....Hon. Harry John
Eagle County, Gypsum, Col
3:00 Tax Redemption.....Led by W. I. Giffo
La Plata Count
3:30 Tax Improvement in Making Assessments by Counties....Paul V. Pattridge, Co. Assessor, Golden, Col
4:00 Local Employment.....R. P. Lewis, Otero Count
Adjournment.
7:00 Colorado State Association of County Commissioners and Denver Night..Stock Show Stadium, Denve

FRIDAY MORNING, JANUARY 22, 1932

9:30 Fault and Complaint 1931 Truck Law....Marion F. Jone
Atty. Independent Truckmen's Assn., Longmont, Col
9:45 Benefits of 1931 Truck Laws.....Jack Sco
10:00 Truck Laws, Uses and Abuses.....Hon. Worth All
Chairman, Public Utilities Commissio
10:30 Extension Work.....H. A. Sandhous
County Extension Agent, Adams Count
10:40 Consolidation of Counties.....Senator Geo. C. Manle
Denver, Col
11:10 State Water Commissioners.....Hon. M. C. Hinderlide
State Engine

AFTERNOON

2:00 Report of Committees.
Necrology and Eulogy by some member from th county where deceased served, or send obituary t Secretary.
Auditing.
Resolutions.
Appointment of Standing Committees.
Meeting Place Next Convention.
Election of Officers.
Adjournment.

OFFICERS

LYNN KENNEDY, President, Garfield County.

ANDREW LINDSTROM, 1st Vice-President, Summi County.

W. I. GIFFORD, 2nd Vice-President, La Plata County.

JOHN R. BROWNE, 3rd Vice-President, Jefferson Count

FRED O. PEARCE, Secretary-Treasurer, Brighton, Col

Fifty Years of *Progress in Bridge* Engineering

BY D. D. STEINMAN, Consulting Engineer, New York City

I WANT to review for you the story of bridges, not as a dry recital of span lengths or structural principles or erection details, but rather as a heart-stirring narrative of high adventure and deep dramatic interest. I want to give you a glimpse into the drama, the romance, the poetry of bridge building. I want to tell you of men's dreams, of their faith, of their struggles, of their tragedies, and of their glorious realization. I want you to visualize the story of bridges as an epic of human vision and courage, high hopes and disappointments, heroic efforts and inspiring achievements. I want you to picture the attainment of greater and greater spans, not as a matter of routine development, but as Man's front-line battle to force outward the challenging barrier that separates his efforts from the "impossible."

I want to make you see bridges as I see them—not as mere prosaic objects of utility and economy, but as something far more significant and inspiring. For to me, a bridge is more than a thing of steel and stone; it is the embodiment of the effort of human heads and hearts and hands. To me, a bridge is more than a thing of stresses and strains; it is an expression of Man's creative urge—a challenge and an opportunity to create the beautiful. A bridge is the fulfillment of human dreams and hopes and aspirations. A bridge is the symbol of Humanity's heroic struggle toward mastery of the forces of Nature. A bridge is a monument to Mankind's indomitable will to achieve.

The Brooklyn Bridge

Fifty years ago the Brooklyn Bridge was under construction. It was the crowning achievement of John A. Roebling—a monument to his vision, courage, and genius. He had conceived and developed the modern method of constructing cables by stringing wires through the air, and had built a number of notable suspension structures, including the record-breaking spans at Niagara and Cincinnati. Those achievements, however, were but preliminary training for this greater work that was to cost him his life while crowning it with glory. When he presented his plans for flinging a mighty span across the East River, he had to fight his way, inch by inch, against disbelief, ignorance, and prejudice, before the right to try was given him. He overcame all obstacles and succeeded in seeing his project finally launched. But he was not fated to behold the fulfillment of his dream—he died during the first year of construction from an injury received on the work.

The work he had planned was carried forward, with loyalty and courage, by his son, Washington Roebling—but not without further vicissitudes and sacrifices. During the sinking of the deep foundations, fire broke out in one of the timber caissons, and young Roebling fought heroically to save his father's dream from destruction. For 24 hours, without relief, Roebling remained in the heart-crushing pressure of the compressed air in the subaqueous chamber, fighting the flames, hour after hour, until the structure was saved. He was carried out, broken in body, a paralytic invalid for life. On the day when the bridge opening was celebrated, amist clanging of bells and shrieking of sirens, the procession marched in front of Roebling's home, to do honor to the man who had sacrificed himself to carry the project to its consummation.

Brooklyn Bridge over the East River, New York. Span 1,595½ feet. Completed 1883.

When the Brooklyn Bridge was completed in 1883, it was heralded as one of the "Wonders of the World." It was a triumph of the bridge builder's art.

But the science of bridge building was then in its infancy. The first crude theory of suspension bridge analysis did not appear until too late to influence the design of the Brooklyn Bridge. According to modern analysis, the stiffening trusses of that structure are grossly inadequate. Nevertheless, the Brooklyn Bridge, designed by empirical judgment and rule of thumb, has been carrying, after a generation of service, two or three times the loading for which it was planned. The trusses are weak and can be replaced, but the towers, cables, and anchorage are good for centuries.

Fifty Years of Progress

The past 50 years have been a period of unprecedented achievement in bridge engineering. Greater progress has been made than in all the centuries preceding. The great bridge structures now being undertaken surpass the Brooklyn Bridge as it surpassed the structures that preceded it.

The outstanding elements of improvement in bridge design and construction have been the following:

1. **Material**—In the construction of the Eads Bridge at St. Louis, completed 1874, was the first use of steel in bridge construction. This valuable metal soon superseded the timber and cast iron used in earlier structures. Steel offered new and enlarged possibilities and opportunities. The quest for an even stronger metal soon led to the development and application of alloy steels. Nickel steel was used in the Manhattan, Queensboro, Quebec, Metropolis, and Philadelphia bridges. A more economical alloy was found in silicon steel, and this was used in the Philadelphia, Carquinez, Mount Hope, Detroit, St. Johns, and Hudson River bridges.

Finally heat-treated steel was developed for bridge work, the increase in strength being produced by a special process of heat treament

of the steel, without the addition of other metals. The highest form of this high-tension heat-treated steel, permitting a working stress three times as high as that allowed on ordinary structural steel, was used in the Florianopolis Suspension Bridge in Brazil, completed in 1926. This development of higher strength steels has extended the range of economic construction of long-span bridges.

2. **Foundation Methods**—The Brooklyn Bridge and the Eads Bridge represented practically the first use of pneumatic caissons for bridge foundations. The successful completion of these foundations was regarded as a great achievement. Since then the methods of sinking deep foundations have been greatly improved, and greater depths have been successfully reached.

The recently completed foundations of the Carquinez Bridge in California go down through 90 feet of water in swift current to a depth of 135 feet below the water surface. In sinking the foundations of the Hell Gate Arch Bridge, a chasm was encountered in the underlying rock, and this was bridged by a concrete arch built under the caissons at a depth of 70 feet below the surface. Such improvements in the art of building foundations have extended the range of feasibility of bridge projects.

3. **Theory of Bridge Design**—The mathematical theory of the analysis and design of bridge structures has been vastly extended and improved in recent years. The economic proportioning of a structure can be determined by modern analysis. Every pound of metal can now be placed where it will do the most good. The load capacity of a structure is now known instead of being a matter of empirical guesswork.

The clumsy, massive designs of the past are now being outrivalled by more graceful, yet more scientific designs. Stronger and more efficient structures can now be built with a smaller expenditure of material. In the case of the Florianopolis Bridge, the introduction of a more scientific design produced a structure four times as rigid, with only two-thirds as much metal in the stiffening truss.

4. **Erection Methods**—Erection methods have been vastly improved in efficiency, safety, and speed. The use of cumbersome falsework has been reduced to a minimum. The Brooklyn Bridge took more than 10 years to build; a modern bridge of equal or greater magnitude is built in four years or less. The reduced time required for spinning large suspension bridge cables (as a result of the improvements developed by H. D. Robinson) illustrates the improvement in the art. The Brooklyn Bridge cables (only 900 tons of wire per cable) took 21 months; the Williamsburg Bridge cables (1,100 tons of wire per cable) took 7 months; the Manhattan Bridge cables (1,600 tons of wire per cable) took 4 months; and the Philadelphia Bridge cables (3,300 tons of wire per cable) took only 5 months.

5. **Aesthetics in Bridge Design**—The artistic design of bridges has been greatly developed. Early steel bridges were purely utilitarian and some, like the Forth Bridge, were merely expressions of brutal power

Eads Bridge—Steel arch bridge—over the Mississippi at St. Louis. Spans: 502, 520, 502 feet. Completed 1874.

and strength. We are now coming to realize that bridges are an index of progress and civilization, and that any large bridge should be designed with a view to fine architectural effect. That much is due to a civilized age; to do less is to violate our responsibility to our profession, our duty to the civilization in which we live, and our obligations to the community in which the bridge is built. The highest artistic qualities of design are particularly important in a monumental bridge erected in a great metropolis. The recognition of these requirements is bringing about a new era of beauty in bridges.

Different Types of Steel Bridge Construction

A review of progress in this field of engineering achievement covers five different types of construction available for long-span steel bridges: Simple trusses, continuous bridges, steel arches, cantilever bridges, and suspension bridges.

1. **Simple Trusses**—The longest simple truss span is now the Metropolis Bridge, over the Ohio River. This bridge has a span of 720 fee

2. **Continuous Bridges**—The lar est continuous bridge in the world the Sciotoville Bridge, over the Oh River. This bridge, completed 191 has a truss 1,550 feet long contin ous over three supports.

3. **Steel Arches**—The Hell Ga Arch Bridge, with a span of 977 feet between centers of end bea ings, or 1,016 feet 10 inches betwe faces of abutments, is the large arch bridge thus far completed. will be exceeded in length by t Sydney Harbor Bridge, with a spa of 1,650 feet, and by the arch brid over Kill van Kull, between State Island, N. Y., and Bayonne, N. with a span of 1,675 feet, both no under construction.

4. **Cantilever Bridges**—The For Bridge, with its two spans of 1,7 feet, held the record until the Qu bec Bridge was built. The latt structure was finally erected in 19 after two disastrous failures, and i span of 1,800 feet now holds t world's record as the longest cant lever span.

5. **Suspension Bridges**—T Brooklyn Bridge, with its span 1,595½ feet, yielded the record f suspension bridges in 1903 to t Williamsburg Bridge, of 1,600 fe span. The Bear Mountain Brid completed in 1924, then held the re ord for a short time with its span 1,632 feet, only to be surpassed b the Philadelphia-Camden Brid completed in 1926, with a span 1,750 feet, and the Ambassad Bridge, at Detroit, completed 1929, with the record-breaking spa length of 1,850 feet. These are a wire cable bridges. The longest ey bar suspension span was the 95 foot span of the Elizabeth Brid (completed 1903) over the Danu at Budapest, until the Florianopol Bridge, with a span of 1,114 fe was completed in 1926 in Brazil.

All of these spans, however, a greatly exceeded by suspensi bridges now under construction projected.

Lindenthal's design for a brid to cross the Hudson River at Fift seventh Street, New York, has span of 3,240 feet; the N. Y. Po Authority is now constructing t epoch-making Hudson River Brid at 178th Street, New York, with span length of 3,500 feet; and Ro inson and Steinman's design for t proposed Liberty Bridge, to sp the Narrows between Brooklyn a Staten Island, has a main span 4,500 feet.

(Continued on page 12)

Fifty Years of Progress in Bridge Engineering

(Continued from page 10)

The Eads Bridge

Like the Brooklyn Bridge, the Eads Bridge is a monument to the boldness and genius of a pioneer master builder. This steel arch bridge, spanning the Mississippi at St. Louis, was conceived and executed by Capt. James B. Eads, who gave his health and strength to carry this project to its consummation. They had called him crazy when he proposed it. The bridge was successfully completed in 1874, and is still carrying heavy railroad, highway, and street car loading after more than a half century of service.

The Eads Bridge was the largest and boldest arch bridge of its time; in fact, it was decades ahead of its time in a number of pioneer features. It represented the first extensive use of steel in bridge construction, the first use of pneumatic caissons for bridge pier foundations, and the first use of riveted tubular chord-members. The chords are chrome-steel tubes, 17 inches in diameter. The arches were made of the hingeless, fixed-ended type, involving problems of stress analysis and erection adjustment that would challenge the temerity of most modern engineers.

With a fine sense of aesthetic requirements, Captain Eads insisted upon making the center span somewhat longer than the flanking spans. The three spans are 502, 520, and 502 feet, respectively.

When the first two half-arches of the Eads Bridge approached junction at mid-span, the gap was measured and was found to be 4 inches too short. Captain Eads, worn out with care and broken in health from the strain he had undergone, was then in England on an important mission. When the report reached him, he cabled his instructions: "Pack the arch in ice. Advise when closed." As ice was packed around the tubular chords, the ribs shrank, the gap visibly lengthened, and the closing member dropped into position.

The Quebec Bridge

The longest cantilever span in the world is the 1,800-foot span over the St. Lawrence River, in Quebec.

It was first decided to erect the span by the cantilever method. In this method, after anchor arms are constructed on falsework, the cantilever arm and half of the suspended span are built out from each shore. Special toggle connections were provided to facilitate the final adjustment when the two halves met at mid-channel. On the memorable date of August 29, 1907, as the south arm was approaching mid-span, something went wrong in one of the bottom chord members, and the entire structure suddenly crumpled and came crashing down. Eighty-two men were carried down with the tangled mass of wreckage.

To me, the most poignant tragedy standing out in the story of this catastrophe is the tragedy of a human career wrecked at its climax. Theodore Cooper, after a lifetime of contributions to the art of bridge building, was then at the zenith of professional fame. He had striven frantically to save the bridgemen,

Quebec Bridge, crossing the St. Lawrence River. The world's longest cantilever span. Span 1,800 feet. Completed 1917.

but his telegram ordering every man off the span arrived too late. Following the disaster, he retired to seclusion and in a few years died—a broken man.

The cause of the collapse was charged to the buckling of a compression member, due to inadequate lacing. After investigations and hearings lasting several years, plans were made for a new bridge designed more substantially and with different outlines and proportions. The new design provided nearly two and one-half times as much steel to carry the same specified loading. This time it was decided to take no chances with the cantilever method of erection for the suspended span, and the lifting method was adopted instead. By means of powerful hydraulic jacks, the spans had to be raised from barges a total height of 150 feet. After the span had gone up about 12 feet, something went wrong with the lifting rig, and the span suddenly dropped into the river, with the loss of 13 lives.

The following year (1917) a ne suspended span was completed. was towed out to mid-channel, an was lifted stage by stage with th use of the hydraulic jacks. At th end of four days of the lifting oper tions the span was finally and su cessfully connected in place.

The lessons learned from the tw Quebec disasters have contribute to engineering knowledge and pra tice. To the world, the Queb Bridge stands as a monument to i domitable courage and persistent d termination. At the price of tw great catastrophes, the world's re ord span length had been increas from 1,700 to 1,800 feet.

The Carquinez Strait Bridge

On May 21, 1927, there was cel brated the official opening of th Carquinez Strait Bridge in Califo nia. This marked the closing of th last gap in the Pacific coastal hig way system extending from Cana to Mexico.

The bridge was conceived by California business man, Aven Hanford. He gave his strength an energy to financing the project an launching its construction, but su fered the tragedy of not living to s the final consummation of his visio He died a half year before the brid was completed.

Unusual difficulties and problem had to be met with ingenuity an resourcefulness in the design an construction of the Carquine Bridge. Six piers had to be sun through 90 feet of water in swi current and with large tidal rang and then through 45 feet of overl ing material before reaching ro foundation. These are believed be the deepest water piers ever bui

The Carquinez Bridge is the fir bridge ever built with special co sideration given to earthqua forces in designing the structure an in providing special protective d tails. Six powerful hydraulic bu fers are provided at the expansio joints, in order to check longitudin vibration or any sudden longitudin movement. The stress computatio and the proportions of the eart quake buffers were based on th data of previous earthquake record

Three different kinds of steel a used in the Carquinez spans: Ord nary structural steel, tension mem bers of heat-treated eyebars, an compression members of silic steel. The adoption of silicon ste for the truss compression membe saved $600,000 in the cost of th bridge.

The cantilever structure of th

(Continued on page 24)

IT'S STILL THE

"Quick-way"

To the job—
To do the job—
To the next job.

We'll demonstrate one any place, any time. See the "road show" special when attending the Commissioners' Convention in January.

They have been "tried out" in Colorado in 1931 under the most severe conditions in counties with the contractors and State Highway Department, and we're more convinced than ever that they are built right and perform right at a surprisingly low "upkeep cost."

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The powerful scarifier, which is entirely independent of moldboard operation, making it practical to scarify and grade at the same time.

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Easily and quickly attached—increases the efficiency of the grader in clearing snow from the highways.

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Equipped with this power operated gravity dump body, the Galion Center Control Grader meets every requirement of a road maintenance machine, performing the job of both truck and grader.

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For

Whether the job is reducing a subgrade, leveling surfacing material, taining berm beside surface roads, removing snow, or any other road nance work, you will find this new Galion E-Z Lift Motor Grader fitted to the task. In design, construction and performance it is unqu ably the most outstanding value ever offered the road-building industry

SPECIFICATIONS

POWER—McCormick-Deering Industrial Tractor, 10-20 H. P. Forward speeds, 2.27, 4.08, 6.92 and 10.41 miles per hour. Reverse speed, 3.11 miles per hour. Speed of engine, 1,000 R. P. M. Mounting, 3 point suspension, on spring in front.

FRAME—10-inch channel, 20 lbs. per foot. Cross bracing, two 8⅝-inch diameter pipes, electric welded at ends. Auxiliary bracing of frame by heavy built up gear case supporting bracket. Motor support, side shift bracket, radius rod support and heavy cast head block add extra support to frame.

AXLES—Rear, regular tractor axle. Front, regular 15- mick-Deering tractor axle.

WHEELS—Solid rubber tired equipment: front, 32 x 5; 10. Pneumatic rubber tired equipment: front, 32 x 6; 7 duals or 40 x 8 duals.

STEERING—Tractor steering assembly operated by Ross steering gear enclosed by oil-tight and dust-proof hous operation, steers like an automobile.

SEMI-CIRCLE—Heavy one piece steel, 45 lb. railroad ra diameter. Equipped with Galion anti-chatter device. above ground, 14 inches.

MOLDBOARD—Standard 8 ft. Can be furnished with 1 board width, 16 inches x ½-inch.

BLADE—10 feet long, ½-inch thick, reversible, two cutt giving double wear. High carbon manganese steel, hard; will outwear any other make of grader blade.

ADJUSTMENT—Moldboard and blade are easily adjust pitch. They can be side-shifted to right or left with 18 inches, adjustment being made from operator's pl means of Acme double machine-cut thread screw.

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ol Motor Grader

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trong, massive frame, pipe reinforced, gives assurance of sturdiness under working strains. Rigid moldboard assembly eliminates all chattering and ds the blade steadily against its work. Many other distinctive Galion fea-s make this Grader the easiest operating Grader ever built.

any desired grading angle either to right or left is made from perator's platform.

T MECHANISM—E-Z Lift machine cut gear and worm, self-ocking and operating in grease in a dust-proof gear case; E-Z ift counter-balance springs; 26-inch hand wheels; lift arms and -Z Lift spring cams are a one piece electric steel casting, tubu-ar hang rods with ball and socket joints at each end. Lift earings, shafts and ball and socket joints are machine fitted, iving easy operation, long service and accurate control.

RATOR'S POSITION—Center controlled. Spring platform, ide and roomy. Operating controls convenient to operator.

RIFIER—Operated from platform, pressure being supplied as esired by machine cut worm gearing and sturdy lift arms. welve teeth of tool steel. Teeth clearance above ground, 8 iches.

IP BODY ATTACHMENT—1½ yards capacity. Gravity dump. ll steel construction.

RICATION—Alemite system throughout. Alemite grease gun provided as part of the tool kit.

Double Drive or Crawler Equipment

DOUBLE DRIVE

In the Galion Double Drive, with its centered axle, all four wheels do their full duty under all conditions of travel.

SURE-TRAC CRAWLER

A smooth, flexible rubber track that insures positive traction under any ground condition.

The new "double drive" one man power Graders are on display for your approval—see them demonstrated at our demonstration yard during Commissioners Convention in Denver, January 20, 21, 22.

DIMENSIONS—Wheel base, 16 feet. Overall length, 20 inches. Height over all, 89 inches.

WEIGHTS (Approximate)—Grader complete, with solid rubber tired wheels front and rear, 10-foot blade and Scarifier ..... 10,935 lbs.
Complete as above, but with pneumatic front tires and dual pneumatic tires in rear ..... 11,435 lbs.
Complete as above but with Double Drive ..... 14,000 lbs.
Complete as above, but with Sure-Trac Crawlers ..... 10,000 lbs.
Weight of Scarifier ..... 1,035 lbs.
For each added 2 feet of moldboard, add ..... 60 lbs.

ment Company

ORADO **Phone TAbor 1361**

Denver-Golden *Route Carries* Most Traffi

THE Denver-Golden paved road is the most heavily traveled highway in the state, according to John E. Furlong, chief census enumerator, State Highway Department.

A total of 8,831 automobiles passed over this road every twenty-four hours over a test period of one month, according to John E. Furlong, a State Highway Department engineer, who, with a force of assistants, recently conducted a traffic census on the state's principal highways.

Next in density of traffic is the Denver-Boulder road, where the daily average showed 8,000 motor vehicles per twenty-four hours.

The Brighton road, with 7,166 cars at the Denver city limits, was third.

Several years ago the Denver-Littleton stretch of the Denver-Colorado Springs highway was the most heavily traveled road. This year the census takers observed a daily average of only 5,842 cars between Overland Park and Littleton. This smaller number is due to construction of the oiled highway on Broadway from Englewood southward. Many motorists driving to Colorado Springs and Pueblo, it is reported, use the new oiled road through Englewood in preference to the dilapidated concrete road past Overland Park.

Of the other Denver roads, the Morrison paved road showed 5,271 vehicles every twenty-four hours; the Denver-Limon road, east of Aurora, 2,003 vehicles. The Denver-Limon road, for nearly its entire length, was under construction all last summer and motorists used the parallel highways to the north or the south.

Traffic on the Denver-Boulder road fell off toward the north. Ascertained at 8,000 vehicles at the Denver city limits, it was 6,300 at the junction of the Boulder road with the main highway, just north of Lafayette, 2,500 at Boulder and 3,395 at the southern city limits of Fort Collins.

On the Denver-Greeley road the traffic density was as follows: Denver city limits, 7,166; Brighton, 5,829, and Greeley, 4,102.

The following number of cars was observed on the Denver-Pueblo road: Denver, 5,842; Littleton, 4,371; Colorado Springs, 6,184, and Pueblo, 2,456. East of Pueblo, on the road toward La Junta, the count showed 3,122 cars. At Lamar, farther to the east, there were only 1,475.

At Trinidad 1,771 cars were counted, and at Morley, south of Trinidad and not far from the Colorado-New Mexico line, 1,109.

Following are the number of cars counted at the principal eastern entrance points to the state: Julesburg, 550; Holyoke, 500; Wray, 800; Burlington, 755; Cheyenne Wells, 820; Holly, 847.

Get New Auto License Before Starting Tour

If you are a bona fide resident of Colorado and plan making a winter trip to some other sections of the country get your 1932 automobile license plates before you start. This is the advice given out by the Secretary of State's office.

Colorado citizens taking interst trips will find a variety of regulati in different states, and in some sta they may have difficulty if they still using 1931 plates. So th persons who plan motoring a from home should check up on license requirements of the vari states they intend visiting.

In many states the 1931 lice plates are void after Dec. 31, wh is the case in Colorado. And Colorado the rule has been where tags are void in the home state th also are void here. So the advice checking up applies alike to Co radoans who are traveling to oth states, and people who have come Colorado with cars licensed in oth states.

If the owner of a car is a bona f resident of another state, and inte to return there, he should send his plates, and if he has taken up re dence here, he should obtain Co rado plates before he uses the c No permits can be issued except 1932 license plates. A visitor's e emption is issued only to bona f residents of the state in which car is licensed. If a permit has b issued for a foreign car, and own ship of the car passes to a resid of the state, the permit becomes v

View of the new concrete paved Federal Aid highway located west of Fowler on th Santa Fe trail. Photo by U. S. Bureau of Roads.

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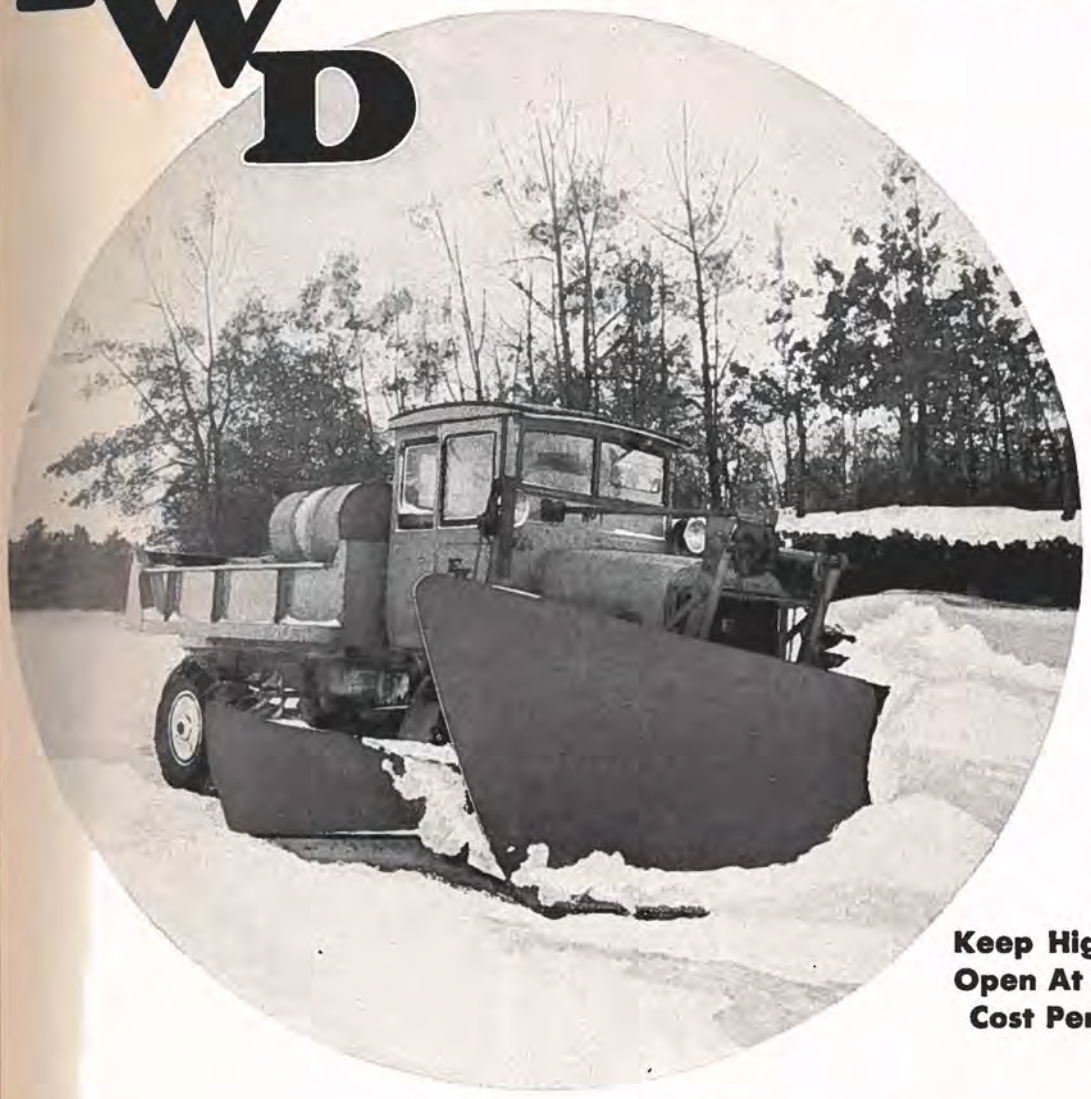

FEATURES

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Furnished in 2 to 10 ton sizes, including four wheel, six wheel and tractor trucks.

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Our Message to You

NEW YORK STATE HIGHWAY buys 100 more F. W. D.'s since October 1 last, and purchased 171 during 1931—

PENNSYLVANIA STATE HIGHWAY buys 45 more F. W. D.'s since October 1 last. Has purchased 190 in last five years—

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39 STATE HIGHWAY DEPARTMENTS now using F. W. D. Trucks.

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Practically any degree of non-skid asphalt wearing surface can be constructed by the methods which have been developed. Furthermore, they are low-cost roads — low in cost of construction and because of their durability and resistance to traffic wear, can be maintained at a very small expense. Of all low-cost roads being constructed, Stanolind Cut Back Asphalt roads provide all of the desirable qualities a good road should have.

If you wish further information or specifications regarding our methods of constructing low-cost, non-skid roads, send your request to the Asphalt Department. We will be glad to furnish any information you desire.

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Davenport	Des Moines	Evansville	Green Bay	Joliet	Mankato	Milwaukee	Quincy	South Bend	Wichita

FOR EVERY PURPOSE

NEWS OF THE MONTH

Maintenance of county roads in Boulder County cost $177,745.95 during 1931, according to a report given out by the board of commissioners.

Construction of fifteen miles of new highway between the Kansas state line and Springfield is planned by Baca County early in the spring. George Russell has been engaged to run the survey lines. It is estimated the project will cost $10,000.

Plans are being made by the commissioners of Boulder County and the State Highway Department to oil surface the road from the city of Boulder to Lyons next summer. This is known as the Foothill road.

Highway Engineer C. D. Vail has announced that plans for the construction of the first Federal land highway project in Colorado has been completed. It calls for the construction of ten miles of new roadway on U. S. Highway 40, west of Craig. The project starts 62 miles west of Craig, near Elk Springs, and ends near Massadona, spanning the Wolf Creek Basin. An appropriation of $200,000 was made for the project. Payment for the project is to be made from Federal funds under the Colton-Oddie public land road law. Work on the project will start early in the spring.

The historic Ute Pass road has been closed for the first time in a thousand years of usage. A new highway is being constructed through the pass from Manitou to Cascade. Plans of the highway department call for the completion of the work early in the spring. The project is 5 miles in length. Hamilton & Gleason are contractors. Ernest Montgomery is division engineer in charge.

Census enumerators of the State Highway Department have found that the Denver-Golden road is the most heavily traveled highway in Colorado. A total of 8,831 autos passed over the road every 24 hours over a test period of one month.

Work on the Wilkerson Pass project in South Park has been shut down for the winter.

Completion of the new project extending east from Colorado Springs to Falcon on the Colorado Springs-Limon highway is announced. The project was thirteen miles in length. The road is graveled for possible ture hard surfacing. Chas. B. Ow was the contractor. Cost of project was $143,370. Ernest Mo gomery was division engineer charge.

Final payment for the constr tion of 3¼ miles of concrete pa ment extending south from the c limits of Trinidad has been made the J. H. Miller Const. Co.

Plans are being formulated Mesa County and the State Hi way Department for the resurfac of the state route between Gra Junction and Fruita during the co ing year.

Completion of 5.796 miles gravel surfacing extending east Montrose over Cerro Hill is nounced by the highway dep ment. This was a Federal Aid pr ect, and eliminates one of the wo stretches of roadway on the We ern Slope. Lumsden-Hall Co Co., Grand Junction, were the c tractors. John J. Vandemoer the division engineer in charge construction. A view of one s tion of the project is printed on t month's cover of Colorado Hi ways.

A long stretch of the Federal Aid concrete pavement east of Boulder, showing newly completed underpass of the C. & S. railroa tracks at the foot of Goodhue hill. Photo by U. S. Bureau of Public Roads.

News of the Month

Fred Boyer, 58, at one time an employe of the accounting division of the State Highway Department, died at the Presbyterian Hospital in Denver on Wednesday, Jan. 6th. Mr. Boyer was born and reared in Denver. His father was one of the first employes of the Denver mint.

He was a former secretary of the Denver civil service commission, and was secretary to Chas. D. Vail when Mr. Vail was Denver manager of parks and improvements. He had no living relatives.

N. M. Monaghan of Denver was awarded the contract for the construction of ten miles of grading and gravel surfacing on the Victory Highway between Elk Springs and Massadona, west of Craig. This is a Federal Aid project, and Monaghan's bid price for the completed project was $156,379.26. The engineer's estimate was $194,236.50. Morrison-Knudsen of Boise, Idaho, with a bid of $171,551.40, was second in the bidding and W. A. Colt & Son of Denver, with $181,961.15, was third.

A large part of the building cost will be paid for entirely by the Federal government, since the road passes through public lands, under the Colton-Oddie Federal Aid law.

Following a conference of the state auditing board, held Jan. 6th, State Auditor Wm. D. MacGinnis was authorized to start an audit of all the expenditures of gas tax funds made by the various counties of the state during the last year.

Another notable road improvement completed by the Colorado Highway Departme with Federal Aid during 1931—A fine stretch of gravel surfaced highway located DeBeque canon, between DeBeque and Grand Junction. Photo by U.S.Bureau of Roa

This action follows the passage of a law by the last legislature providing for an audit of the gas tax expenditures, after charges had been made that several counties were using their gas funds for other purposes than the construction and maintenance of county roads.

Counties of the state are receiving 27 per cent of the gasoline tax collections, with the proviso that the money be used exclusively for road work.

Cost of the audit of the county road funds must be paid by the State Highway Department. Auditor MacGinnis stated the audit would be started immediately after the highway department had consented to pay the bills.

Originally it was proposed to make an audit of all the years the gas tax has been operative, bu recent ruling of the attorney-gene confines the audit to the last year

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A pre-mix oil process plant been purchased by the City a County of Denver. It will have capacity of 1,000 cu. yds. of oil s facing material daily. One of first projects to be undertaken ea in the spring will be the resurfac of the Lookout Mountain road, s Walter B. Lowry, manager of pa and improvements.

Construction of the new road o the Black Mesa in Gunnison Cou will be continued in 1932, accord to plans now being formulated the state and Federal road dep ments.

Jack Jay also extends an inv tion to commissioners to visit plant of the Quick-Way Tr Shovel Co. while in Denver. T plant is located at 4160 Joseph Street. Over twenty-five of th machines are in operation in vari sections of Colorado. Sales age for this machine are now being pointed in all parts of the coun for nationwide distribution.

It might interest some of the co missioners to see how corruga culverts are manufactured. Th are three of these plants in Den They are: Hardesty Mfg. Thompson Mfg. Co. and the Den Steel & Iron Works. Officials these plants will be pleased to h road officials visit their plants at time. Fabrication of steel brid is also an interesting process, at Denver Steel & Iron Works.

Showing a stretch of the new graveled highway between Fraser and Tabernash on the Victory Highway, completed during the 1931 construction season. Photo by U. S. Bureau of Public Roads.

GALION

WHY DO GALION E-Z LIFT LEANING WHEEL SKEW AXLE GRADERS SERVE YOU BEST?

We have all sizes in Denver stock for immediate delivery.

First—Because Galion is one of the largest and oldest builders of road equipment in the world and "knows" the hows and whys of building graders from experience in the field.

Second—Because they are more sturdily built than most graders of the same blade length and are built heavier where the strain comes.

Third—Because "Galion Graders" are the best serviced graders sold in Colorado—and we'll prove it.

H. W. MOORE EQUIPMENT CO. **Denver and Grand Junction**

Fifty Years of Progress in Bridge Engineering

(Continued from page 12)

Carquinez Strait Bridge is 3,350 feet long, including two main spans of 1,100 feet each, balanced about a central tower span only 150 feet long. A gap of 433 feet in the middle of each main span had to be bridged by means of a suspended span which was erected by the lifting method. Instead of using hydraulic jacks, a novel and ingenious lifting system was devised, employing powerful steel cables and sandbox counterweights; each corner of the span was counterbalanced by the weight of a box filled with five carloads of sand.

The final successful raising of the suspended span of the Quebec Bridge to a height of 150 feet took 96 hours. A decade later, with improved and simplified methods, the south suspended span of the Carquinez Strait Bridge was successfully raised to an equal height in 35 minutes. Ten thousand people lined the shores to witness the spectacle; many of them were drawn to the scene by the fascination of pictured catastrophe, and they must have gone home somewhat disappointed when the operation was concluded without a mishap. But I can assure you that those of us who had our hearts in the bridge breathed a deep sigh of relief when there came over the wires the glad news that all was well.

Beauty in Steel

There is one message I want to carry to bridge designers and laymen throughout the land: I want to preach the gospel of **Beauty in Steel.** I want to drive home the truth that we have, in steel, a material that possesses the highest potentialities for expressing the harmonious union of beauty and strength. I want to awaken the profession to the fact that the full possibilities of making steel structures beautiful have not yet been realized.

Before the advent of steel, it was necessary and therefore appropriate to build lofty bridge towers of masonry. With the advantage of centuries of development behind it, masonry construction lent itself to the production of structures of high artistic effectiveness. When steel came into use, the first designers to utilize the new material apparently ignored its artistic possibilities and requirements; steel towers and spans were built along strictly utilitarian lines, with awkward proportions and angular forms. Then came attempts to secure more pleasing effects in steelwork through the addition of decorative details and embellishments. Now we are entering a third stage of steel design, in which the true artistic potentialities of steel will be realized—not by ornamentation but by the development of structural forms that will be inherently beautiful in their simplicity.

Some designers, influenced by the tradition of the masonry construction that preceded the advent of steel, or prejudiced by the crudities of early structures built with the new material, are resorting to the dubious architectural expedient of building huge bridge towers of steel for strength and then masking or covering them with concrete and stone for appearance. To me, such

Carquinez Strait Bridge—Spanning Carquinez Strait, California. Two 1,100-ft. cantilever spans. Deep-water foundations. Silicon steel compression members and heat-treated eyebars. Proportioned for earthquake forces and designed with special protective details. Completed 1927.

treatment of the problem is a subterfuge and evasion. To me, the fundamental requisite for true beauty is honesty and sincerity. Where steel is the essential carrying element, I do not believe in hiding it behind a weaker and nonessential material. I believe that truly beautiful and appropriate forms can be attained in steel. A lofty steel tower or a farflung steel span **can** be designed as a thing of inspiring and enduring beauty. Steel lends itself admirably to artistic design in a variety of forms, in graceful, sweeping curves, and in pleasing harmonious proportions. We must not be bound by traditions. Instead of resorting to concealment or extraneous decoration, we should direct our efforts toward producing the most beautiful designs in the steel itself, and this can be done by departing from convention and developing forms that will most beautifully express the dominant spirit of this material —its strength, its power, and grace.

With steel and masonry in h monious combination, each mate being used where it is most app priate, every great span should an inspired effort to create " bridge beautiful."

Conclusion

In the review of the epic of bri building during the past 50 years, I have attempted to trace it he there stands out one dominant pression. In every great bri project there must be: First, vision—then the compelling deavor to bring that vision to ality.

The engineers who preceded dreamed their dreams and wrou their dreams, giving health, stren and even life itself as the price achievement. This generation profiting by the work of the pione and is tackling even greater ta Whatever we may accomplish in turn be eclipsed by those who low us.

This is but an epitome of progress of humanity through the ages. We, too, must carry o the noble faith of the pioneer ma builders, bequeathing that faith tarnished to the generations t follow—that the years to be, as w as the years that were, may sh forth the truth embodied in lines:

"From dream to deed, and from t
deed again
To further dream, and deed m
mighty yet."

When roads are slippery, the f safety rule is to go very slowly. times when the sleet and snow very bad, it may be necessary avoid all hills. Extreme caut should be used on curves and int sections, and when meeting or pa ing other cars. At times there m be slippery spots when the rest the road is in good condition. T driver who approaches one of th treacherous spots at high speed taking serious risks. The only s way is to keep the car under cont so that you can always stop in clear space ahead.

Plans are announced for the surfacing of the road west from A to Fort Collins in Weld Coun Estimate of the cost is $16,000.

Plans have been completed by highway department for the c struction of eight miles of gra surfaced highway located west Holly on U. S. Highway No. 50.

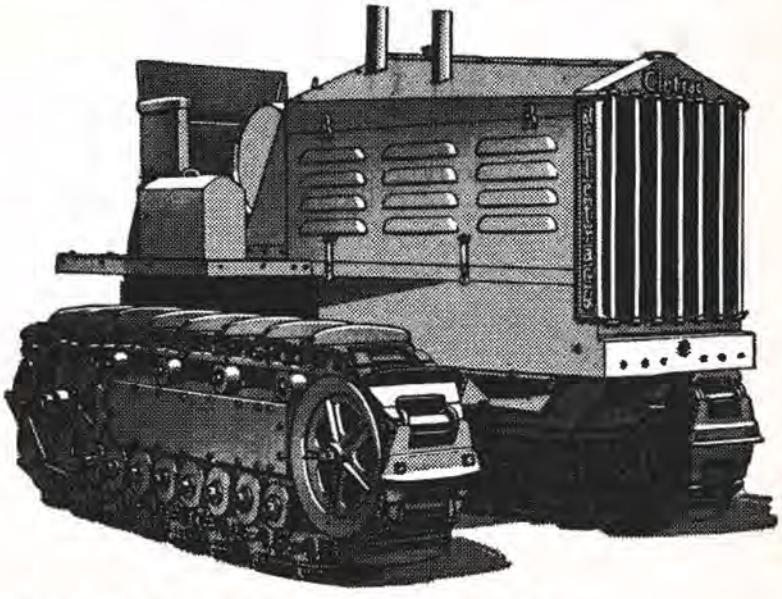
MORE POWER

FASTER TRAVELING

LOWER COSTS

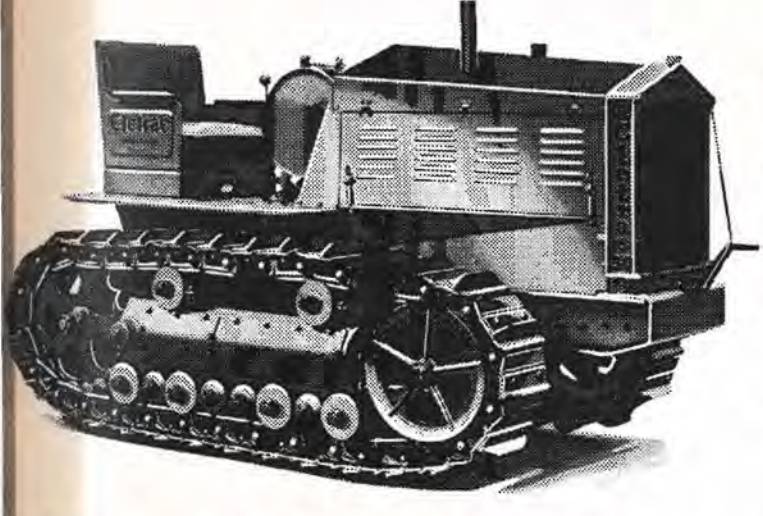
CHEAPER

(Per H. P. Rating)



Cletracs' ability to travel fast, haul tremendous loads and go anywhere makes them supreme for every type of heavy duty tractor work. They can maneuver in tight places where others can hardly operate. They control easily and can turn in practically their own length. Sure-grip traction fits them for tough grades and bad going. Continuous gravity oiling eliminates the daily job with grease gun and oil can.

For heavy road work and wherever giant power is needed, the big Cletrac "80-60" is the ideal tractor.



For ROAD MAINTENANCE or ROAD OILING, the Cletrac 40-30 cannot be equalled in either speed, performance or lowest cost.

The Liberty Trucks & Parts Co.

Distributors

W. 6TH AVE. AND BANNOCK ST., DENVER, COLO.

New Highway Equipment and Materials

Our old friend, C. A. Pope, who, a few years ago, handled the advertising and publicity for the Hendrie & Bolthoff Co., Denver, is now located in Indianapolis. Pope was well acquainted with the contracting trade in the Denver territory.

Among the Denver dealers who will attend the National Road Show in Detroit are George Meffley, general manager of the H. W. Moore Equipment Co., and Harry P. Wilson, president of the Wilson Machinery Co. Both will be home in time for the County Commissioners' Convention, Jan. 20-22.

One of the unusual pieces of roadway adjacent to Denver which the county commissioners will be interested in during their convention and which they will see is the piece of bituminous road-mix material laid east of Englewood in Arapahoe County. This was laid with a Cedar Rapids pre-mix plant.

Almost without exception, road machinery prices are lower at the present time than ever before in history, a survey among Denver dealers shows. All of which indicates now is the time to buy.

A new line taken on by the H. W. Moore Equipment Co. is the Cleaver-Brooks road oil booster. One of these new machines will be exhibited during the County Commissioners' Conference.

Delegates to the annual convention of the county commissioners will be guests of the H. W. Moore Equipment Co. at a noonday luncheon on Thursday, Jan. 21. George Meffley and John Moore are making elaborate plans to give the commissioners and members of their families a royal good time. Besides a luncheon, there will be entertainment and merrymaking.

Mr. and Mrs. John A. Crook will be at home to the county commissioners at 1801 York Street on Wednesday evening.

And we have the "pledge" of every dealer that none will be asked to buy. Just come and look, that's all!

Harry P. Wilson and his staff will be at home to the commissioners each day at noon during the three-day convention. A self-serve luncheon will be on the boards at the company's show rooms, 1936 Market Street, each day.

Many new pieces of equipment will be shown by the various local dealers. Several new pieces of equipment will be exhibited by the Clinton & Held Co. and Elton T. Fair. Mr. Fair will show several new models of Adams leaning wheel graders and maintainers.

Open house will be the "order of the day" at the Liberty Trucks & Parts Co., W. 6th Ave. and Bannock St., with Tony Monell, former secretary of the commissioners' association, at the head of the "receiving line." New models in F. W. D. and Indiana trucks and Cletrac tractors will be exhibited.

At the Moore Equipment Company there will be new "styles" in Galion graders, Bates tractors, General shovels, Quick-Way shovels, Cedar Rapids crushers, pre-mix road oil plants, Wehr graders, McCormick-Deering tractors and power units.

On Thursday night the commissioner delegates will attend the National Stock Show in a body. It has been designated as Colorado County Commissioners' Night.

Showing installation of 72-inch corrugated culvert under three railroad tracks near Fort Collins.

Those commissioners who, for o reason or another, find themsel unable to attend the convention, invited to tune in on KOA, no Thursday, Jan. 21, and hear the tertainment and speechmaking the H. W. Moore Equipment luncheon. The program will broadcast by remote control dir from the dining room at the Mo Company's plant.

Four new pieces of construct and maintenance equipment are nounced by the Wilson Machin Co. These include: the Aus Badger, 11-foot tractor shovel; lis-Chalmers Model "L" tractor, high speed, heavy duty dirt movi Austin "101" leaning wheel grad embodying new and radical featu of design; and Shawnee one-m maintainer and grader, designed eliminate road corrugations. All be exhibited in Denver during Commissioners' Convention.

The need for increased stor space for carloads of sugar be last year necessitated construct of three tracks from the main railroad to the Fort Collins, Co rado, factory of the Great West Sugar Company. The single tr which formerly accommodated all the carloads shipped into the pl no longer sufficed at the height the season.

The three tracks had to be carr over an irrigation ditch, and to p vent delay in construction and h the trackage ready for use dur the 1930 season, a 72-inch cor gated iron culvert was installed care for this waterway.

The original single track cros this ditch on a pile bent brid which can be seen in the backgrou of photo, which also shows the pl ing of the 72-inch, 8-gauge Ar pipe and tightening of the b coupling.

Backfill was placed by the dr line and tamped around the pipe hand up to its middle. When fill was only partly completed dragline crossed over the pipe to to another job, but no serious da age resulted, although a little di culty was encountered in strutt the pipe because the backfill been compacted by the weight the machine.

Many New Highways for Western Slope

(Continued from page 6)

the past year and the old Plateau bridge has been moved to Gateway to be rebuilt and add a great improvement there. About half a mile of new road was built along Plateau creek to join the old Plateau canon road with the new DeBeque canon highway.

At the present time the highway department is making location surveys from Grand Junction south including investigation for a proposed new bridge across the Colorado river, between Montrose and Ouray including alternate lines at Kelly Trail, detail location from Montrose east, and between Gunnison and Saguache county line up the Cochetopa canon.

The year of 1931 was an eventful year for the highway construction department in this division as such construction work was completed that for the first time in the history of Colorado and Utah good safe roads are open all winter to encourage through automobile traffic to the coast. Many dangerous curves have been eliminated, washes have been bridged and all dangers have been removed so that travelers may drive safely through this section at a good speed.

U. S. Spends Huge Sum on Forest Roads

(Continued from page 7)

In Southwestern Colorado work was continued on the road between Dolores and Rico, a section 23 miles in length being improved. Another 10.7 miles long had been previously constructed to a high standard, which makes a total improved length of 33.7 miles. Another four-mile section still in need of improvement will, when completed, result in a good road for the entire distance. On the Black Mesa, a five-mile section of new road to connect the Gunnison country with the Paonia-Crawford-Hotchkiss district was completed during the summer at a cost of over $70,000. It is expected to build an additional 35-mile section next year.

In addition to the foregoing major work, which was done under the supervision of the Bureau of Public Roads, a considerable mileage of minor road construction was done by the forest service. The Big Lake road on the San Isabel National Forest was completed and the Squirrel Creek road was widened to 16 feet and new structures installed. This work required a lot of expensive rock excavation and was carried out very efficiently by Ranger Lowell.

A total of 22.5 miles of new road was completed on the Uncompahgre National Forest, including the Horsefly section of the divide road 17.4 miles long. We now have an excellent road from the forest boundary above Delta, by way of the Mesa Ranger Station, to Columbine Pass and from U. C. Cowcamp near Cold Springs Ranger Station to Horsefly Ranger Station. Also a two-mile section on the south end of the Transfer Road was completed.

On the White River National Forest, the Ripple Creek road was completed and the last section of the Newcastle-Buford road was finished.

PROJECTS ADVERTISED FOR BIDS

Proj. No.	Location	Type	Length	Date Bids Open
150-4 & F. L. H. P. No. 1	Southwest of Elk Springs	Gravel Surfacing	10.692 mi.	Jan. 5, 193

PLANS FINISHED

Proj. No.	Location	Type	Length
149-E	West of Strasburg	Gravel Surf. & Underpass	4.412 mi.
58-AR, 216-AR, 216-B	West of Holly	Gravel Surf. & Underpass	7.825 mi.

PLANS BEING PREPARED

Proj. No.	Location	Type	Length
158-A No. 2	West of Manitou	Bridge and Approaches	0.01 mi.
298-E No. 2	South of South Fork	Bridge and Approaches	0.01 mi.

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R11	South of Trinidad	3.130 mi.	Paving	J. H. Miller & Co.	$ 89,063.70	100	2-R1
57-R4 & 168-BCR	West of Lamar	4.801 mi.	Paving	Pueblo Bridge & Const. Co.	130,690.50	85	57-R4 / 168-BC
68-B	South of Saguache	3.290 mi.	Gravel Surfacing	H. C. Lallier C. & E. Co.	74,428.75	52	68-B
71-C	Bet. Durango and Mancos	4.965 mi.	Gravel Surfacing	J. Finger & Son	86,146.75	88	71-C
79-B	East of Colorado Springs	12.248 mi.	Gravel Surfacing	Chas. B. Owen	145,370.05	90	79-B
91-AR	East of Trinidad	5.613 mi.	Oil Processed	Pople Bros. Const. Co.	77,655.05	100	91-AR
134-E	East of Limon	5.052 mi.	Gravel Surfacing	Bedford & Woodman, Inc.	31,426.40	59	134-E
144-G	Bet. Forks & Colo.-Wyo. Line	13.204 mi.	Gravel Surfacing	Morrison-Knudsen Co.	248,078.00	100	144-G
145-C	East of Rifle	14.901 mi.	Grading & Grav.	A. R. Mackey	271,703.80	50	145-C
149-F	Bet. Strasburg and Peoria	10.745 mi.	Gravel Surfacing	H. C. Lallier C. & E. Co.	198,660.00	100	149-F
149-H	East of Deertrail	18.565 mi.	Gravel Surfacing	Hamilton & Gleason	240,319.15	80	149-H
150-C	West of Craig	6.893 mi.	Gravel Surfacing	J. Fred Roberts & Sons	120,139.05	60	150-C
151-A	Bet. Granby and Tabernash	6.663 mi.	Gravel Surfaced	J. H. Miller & Co.	76,909.90	90	151-A
151-B	Bet. Fraser and Granby	3.925 mi.	Grading & Surfacing	Utah Construction Co.	63,954.80	100	151-B
158-B	Bet. Hartsel & Florissant	10.319 mi.	Gravel Surfacing	J. H. Miller & Co.	133,380.70	70	158-B
181-A	In Idaho Springs	1.876 mi.	Paving	J. Fred Roberts & Sons	93,749.55	14	181-A
189-C	West of Hayden to County Line	7.534 mi.	Gravel Surfacing	F. L. Hoffman	115,356.94	93	189-C
211-B	South of Craig	2.725 mi.	Gravel Surfacing	Utah Const. Co.	93,720.40	78	211-B
242-D	Bet. Mack & Colo.-Utah Line	9.883 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	124,552.36	94	242-D
245-AR	West of Las Animas	4.544 mi.	Grading & Oiling	Driscoll Const. Co.	94,398.85	90	245-AR
248-C	Between Buena Vista and Salida	3.944 mi.	Gravel Surfacing	Pantle Bros.	48,820.50	24	248-C
258-I	Bet. Montrose & Gunnison	2.481 mi.	Gravel Surfaced	J. H. Miller	50,272.60	79	258-I
258-I2	East of Montrose	Concrete Box Culvert		Hinman Bros. Const. Co.	8,455.50	99	258-I2
258-J	West of Cerro Summit	5.796 mi.	Grading and Gravel	Lumsden Hall Const. Co.	107,027.30	100	258-J
259-B	Bet. Gunnison and Parlin	9.587 mi.	Gravel Surfacing	Cole Bros.	184,503.00	66	259-B
263-C	East La Veta Pass	5 mi.	Gravel Surfacing	State Forces		0	263-C
265-E	West Bayfield	2.950 mi.	Gravel Surfacing	J. H. Miller & Co.	97,839.06	86	265-E
270-E	Bet. Del Norte & Monte Vista	8.663 mi.	Gravel Surfacing	Mountain States Const. Co.	102,199.10	69	270-E
278-D	West of Cheyenne Wells	21.913 mi.	Gravel Surfacing	A. R. Mackey	93,563.30	72	278-D
282-I	South of Craig	1.981 mi.	Gravel Surfaced	Utah Construction Co.	70,225.16	87	282-I
292-D	Bet. Wolcott and Avon	9.834 mi.	Graded Surface	Utah Const. Co.	159,143.40	88	292-D
295-E	South of Alamosa	7.627 mi.	Gravel Surfacing	Mountain States Const. Co.	71,049.56	97	295-E
296-AR&BR	South of Pueblo	4.372 mi.	Paving	New Mexico Const. Co.	154,509.00	70	296-AR
296-D	South of Pueblo	8.348 mi.	Gravel Surfacing	Cole Bros.	84,815.10	99	296-D
298-D	Bet. Del Norte and Durango	4.100 mi.	Gravel Surfacing	H. C. Lallier	164,814.00	100	298-D
298-F	East of Bayfield	5 mi.	Gravel Surfacing	Wood, Morgan & Burnett C. Co	66,920.85	95	298-F
158-A	Between Manitou & Cascade	4.062 mi.	Grading	Hamilton & Gleason	164,681.20	48	158-A

Extending Our Sincere Season's Greetings to Colorado Road Builders

Trusting 1932 Will Give More Work with Profitable Results for Each of You

"We Boast Complete Service to the Construction Industry"

LEADING ACCOUNTS DISTRIBUTED AND SERVICED

AMERICAN CABLE COMPANY
"Tru-Lay" wire rope.

ALLIS-CHALMERS MFG. CO.
Crawler and round wheel tractors.

AUSTIN-WESTERN ROAD MACHINERY CO.
Elevating graders, blade graders; crushers and crushing plants; dump wagons; street sweepers; maintainers; gas shovels; fresnos; plows; slips; truck snow plows.

BAKER MANUFACTURING CO.
Tractor and truck snow plows; tractor bulldozers and backtillers; maintainers; scarifiers; scrapers.

BARBER-GREENE CO.
Ditchers; loaders; oil paving plant; coal handling machinery; conveyors.

BLAW-KNOX COMPANY
Steel bins; steel forms; weighing batchers; truck turntables; concrete finishing machines.

BUDA MANUFACTURING CO.
Diesel and gasoline engine power units.

C. H. & E. MANUFACTURING CO.
Saw rigs; small hoists; small pumps; elevators.

COLORADO FUEL & IRON CO.
Grader and drag blades.

INSLEY MANUFACTURING CO.
Small gasoline shovels and draglines; concrete tower and chuting equipment.

JUMBO SCRAPER COMPANY
Wheeled type tractor scrapers.

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Small gasoline engines.

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Asphalt and tar kettles, oil burning; also asphalt tools, oil burners, etc.

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Zenith brand of hand shovels and picks.

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Koehring and Smith concrete mixers and pavers; Kwik-Mix mixers; Koehring, Diesel and gasoline shovels and draglines.

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Pull type maintainers for tractors.

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Truck, tractor, roller and transmission grease.

Wilson Machinery Company

Tabor 0135 DENVER 1936 Market St.

THE BRADFORD-ROBINSON PTG. CO.,

COLORADO HIGHWAYS

Vol. XI February, 1932 No. 2

CEDAR RAPID

"Straight Line" Portable . .
Crushing and Screening Plan

The Utmost in PORTABILITY, CAPACITY and EFFICIENCY

A completely ... *tained portable cr* ... *screening and* ... *plant that can be* ... *in the pit in a ver* ... *time.*

The Reasons for Its Capacity and Performance Record

1. Climax 90 HP 1,000 RPM engine with Vortox air cleaner twin disc clutch. Snub pulley and belt tightener.
2. Feed hopper of 3½ cu. yds. storage capacity is mounted at the end of the plant so that it can be fed directly from shovel in the pit. Charging height from ground is 8′ 10″.
3. A special 20″ feeder feeds the material from the feed hopper and is adjustable to 4″ or 6″ strokes.
4. Hydraulic jacks are built into the lower side of the truck beams on the end of the plant. Road clearance is 18¾″ and wheelbase is 19′. Overall height is 14′ and overall length is 42′. Has short turning radius.
5. Truck is made of 10″ 30-pound I beams properly balanced and reinforced with cross members. Standard steel disc roller bearing wheels.
6. A 14″ belt conveyor (185 FPM) takes the crushed material from below the crusher and puts it back into the conveyor leading to the screen—a closed circuit on conveyors.
7. Standard 936 or 924 Cedar Rapids Crushers.
8. Cone on lower end only as front part is taken care of by 1½-yard surge hopper mounted directly below the front end of the screen.
9. New style double strength pulling tongue on front of ... very easily attached to truck or shovel.
10. All-weather Goodyear solid dual tires on roller bearin... steel wheels—front tires 34″ x 6″ and rear 40″ x 7″.
11. 24″ x 22′ conveyor, 300 FPM, discharges the finished ... from the screen and surge hopper directly into waiting ... plenty of clearance (9′ 0″) for truck loading.
12. Feeder clutch and delivery conveyor clutch are mou... front end of the plant, thereby centralizing all control... place. Gear arrangement and clutch controls for the re... screen are the same as we are using on our standard O...
13. All controls at front—uses standard OPO drives—ab... chain and 10 sprockets on entire plant—standard parts ...
14. 18″ feed conveyor (300 FPM) mounted on side of plan... materials discharged from automatic feeder and carri... to top of plant, where they are discharged directly i... screen.
15. Revolving screen is standard 10′ screen, 48″ diamet... perforations to suit.

Years of manufacturing and engineering experience in ... material producing field are behind this new portable u...

H. W. Moore Equipment Co.

Distributors

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120 West 6th Ave., DENVER, COLOR...

Colorado Highways

Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
Denver, Colorado

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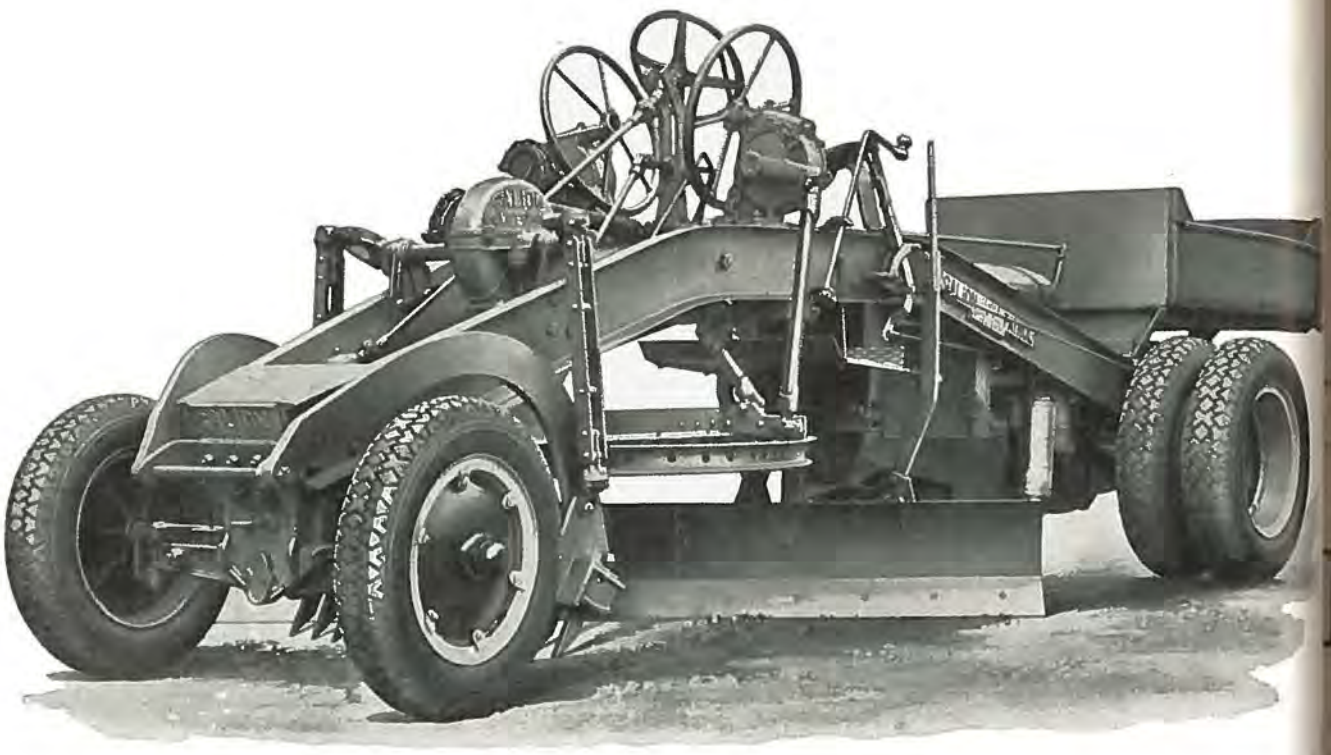
M. W. BENNETT, Editor

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. $2.00 A YEAR.

Our Cover Picture

ON the cover page of this month's COLORADO HIGHWAYS we print a picture showing the new highway in DeBeque Canon between Grand Junction and Glenwood Springs, completed with Federal Aid co-operation last fall. This is one of the finest gravel-surfaced highways in the state and forms an important link in U. S. Highway 40-S, connecting the eastern and western slopes of Colorado. Photo by U. S. Bureau of Public Roads.



GALION

Center Control Motor Grader

For Year-Around Service

Whether the job is reducing a subgrade, leveling surfacing material, maintaining berm beside surface roads, removing snow, or any other road maintenance work, you will find this new Galion E-Z Lift Motor Grader exactly fitted to the task. In design, construction and performance it is unquestionably the most outstanding value ever offered the road-building industry.

A strong, massive frame, pipe reinforced, gives assurance of sturdiness under all working strains. Rigid moldboard assembly eliminates all chattering and holds the blade steadily against its work. Many other distinctive Galion features make this Grader the easiest operating Grader ever built.

DOUBLE DRIVE
In the Galion Double Drive, wit
centered axle, all four wheels do
full duty under all conditions of t

SNOW PLOW
Easily and quickly attached—incr
the efficiency of the grader in cl
snow from the highways.

DUMP BODY
Equipped with this power op
gravity dump body, the Galion
Control Grader meets every re
ment of a road maintenance ma
performing the job of both truck
grader.

H. W. Moore Equipment Co.

120 West 6th Avenue, Denver, Colorado, Phone TAbor 1361

Colorado Highways
"BETTER ROADS"
VOLUME XI. FEBRUARY, 1932 NUMBER 2

Highway Work *Should Proceed* at Present Pace

TO THE uninformed observer it might appear that the amount of money being spent on the nation's highways is out of line with actual needs, hence a tendency on the part of those who do not understand road building and highway transportation requirements to cripple highway work."

This statement was issued by Frederic E. Everett, president of the American Association of State Highway Officials, in commenting on the necessity of continuing road building on its present scale. He went on:

"First of all, we need good roads because we have some 26,000,000 passenger cars, trucks and busses, vehicles which during the lean year of 1931 were given a greater usage than ever before. Every dollar taken away from road building reduces the utility of the automobile and, therefore, its value. Every dollar spent in road betterment makes the car worth more. Neither the highway or the automobile can be evaluated alone; both must be weighed together and considered as a single transportation medium.

"The automobile industry is the largest industry, employing, in one way or another, one-tenth of the nation's workmen. It is large because it serves a public demand and because the United States is building roads.

"To operate the gigantic highway-automobile transportation system that we have built up requires large sums of money, but I know of no activity wherein greater value is received. No one will gainsay that the highways we have already improved are saving the country's motorists two cents per mile traveled. Even on that conservative basis the annual saving to the nation is twice the actual annual investment, which is only one cent for each mile of motor travel.

"In view of the urgent need for more improved roads, the cash benefits received, the employment of three-quarters of a million men on state and local roads, road building this year and in years to come should maintain its pace.

"No cog in the wheel should be hack-sawed. Money dedicated by motorists through gasoline and motor vehicle taxes to the cause of good roads should be used for good roads. Every state should fight gasoline tax evasion, which is costing us upwards of $40,000,000 a year. Federal participation should continue in full measure. States must meet this federal challenge. Local communities should also realize that the road dollar performs a money saving function, that if properly spent it is a dollar as solidly invested as though it were in government securities," concluded Mr. Everett.

1932 State *Road Budget* Approved

ON February 4th, Governor William H. Adams signed the 1932 state highway budget calling for an expenditure of $5,394,100. It is estimated that expenditure of this sum will furnish employment for 10,000 men through most of the year.

In addition to the above sum the highway department, on December 31, had a carry-over of $3,822,608 remaining from the 1931 budget that will be expended during the present year.

Under this budget there will be $1,536,200 spent on major Federal Aid projects during 1932. These projects are located in every section of the state and include nearly 200 miles of oil surfacing and approximately 35 miles of concrete pavement.

The new budget provides $269,500 for oil surfacing U. S. Highway No. 40 between Denver and Limon.

The budget also makes provision for the construction of approximately 150 projects to be built by state funds alone. A number of projects included will be built on a 50-50 basis with the counties. All work is on parts of the state highway system, and projects are designed to provide employment in every section of Colorado.

The sum of $940,500 will be spent on state projects. Some of these projects already are under way. State Highway Engineer C. D. Vail has announced that the work will be carried out with a minimum of delay.

Another item in the budget calls for the expenditure of $85,000 for road signs. Matched with this sum is $25,000 which is being contributed by civil service employes. Designs for the signs are now in course of preparation and bids on the signs will be asked for in a short time. Unemployed men in the various communities will be given jobs erecting the signs. Colorado labor will be used in the manufacture of the markers.

For maintenance during the year there is set aside $1,800,000. Approximately 80 per cent of this sum will go for labor.

The budget covering state and Federal Aid projects follows:

ESTIMATED RECEIPTS

70% 4-cent Gasoline Tax	$4,533,000.00	
Federal Aid	768,100.00	
Internal Improvement Fund	60,000.00	
P. U. Bus Tax	60,000.00	
Total		$5,421,100.00

ESTIMATED DISBURSEMENTS

Federal Aid Projects	$1,536,200.00	
State Projects	940,500.00	
Maintenance	1,800,000.00	
1932 Federal Aid and State Projects advanced to 1931, and overruns on Federal Aid and State Projects	749,990.34	
Surveys	40,000.00	
Traffic Signs	85,807.66	
Traffic Census	20,000.00	
Property and Equipment	20,000.00	
Compensation Insurance	40,000.00	
Administration	188,602.00	
Total		$5,421,100.00

DETAIL OF EXPENDITURES

Road			
District No. 2—Federal Aid Projects			
4	Addition to F. A. P. 145-D		$ 80,000
4	Mesa County, resurfacing Grand Junction-Fruita		52,000
6	Montrose, east		70,000

Proj.	Road	Delta County — State Projects	County	State
803	6	Resurfacing F. A. P. 171		$ 5,000
600-C	92	Improvements, Crawford, east	$ 2,000	2,000
501	135	Improvements, Hotchkiss-Paonia	3,000	3,000
		Eagle County		
804	104	Ruedi-Hopkins	5,000	5,000
		Garfield County		
728-C	4	Resurfacing, Grand Valley, east and west		4,000
729-A	82	Improvements at Cattle Creek	2,500	2,500
729-B	82	Bridge repair, Glenwood Springs	5,000	15,000
503	139	Improvements, Douglas Pass		2,500
		Gunnison County		
756	114	Cochetopa-Parlin		25,000
800-B	135	Improvements, Gunnison-Almont	1,500	2,500
800-C	135	Improvements, Crested Butte-Somerset		10,000
		Mesa County		
805	4	Widening R. R. Underpass, DeBeque		5,000
		Montrose County		
806	97	Improvements, Naturita-Nucla	2,000	2,000
		Ouray County		
660	62	Improvements, line change at Dallas		1,000
		Pitkin County		
509-F	82	Improvements, Aspen-Basalt		8,000
509-G	82	Improvements, Independence Pass in S. H. Dist. No. 5		5,000
510-C	104	Improvements, Norrie, west		4,000
		Rio Blanco County		
511	64	Improvements, Meeker-Rangely	8,000	8,000
		San Miguel County		
662	62	Improvements, Dallas Divide		7,500
512	145	Improvements, Lizard Head-Telluride		3,000
		Summit County		
550	91	Loveland Pass { Dist. 1		12,500
		{ Dist. 2		7,500
550-B	91	Line change near Dillon		1,500
		Total		

Road			
District No. 3—Federal Aid Projects			
1	F. A. Project 2-R-11, oiling		$ 15,000
10	Grading and surfacing between 294-B and 269-A		60,000
10	Fort Garland to Alamosa		34,000
17	Alamosa, south, oiling		60,000

Proj.	Road	Alamosa County — State Projects	County	State
758	158	Alamosa, south, two bridges		$ 4,000
		Archuleta County		
607-C	450	Piedra, west, 4½ mi. surfacing		9,000
		Conejos County		
807	15	La Jara, west, improvements		10,000
		Costilla County		
759	152	Whiskey Creek Pass		15,000
		Dolores County		
517	145	Rico, north and south		6,000
		Hinsdale County		
518-B	149	North or south of Lake City		2,000
		Huerfano County		
666-A	69	West of Tioga	$ 5,000	5,000
666-B	69	Gardner, west	5,000	5,000
		La Plata County		
808	10	East from F. A. P. 265-D, approximately 2½ mi.		5,000
		Las Animas County		
809	1	Oiling, Starkville-New Mexico state line		15,000
810	1	Paving North Ave., Trinidad		5,000
773-B	12	Bridge near Weston		3,500
759-B	152	Whiskey Creek Pass		15,000
773-C	12	Between Hoehne and Earl		5,000
		Mineral County		
521-D	149	Bridge, 7 mi. S. W. of Creede	7,500	7,500
		Rio Grande County		
811	112	Bridge	9,000	9,000
		Saguache County		
522-C	114	Cochetopa Pass		10,000
		San Juan County		
812	110	Bridge south of Howardsville		4,000
		Total		

Proj.	Road	District No. 4—Federal Aid Projects	
245-C	6	La Junta-Hadley, paving	$190,000
245-D	6	Paving 245-A to 245-C, Hadley, east	45,000

State Projects

Proj.	Road		County	State	
Baca County					
-A	59	Gravel surfacing	$ 2,000	$ 9,000	
Bent County					
	101	Las Animas, S. E., gravel surfacing	7,000	7,000	
Chaffee County					
	6	Salida, west, gravel surfacing	3,000	3,000	
Crowley County					
-B	96	Improvements	3,000	7,000	
Chaffee and Fremont Counties (Jointly)					
-A	6	Road repairs between Canon City and Salida	.....	40,000	
Custer County					
-B	69	Rebuilding bridge 2½ mi. south of Westcliffe	.....	2,500	
-A	76	Building bridge at junction with S. H. No. 96	.....	2,000	
	96	Improving cuts and fills beginning about 3 miles east of Querida	.....	2,000	
Fremont County					
	6	Three Mile Bridge	3,000	3,000	
-C	67	Improvements in Phantom Canon	4,000	4,000	
	69	Improvements north of Hillside, along Texas Creek; Ballman Lane	2,500	2,500	
Kiowa County					
	96	Grading and graveling	9,000	9,000	
Otero County					
	167	Reimbursement for bridge over Arkansas River, Fowler	.....	6,250	
Prowers County					
	59	Gravel surfacing	10,000	10,000	
Pueblo County					
	1	Oiling on Project 296-D	.....	10,000	
	1	Oiling near Greenhorn	.....	10,000	
	4	Bridge over Highline Ditch	.....	5,000	
-B	76	Oiling	15,000	15,000	
-D	96	East and west of Pueblo	5,000	5,000	$152,250
Total					$387,250

District No. 5—Federal Aid Projects

Proj.	Road			
-B	4	Colorado Springs to Falcon, paving to forks of road, and oiling remainder	$ 54,000	
	4	Burlington, east to state line	140,000	
-D	4	Stratton, oiling	22,400	
-E	4	Seibert, oiling	26,300	
	4	Leadville to Malta	40,000	
-H	8	Limon-Denver (oiling)	85,000	$368,200

Cheyenne County — State Projects

Proj.	Road		County	State	
-A	51	At county line, 3 mi. gravel	.....	$ 1,800	
-B	51	Bridge, north of Cheyenne Wells	.....	2,500	
-C	51	9 mi. north Cheyenne Wells, elevate and gravel	.....	3,000	
-D	51	South of Cheyenne Wells, elevate and gravel. (County will elevate roads and spread gravel at own expense)	.....	500	
Douglas County					
	67	Bridge and betterments	$ 3,000	3,000	
	83	Bridge and betterments	1,200	1,200	
	105	Betterments	1,000	1,000	
	177	Betterments	.....	9,000	
Elbert County					
-B	86	Gravel	5,000	5,000	
-B	167	Bridge, 6 mi. southwest Elbert	1,600	1,600	
-C	167	Gravel	1,600	1,600	
El Paso County					
-G	4	Oil, F. A. P. 158-A, Ute Pass	.....	5,000	
-B	50	Bridge	900	900	
	94	Gravel	5,000	5,000	
	115	Betterments	13,000	13,000	
	122	Betterments	1,000	1,000	
Kit Carson County					
	51	South of Burlington, elevate and gravel	1,600	2,000	
	57	Gravel, north Stratton	1,000	1,000	
	59	Gravel, north Seibert	1,500	1,500	
Lake County					
	82	Betterments	.....	20,000	
Lincoln County					
	63	North and south Arriba, grading and graveling	2,500	2,500	
	71	North and south Limon, grading and graveling	3,500	3,500	
	94	Fence on right-of-way and betterments	3,500	4,000	
	109	South of Hugo	500	500	
Park County					
	4	Wilkerson Pass, connection	.....	2,000	
-D	9	East of Alma	2,500	2,500	
	77	East of Jefferson, bridge and betterments	.....	2,500	
-B	77	West of Lake George	.....	1,030	
Teller County					
-G	67	Bridge and betterments	.....	5,000	
-H	67	1 mi. north of Midland, betterments	.....	2,500	
-I	67	Phantom Canon, betterments	.....	1,000	
-J	67	Canon City to Victor, betterments	.....	2,500	
-K	67	Change of alignment	.....	900	
-B	143	Harner Bridge	.....	500	
P.	791	Changing roads in Park County due to Eleven Mile Canon Reservoir construction	.....	10,000	$121,000
Total					$489,200

District No. 6—Federal Aid Projects

Proj.	Road			
	2	To complete F. A. Project west of Elk Springs in connection F. L. H. P. No. 1	$ 70,000	
144-G	123	North of Fort Collins, oiling	66,000	
				$136,000

Boulder County — State Projects

Proj.	Road		County	State	
823	7	Boulder to Lyons	$ 10,000	$ 10,000	
792	119	Boulder Canon	.....	5,000	
Clear Creek County					
550-C	91	Silver Plume-Graymont	2,500	2,500	
824	103	Oiling Miner Street, Idaho Springs	.....	6,000	
552-E	119	Idaho Springs, toward Russell Gulch	2,500	2,500	
Gilpin County					
552-D	119	Building three bridges across South Boulder Creek	.....	5,000	
Grand County					
825	2	Rock work in Byers Canon	4,000	20,000	
826	84	Gore Canon	6,000	11,000	
Jackson County					
629 C	14	Graveling and improving from Murphy's Ranch toward Walden	.....	10,000	
629-D	14	Graveling and straightening from Michigan River toward Walden	.....	10,000	
Jefferson County					
828	2	Mt. Vernon Canon, oiling	.....	5,000	
827	58	Guy Hill, improvements	10,000	15,000	
829	72	Coal Creek, improvements	15,000	20,000	
632-B	126	So. Platte to Long View	.....	1,500	
632-C	126	Dawson to Foxton	.....	8,000	
632-D	126	Buffalo to Ferndale	.....	4,000	
Larimer County					
766-A	14	East of Ft. Collins to Weld Co. line, oiling and grading (the county to complete project)	.....	10,000	
766-B	14	Poudre Canon Road	5,000	5,000	
562-B	16	Six bridges in Big Thompson Canon	.....	14,000	
562-C	16	Grading and oiling in Estes Park Village east from Elkhorn Lodge	.....	15,000	
Routt County					
634-B	131	Reimburse county	.....	10,000	
688	131	Continue work, Oak Creek to Sidney	.....	45,000	$234,500
Total					$370,500

District No. 7—Federal Aid Projects

Proj.	Road			
	2	State line, west, paving and overhead R. R. crossing	$ 87,000	
296-E	8	Underpass at Strasburg	55,000	
	8	Oiling F. A. Projects, Denver-Limon Road	184,000	
15-B	14	Sterling, east, oiling	80,000	
				$406,000

Adams County — State Projects

Proj.	Road		County	State	
831	79	Improvements, north of Bennett	$ 2,000	$ 2,500	
Arapahoe County					
823	75	Oiling, 4 miles	6,000	12,000	
833	88	Oiling, 1½ miles	3,000	3,000	
711-B		Bridge	1,000	1,000	
Logan County					
796	2	Sterling, northeast, paving in connection with 3% fund project	.....	6,000	
637	14	Sterling, west	2,500	2,500	
637-A	14	To reimburse county	.....	1,250	
797	154	Bridge and improvements	4,000	4,000	
Morgan County					
835	2	Grading and improvements, Brush surface crossing, C. B. & Q. R. R.	5,000	35,000	
767	54	Improvements	1,000	1,000	
767-B	54	To reimburse county funds advanced	.....	1,000	
834	81	To reimburse county funds advanced	.....	3,500	
Phillips County					
572	51	Improvements	4,500	4,500	
583	59	Improvements	3,000	3,000	
798	154	Improvements	1,750	1,750	
Washington County					
575-C	54	Improvements	7,500	7,500	
576-A	63	Improvements	3,000	3,000	
576-B	71	Improvements	3,000	3,000	
636-B	102	Improvements	6,000	6,000	
Weld County					
836	14	Ault, west, oiling	16,000	16,000	
837	16	Improvements, Greeley, west	1,250	1,250	
838	60	Near Johnstown, oiling	13,000	13,000	
Yuma County					
694	51	Improvements	2,000	2,000	
575-D	54	Improvements	15,000	15,000	
636-C	102	Improvements	7,500	7,500	$156,250
Total					$562,250

1932 Projects advanced to 1931 and overruns		$ 749,990.34
Maintenance		1,800,000.00
Surveys	$ 40,000.00	
Traffic Signs	85,807.66	
Traffic Census	20,000.00	
Property and Equipment	20,000.00	
Compensation Insurance	40,000.00	
Administration	188,602.00	
		$ 394,409.66
GRAND TOTAL		$5,421,100.00

County *Officials Meet* in Denve

WITH the largest attendance on record the county commissioners of Colorado held one of their most important conventions in Denver on January 20th to 22nd.

Among the county governmental problems discussed during the three-day conference were the old age pension law, the pauper question, state and county roads, various tax problems and the truck and bus laws.

The speakers included Mayor George D. Begole of Denver, Governor William H. Adams, A. E. Palen, head of the Denver office of the U. S. Bureau of Public Roads; Charles D. Vail, state highway engineer; Peter Seerie, chairman of the State Highway Advisory Board; A. K. Vickery, Denver city engineer; Judge V. H. Johnson, Lynn Kennedy of Rifle and W. L. Knauss of Montrose.

New officers elected for 1932 were Andrew Linstrom, Summit county, president; W. I. Gifford, La Plata county, first vice president; John R. Browne, Jefferson county, second vice president, and Fred O. Pearce, Adams county, secretary-treasurer.

The following resolutions were adopted:

RESOLUTION NUMBER 1

Whereas, the present economic condition has caused the attention of the citizens of this State to be focused upon the financial structure of our State, local and county governments, and

Whereas, it is our opinion that the greatest stimulus that can be given to individual enterprise and industry at this time must come from a reduction of the general burden of taxation and a more equitable distribution of the said burden, and

Whereas, it is our opinion that the existing revenue laws of the State of Colorado and the administration thereof lead to gross inequalities and discrimination between taxpayers, discriminating particularly against the owners of real property and in favor of the owners of intangible personal property, and

Whereas, it is our opinion that a real emergency exists, but that this emergency can be rectified only after a careful and expert study of the present situation, and by a thoughtful and well-planned system of remedial measures.

Therefore, be it resolved, that we, the County Commissioners of the State of Colorado, in conference here assembled this twenty-second day of January, A. D. 1932, recommend and request that the Governor of the State of Colorado immediately appoint a committee which shall be ordered to make a thorough survey and study of the present financial structure of our State, county and local governments, as to the methods of levying, imposing and collecting taxes, and as to the disbursement and spending of funds, and the incurring of debts by our State, local and county governments; and as to the efficiency of our present revenue laws and the administration thereof.

Be it further resolved, that said committee be composed of representatives of the county officials of the State of Colorado, members of the State legislature, and representatives of all the larger industries in the State of Colorado.

Be it further resolved, that the above-mentioned committee report its findings as soon as possible to the Governor, to the legislature and to the people, and make whatever recommendations they deem most provident as to necessary changes, both in our fundamental law, either statutory or constitutional, and in the administration thereof, all to the end that governmental expenditures be curtailed, and that all excess and unnecessary expenses be eliminated, and that the burden of taxation be equitably distributed as between the various localities, peoples and classes of property in this State.

RESOLUTION NUMBER 2

Whereas, Our present tax system has placed such a burden upon real property as to be almost confiscatory in effect. Farmers are compelled to pay a third of their income toward the support of our public institutions. T on city property in many instances sorb the revenue derived in form rent. Such a system, if allowed to tinue, will imperil the safety of our lic institutions and demoralize our w economic structure.

Now, therefore, be it resolved, T we favor a graduated income tax no exemptions that will materially lieve real property of its present burden, and that we request the ex tive committee of this body to t oughly study the various proposed initiated measures to the end that may consolidate the best thoughts of same, in order that the most effi measure may be adopted and the ef of this body concentrated behind definite measure.

RESOLUTION NUMBER 2

Be it hereby resolved by the co commissioners of the State of Colo in conference here assembled this t ty-second day of January, A. D. 1 that we, the county commissioners the State of Colorado, herein express opposition to the mandatory old age sion bill as passed by the State leg

A stretch of oil-surfaced highway extending east from Trinidad in Las Anim County constructed by the State Highway Department under agreement with t U. S. Bureau of Public Roads.

ure in 1931, and any similar laws, and sk that the said law be repealed by he next session of the legislature.

Be it further resolved, that we endorse nd recommend all proper and necessary gal opposition as to the constitution- lity of the present law as it appears on ur statutes.

Be it further resolved, that it is our elief that prior to this law there had lready been passed legislation that has nd will adequately care for the indigent nd needy citizens of our various coun- es in this State.

Be it further resolved, that it is our elief that the legislation as passed by ur legislature in 1931 in reference to the d age pension law is not necessary in rder for our counties to properly care or the indigent and needy, but creates n additional and unnecessary burden on he taxpayers of our various communi- es, which at present they are unable bear.

RESOLUTION NUMBER 3

Be it hereby resolved by the county mmissioners of the State of Colorado conference here assembled this twen- -second day of January, A. D. 1932, at we, the county commissioners of the tate of Colorado desire to express to e State Highway Advisory Board, the ighway engineer and the Governor of e State of Colorado our appreciation of e efforts they have expended in the reparation of the 1932 road budget.

We believe that they have earnestly deavored to arrange and allocate this ork so that pressing necessities of to- y may be most adequately met.

RESOLUTION NUMBER 4

Be it hereby resolved by the county mmissioners of the State of Colorado, conference here assembled this twen- -second day of January, A. D. 1932, at we, the county commissioners of e State of Colorado, will welcome an dit of the books of our various coun- s as to the money paid our counties om the gasoline tax, feeling confident at each county has properly used the oney so received.

We hereby express our desire that this dit take place at once, that the ex- nse of this work be kept to a low and asonable cost, and that the audit be mpleted within a very short period of me.

RESOLUTION NUMBER 5

Be it hereby resolved by the county mmissioners of the State of Colorado, conference here assembled this twen- -second day of January, A. D. 1932, at we, the county commissioners of the tate of Colorado, are opposed to any w method of distributing the gasoline x. We believe that the present method sed on the mileage of State roads in ch county is just and fair.

RESOLUTION NUMBER 7

Be it hereby resolved by the county mmissioners of the State of Colorado, conference here assembled this twen- -second day of January, A. D. 1932, at we, the county commissioners of the tate of Colorado, believe that the sal- ies paid to the clerks of our courts e in excess of and out of proportion the salaries paid to clerks in other visions of our governmental units.

View of the newly-constructed Federal Aid highway on Wolf Creek Pass, completed in 1931 by the State Highway Department in co-operation with the U. S. Bureau of Public Roads.

Be it further resolved, that we, the county commissioners of the State of Colorado, hereby request of the judges of the various courts throughout our State that they limit the expenditures of their offices and of the offices of their clerks to a just and reasonable amount which reasonably conforms with the expenditures made by other divisions of our county government, particularly the salaries of the clerks of the various divisions of the district courts throughout our State.

RESOLUTION NUMBER 8

Be it hereby resolved by the county commissioners of the State of Colorado, in conference here assembled this twenty-second day of January, A. D. 1932, that we, the county commissioners of the State of Colorado, do hereby express our opposition to the manner in which the State civil service laws are now functioning and being administered, and do hereby recommend and request that the legislative committee of this body take such steps and adopt such measures as they deem most necessary, either abolishing or modifying the said law, in order to promote the efficiency of the State employees and the economical operation of our State government.

RESOLUTION NUMBER 9

Be it hereby resolved by the county commissioners of the State of Colorado, in conference here assembled this twenty-second day of January, A. D. 1932, that we, the county commissioners of the State of Colorado, express our thanks for the fine cooperation we have received during our stay in Denver to the following individuals and companies:

John R. Crook,
The Liberty Trucks and Parts Company,
H. W. Moore Equipment Company,
H. P. Wilson Machinery Company,
Out West Publishing Company,

and all others who have in any way contributed to the success of this convention.

Letter to Division Engineers

To the division engineers of the Colorado Highway Department Engineer C. D. Vail on February 10th addressed the following letter:

"Owing to the fact that the State Highway Department budget for 1932 contains items of state projects amounting to $940,500, it is important that division engineers give special attention to the expenditures of these moneys.

"This large expenditure this year is to aid in the relief of unemployment, but in no sense to be used as charity. Full value in work is expected for the money expended.

"In general, work on Federal Aid roads will be handled by the State Highway Department as day labor jobs. Large expenditures on state roads may also be handled from this office.

"No state project handled through county commissioners should be started until agreements have been signed in this office and no project started until road and weather conditions are such that work can be economically performed.

"Where projects are to be handled by county commissioners, division engineers, or their assistants, will go over the work to be done and report the same to this office with the proposed agreement.

"Day labor on projects handled by the county should not be paid less than 40 cents an hour, and on state projects handled by this department the pay will be 50 cents an hour."

Highway Engineers Hold *Conferenc*

AN unusually attractive program of papers was presented at the Sixth Annual Highway Engineering Conference at the University of Colorado in Boulder on January 14 and 15, 1932.

This conference, which is sponsored by the Civil Engineering Department and the Extension Division of the University, brought together highway engineers and contractors from the states of Kansas, Wyoming, New Mexico and Colorado. The two days were spent in presenting papers and discussing the pertinent problems that confront the highway engineer.

"Highway Research," by Prof. R. L. Downing of the University of Colorado, gave an interesting digest of the papers presented at the Eleventh Annual Meeting of the Highway Research Board at Washington, D. C., on December 10 and 11, 1931. The subjects covered were: Highway Maintenance, Calcium Chloride as a Dust Palliative, Mineral Aggregates, Soundness Testing, Compaction of Earth Fills, Pavement Reinforcement, Culvert Inspection, Highway Finance, Hot Cement, Volume Change in Concrete, New Frost Heaving Theory, Determination of Soil Characteristics, Traffic Studies, and Highway Design.

Oliver T. Reedy, Senior Assistant Highway Engineer, Colorado State Highway Department, discussed the "Factors to Be Considered Prior to State Control of County Highways." This paper is the story of the recent and continuing experiment of the State of North Carolina in the centralization of control of public highways.

Papers by G. C. Lassetter, Engineer of Surveys, New Mexico Highway Department, and J. S. Marshall, Chief Draftsman, Colorado State Highway Department, dealt with the "Value of Aerial Reconnaissance in Highway Location." Aerial surveys saved in actual engineering work at least 3% of the entire construction cost of the grading and drainage, 60% of the necessary work on location, and 50% of the usual time required. The photographic record of the aerial survey will furnish a more complete record of the topographic detail than can be expected from the average ground survey.

"Present Trends in Highway Construction" was discussed by E. B. Van de Greyn, Bridge Engineer, New Mexico State Highway Department, and Paul S. Bailey, Bridge Engineer, Colorado State Highway Department. Alignment and grades are improved to provide for higher speeds and increased sight distances. Wider roadways and heavier design loads are used. Designs are such as to allow for future widening or for maximum salvage value.

"Soil Conditions" was discussed by C. F. Seifried, Engineer of Plans, Wyoming State Highway Department. Specifications for the thickness of the subcourse material should be so stated that the engineer in charge can vary the thickness according to the soil in question. Some soils require no subcourse material added, while others require a maximum.

J. E. Lloyd, Oil Construction Engineer, Wyoming State High Department, presented a pape "Desirable Design and Constru Prior to Oil Surface Treatm Factors entered into were: the rect location, construction of grade, base course surfacing, the wearing surface itself. Th per brought out considerable cussion on the advisability of al applying a tack coat on the grade.

In a paper on "Necessary eration between Laboratory Field in Oiled Gravel Road struction," L. C. Campbell, rials Engineer, New Mexico Highway Department, empha that care in taking field sample continuous cooperation with th oratory saved time and mone general, poor cooperation poor and costly roads.

"The Recommended Chan Road Oil Specifications for Asphaltic Road Oil" was pres by P. J. Greer, Engineer of Roads, Colorado State Highwa partment. He recommended c es in the viscosity and ductilit addition of a solubility in c

(Continued on page 20)

One of the scores of treated timber bridges constructed on the new Federal gravel surfaced highway extending thirty-five miles west of Craig on the Vic Highway. Photo by U. S. Bureau of Public Roads.

Road Building *for* Jobless

ROAD and street building today is employing nearly a million men. Highway work furnished jobs for many of the army of unemployed recruited during the depression of the past two years. There are several reasons why highway work fills an important public need when other forms of industry are temporarily inactive. The most important reason is the fact that road and street improvement benefits the entire public more than any other form of public activity. Inexpensive transportation by highways lowers the cost of living, increases the convenience and pleasure of social intercourse, and improves the speed and economy with which business is conducted.

The effectiveness of road and street building as a reservoir of jobs for the relief of unemployment has been tested most effectively during the past year. Congress sought to aid the idle through an increase of the regular Federal Aid appropriations of $75,000,000 annually to $125,000,000, and advancing an emergency fund of $80,000,000 to the states to be repaid over a period of years. The total expenditures of state and federal money on the state highways will exceed a billion dollars in 1931. What did this expenditure of money accomplish? Students of economics tell us that for every man employed directly on the road there are two other men busy supplying the road worker with supplies and materials. A total of 3,000,000 men are deriving support from road and street work, all of this in addition to providing much-needed roads and streets.

A broad program of emergency road building has been adopted by the Canadian government for unemployment relief. Heads of families are to be given work as near home as possible, but many unattached workers will be sent into the Northwest to labor on the Canadian transcontinental highway. Improvements will be in charge of the provincial administrations, as a rule, but the Dominion will render financial aid.

Labor enters into every phase of highway work. Every dollar expended for the construction of surfaced road is divided between labor, aggregates, binder, equipment and miscellaneous items, but labor is by far the most important factor. Money paid for labor goes for food, clothing, rent and other essentials. The cost of producing aggregates and binder is about 50 per cent labor, and the remainder is divided between equipment, power, transportation, etc. Money for labor is again distributed to the grocer, clothier and real estate owner. The cost of manufacturing equipment is divided into 40 per cent labor, 40 per cent materials, and 20 per cent largely power and transportation. Factories are busy furnishing the finished steel that, in turn, is made in furnaces and mined as a raw material. Transportation by railroad and motor truck enters every phase of road building. In short, labor in all parts of the United States is given a job through the construction of each mile of surfaced road.

Road and street construction and maintenance consume large quantities of materials. The railroad tonnage of freight for highways is enormous. Highway work is one of the largest activities—probably the most uniformly distributed—for the employment of unskilled labor. Road and street building is work that readily absorbs men from all classes of industries temporarily inactive.

Employment of labor is largely a local problem dependent on the initiative of local leaders. Money expended by the public must be on public works and increased public construction. The dollar spent for construction of highways has a double value; in addition to the dollar placed in circulation in the hands of the worker, there is the permanent value of decreased cost of transportation by highway that affects every one of us. Cheap transportation is one of the crying needs of the day.

Road building for unemployment relief has a tremendous advantage in that it brings the job to the worker—a man needs a job where he lives.

Roads and streets can be bought at a bargain now; the low cost tends to offset the interest charges if built by bond money to be repaid in more prosperous times. The increment in national wealth due to good roads will remain long after the depression is forgotten.

Most of the men out of work are in the cities. There is a need for cities to increase their paving budget to provide streets that will not be congested with traffic, to supply parking areas near business sections, to develop new business districts. All this takes money. How is money to be raised without increasing taxes, which are heavy enough now?

We must be forehanded. A noted economist has advanced the idea for a forehanded tax policy that in times of business expansion the public should tax heavily, spend lightly, pay debts; in times of business depression it should tax lightly, spend heavily, borrow money. This policy necessitates advance planning of public works for public needs. Such advance planning has recently been inaugurated for federal activities through the Stabilization Board authorized by the last Congress, which began to function this past summer.

The time to buy is when prices are low—everyone knows that. The public can buy needed road and street improvements at a bargain now, and at the same time give employment instead of charity to the unemployed. It is much less expensive in tax money to give a man a job than it is to give him a dole. The dole is a dead tax expense; a public improvement is a return for the dollar expended and the man employed is better off because of increased self-respect and a full stomach.

The public borrows money by issuing bonds and deferring payment until better times. The low

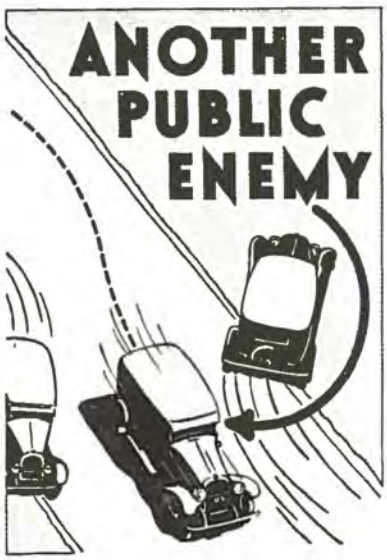
price at which roads can be purchased by the public tends to offset the interest charges. No community can say today that it has enough improved roads and streets. The cost of building and maintaining an adequate system of highways must be distributed according to the benefits derived. The natural division is into roads that benefit the general motoring public, and roads of purely local use.

Perhaps the strongest influence in the stabilization of highway programs is the continuity of the income from gasoline taxes and license fees. The budgeting of highway money has been made possible for several years ahead through the steadiness of this income for highway purposes. This money has been an important factor in supplying funds with which to match Federal Aid. Diversion of this tax from use on the highways would be most disastrous to highway programs. Without the motor vehicle taxes the continuation of highway programs becomes dependent on bond issues and taxes on land. The tax on land has been decreasing because of the increased income derived from the motor vehicle taxes.

Highways are held as common property by the public. The best possible transportation on the highways must be provided by the public that has assumed that responsibility. Transportation by motor vehicles has assumed the proportions of a gigantic industry—an essential industry—as the relative stability of motor vehicle manufacturing during the depression period has definitely proved. Motor vehicles must have roads on which to travel with comfort, speed and economy just as a railroad must have a strong roadbed over which to operate its rolling stock. The provision of money for building roads and streets is a public responsibility.

Plans for providing work for unemployed might well be concentrated on road and street construction. Road and street building as a means of unemployment relief has been well tested during the past year and has not been found wanting.

A crew of twenty men are working in Byers Canon near Hot Sulphur Springs. They are engaged in widening and straightening this road. Day labor is being used. This is another unemployment road project.



"Weaving driver," "speeder," "road hog"—call him what you will, he stands out as one of motordom's greatest public enemies.

Studies reveal that nearly 50 per cent of all accidents caused by improper driving are caused by this fellow. He is discourteous and dangerous.

In its recent analysis of 105,000 accidents directly due to improper conduct at the wheel, the National Safety Council reached these conclusions:

"Cutting in" was responsible for 7,051.

"Passing on a curve or hill" was responsible for 891.

"Passing on the wrong side" was responsible for 865.

"Exceeding the speed limit" was responsible for 20,370.

"Driving on the wrong side of the road" was responsible for 16,926.

Adequate traffic laws, rigidly enforced, would keep this public enemy off the road and make motoring both safe and pleasant for the vast majority of automobile drivers.

COUNTIES SHARE OF GAS TAX IS $1,625,695

DURING the year of 1931 the counties of Colorado outside of Denver received $1,625,695.09 as their share of the 4-cent gasoline tax. This tax was distributed to the counties on a basis of state highway mileage in the various counties, and was 27 per cent of the total tax collected.

In Denver county there is no state highway mileage. And under the law Denver is excluded for this reason from sharing in the distribution of the gas tax, except for 3 per cent, which is distributed to the cities construction and maintenance streets designated as "through h ways."

The largest sum distributed any one county under the 27 cent distribution went to W county, which received $62,21 Las Animas county received the ond largest sum with $47,743.

The distribution was certified State Auditor William D. Mac nis as follows:

Gasoline Tax Distribution, 193 27 Per Cent to Counties

Adams	$ 17,09
Alamosa	20,08
Arapahoe	18,46
Archuleta	18,18
Baca	42,00
Bent	12,81
Boulder	24,62
Chaffee	16,46
Cheyenne	22,46
Clear Creek	19,10
Conejos	22,98
Costilla	22,76
Crowley	11,28
Custer	16,81
Denver	
Delta	21,08
Dolores	12,58
Douglas	27,18
Eagle	22,60
Elbert	22,67
El Paso	43,51
Fremont	31,84
Garfield	27,48
Gilpin	6,85
Grand	33,97
Gunnison	45,47
Hinsdale	8,55
Huerfano	24,69
Jackson	23,95
Jefferson	42,26
Kiowa	25,71
Kit Carson	30,77
Lake	13,15
LaPlata	17,85
Larimer	45,17
Las Animas	47,74
Lincoln	56,49
Logan	30,87
Mesa	39,52
Mineral	11,81
Moffat	30,90
Montezuma	24,24
Montrose	41,24
Morgan	23,97
Otero	16,35
Ouray	8,71
Park	34,02
Phillips	17,67
Pitkin	15,49
Prowers	34,01
Pueblo	35,13
Rio Blanco	36,31
Rio Grande	15,17
Routt	32,38
Saguache	29,77
San Juan	7,86
San Miguel	25,15
Sedgwick	12,66
Summit	16,31
Teller	18,14
Washington	45,78
Weld	62,31
Yuma	43,57
	$1,625,69

An Inventory *of Road* Traffic

BY W. R. SMITH, President
American Road Builders' Association

ORDERLY progress and the necessity of balancing costs against returns in any business make a periodical inventory necessary. This is particularly true of highway transportation because the roads over which vehicles run are owned and administered by the general public, which demands an exact accounting.

Over the public highways are operated vehicles used for recreation, private business, and the hauling of people and goods for profit. This traffic has grown faster than highways could be provided during the past decade. There has been an under-production of highways. The present cost of transportation on improved roads and streets must be compared with the cost on unimproved highways to get a clear picture of the facts and figures in our inventory.

Let us examine some of the facts and figures about transportation by highway. Only a few years ago highway travel was slow, expensive, and laborious, depending on animals for power and hindered by poor roads. Costs of transportation were as high as 25 cents per ton-mile over the best roads of the day, as contrasted with 6 cents per ton-mile over modern improved highways. The speed of travel has increased at least tenfold, or from 5 miles an hour to 50 miles an hour. The cost and difficulties of maintaining for power horses that consumed almost as much food when idle as when working must be contrasted with the modern motor that uses no fuel when not at work.

The pleasure travel bill by motor vehicle last year amounted to $3,-00,000,000 in the United States, according to figures of the American Automobile Association. This money was spent in all parts of the country for necessities incident to travel.

The public investment in motor vehicles and in roads and streets on which they operate now approximates 30 billion dollars, or more than the total investment in railroad tracks and rolling-stock. Highway activities considered as an operation owned by the public and operated for public welfare is the largest public utility in the United States. This investment of public money must be maintained at proper working efficiency, and additions made to the useful system to reduce the cost of transportation as well as to facilitate the speed and comfort of travel.

Let us view a few figures as to where we stand on road and street building. There are some 3,000,000 miles of country roads in the United States, and probably not less than 250,000 miles of city streets. Of the 3,000,000 miles of country roads, only 700,000 miles have been surfaced to provide a firm roadbed for vehicles. City streets have a higher percentage of improvement. Of the 700,000 miles of surfaced roads, about 200,000 miles are state highways and 500,000 miles are roads of local use. The federal government has paid part of the cost of building only 88,000 miles of state roads, of which 51,000 miles are of pioneer type without strong surfaces. It is seen, therefore, that the building of a complete highway system to care for the 26 million motor vehicles in the United States hardly has more than begun.

In 1902 the total mileage of improved roads was but 150,000 and the registration of motor vehicles was 23,000, or six miles of road per automobile. Today the mileage of improved roads is 700,000, or 37 vehicles per mile of road. We have passed from a condition of freedom of travel to a situation where the roads are congested with traffic. Proof of this statement may be obtained from almost any automobile driver—especially a Sunday driver. Further proof is in the accident record last year, when 33,000 people were killed and nearly a million injured in highway accidents.

The economy of improved highways may be illustrated by a simple example. Extensive research work has shown that the operating costs of an average motor vehicle is 2

Another big improvement was made on the road between Durango and Mancos in 1931 with the completion of the project at Hesperus as shown by above view. Photo by U. S. Bureau of Public Roads.

cents a mile greater on an unimproved highway than on a surfaced road. It is clear, therefore, that an unimproved highway carrying 1,000 vehicles a day costs the vehicle owners $20 a mile in increased operating costs more than they would have to pay on a surfaced road. In a year this loss amounts to $7,300, sufficient to pay the cost and maintenance on a $93,000-per-mile highway, or several times the cost of the best type of highway.

Let us approach the matter of economy from another direction. Just how much has the public saved by improving 700,000 miles of surfaced highways? The gasoline consumption in 1930 was 15 billion gallons. Half this fuel probably is used in vehicles traveling on surfaced roads, so that vehicles traveling only 12 miles on a gallon traversed 90 billion miles of highways. From this figure of 2 cents a mile saved to the vehicle driver because of the improvement of the highways, it appears that the saving to the public due to the surfaced roads is $1,800,000,000 annually. This sum would have been paid out by the traveling public had the roads not been surfaced. The money saved is more than is expended on roads, a large part of which goes for capital investment in more improved roads, which, in turn, save more dollars for the taxpayers.

What part of the freight and passenger business of the United States are these highways carrying? Commercial freight traffic in the United States handled by all transportation agencies amounted in 1929 to 650 billion ton-miles, according to figures of the Interstate Commerce Commission. This freight was handled as follows: steam railroads, 75.8 per cent; electric railroads, motor trucks, airplanes, 3 per cent; pipe lines, 4.9 per cent; inland waterways, 16.3 per cent. Motor truck transportation is an almost unappreciable part of the total freight movement. Moreover, it is estimated by the chief of the United States Bureau of Public Roads that the maximum capacity of the highways for motor freight is 100 billion ton-miles, only 15 per cent of the total commercial tonnage moved in 1929.

Many railroads are operating motor freight and bus lines. In 1930 about 80 railroads operated 4,000 buses and 60 railroads operated 7,000 trucks. The property investment of railroads in motor freight equipment was about $40,000,000 in 1930.

Above picture shows a stretch of the new highway extending east of Sterling, co pleted in 1931 with state and Federal Aid funds. The project was sixteen miles length and was constructed for oil surfacing. Photo by U. S. Bureau of Public Roa

Travel on railroads in 1929 amounted to 31 billion passenger-miles; the travel on highways, based on gasoline consumption of 12 miles per gallon and two passengers per car, is about 300 billion passenger-miles.

The ideal situation, as stated by officials of the Interstate Commerce Commission, would be for passengers and freight to be handled by the most economical transportation agency. Today there are many forms of transportation, each offering certain advantages for the shipper or the traveler. The interests of the public should be considered of first importance in any matter of transportation.

At the present time there is need to put men to work and to start the wheels of industry turning. The money expended on roads and streets this year employed more than a million men and it is estimated that two million others are busy furnishing materials, equipment, and supplies to road workers. Federal Aid and state road building this year exceeded a billion dollars and employed 380,000 men; county and township road work expended in excess of two-thirds of a billion and probably as many men were at work because of its diversified character; city paving, somewhat reduced this year, had almost as many men on the payrolls.

Analysis of the dollar spent in road and street building projects increases the national wealth — a wealth that belongs to the public rather than to individuals. The results of money spent for roads and streets will remain long after depression has passed.

So in taking even such a rough ventory as we have made, it ap clearly that true economy lies i improvement of the 2,300,000 of roads that are yet unsurf This improvement must be ma reduce operating costs and it is itable from that standpoint Safety to the public requires highway improvement be such congestion will be relieved and dents reduced. Finally, until provement in highways appro in some measure the increase i hicles, it is evident that incr highway programs bring s economy, and comfort to the t ing public.

Here is one reason why D was one of the bright spots o financial map during 1931. Re tial construction in Denver d last year increased 46.2 per over 1930, according to an an of building permits made b market development departme the Chamber of Commerce. of residences built in 1931 to $3,647,100, as compared with 497,450 in 1930.

Secretary of State Charle Armstrong recently placed an for the manufacture of auto li tags with a Denver concern. tags for the coming year will 20½ cents per pair. The cost 1931 tags was the same. Total of tags was $78,364.12 for 1931.

The Oshkosh Motor Truck, Inc.

Announce

The H. W. Moore Equipment Co.

As Distributors

Oshkosh Four-Wheel Drive Trucks

Trucks and Parts in Denver Stock

OSHKOSH FOUR-WHEEL DRIVE TRUCKS will be sold and *serviced* as all equipment sold by THE H. W. MOORE EQUIPMENT CO. is serviced—"*Service Plus.*"

GALION

WHY DO GALION E-Z LIFT LEANING WHEEL SKEW AXLE GRADERS SERVE YOU BEST?

We have all sizes in Denver stock for immediate delivery.

First—Because Galion is one of the largest oldest builders of road equipment in the w and "knows" the hows and whys of building g ers from experience in the field.

Second—Because they are more sturdily built t most graders of the same blade length and built heavier where the strain comes.

Third—Because "Galion Graders" are the serviced graders sold in Colorado—and we'll p it.

H. W. MOORE EQUIPMENT CO. **Denver and Grand Junct**

T'S STILL THE

"Quick-way"

To the job—
To do the job—
To the next job.

They have been "tried out" in Colorado in 1931 under the most severe conditions in counties with the contractors and State Highway Department, and we're more convinced than ever that they are built right and perform right at a surprisingly low "upkeep cost."

One in stock for immediate delivery.

Come in and see one demonstrated—or we'll demonstrate on your job—any time.

H. W. Moore Equipment Co.

120 West Sixth Avenue, Denver, Colorado
Phone Tabor 1361

NEWS OF THE MONTH

Wilson Machinery Company on a full page advertisement of this issue announce to the trade they have recently taken on the distribution in the state of Colorado of the Coleman truck, a home-made product with the main factory being located at Littleton, Colorado. This truck for the past several years has proven its ability on tough, hard going, and Wilson Machinery Company are to be congratulated on taking over the sales distribution for the home state of this truck.

Wilson Machinery Company were fortunate in having as a recent visitor Mr. H. H. Barber, president of the Barber-Greene Company, who had the pleasure of discussing and showing moving pictures of the Barber-Greene Bituminum and Oil Paver. Mr. Barber showed these pictures and gave talks to the highway departments of both Wyoming and Colorado, the U. S. Bureau of Public Roads, and several prominent contractors.

Wilson Machinery Company also notify the trade that they will have two new salesmen on their sales force beginning March 1st, one who will handle the Western Slope, Mr. F. A. Berg, formerly connected with the Arizona state highway department, and Mr. P. R. Collier, formerly with the Colorado state highway and the Arkansas state highway departments. Both of these men are not only professional engineers, but have had experience in the sales game.

Hugh Winbourn announces he is no longer connected with the Vacuum Oil Company, in the sale of their oil products. Winbourn is well known among contractors, state and county road officials. He expects to make a new connection with some other oil company in the near future.

And for the state as a whole there was expended more than $20,000,000 on roads. This was the largest program in the history of the ... On state roads alone there was ... than $10,000,000 expended.

W. J. Koehring Now Presiden... National Equipment Corporati...

Succeeding his brother Philip J. Koehring has been made p... dent of the National Equip... Corporation, of which he had ... vice-president since its organiza...

W. J. Koehring has been id... fied with the equipment indu... since 1906, when he, with his br... Philip and Richard Kiel, orga... the Koehring Machine Compan...

Until this recent change, he ... president and works manager o... Koehring Division and preside... the T. L. Smith Division of the ... tional Equipment Corporation. ... is a director of the Sterling M... Truck Company and of the ... City State Bank, Milwaukee.

STATE HIGHWAY DEPARTMENT

Financial Statement, December 31, 1931

BALANCES		
State Treasurer	$ 885,930.15	
County Time Warrants	10,333.42	
Revolving Fund	9,500.00	
Total Balances		$ 905,763.57

RECEIPTS		
U. S. Government	$4,793,419.97	
Gas Tax	4,219,680.76	
Internal Improvement	45,500.00	
Highway Receipts	179,443.63	
Bus Licenses	43,944.95	
Unemployment Fund	3,231.52	
Total Receipts		9,285,220.83
Total Balances and Receipts		$10,190,984.40

DISBURSEMENTS		
Federal Aid Projects	$7,213,339.81	
State Projects	917,454.04	
Maintenance	1,364,421.41	
Maintenance Equipment	292,270.26	
Property and Equipment	47,707.40	
Surveys	46,268.00	
Traffic Signs and Census	21,311.42	
Administration	196,138.58	
Compensation Insurance	27,165.56	
Legislative Relief	2,067.35	
Total Disbursements		$10,128,143.8...
BALANCES 12-31-31		
State Treasurer	$ 44,757.15	
County Time Warrants	8,583.42	
Revolving Fund	9,500.00	
Total Balances		62,840.6...
Total Disbursements and Balances		$10,190,984.4...

3% SPECIAL GAS TAX FUND	
Receipts	$ 275,000.4...
Disbursements	138,023.2...
Balance	$ 136,977.1...

Wilson Machinery Co.

Announces

COLORADO DISTRIBUTION

OF THE

Coleman 4-Wheel Drive

LINE OF TRUCKS

Push a snow plow . . . haul road material . . . spread gravel . . . Pull a maintainer with a hydraulic blade . . . maintain roads . . . all-year utility unit . . . front and rear axles of equal strength and interchangeability of parts . . . the truck of power and stamina . . . Colorado-made.

wners: Colorado and Wyoming Highway Departments, several Colorado Counties, and many utstanding contractors.

New Highway Equipment and Materials

Cedar Rapids announces a new and heavier Bituminous Road Mix plant for 1932. It has a 17-foot pugmill mixer and is built to operate at full capacity at altitudes up to 12,000 feet. One of these machines was recently demonstrated in Colorado. Road officials displayed considerable interest in the plant. If you are interested further, George Meffley of H. W. Moore Co., Denver, will be glad to answer all questions.

Paul Fitzgerald, U. S. National Bank Bldg., has been appointed sales representative for Denver Road File in Colorado. This modern road maintainer is manufactured in Denver by a Colorado concern. H. B. Barnes was the designer. It is said with the Denver Road File one may completely eliminate "soft corrugations" at a speed of twenty miles per hour. The Colorado Highway Department now has one mounted with a 3½-ton F. W. D. truck working east of Sterling. Fitzgerald says: "Don't take my word for it—just ask the men working them on the roads."

Operations at the plant of the Quick-Way Shovel Co., Denver, have been resumed, according to John Jay, president. Work is now progressing on a dozen Quick-Way shovels purchased in the last thirty days. Deliveries are now being made.

Our good friend P. Y. Timmons, in charge of power equipment sales, International Harvester Co., has just sent us a copy of "Powertrax," showing pictures of McCormick-Deering tractors operating in fourteen foreign countries. One of the most interesting of these pictures shows a fleet of seventeen McCormick-Deering industrial tractors operated by the South Manchurian Railroad terminal docks at Dairen, Manchuria. It was from this point that the Japanese made their drive into Manchuria and Mongolia. McCormick-Deering tractors are made in America. They are sold and serviced throughout the world.

In the same issue of "Powertrax" there is an announcement of the new McCormick-Deering Model T-20 "TracTor," a track-laying power unit which provides cost-reducing power for many industrial and commercial uses. Anyone interested in this new power unit can get full details from the H. W. Moore Equipment Co., Denver, Colorado, distributors.

Left to right: M. A. Bircket, western territory; F. B. Egan, northern territory; G. Garrett, chief engineer; N. J. Thompson, southern territory; E. G. Young, office ... Roy H. Atchison, city sales and contractors; J. L. Brown, president; J. C. Van ... furnace sales, and B. F. Powell, sales engineer.

"What a sales force!" And that's no pun. Above we have a group picture of the sales representatives of the Thompson Manufacturing Company, recently appointed sales distributors of Toncan corrugated metal culverts in the Rocky Mountain territory.

The Thompson Manufacturing Company is a Denver concern established in 1878. Directing head of the concern today is J. L. Brown, president. More than a dozen different products are manufactured by Thompson, including corrugated metal culverts, irrigation and hydraulic equipment and hot air furnaces. The lines include the Thompson modern hearth furnace in four models, Thompson metal flumes; Thompson smokestacks; Thompson-Parshall measuring flumes; Weigele riveted steel pipe for mining, irrigation, municipal and industrial purposes; Haviland fish oxy-tanks for fish transportation, and Toncan corrugated metal culverts.

Sale of fifty of the Thompson hot air furnaces was recently made to the U. S. Government for use at the Boulder Dam project. The Thompson plant is one of the largest ... kind in the western states. ... products are shipped to many ... eign countries.

Two new 6-cylinder motor tr... each with a rated capacity of 5 ... have just been announced by ... national Harvester. These ar... Model A-7 and Model A-8 and ... available in wheelbases of 160, ... 200 and 225 inches, thus ada... them to a wide variety of h... hauling, especially that encoun... in tractor-trailer service and ... work.

Engines are of the 6-cyl... valve-in-head type.

Instead of the usual two sp... there are four springs at the ... end; these are semi-elliptic sp... one being mounted above and ... other below the rear axle on ... side as shown in an accompan... illustration. Both upper and ... springs are attached at the fro... a swivel-beam equalizer, ... equalizes torque and driving str... from the upper and lower sp... when power is applied.

Chain Belt Company announ... new Rex Paver for 1932. It ... scribed in a 48-page elaborate ... lustrated booklet. This new ... has every kind of a "gadget" k... to increase concrete mixing pr... tion. The Chain Belt Company ... Milwaukee.

The Allis-Chalmers Tractor Division announces their entrance in the road machinery field and will manufacture a complete line of graders. This development became known when Allis-Chalmers announced the purchase of the line of graders manufactured by the Ryan Manufacturing Co. of Chicago. The grader line will be manufactured at La Porte, Indiana, in the Advance-Rumely plant, which was recently acquired by Allis-Chalmers.

During 1931 the counties received $43,044.95 as their share of the truck and bus tax collected through the state utilities commission. The counties received $19,188.96 on July 1st, and $24,755.99 on Dec. 31st. An equal amount was turned over to the State Highway Department for matching Federal Aid funds. Distribution of the bus and truck tax is made on a basis of state highway mileage in the various counties. Weld County received the largest amount with $1,684.59.

During 1931 a total of 276,376 passenger automobiles were registered in Colorado. This was a reduction of 471 from 1930. Last year there were 32,082 trucks registered, an increase of 420 over the previous year. However, the tax receipts showed an increase of $9,530.55. The total amount collected from motor vehicle fees since the state assumed control of licensing in 1913 is $18,693,660, according to a report made by James Pullar, motor vehicle supervisor.

COMPARATIVE STATEMENT
STATE HIGHWAY DEPARTMENT
For the Month of December, 1930, and 1931

RECEIPTS	1930	1931
U. S. Government	$171,488.96	$ 194,138.67
Gas Tax	314,000.00	360,802.07
Internal Improvement	7,400.00	1,700.00
Highway Receipts	1,725.87	20,984.42
Bus Licenses	27,429.46	24,755.99
Unemployment Fund	.....	3,231.52
	$522,044.29	$ 505,612.67
DISBURSEMENTS		
Federal Aid Projects	$473,554.91	$ 768,230.25
State Projects	100,168.67	72,567.82
Maintenance	177,254.31	166,587.35
Maintenance Equipment	8,205.28	11,779.60
Property and Equipment	4,331.99	6,609.35
Surveys	17,862.39	14,088.63
Traffic Signs and Census	1,005.37	2,026.11
Administration	17,803.62	21,490.92
	$800,186.54	$1,063,380.03

Highway Engineers Hold *Conference*

(Continued from page 8)

disulphide test and a maximum allowable wax or paraffine scale of 2 per cent.

Dr. S. K. Loy, Chief Chemist of the Standard Oil Company, Casper, Wyoming, in discussing Mr. Greer's paper, advocated a standardization of road oil specifications, and he doubted very much whether wax scale somewhat in excess of 2 per cent was detrimental.

"Wyoming's Venture Into the Field of Penetration Macadam" was described by G. W. Marks, Division Engineer, Wyoming State Highway Department. The paper dealt with the lighter and less expensive types of penetration macadam. Construction methods and unit cost data were given on several Wyoming projects.

Frank S. Gilmore, Assistant Maintenance Engineer, Kansas State Highway Department, in a paper on the "Blotter Type of Oiled Gravel Roads," discussed their development which led up to the present design as used in Kansas. This design is of a much lighter construction than is generally used in the other western states.

"Oregon's Standard for Oiled Gravel Roads" was presented by R. H. Baldock, Assistant State Highway Engineer, Oregon State Highway Department. History of development, location and grading, foundations and drainage, gravel and macadam bases, "multiple lift" construction and oil mat surfaces were emphasized.

"Rock Asphalt," by A. A. Weiland, described the characteristics and advantages of rock asphalt. Very thin sections of this material provide a shock-resisting, resilient, traffic-absorbing surface at very low costs for most any type of road.

"Modern Paving Emulsion," by C. L. McKesson of the American Bitumuls Company, San Francisco, was read. This paper gave a group of tests for "quick-breaking" asphaltic emulsions.

Motor Vehicle Fees for 193

The following is a statement the disposition of the motor veh fees for 1931, as announced by S Auditor Wm. D. MacGinnis:

Total Receipts from License Fees	$1,910,74
Administration Expense	$ 68,33
Clerk Hire, County Clerks	32,10
Cost of Plates, Freight, etc.	62,78
Counties' Share	873,76
Applied to Redemption and Interest Highway Bonds, 1923	873,76
	$1,910,74

Colorado has two Federal Aid employment road projects in co of construction this winter. On located on La Veta Pass, while other was recently started near Junta, on the Santa Fe Trail.

The per capita wealth of Colo in 1930 was $3,165, compared $2,677 for the entire country.

PROJECTS ADVERTISED FOR BIDS

Proj. No.	Location	Type	Length	Date Bids O
150-4 & F. L. H. P. No. 1	Southwest of Elk Springs	Gravel Surfacing	10.692 mi.	Jan. 5, 19

PLANS FINISHED

Proj. No.	Location	Type	Length
149-E	West of Strasburg	Gravel Surf. & Underpass	4.412 mi.
58-AR 216-AR 216-B	West of Holly	Gravel Surf. & Underpass	7.825 mi.

PLANS BEING PREPARED

Proj. No.	Location	Type	Length
158-A No. 2	West of Manitou	Bridge and Approaches	0.01 mi.
298-E No. 2	South of South Fork	Bridge and Approaches	0.01 mi.

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj No.
2-R11	South of Trinidad	3.130 mi.	Paving	J. H. Miller & Co.	$ 89,063.70	100	2-R
57-R4 & 168-BCR	West of Lamar	4.801 mi.	Paving	Pueblo Bridge & Const. Co.	130,690.50	85	57-R4 & 168-BC
68-B	South of Saguache	3.290 mi.	Gravel Surfacing	H. C. Lallier C. & E. Co.	74,428.75	52	68-B
71-C	Bet. Durango and Mancos	4.965 mi.	Gravel Surfacing	J. Finger & Son	86,146.75	88	71-C
79-B	East of Colorado Springs	12.248 mi.	Gravel Surfacing	Chas. B. Owen	145,370.05	90	79-B
91-AR	East of Trinidad	5.613 mi.	Oil Processed	Pople Bros. Const. Co.	77,655.05	100	91-A
134-E	East of Limon	5.052 mi.	Gravel Surfacing	Bedford & Woodman, Inc.	31,426.40	59	134-E
144-G	Bet. Forks & Colo.-Wyo. Line	13.204 mi.	Gravel Surfacing	Morrison-Knudsen Co.	248,078.00	100	144-G
145-C	East of Rifle	14.901 mi.	Grading & Grav.	A. R. Mackey	271,703.80	50	145-C
149-F	Bet. Strasburg and Peoria	10.745 mi.	Gravel Surfacing	H. C. Lallier C. & E. Co.	198,660.00	100	149-F
149-H	East of Deertrail	18.565 mi.	Gravel Surfacing	Hamilton & Gleason	240,319.15	80	149-H
150-C	West of Craig	6.893 mi.	Gravel Surfacing	J. Fred Roberts & Sons	120,139.05	60	150-C
151-A	Bet. Granby and Tabernash	6.663 mi.	Gravel Surfaced	J. H. Miller & Co.	76,909.90	90	151-A
151-B	Bet. Fraser and Granby	3.925 mi.	Grading & Surfacing	Utah Construction Co.	63,954.80	100	151-B
158-B	Bet. Hartsel & Florissant	10.319 mi.	Gravel Surfacing	J. H. Miller & Co.	133,380.70	70	158-B
181-A	In Idaho Springs	1.876 mi.	Paving	J. Fred Roberts & Sons	93,749.55	14	181-A
189-C	West of Hayden to County Line	7.534 mi.	Gravel Surfacing	F. L. Hoffman	115,356.94	93	189-C
211-B	South of Craig	2.725 mi.	Gravel Surfacing	Utah Const. Co.	93,720.40	78	211-B
242-D	Bet. Mack & Colo.-Utah Line	9.883 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	124,552.36	94	242-D
245-AR	West of Las Animas	4.544 mi.	Grading & Oiling	Driscoll Const. Co.	94,398.85	90	245-A
248-C	Between Buena Vista and Salida	3.944 mi.	Gravel Surfacing	Pantle Bros.	48,820.50	24	248-C
258-I	Bet. Montrose & Gunnison	2.481 mi.	Gravel Surfaced	J. H. Miller	50,272.60	79	258-I
258-12	East of Montrose	Concrete Box Culvert		Hinman Bros. Const. Co.	8,455.50	99	258-12
258-J	West of Cerro Summit	5.796 mi.	Grading and Gravel	Lumsden Hall Const. Co.	107,027.30	100	258-J
259-B	Bet. Gunnison and Parlin	9.587 mi.	Gravel Surfacing	Cole Bros.	184,503.00	66	259-B
263-C	East La Veta Pass	5 mi.	Gravel Surfacing	State Forces		0	263-C
265-E	West Bayfield	2.950 mi.	Gravel Surfacing	J. H. Miller & Co.	97,839.06	86	265-E
270-E	Bet. Del Norte & Monte Vista	8.663 mi.	Gravel Surfacing	Mountain States Const. Co.	102,199.10	69	270-E
278-D	West of Cheyenne Wells	21.913 mi.	Gravel Surfacing	A. R. Mackey	93,563.30	72	278-D
282-I	South of Craig	1.981 mi.	Gravel Surfaced	Utah Construction Co.	70,225.16	87	282-I
292-D	Bet. Wolcott and Avon	9.834 mi.	Graded Surface	Utah Const. Co.	159,143.40	88	292-D
295-E	South of Alamosa	7.627 mi.	Gravel Surfacing	Mountain States Const. Co.	71,049.56	97	295-E
296-AR&BR	South of Pueblo	4.372 mi.	Paving	New Mexico Const. Co.	154,509.00	70	296-A
296-D	South of Pueblo	8.348 mi.	Gravel Surfacing	Cole Bros.	84,815.10	99	296-D
298-D	Bet. Del Norte and Durango	4.100 mi.	Gravel Surfacing	H. C. Lallier	164,814.00	100	298-D
298-F	East of Bayfield	5 mi.	Gravel Surfacing	Wood, Morgan & Burnett C. Co	66,920.85	95	298-F
158-A	Between Manitou & Cascade	4.062 mi.	Grading	Hamilton & Gleason	164,681.20	48	158-A

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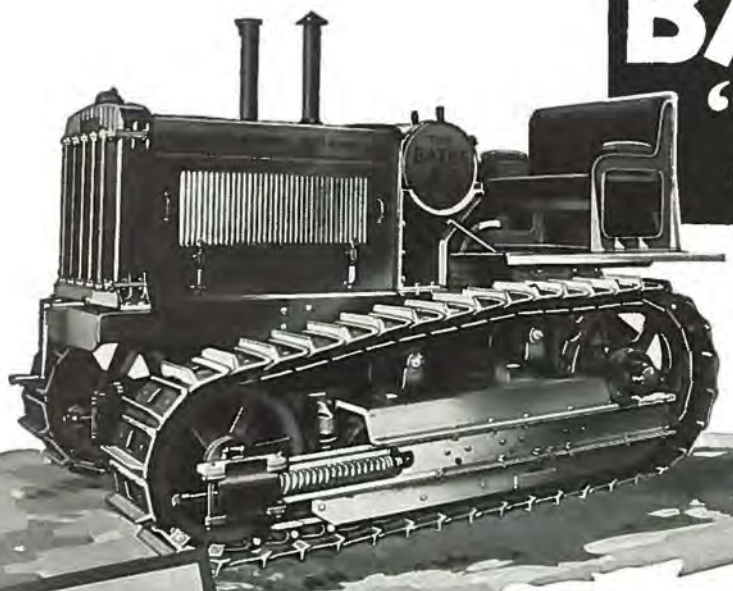

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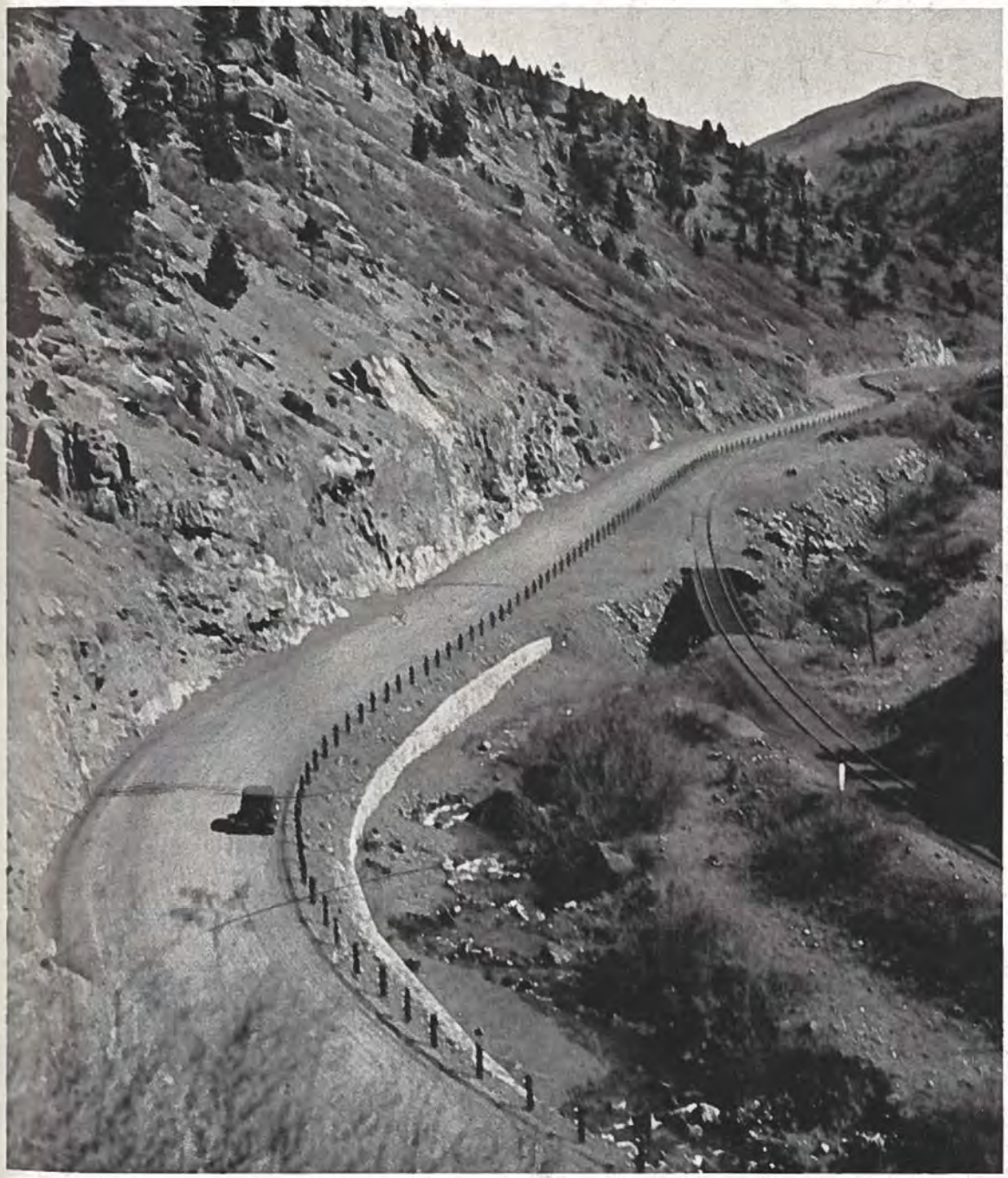
COLORADO HIGHWAYS



Vol. XI April, 1932 No. 4

"Particularly Efficient"

"The Cedar Rapids Tandem Outfit"

KENT COUNTY, MICHIGAN, reviews accomplishments for 1931. This picture shows a Cedar Rapids Tandem 936-336 Crushing, Screening and Loading Plant with swivel type feed conveyor and feeder with grizzly operating in a Kent County pit with 45% oversize material to be crushed.

In a comprehensive report made to the Kent County Board of Supervisors, and now printed in book form, there appears the following paragraph under the heading of Maintenance:

"The Maintenance Department this year, with the addition of a particularly efficient gravel plant, is furnishing gravel of an excellent type by handling the entire deposits in the pits in an automatic tandem crusher, which reduces all oversize material to the county's standard of 11/16 inch in diameter. This plant has produced this year as high as 450 cubic yards of gravel daily. The investment has been a distinct factor in making possible the maintenance of an increased mileage of highways, without an increase in the budget." YOU, TOO, CAN DO IT BETTER WITH A CEDAR RAPIDS PLANT

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Colorado Highways

"BETTER ROADS"

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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

HERE we have another view of the world-famous Ute Pass highway, located in El Paso County, west of the town of Manitou, famed summer resort. It takes clever engineers, skillful workmen with powerful, sturdy machines to build new roads on the steep slopes of the Rocky Mountains. Many unusual engineering problems were encountered in the construction of this project. Worth any reader's time is the article by Lewis H. Height on page 4. Photo on cover by courtesy V. H. Littlefield, resident engineer, Colorado Highway Department.

Colorado Highways
"BETTER ROADS"
VOLUME XI. APRIL, 1932 NUMBER 4

700,000 Jobs *at Stake In U. S.* Highway Bill

JOBS for nearly 700,000 men and the food and shelter of 2,000,000 persons are involved in a bill ated to soon come before the nited States Senate for action.

It is the $136,000,000 emergency ighway construction bill which has e unqualified backing of the Amer- n Legion, the American Farm Bu- au Federation, the National range, National Rural Letter Car- ers, American Motorists Associa- n, and the American Road Build- rs' Association.

Conceived upon the same principle the $80,000,000 emergency road ppropriation made available last ear, the bill is designated to thaw e frozen credit of the various tates which prevents them from im- ediately matching available Fed- al Aid highway funds. The meas- re already has been passed by the ouse and reported favorably in the enate.

Confidence of favorable action on e appropriation among the organ- ations unqualifiedly backing its nactment is based upon several ctors. These are:

That both parties in the last Con- ress went on record as favoring e principle of the measure as re- ected in the ready approval given e $80,000,000 emergency fund ore than a year ago.

The strong advocacy of the earlier ill by President Hoover and his un- iling endorsement of highway con- truction as a means of absorbing e slack of unemployment.

The established fact that 691,000 men, including many in agricultural communities, will be given part-time employment over a considerable period. The allocation of the fund is such that its benefits will reach the unemployed in all parts of the country.

Universal recognition of the directness of the unemployment relief involved. In this connection, figures of the United States Bureau of Public Roads are cited to show that 85 cents of the dollar spent for highway construction goes straight to the hands of the wage earner.

Another element creating confidence that the Senate will approve the bill is the fact that the $136,000,000 represents merely an advance to the various states with definite provision made for its repayment.

Support for the measure by the organizations unitedly demanding its enactment is based upon the immediacy and certainty of the unemployment relief it provides. In this connection, Senator Tasker L. Oddie, Nevada, leading the fight for the bill in the upper house of Congress, says:

"The maximum number of persons employed on emergency highway work as a direct result of the $80,000,000 Federal emergency appropriation in 1931 was 115,167 persons, according to the United States Bureau of Public Roads. On the same basis the emergency appropriation as now proposed would employ 172,750 persons, but since staggering of employment is being very generally used in highway emergency work, this number would likely be doubled or 335,000 persons would be directly employed.

"For every man engaged on the highway there are two men engaged in the production of road building equipment and materials, in the factories or mines, and the transportation of them. Taking into consideration, then, that for each man directly employed there are two men behind the lines, the total number engaged by reason of the appropriation would possibly be three times the net number of 172,750 directly employed on the highway plus the additional 172,750 road workers alternating in staggered work or a grand total of 691,000. Further, assuming that an average family consists of three, more than 2,000,000 persons may be reached by reason of the emergency appropriation."

Need for unemployment relief is so great in this state, Colorado will be able to match only $264,397 in Federal Aid funds for road purposes this year. This was the statement made by Chas. D. Vail, state highway engineer, in a telegram to W. C. Markham, executive secretary of the State Highway Officials Association in Washington.

Unless an emergency appropriation is passed by Congress giving the state additional road funds, Colorado will be compelled to curtail its Federal Aid road projects. The state has $2,064,397 to its credit in Federal Aid funds, said Mr. Vail, but it will be necessary to let $800,000 be carried over until 1933 unless additional Federal funds are made available to match the excess funds.

Ute Pass *Project* *Built* for Safety

By LEWIS H. HEIGHT, Draftsman, Colorado Highway Department

THE new highway in Ute Pass between Manitou and Cascade, Colorado, is an excellent example of modern mountain highway design and construction. This project, designated Federal Aid Project 158-A, comprises a stretch of four miles through tremendous natural obstacles. It is very interesting in its technical aspects, as well as in its scenic and historic associations. It lies on the transcontinental route of U. S. 40 S, which undoubtedly will be used much more extensively in the future because of additional improvements along the line made by the state of Colorado during the past year or two, among which are those at Wilkerson Pass and at Tennessee Pass.

For a time it was doubtful if the state could obtain the necessary right of way through a valuable property on which nationally famous mineral springs are situated. The owner feared that the blasting necessary in construction might cause irreparable damage to the springs, which lie close to the surface amid a veritable honeycomb of rock. In addition, it was a knotty problem to lay a grade that would meet state and federal requirements, and also provide enough parking space around the springs and buildings on the property.

A compromise, which necessitated a new location on the opposite side of the canyon below Rainbow Falls, was effected by Mr. Ernest Montgomery, division engineer of District No. 5, with the cooperation of the owner, interested local men and state and federal engineers. The project includes the construction of a concrete arch bridge having a clear span of 165 feet over Fountain Creek just below Rainbow Falls. Above Rainbow Falls the improvement follows approximately the old road location.

In the location and design of the highway, safety was the first and most important consideration. This required a wide roadbed, elimination of sharp horizontal and vertical curves and careful super-elevation of the roadbed on all horizontal curves in order to eliminate any tendency toward skidding or sliding on turns. The frequently occurring reversals of horizontal curvature combined with vertical curvature made it necessary to employ special methods for laying out satisfactory super-elevation. The usual methods, under the different conditions, would not give very pleasing results. The highway department used special graphic means with excellent results. The entire alignment was plotted in profile on a very exaggerated scale, the vertical distances being fifty times the horizontal distances. Next the amount of super-elevation for each curve was calculated by formula, and then plotted the corresponding distance above the profile which governed the low shoulder in all cases. The transition point from right to left was then marked on the graph, and smooth curves connecting the high and low shoulders were laid out so as to intersect on the transition point. The elevation of the transition point was plotted so as to make the profile of the center of the road a smooth curve. Various lengths of transitions were used, depending upon the degree of curvature and the distance between curves of opposite direction. In some cases there was hardly any distance between the end of one curve and the beginning of another, but the method was applicable and satisfactory in all cases.

View of new Ute Pass highway near Cascade with old road at the right. Photo by V. H. Littlefield.

The safety considerations for alignment influenced the laying of the grades. More curvature would have made easier grades possible, but the lack of visibility would have been a serious drawback. Accordingly the limits to which the grades had to be held made it impossible to avoid deep cuts and high fills involving a great amount of rock to be blasted, loaded and transported. On this four-mile job, there were more than 200,000 cubic yards of material excavated, a great part of which was rock that had to be blasted from the solid.

The fills, too, required special treatment. Their great height, in some cases nearly sixty feet, or their proximity to the stream, would have caused their slopes to fill the channel and to create an impossible condition for drainage. The only solution was the construction of retaining walls of cement rubble masonry. A large number were built, which totalled in all some 3,500 cubic yards. Not content to stop at the wide roadbed, easy, super-elevated curves and the lowest possible grades, the highway department has gone further in providing safety. Throughout the length of the proj-

t, strong cable guard fences have en erected. Nearly 18,000 feet of is type of safeguard have been t in place.

All drainage structure on the sub-ade are reinforced concrete box lverts, because the road will be ved in the near future. Twenty- of these were required. Near Cascade end the alignment sses the meandering Fountain eek twice, which eliminates a eat deal of curvature. Two I-am single span bridges were built these crossings, making a total three bridges for the project.

The road has a minimum width of irty feet between shoulders, but the most part it is considerably der, as all excess or waste mate-l from the cuts has been used to den the fills. This extra width ill be appreciated by the traveling blic, and will also allow the rves to be made still easier when e pavement is laid.

Hamilton and Gleason were low lders and were awarded the con-ct for grading, installing all struc-res except the arch bridge at Rain-w Falls, and finishing the sub-ade with selected material, com-sed of disintegrated granite. The ntract, which was signed on No-mber 20, 1931, called for opening e road to traffic not later than ril 1, 1932. The first regular ffic was resumed on March 28, 32, which is no mean compliment the contractor's efficiency and or-nization. Fortunately, they were t hampered by snow or storm, but e cold weather made concrete rk an exacting and laborious task. l structures of concrete required e-heating of the aggregates and ter, and after pouring the con-ete had to be covered and kept ated by steam pipes until it had ne to set thoroughly.

The contractors moved in with nple equipment, including two soline shovels and two steam vels, one steam driven air com-essor mounted on a railroad car, ree gasoline compressors mounted tractors, a fleet of Coleman cks, a large number of smaller cks, about thirty rock drills, drill el, hundreds of feet of pipe for nveying air to the drills, a num-r of fresnoes and teams, and all ds of hand tools. They employed er one hundred and seventy men the job nearly all the time until e work was completed.

From the beginning, the work was ll organized. Mr. M. F. Dooling as superintendent of the grading m the beginning of the job at

Showing entrance to new highway on left, old road on right, at Manitou end of project. Photo by V. H. Littlefield.

Manitou to a point above Waldo Canon. Mr. Myron Beswick acted in a similar capacity from Waldo Canon to the end of the job at Cascade. Mr. Harry Stocker directed the construction of all the substructure. Mr. V. H. Littlefield, resident engineer, was in charge for the state.

The grading operations were begun simultaneously at both ends of the job. The culvert crews were busily engaged in keeping ahead of the grading. At the same time, a large number of stonemasons and helpers were building the retaining walls. Special equipment was required for handling and transporting the large boulders used in the walls. The contractors built long booms consisting of suitably braced telephone poles mounted on truck beds. The boulders were picked up and carried on cables hanging from these improvised traveling derricks and were unloaded directly into their permanent places in the walls. Smaller rocks were hauled as usual in dump trucks.

For the first month, the contractors were put to great inconvenience by the traffic on the road. It was a common sight to see a large number of private vehicles lined up and waiting while the road was blocked temporarily. The pass was closed to traffic on the 28th of December, 1931, and contractor's operations speeded up immediately. "Coyote holes"—long, small-bore tunnels—along the new alignment were packed with several cases of dynamite and exploded, breaking out hundreds of tons of rock at once. Other blasting operations were carried on, and for several weeks there was an almost continual sound like that of a Fourth of July celebration. The contractors estimate that they drilled over nine miles of drill holes and consumed approximately fifty tons of high explosives.

After the road was closed to traffic, Mr. J. H. Busselle, a contractor who has erected many highway bridges in the state, took a sub-contract for the two I-beam spans near Cascade. He did an excellent job on both of them, in spite of the cold weather that prevailed all during the time he was pouring the concrete for the abutments and wings.

During the excavating, some peculiarities of rock formations on the cut slopes caused slides to occur, often with little or no warning. In one particular instance, a huge chunk roughly thirty feet in diameter, slipped out from what appeared to be a solid face and hurtled over a pile of broken rock onto the shovel engaged in loading. The shovel looked like a total loss after that rock crushed it, but the damage was not as great as it appeared at first. The big boulder had to be drilled and broken by light charges of explosives before the shovel could be extricated. Three or four days after the incident, the shovel was repaired and at work again. This illustrates the spirit and efficiency exhibited by the men who built the highway. Nothing was too hard, and obstacles were just something to be overcome. The work went on with few delays, and was carried to completion on schedule.

The finished job was acclaimed by local newspapers as a modern superhighway in the mountains. The state engineers were given much credit, not only for their engineering skill, but for their aesthetic planning. The entire aspect of the

(Continued on page 14)

Centralized *Control of Public* Highways

By OLIVER T. REEDY*

WORD was received a few days ago that a county commissioner, upon noting the above assigned topic, exclaimed, "Good heavens! Is the highway department trying to get control of the county highways, too?" So at the outset let it be said that nothing is farther from the purpose and plan of the highway department, so far as is known—at least not for years and years. Eventually, yes. The day will come when all of the public highways of the state will be centralized under one control, but that is something about which there is no need to worry at present. The State Highway Department has plenty of troubles of its own at the present time and is not looking for any more, but some day the county highways will be placed under its charge, whether such procedure is pleasing to the department or not. The history of human events and human progress unerringly indicates the trend of all modern activities, governmental, industrial, research, financial, religious, almost any activity whatsoever, to be toward centralization, and not the least of these is the control and regulation of public highways.

But I am getting somewhat ahead of myself. It will probably be of advantage to amplify the subject a little. Suppose we say, "Some Factors to Be Considered When Studying the Question of Centralization of Control of Public Highways." Not that it makes much difference, however, for the situation is something like that of the lyceum lecturer who wrote to the secretary of an organization before which he was engaged to speak, enclosing a list of half a dozen lecture titles and asking him to select the one which the club desired the lecturer to use. He added, however, that it made no difference which topic was selected, the lecture would be the same.

North Carolina's Venture

The assignment of this subject was prompted by the recent and continuing experiment of the State of North Carolina, and what I have to say will be principally the story of this experiment, for which I am indebted mainly to Mr. Charles Ross, General Counsel for the Highway Department of North Carolina, as covered by his excellent paper, read before the recent convention of the American Association of State Highway Officials at Salt Lake City; an article which Mr. Ross prepared for the Brookings Institution of Washington, D. C., covering the history of highway development in North Carolina; and also some direct correspondence.

This new venture of North Carolina begins with an act of the 1931 legislature providing that after July 1st of that year the supervision and control of all public roads, except the streets of cities and towns, be placed in the hands of the state highway department. The act provided that after the date mentioned it should be unlawful for any county, or any subdivision of the county, to levy any tax or incur any indebtedness in connection with the construction, maintenance or improvement of any public highway, including bridges. As Mr. Ross states, this complete centralization in the hands of one agency of all the public roads in the state is probably without parallel in the legislative history of this country.

Not Revolutionary

At first glance we gather the impression that this is a very revolutionary measure. We have long been accustomed to think of the county as the primary unit in control of highway activities, and for the very good reason that in practically every state in the Union road development began with the county, and until comparatively recent years it was confined to the county. An exception to this is that in many

State motor grader smoothing oil-surfaced road northwest of Fort Collins, one of Colorado's low-cost surfaced highways.

*Senior Assistant Highway Engineer, Colorado State Highway Department, Denver, Colorado.

the states there is still a minor vision of governmental authority own as the township, having com- ete organizations for all road ilding and maintenance activities. st as there are often counties in any states which have organiza- ns, equipment, and finances for king care of road building prob- s within their boundaries, com- rable, if not superior, to the simi- r organizations of the state high- y departments, so in turn it is ten found that township organiza- ns are sometimes superior even those of the county in which they cur. However, the trend today is ry decidedly along the line of do- g away with township organiza- ns and concentrating all of the d building activities in the coun- . A number of states have already ne this. Just recently Michigan ssed a law which provides for tak- g over of the township activities the county at the rate of 20 per nt of the mileage per year, thus ac- mplishing the entire task in five ars. North Carolina is the only ate, however, which has, on a spec- ed date, only about six months ter the passage of the act, taken er the entire county system. The arest approach to so drastic a ange is the case of Pennsylvania, hich, on the middle of last August, ded 20,000 miles of county high- ys to the state system.

And yet, when we examine the end of the times, we find this vement perfectly consistent with at is being done in other activi- s. The situation is entirely differ- t from the early days when set- rs dwelt in small groups on the ntier, and because of the tremen- dous obstacle of distance were pri- marily self-supporting. As Mr. Ross says: "It was but natural that they should be individualistic in their po- litical thinking and emphasize local autonomy, but today the men who shape and control the policies of government are interested in busi- ness enterprises whose organizations cover a wide extent of territory and often encircle the globe. The most striking and outstanding tendency of the change that is taking place all around us in the mechanics of our government is the transfer of one function after another of govern- ment from the smaller to the larger units. Functions of government formerly regarded as distinctly state questions are now national. Prob- lems a few years ago performed ex- clusively by the counties are now wholly absorbed by the state, and township and local districts that for- merly managed their roads or schools in nearly all the states have yielded to the county.

"We may philosophize about it and political orators may declaim the sacredness of the slogans of lo- cal self-government, but he is blind indeed who does not see in the acts of almost every legislature and in every succeeding session of Con- gress, and in the judicial opinions of our courts, a constant tendency towards centralization. State sup- port of public schools, state organ- ization of public health departments, state and national welfare and social services, one form of state constab- ulary after another, as well as the ever enlarging state highway depart- ments, all illustrate a tendency uni- versal in its scope."

The "finished product," showing road northwest of Fort Collins after it had been "given" to traffic two weeks. Photos by Paul J. Greer.

Comparison of North Carolina and Colorado

An item that makes this story of special interest to us in Colorado is that in round numbers the public highway mileage is the same in both states, 55,000 miles; and, prior to the wholesale enlargement in the eastern state the state systems were the same; namely, 9,200 miles. A comparison of other features and characteristics, however, reveals great differences. The area of North Carolina is almost exactly half that of Colorado, while it has almost ex- actly three times our population. There are 100 counties in the sister state and 63 here at home, about 524 square miles to the county back there with an average of about three times that out here. The normal income for expenditure on state highways in North Carolina is about $21,000,000 per annum, or about $2,300 per mile; in Colorado it is be- tween five and six million dollars annually, or about $650 per mile.

At the time this matter came up for consideration before the North Carolina legislature, the status of county roads varied among the sev- eral counties much the same way it varies now in our state. Mr. Ross says that some of the wealthier counties had elaborate organizations and were maintaining county roads more intensively and more expen- sively than the state was providing for the state highway system, but that at the other extreme, one small mountain county had a road force consisting of a one-armed man and a split-log drag. I rather think that in Colorado the extremes are much closer together than in North Caro- lina. I am sure that the road or- ganization and equipment in even our poorest county is indeed elabor- ate compared with the one just men- tioned in the mountains of North Carolina.

It should be borne in mind that the conditions and status of county roads were not simply taken for granted, nor assumed from a super- ficial preview, but were accurately determined by a careful survey in which the Bureau of Public Roads participated, so that when the mat- ter was taken up by the legislature, the financial and physical facts re- lating to the local roads had been compiled and were available. This procedure is certainly strongly indi- cated, and no action along the line of centralization of the responsibil- ity for all the public highways of a state should ever be taken without a similar careful survey and compila- tion of the facts and figures.

Reasons for Change in North Carolina

As I see it, the most weighty argument in North Carolina for the change in policy in regard to administration of public roads was the condition of county finances. The state did not begin to take a prominent part in financing highways until about 1921, and then it attacked the problem with exceptional vigor, carrying the county activities along with it. The counties issued bonds for road construction to the extent of more than a hundred million dollars, apparently controlled by the shortsighted but not unusual theory that if roads were only constructed they would by some peculiar magic maintain themselves. In this way the credit of many counties was exhausted in building one road after another, while, at the time of this condition survey they were waging an unequal battle against the twin vandals, traffic and weather, in a frantic effort to preserve enough of the work to serve as a memorial until the day of the maturity of the bonds. The only means of supporting this frantic effort was taxation, and it was found that the counties were spending eight and one-half millions of dollars annually for this purpose. Then came the dark—meaning the depression—and the burden was so great that Mr. Ross says:

"When the general assembly had laid before it these facts and contrasted the general satisfaction and efficiency with which the state highway funds had been administered and the state highway system maintained, with the further urge of the widespread economic distress and the consequent terrific burden of the property tax, the historical reverence for the conception of local government was overcome, and the general assembly by an overwhelming majority surrendered to the State Highway Commission the absolute control of all the public roads of the state, together with the accumulated road machinery and equipment."

New Policy Seems Satisfactory

At the time Mr. Ross wrote his paper the new policy had been under way only a little more than three months, with very satisfactory results to those who knew the difficulty and appreciated the gravity of the task, and with dire disappointment to those "hopeful and expectant souls who thought that by some magic the passing of the roads from county to state control would instantly convert the dust and mud and sand into pavement."

One of the splendid new creosoted wooden pile bridges located on the Denver-Limon highway, over 200 feet in length.

I wish to quote in full the more tangible results as Mr. Ross sums them up. I gather from correspondence that an additional three months' trial has not changed his attitude or conclusions.

1. A burden of eight and a half million dollars annually has been lifted from the property tax of the counties and the transfer of the responsibility for future development of the local roads from the local governments to the state has definitely ended one of the most fruitful sources of the ever-mounting burden of local bond issues.

2. There has been concentrated into one spending agency unified control of the motor vehicle and gasoline tax, and this source of revenue definitely dedicated to road purposes, while the ever-recurring demand of different and sometimes jealous agencies for participation has, I trust, been ended.

3. The state's best engineering training and experience and laboratory facilities have been made available for the road problems of all sections of the state, whereas heretofore two-thirds of the counties met their road problems without the benefit of engineering advice.

4. The decisions on road problems are now based on the result of factual surveys developed by trained forces, rather than settlement by the enthusiasm of a mass meeting or the exigencies of local political candidacies.

5. Expenditures are subjected to the analysis of accurate cost records and budgetary control impossible in so many small divisions.

6. Substitution of wholesale for retail buying in the purchase of all supplies and equipment.

7. Nearly 100 per cent capacity use of heavy equipment is provided, whereas this class of equipment, when owned and operated locally, was necessarily idle much of the time.

Other Factors

Another condition obtaining in North Carolina was mentioned only casually by Mr. Ross, and without reference to any special bearing on the subject, is one that seems to me of prime importance. The state highway system itself had been brought in general to a fairly high state of improvement, and it was logical that a portion of the human and material machinery of the department should be transferred to other but similar activities. This condition is found in many of the older states. In at least 50 per cent of the states more than 80 per cent of their systems are either paved or all-weather surfaced roads, and in several this is 100 per cent. Mr. Samuel Eckels, chief engineer of the State Highway Department of Pennsylvania, refers to this in his discussion of the addition of 20,000 miles of county roads to his state highway system. He says:

"Fundamentally, the functions of a state highway department are road improvements in degree commensurate with traffic importance, and adequate maintenance. It is a well-established criterion for a state highway system that it include the principal intercounty roads and as long as principal intercounty roads remain unimproved the addition of mileage of lesser important roads to the system, without compensating increase of revenue, can only retard the proper development of the system.

"But when the state highway system reaches or approaches completion of improvement, the question arises as to whether there should be adjustment by raising type of improvement, diverting road revenues to subdivisions of the state, divert-

(Continued on page 20)

Value of *Aerial Maps in Highway* Location

By G. C. LASSETTER*

THE speaker feels that it is an imposition on his hearers to listen to a paper on a subject one who knows so little about question, especially when they ve probably read and discussed merous articles or papers by ex-rienced men on the subject. How-er, the object of this paper is to vey some personal ideas on the bject from an entirely practical, nomical and feasible standpoint applying this most advanced thod of surveys to highway loca-n in the western states.

General Considerations

In the construction of any high-y the first question is the general te and control points of the ject. When such projects are on Federal Aid system, the state st submit a route map which is estigated in the field and reported by engineers for the Bureau of blic Roads. This invariably takes re time than the average layman even members of the Highway mmission think is necessary. This often due to overworked organi-ions or to weather conditions, and sequently these reports are ger in getting to their destina-n than they should be.

After the general route has been proved, a detailed location must worked out in the field by the ular locating parties before any nite plans or estimates can be de up. This again takes more or s time, according to the length of route involved and the terrain the country to be covered. By ordinary method of location, a eral reconnaissance would be de over the entire route by auto-bile, horseback, or on foot—metimes by the use of all three—obtain a general knowledge of the ire country to be covered. Even ugh our forefathers used this thod for years, it is unsatisfac-y, and it takes a great deal of e to cover the ground as thor-oughly as possible. After having completed the preliminary study, the locating engineer probably will have decided on one, two, or three possible routes; and must determine which of these routes is the most favorable. Preliminary lines, usually consisting of a center line, with profile levels and a small amount of topography will then be run in order that a comparative estimate and layout can be made. This usually takes considerable time, especially in the rougher sections of the country. After the preliminary surveys have been gone over thoroughly, a definite and final location can be worked out very satisfactorily with possible short alternate locations.

Modern Procedure

Today the modern engineer takes to the air, and from any elevation he desires above the ground makes an accurate observation study or an accurate map to scale with 100 per cent photographic detail at a great saving in cost and an inestimable saving in time.

Where aerial equipment is used in making these surveys, the first flight over the project should be made with an engineer of the Bureau of Public Roads to determine the most favorable general route and the control points. This flight can usually be made in a very short time on the average project.

After the route has been determined, a flight should be made over the same territory with the chief of the party that is to make the actual location in the field. At this time a thorough study of the entire country should be made and photographs necessary for an aerial map should be taken of sections that might be in dispute. These with a few oblique pictures should be sufficient for some record of preliminary work. In the speaker's opinion this procedure should eliminate at least 60 per cent of preliminary ground surveys and would speed up the final location more than 50 per cent.

It is not believed that actual aerial maps are necessary except in a few short sections of rough country and in or adjacent to towns and villages where the route is in question or dispute among the local people.

After these two preliminary flights have been made and the final location has been completed, together with drainage maps, etc., it is in many cases advantageous and saves a great deal of field work to make a thorough study of the drainage from the air.

It is believed that a small laboratory equipped to develop aerial pictures and make maps would be very satisfactory and economical in any highway department. If a department owns its own cameras and plane (it is not essential that a plane be owned if one can be chartered on short notice) an aerial map made to scale can, in most cases, be completed in rough form and be placed before the Highway Commission within 24 or 48 hours after it has given instructions for the survey to be made. In many cases this procedure would save the Highway Commission much trouble and expense, more especially on locations through thickly populated countries and in small towns and villages where disputes usually develop when a proposed highway is being located.

Advantages

The Commission invariably is bothered with committees from these localities, usually from two or more factions, who have different ideas as to where the location should be. These committees, or individuals, as the case may be, often misrepresent conditions as they actually exist on the ground. If on short notice the Commission is able to get an aerial map that can settle these problems when they first come up, it would be advantageous. If the members of the Commission have to make field investigations and have the committees appear before them later, it not only takes up the department's time, but is costly in both time and

(Continued on page 15)

*Engineer of Surveys, New Mexico State Highway Department, Santa Fe, New Mex-

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EVERY PURPOSE

Colorado Trout *Made Famous by* Salida Man

FOR seventy years Colorado has been the paradise of sportsmen and famous for its rainbow trout, reared in its cold, crystal waters, but it remained for one young man, an adopted son, to make the rainbow trout of Colorado commercially famous. A young man of fine parentage and some wealth came to Colorado twenty years ago from New York in search of health, and since then has spent a half million dollars in developing the rainbow trout and fox farm industries, instead of playing the game of the idle rich, as many young men do.

Horace G. Frantz of Salida has been a fine asset to Colorado and has made excellent use of his time and money. Some twelve years ago he started in the trout business, when he purchased a small hatchery site within the residential district of Colorado Springs. Here he raised rainbow trout to the full capacity of his water supply, and in the intervening years acquired the technical knowledge and experience so necessary to successful trout culture. After purchasing another location within the city limits of Colorado Springs, he finally bought the Mt. Shavano Trout Farm in Salida, Colorado. This farm was originally built by O. M. Ridgeway, a former superintendent of the Denver & Rio Grande Western Railroad and one of the best known and forceful characters of the old West. The Mt. Shavano Trout Farm at Salida, held under the name of the Frantzhurst Rainbow Trout Company, Inc., represents the largest and most scientific plant of its kind in America, if not in the world.

From ocean to ocean, the Frantzhurst rainbow trout are used in fashionable hotels, restaurants and clubs and are appreciated for their excellent flavor and perfect texture. Every one of them is an advertising emissary, helping to make Colorado famous as a happy hunting ground for sportsmen.

At Salida, Frantz has built up this great enterprise single-handed and has gained distinction as the leader in his line throughout the United States. The Mount Shavano Trout Farm comprises over 150 acres, stretching for a mile or more along the Arkansas River above Salida, and just outside the city limits. A trout location cannot be made, it must be found, for the first requisite is a large supply of cold spring water, which must prove unfailing the year around. This has been cleverly accomplished, the Frantzhurst Rainbow Trout Co., which is the holding company, having laid a 16-inch perforated steel pipe, embedded in the hillside, seventeen feet above the highest rearing pond and continuing almost a mile above the uppermost pond. The water maintains a constant temperature of forty-four to fifty two degrees summer and winter, and in the coldest weather it never freezes. Drouth, cloudbursts or climatic conditions do not impair the purity or volume of the water. The maximum temperature of fifty-two degrees insures a firm, solid flesh in the trout at all times, and with every modern sanitary condition, Frantzhurst rainbow trout always have a clean, sweet taste with no taint of moss or mud so often found in other trout.

Trout have been raised commercially in the United States for a good many years, but it has only been the last ten years that the industry has been developed to any great extent. The eastern trout growers raise brook trout almost exclusively, while here in the West we find only the rainbow trout can be raised profitably on a commercial basis. There are many advantages for the rainbow over the eastern brook, and for that matter any other variety of trout. The flesh of the rainbow is much firmer than the brook, it is hardier, will stand more handling, is less liable to disease, can be shipped farther, and will arrive in much better condition than any other trout.

There are over three hundred commercial trout farms in the United States, but Colorado has the largest number of any state in the Union. Colorado trout are considered the finest table trout in the United States. This is principally due to three factors: first, that nothing but rainbow trout are raised commercially; second, that they are raised in cold spring water, and finally that they are fed the best of food, specially prepared each day. A day's feed at the Mt. Shavano Trout Farm requires at the present time about two thousand pounds of mate-

(Continued on page 14)

View of the Frantzhurst fish hatchery and ponds, the largest commercial trout farm in the world.

Colorado Trout Made Famous by Salida Man

(Continued from page 12)

rial, consisting of wheat, alfalfa meal, beans, molasses, tomatoes, buttermilk, meat and minerals.

The Frantzhurst Rainbow Trout Company now has about one and a half million trout, big and little. It has developed many acres of concrete rearing ponds, with scientific circulation and automatic cleansing systems, and the hatchery has attracted the attention of thousands of tourists from all states.

The farm is scenically situated within sight of the famous Mt. Shavano, with its gigantic snow angel.

In addition to the many acres of concrete breeding ponds are two large lakes at the upper end of the farm, which will be completed and stocked with rainbows. These will prove a genuine paradise for fishermen. The farms are equipped with fine buildings, including Frantz's own modern log cabin.

In the fashionable hotels of a score of states hundreds of pounds of the Frantzhurst rainbow trout are received daily. Frantz has letters of appreciation from the finest caterers in America, and also from President Hoover, former President Coolidge and many other famous men who have been treated to the famous Colorado trout either in their own home or at banquets.

Colorado is famous for many excellent specialties in fruits, vegetables and other foods, but Frantz has done much to give the state prestige for its rainbow trout.

Ute Pass Project Built for Safety

(Continued from page 5)

surrounding territory has been changed, but there is no question of damage to the scenic effects. The new highway does give better vantage points from which to observe the natural beauty of the famous old pass, first seen by a white man 341 years ago, when Don Juan Onate rode his horse up the ancient Ute Indian trail.

It was necessary to do considerable work at both ends of the job and at the Cusack estate near Cascade on private properties which would have suffered considerable damage because of grade changes. At the Manitou end, the previously mentioned owner of the mineral springs was provided with a large and very attractive parking space. He agrees that the finished work leaves nothing to be desired and that the value of his property has been enhanced considerably. It was necessary to raise the grade of the old road at this point, as traffic must be directed over the old road until the bridge is erected at Rainbow Falls.

Lowering the grade and easing the curvature at the Cusack estate damaged the high retaining walls supporting the terraces above the road. The state had the contractors replace a portion of these walls with stronger ones. The grade was lowered within the corporate limits of Cascade and retaining walls were built on private properties at this end. The results were very pleasing to all concerned, which is a source of satisfaction to engineers and contractors.

The road will be oiled in the near future in order to lay the dust and keep the surface in good condition for the heavy traffic expected this summer.

The project has cost nearly $300,000, but it fills a long-felt need and will repay the people of the state many times over in increased pleasure and business and relief from wear and tear on motor vehicles. Colorado can be justified in taking pride in this great accomplishment in road building.

For the first time in history the Denver-Limon highway has been free from snow blockades during the past winter.

View of Frantzhurst fish ponds lodge. Ponds cover over a mile of waterways along the Arkansas River, near Salida, Colo.

BETTER MOTOR FREIGHT TRANSPORT DEPENDENT ON HIGHWAYS

The growth of motor freight hauling over the country roads has grown tremendously since the World War, due to the improvement in highways and the development of motor transport vehicles.

Many motor freight lines were established during the period when the railroads were taxed to provide transportation facilities and when merchants were forced to rely on frequent motor freight deliveries to obtain the goods that manufacturers were allotting them. The motor freight industry—a war baby— has flourished and become increasingly important in the past decade.

The freight hauled is usually highly specialized in character and of a type that the railroads find difficulty in handling, such as household goods, sea food, livestock, garden produce, etc. At the present time less than 2% of the total tonnage of freight goes by motor transport; the railroads handle about 77% of all the tonnage, the remainder is divided between inland waterways and pipelines.

Motor freight transport is flexible, speedy and economical for numerous commodities. Special vehicles have been developed coming within the almost universal state requirement that widths shall not exceed 96 inches. These transport vans are often equipped with air brakes, special tires and engines for heavy duty.

alue of Aerial Maps in Highway Location

(Continued from page 9)

oney to the local people interested.

As a result of the experience that e speaker has had in aerial recon- issance and surveys, he feels that is very conservative in stating at three times the cost of all aerial rveys could be saved in actual en- neering work, and at least 3 per nt of the entire construction cost the grading and drainage could saved in each year's program if e locating division of the depart- ent could have at its command ithout delay the use of aerial uipment as might be required.

If the locating engineer must wait veral days or several weeks for pproval to use such equipment, en the economy to be derived from use on the locations naturally is ssened.

It seems to be the opinion of many gineers that there is a greater lue in aerial reconnaissance in ry rough country than in fairly en country; in fact, they seem to ink there is no value to be derived open rolling country at all, be- use, as they say, you can see far ough from the ground. The eaker believes that more real value comparison to the money spent n be obtained by observation with- t pictures in open country than the rough mountainous sections. ften long stretches of preliminary cation can be saved over entire utes by merely studying the area om a position above attained only airplane.

Aerial Surveys in New Mexico During 1930

Aerial reconnaissance and surveys ere an interesting part of location ork during 1930, as this was the rst time in the state's history that rial work was attempted.

The first reconnaissance by air as from Santa Fe to Aztec, a dis- nce of about one hundred and sev- nty-five miles mostly over rough ountains and broken country. The ntire trip was made in less than ve hours at a cost of $100. A re- nnaissance over this route by any her method would have taken from ree weeks to a month and would ave cost many times as much.

A study of the country from Fri- les to Jemez Springs was made om the air to determine the most asible route through the Valle ade and the best mountain pass the east without making prelim- ary ground surveys. This trip was ade at a cost of $50 and it is esti-

The aerial photograph of Ute Pass is easily understood, it gives a perfect picture of all physical features and it is useful for many purposes. Photo by courtesy Jack F. Lawson, Colorado Springs Chamber of Commerce.

mated that about fifteen miles of preliminary location was saved.

An interesting study was made of drainage of the Federal Aid project between Alcalde and Valarde. The idea of this study was to determine the approximate length and size of the larger drainage areas without actually running them qut on the ground. This work was done in an hour's time at a cost of $30 and with very satisfactory results. It would have taken one man at least two weeks to get the information needed on the ground.

Aerial reconnaissance from Laguna to Acoma, Inscription Rock and Ramah to Zuni and St. Johns, Arizona, was made to determine the feasibility of building a road through this region or possibly of putting it on the Federal system. Due to lack of trails and the poor condition of those that existed, it would have taken several weeks to make an intelligent investigation in any other way. This work was done in five hours' flying time at a cost of $125.

Another interesting piece of aerial work was made on December 22, in the form of a map, to scale, made from photographs of the three highways coming into Shiprock Indian Agency. These highways come in from three distinct directions, one from the north, one from the east, and one from the southwest. Besides the Indian agency, the San Juan river must be considered in any highway location at this point. The main object of this map and survey was to try to settle a disagreement between the Indian agency, the Bureau of Public Roads and the state on rights of way.

If possible, it was the state's desire to save the expense of building

(Continued on page 17)

NEWS OF THE MONTH

One-half of the cost of the La Veta Pass and Holly-Granada projects is being paid for by the Federal government.

Receipts of the Highway Department show in the first four months of 1932 a decrease of approximately $120,000. This is about 15 per cent less than the estimated revenue for this year.

By means of heavy equipment and a crew of eighteen men Berthoud Pass has been kept free from snow the past winter. A U. S. Bureau of Public Roads supervisor is in charge of the work.

Over 5,000 men were given employment on Colorado roads last summer as a result of the increased road appropriations. In some communities of the state the expenditure of road funds proved a "life saver" to scores of workers.

On the 15th of April project agreements with counties totalled $600,000, according to Highway Engineer Vail. Work on over seventy projects in the various counties were in course of construction. Over 1,000 men were being employed.

The post on which the direction signs are being placed is a new type of post, which appears stronger than the standard type for their weight, and there is strong possibility that these posts will find a large demand in the commercial field.

Highway Engineer Vail was elected president of the Democratic Club of Denver for the seventh consecutive time on April 20th. The Democratic club is a social and charitable organization and is one of the oldest clubs of its kind composed of Democrats in the country.

Plans have been submitted to the U. S. Bureau of Roads for the construction of a magnificent new concrete arch bridge above Manitou to complete the Ute Pass highway project. The bridge is of unusual design and a special bridge engineer will be placed in charge of construction.

Two Federal Aid unemployment projects are now in course of construction. One is located on La Veta Pass and the other is between Holly and Granada on the Santa Fe Trail. Nearly two hundred men were given work on these two projects during March, said Mr. Vail.

Between thirty and forty thousand markers will be placed on Colorado highways this summer, according to Highway Engineer Vail. Work of placing the signs was started in Denver on April 1st. About 900 signs will be placed on the streets of Denver.

Plans are under way by the forces of the Highway Department to start oil surfacing operations about the middle of May. Several much-needed improvements will be started at that time. A number of the planned projects will be carried out by contract, while others will be constructed by state forces with state equipment.

If you are interested in relieving the unemployment situation in Colorado through the medium of increased road improvements, write or wire your congressman and senators. Let them know how you stand on this vital question. Latest reports from Washington indicate a change in sentiment for the road relief appropriation.

Over $19,500 has been contributed to the unemployment by state employes. Of this sum approximately $13,500 was contributed by employes of the State Highway Department, according to James Noonan, treasurer of the fund. This money is being expended for labor in the placing of road markers on the main roads of Colorado. The work is being carried out in co-operation with the Highway Department. The department pays for the signs and the employes are paying for their placing on the roads.

At Holly the state forces are laying eight miles of base coarse gravel in preparation for pavement or oil surfacing later. A crushing plant has been installed and in March 140 men were given employment. James D. Bell is in charge of the engineering and Jack Lumsden is supervising the workmen. This project also is being constructed in Federal Aid specifications.

The La Veta Pass project calls for the construction of five miles of new roadway, starting at the summit of the pass and extending eastward. The work consists of widening, straightening on a new grade and new surfacing on Federal Aid specifications. James D. Bell is in charge of engineering on the project, while Axel Swanson has charge of the working crews. Local labor is employed.

At the present rate of progress that is being made on the Loveland Pass project, this road will be opened to limited traffic about August 1st, according to reports from the field. A crew of twenty-five men has been given employment on this project throughout the winter. B. T. Miller is resident engineer in charge of the work.

Edward Selander, contractor, expects to be finished with his 4½-mile grading and graveling project near Strasburg on U. S. route No. 40. This project includes an underpass of the Union Pacific railroad tracks one mile west of Strasburg. When finished this project will mark the completion of the Denver-Limon grading and graveling project.

The signs and the posts upon which they will be attached were made of Colorado materials and by Colorado workmen. So far more than 400 hours of labor has been created in the making of the signs, and more than 1,000 eight-hour man days of labor has been required in making the posts in the Pueblo steel mills of the Colorado Fuel & Iron Co., according to John Furlong, in charge of placing the signs.

On May 15th W. F. Pigg & Son, contractors, expect to be placing oil surfacing material on sixteen miles of U. S. 40 between Cheyenne Wells and the state line. About 23,000 tons of material will be required for the job. H. C. Lallier, contractor, is preparing material for the placing of fifteen miles of oil surfacing west of Burlington. The Pigg project will be plant mix, while the Lallier project will be road mix.

lue of Aerial Maps in Highway Location

(Continued from page 15)

unsatisfactory layout around the ian Agency and possibly a new dge across the San Juan river. It k about six hours' flying time to ke the pictures for this map at a t of $250.

It is hard to determine the eco- nical value of aerial work con- ted with location. Besides the e saved, it gives a much better dy of the country on preliminary estigation before an actual loca- is made than can be obtained in other way. Often a mountain s or open easy country can be lo- ed from the air which would be eptable as a route between con- l points that one might fail to find any amount of study from the und. It is hoped that the past ex- ience in aerial work will be a be- ning for more extensive work of s kind in the future.

Costs

The following is a brief summary the aerial work which has been e to date and the estimated cost doing the work by ground meth- . The estimated saving to the e by making these investigations air is very conservative:

Location	Cost of aerial survey or reconnaissance	Estimated cost of obtaining data in any other way than by air	Saving to State
ta Fe-Aztec	$100 Reconnaissance	$750 (To make reconnaissance)	$650
joles-Valle	$50 Reconnaissance and study location	$1200 (To make reconnaissance and preliminary locations required if aerial study had not been made)	$1150
dy of drainage A. P. 21 k and Ramah	$30 Drainage study	$300 (To obtain drainage data)	$270
guna-Zuni via ma-Inscription	$125 Reconnaissance	$750 (To make reconnaissance)	$625
A. P. 149 hiprock	$250 Reconnaissance aerial map and photographs	$1250 (To make alternate locations that will not be necessary with the data at hand obtained by aerial reconnaissance)	$1000
al Costs	$555	$4250	$3695

n making the above estimates of ings, no consideration has been en to the important feature of the e saved in submitting reports or the fact that if these investiga- ns had been made on the ground an additional engineering force would have been required for a period of several months.

Discussion by J. S. Marshall.*—Mr. Lassetter's presentation of the subject of aerial reconnaissance shows that the New Mexico State Highway Department has been pioneering in an interesting phase of highway engineering. New Mexico's experience indicates the best procedure in getting the greatest value from an aerial survey.

In 1930 the State Highway Department of Colorado authorized the 120th Observation Squadron, Colorado National Guard, to furnish a series of overlapping aerial photographs of the Denver-Limon highway between Denver and Strasburg. The members of the squadron and their commander, Major Bruce Kistler, very kindly cooperated with the department on this project. The flights were made during the military training period between June 7th and June 21st, 1930.

A total of 139 views were delivered, extending from a point approximately 4 miles east of Fitzsimons Hospital to Strasburg via the present road and via the Arapahoe-Adams county line. A total linear distance of 38 miles was covered. These pictures are contact prints, seven inches by nine inches in size, and have an approximate scale of 1 inch equals 400 feet. A section 3200 feet wide was covered by each strip. The pictures were indexed, and placed for reference in loose-leaf binders.

These pictures were not available for use by the field party since they were made after a portion of the location survey on the Denver-Limon road had been finished. However, they were used in the office to check topographic details on field plans and to supply additional data for construction plans prepared in the Denver office. Drainage courses and the meanderings of streams were clearly indicated. These details were transcribed where they related to drainage of the project.

At a conference on the routing of Federal Aid Project No. 149-C at Watkins, when alternate survey lines were not available, the photos were used with great satisfaction to show proposed stream crossings and property encroachments. During preparation of a contour map at the underpass location west of Strasburg on Federal Aid Project No. 149-E, the aerial survey assisted in quickly determining ridge and drainage lines, fences, existing roads, and much other topographic information. The photos have supplied much information on road position, section lines, railroads, towns and streams, for use in preparing sketch maps and in revising details on the military maps which are maintained in the Denver office.

A study of the photos was made with a home-made stereoscope. With the appearance of the third dimension, namely depth or differences in elevation, many details not noticed in the single pictures were easily found. Groups of buildings, stream banks, railroad cuts and embankments — even fence lines — were brought out in bold relief.

The stereoscope is a great help in studying topographic detail on the aerial pictures. For this purpose, the areas of adjacent pictures should overlap at least 60 per cent. The machine in one form consists of four mirrors supported on a metal stand. A good one can be purchased for $85 or one can be made in an evening with fifty cents' worth of plate glass mirror. Two overlapping photographs are placed under the reflecting mirrors, and the details are studied by bringing the images of the two pictures into juxtaposition.

In general, the photographic record of the aerial survey will furnish a more complete record of topographic detail than can be expected from the average ground survey, and the additional information can be used to supplement the ground work.

*Chief Draftsman, Colorado State Highway Department, Denver, Colorado.

This paper was presented at the recent annual conference on highway engineering held at the University of Colorado.

Why Motor Taxes?

By W. R. SMITH, President of the American Road Builders' Association

MOTOR vehicle taxes that have to do with the **use** of such vehicles were imposed at the very beginning for the purpose of improving the roads and streets over which motor vehicles operate. Such highway improvement reduces the operating costs of motor vehicles to the extent that the annual saving due to surfaced roads more than equals the cost of maintaining the highways and the capital investment in new improved roads built outside of cities.

Motor vehicles are dependent for their best operation on the existence of good roads. In addition, no other medium of transportation has been developed that does not depend on highways for its operation. Waterways serve those on the shores, railroads aid people at sidings along the route, airplanes reach only their landing fields. Improved highways fully equipped with motor vehicles connect passenger and freight stations inaccessible without them. From the raw material to the manufacturer, to the distributor, to the retailer, to the consumer, the highway plays an indispensable part.

New industries and more widespread use of commodities developed as a result of highway improvement have increased tremendously the business of other transportation agencies. The highways have persisted and grown in importance because of the service rendered to the public, and their usefulness has been multiplied manyfold through the development of motor vehicles.

The gasoline tax was originally designed to be used only for the improvement of highways upon which motor vehicles are dependent. License fees, distinctly charges for the use of the public highways, have always been devoted to highway purposes. Through the development of these use taxes, which some claim might better be designated as road tolls, the cost of building country roads has been transferred almost entirely from real estate to motor vehicles. Owners of motor vehicles, who in general have suggested the imposition of such taxes and have not objected to them, are compensated in the decreased cost of operation on good roads. These taxes are a true measure of the benefit each taxpayer receives from the use of highways. They apply locally to vehicles from other states. The use taxes on motor vehicles are said by experts on taxation to be the fairest and most nearly perfect form of tax that exists in the United States today, when the proceeds are applied to highways.

The gasoline tax and motor vehicle fees return more than a billion dollars for highways in states, counties, and cities. This is the major part of the cost of country roads. Real estate now pays scarcely a third of the road costs. Highway programs have become stable, so that roads are being built in an economical and systematic way with future improvements planned to meet the growing highway traffic needs, should road improvement ever succeed in catching up with the new developments and rapid growth in number of motor vehicles.

It has been suggested that our road systems are rapidly reaching completion. On the contrary, the task of building the highways of the United States hardly is begun. There are 3,200,000 miles of country roads, of which 700,000 miles have been improved in varying degrees, but only 138,000 miles hard-surfaced. There are 2,500,000 miles of highways that are still mud roads and subject to the "mud roads tax" paid by the motor vehicle owners in the form of higher operating costs, increased depreciation, and greater upkeep expense. "We pay for our roads whether we have them or not" is held to be axiomatic by careful students of highway economics.

At the present rate of construction of state road systems, reconstruction of the systems will be upon us before the state highways are completed. There are 101,000 miles of primitive, unimproved roads included in the 324,000 miles of the combined Federal Aid and state highway systems, and only a small part of the Federal Aid system has been improved with high type surfaces. In cities, streets must be widened and arterial highways constructed to permit vehicles to operate economically. In rural areas, byways must be surfaced for motor vehicle travel, roads widened, and safety of traffic at high speed insured by adequate highways. All this work to keep up with new vehicle developments is in addition to the improvement of the 2,500,000 miles of highways that are still primitive roads.

On U. S. routes all signs will be of standard embossed metal, while on the secondary state roads the signs will be the same color, black on a field of white, but will be made of wood.

A section of newly-completed Federal Aid gravel-surfaced highway located east of Durango in La Plata County.

EDERAL AID OF VALUE TO LOCAL ROAD BUILDING

Although Federal Aid to states in id building is confined to the main ate highways, federal assistance s been of great importance in the provement of local roads.

This statement was made by ederic E. Everett, president of the erican Association of State High- y Officials, in commenting on the ed for continuing Federal Aid at present level.

"When the first Federal Aid sys- n map was published in 1923 the leage on the system was about ,000 miles. Since that time the leage has been increased to ,000," said Mr. Everett. "In 1923 roads composing the state high- y system, which also includes the deral Aid system, totaled 203,000 les, and now the total is about ,000 miles greater. Much of this ditional mileage on the state sys- ns consists of roads taken over m counties and townships, which ieved them of a tremendous finan- l responsibility.

"The states were better able to ume charge of these local roads because of the federal plan of road building cooperation which permitted them to make rapid progress in improving the main state roads.

"A direct case of how counties benefit through Federal Aid was cited by Thomas H. MacDonald, Chief of the U. S. Bureau of Public Roads, in a recent statement made at the hearings conducted by the Committee on Post Offices and Post Roads of the U. S. Senate.

"To quote Mr. MacDonald: 'The state (Wisconsin) has a trunk system of about 10,000 miles. The improvements during 1930 on the state trunk line system were constructed in two classes. One class was built with Federal Aid; the other class was constructed without Federal Aid. For the improvement of the Federal Aid projects, the cost was distributed: state 59.2 per cent, county 23 per cent, and Federal Aid 17 per cent. For the state trunk line projects not on the Federal Aid system, the county contribution was 40 per cent and the state contribution 59.8 per cent. The state contribution was the same in both classes of state trunk projects and the Federal Aid contribution was applied entirely to reduce the portion paid by the counties on Federal Aid projects.'

"It is clear," concluded Mr. Everett, "that federal assistance in improving the heavily used state highway systems, which are largely coincident with the Federal Aid system, is performing the very important secondary function of lifting great mileages of roads from the shoulders of local communities."

THROUGH TRAFFIC HAS RIGHT OF WAY ADVANCED AS UNIVERSAL TRAFFIC RULE.

A motor vehicle moving at normal speed in a single traffic lane on a road carrying more traffic than an intersecting road has the right of way over vehicles making any other maneuver whatever, according to the trend of present practice in driving. This simple traffic rule was advanced by a committee of city traffic officials, M. O. Eldridge ,assistant traffic director, Washington, D. C., chairman, reported.

"Lack of observance of the rule of

right of way or confusion due to misunderstanding of that rule caused 36 per cent of the motor vehicle accidents in Connectcut in 1930," the report declared.

"The Hoover Code defines motor vehicle right of way as the 'right to immediate use of the highway.' It is rather common driving practice—regardless of regulations—to hold the driver of a car coming from a secondary highway strictly responsible for barging into through traffic.

"The effect of giving through traffic the right of way will be to fix the responsibility for accidents more definitely than can be done under present conditions," stated the report. "Failure to grant right of way, a potent cause of accidents, and operating on the wrong side of the road, another prolific cause of accidents, would not be so important as causes of disaster if drivers have a simple and clear idea as to just what are their rights on the road.

"The left-hand turn can now be made with safety only when the intersection is clear. According right of way to through traffic makes it necessary for the left-turner to wait until the street is clear. This idea is in full accord with what the public seems to think right of way should mean," the report concluded.

Centralized Control of Public Highways

(Continued from page 8)

ing road funds to other purposes, reducing fees or other sources of road revenues, or increasing mileage of the state highway system."

To my mind, as I said before, this condition is one of prime importance in considering the question of transferring county roads to the custody of the State Highway Department, and such transfer should not be made until the state roads have been brought to a high standard of improvement.

And yet, there is another side even to this point. Mr. Ross says:

"Let me suggest that the concentration of this large responsibility under one organization has not really created any new problem for the state and for the taxpayer. The same problems of mud and dust and expensive and inefficient prisoners were with us before. We have only brought our problems out in the open. We are attempting to bring to bear upon them the best that science and organization and coordinated effort can do. We have transferred from the realm of local political contest to an organization operated upon business principles one of the great and vital economic necessities of our modern life."

Another observation which has a distinct bearing on this subject is that the local officials are in a much better position to know the local needs than is the distant central organization. That observation doesn't need to be amplified as an argument for the affirmative: it is the whole discussion in itself, and has considerable merit. But let me present the negative side of the proposition. If you substitute the words "local wants" for "local needs," I grant you everything—except that I do not think that local wants, or even local needs, should control. We are speaking of highway building and utilization; the art and science of furnishing travelable ways for the needs of transport, and where "local needs" means local transport-way needs, we are a step nearer to talking on common grounds. But the local official, be he ever so wise and ever so honest and ever so efficient, has at least the disadvantage of being subject to so many influences, either consciously or unconsciously, bringing pressure from local wants and local needs other than transport-way needs, as to cloud his vision of even the transport-way needs of the locality, to say nothing of being able to give proper weight to needs of those away from the local environs who wish to make use of the transport-ways. You will find that trouble even in the central organization when the local representatives thereof are adversely influenced by local considerations in the most honest way against conclusions consistent with a broader and more comprehensive view.

This is the stopping point. I have endeavored to present some of the things to be considered in studying the problem before us in story form. I surmise that sometimes I have been a little argumentative, but above all I hope it has interested you, and that you won't stop thinking about it.

This paper was presented at the recent annual conference on highway engineering held at the University of Colorado.

PLANS BEING PREPARED

Proj. No.	Length	Type	Location
122-R3	11 mi.	Concrete Pav't & Overhead R. R. Crossing	Julesburg, east and west
145-D	6.5 mi.	Gravel Surfacing	East of New Castle
248-D	5 mi.	Gravel Surfacing	South of Buena Vista
260-A	6 mi.	Gravel Surfacing	East of Montrose
263-D	5 mi.	Gravel Surfacing	West of Ft. Garland
286-F	0.5 mi.	Concrete Pavement & Bridge	North of Greeley
294-C	8.5 mi.	Gravel Surfacing	East of Cortez
298-E2	0.1 mi.	Bridge	Wolf Creek Pass

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
58-AR 216-AR&B	Between Holly and Granada	7.825 mi.	Gravel Surfacing	State Forces			58-AR 216-AR&B
68-B	South of Saguache	3.290 mi.	Gravel Surfacing	H. C. Lallier C. & E. Co.	$ 74,428.75	63	68-B
145-C	East of Rifle	14.901 mi.	Grading & Grav.	A. R. Mackey	271,703.80	60	145-C
149-E	Between Bennett & Strasburg	4.412 mi.	Gravel Surfacing	Edw. Selander	60,930.18	34	149-E
150-C	West of Craig	6.893 mi.	Gravel Surfacing	J. Fred Roberts & Sons	120,139.05	69	150-C
150-D & F.L.P. No. 1	Between Elk Springs & Massadona	0.691 mi.	Gravel Surfacing	N. M. Monaghan	156,379.26	22	150-D & F.L.H.P. No. 1
158-A	Between Manitou & Cascade	4.062 mi.	Grading	Hamilton & Gleason	164,681.20	99	158-A
158-B	Bet. Hartsel & Florissant	10.319 mi.	Gravel Surfacing	J. H. Miller & Co.	133,380.70	77	158-B
181-A	In Idaho Springs	1.876 mi.	Paving	J. Fred Roberts & Sons	93,749.55	41	181-A
248-C	Between Buena Vista and Salida	3.944 mi.	Gravel Surfacing	Pantle Bros.	48,780.50	62	248-C
258-I2	East of Montrose	Concrete	Box Culvert	Hinman Bros. Const. Co.	8,455.50	99	258-I2
259-B	Bet. Gunnison and Parlin	9.587 mi.	Gravel Surfacing	Cole Bros.	184,503.00	69	259-B
262-ER	West of Walsenburg	0.465 mi.	Gravel Surfacing	W. A. Colt & Son	20,736.75	10	262-ER
263-C	East La Veta Pass	5 mi.	Gravel Surfacing	State Forces			263-C
265-E	West Bayfield	2.950 mi.	Gravel Surfacing	J. H. Miller & Co.	978,39.06	86	265-E
270-E	Bet. Del Norte & Monte Vista	8.663 mi.	Gravel Surfacing	Mountain States Const. Co.	102,199.10	92	270-E
278-D	West of Cheyenne Wells	21.913 mi.	Gravel Surfacing	A. R. Mackey	93,563.30	100	278-D
292-D	Bet. Wolcott and Avon	9.834 mi.	Graded Surface	Utah Const. Co.	159,143.40	88	292-D
295-E	South of Alamosa	7.627 mi.	Gravel Surfacing	Mountain States Const. Co.	71,049.56	99	295-E
296-AR&BR	South of Pueblo	4.372 mi.	Paving	New Mexico Const. Co.	154,509.00	73	296-AR-BR
298-E	South of South Fork	1.894 mi.	Gravel Surfacing	Grant Shields	92,279.20	0	298-E

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Vol. XI March, 1932 No. 3

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Colorado Highways

"BETTER ROADS"

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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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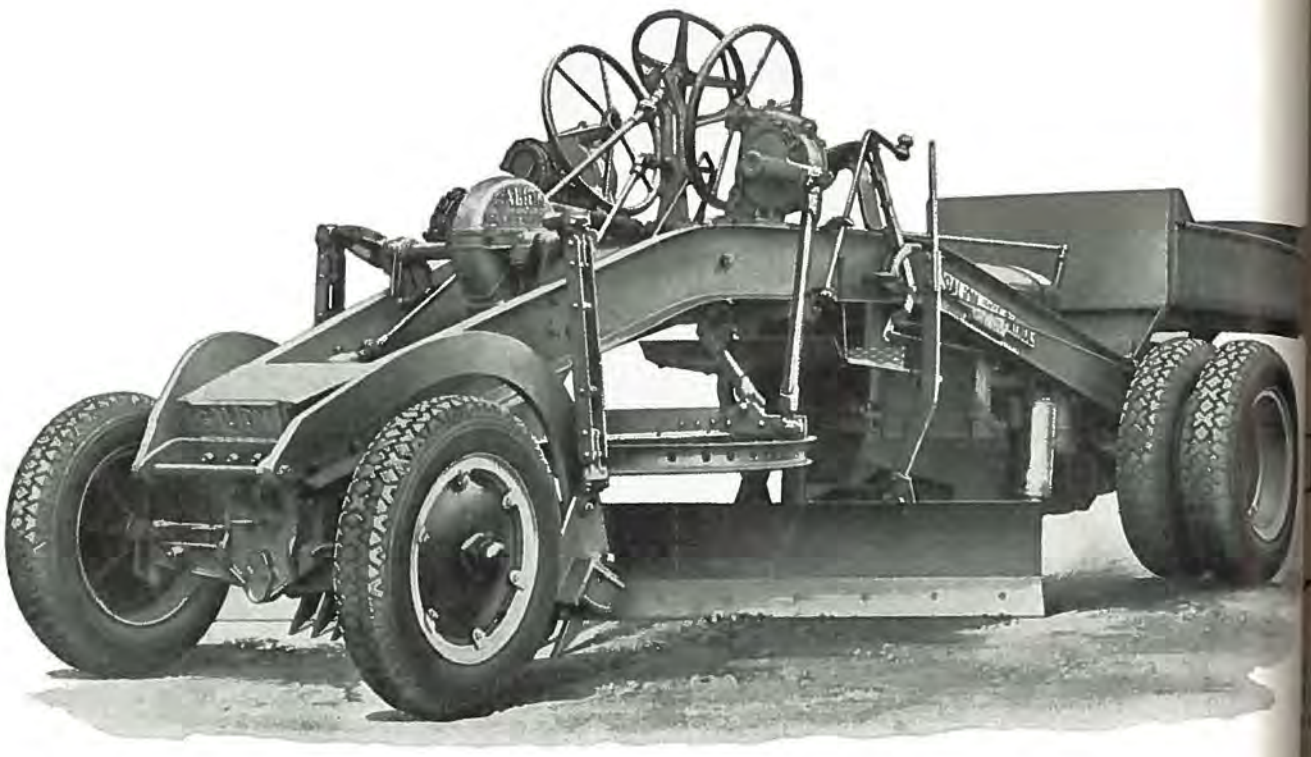
Our Cover Picture

ROADS are the arteries of commerce. The free flow of goods and supplies determines the economic well-being of a community or a nation. This was as true of yesteryear as of today. On the front cover of this month's COLORADO HIGHWAYS we have a picture of an ox train going up Ute Pass, taken more than 60 years ago. The train is hauling supplies to Leadville. On another page we print a picture of the newly completed modern highway in Ute Pass, above Manitou, taken almost in the same spot as the picture of 60 years ago. Photos furnished by courtesy of Jack F. Lawson, Colorado Springs.



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Colorado Highways
"BETTER ROADS"
VOLUME XI. MARCH, 1932 NUMBER 3

Diversion of *Gas Tax Money* Has Pitfalls

By E. E. DUFFY

THE gasoline tax was created as a tax on road usage as a means of obtaining the large funds needed to build connected highways and surfaces that eliminate mud and give low cost motoring. Yet lawmakers have been giving increasing attention to using this tax money for other purposes not at all connected with road building.

During the years in which the gasoline tax has been in effect motorists have pledged support to higher tax rates, for they realized that the money expended by them in motor fuel taxes was being returned many times over by lower car operating costs, increased safety and comfort. Had they realized that some day lawmakers, taking advantage of their legislative power, would transfer these funds from the highway budget to other purposes, it is very doubtful there would be a gasoline tax as it is known today.

Whenever gasoline tax money is diverted to other purposes than for road construction it then becomes a special tax, or a luxury tax, and not a user tax. This abuse of the gasoline tax will in the end mean widespread demand for reduction in the tax rate and even abolishment. It would be only a matter of time until motorists registered strenuous objections against a special tax for miscellaneous purposes, a tax which they themselves created and sponsored for road construction to the benefit of the nation.

Aside from the lack of ethics in gasoline tax diversion, there is a very important reason why this money should be left in highway funds. Money spent for road building goes largely into the pockets of workmen. Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads, has calculated that $910 out of every $1,000 given to contractors for building concrete pavement goes to labor. In general, from 75 to 90 per cent of the money spent in road construction does the very important job of directly furnishing people with livelihood.

Beyond that, the largest industry in the United States, the manufacturing and servicing of automobiles, is greatly dependent upon road activities. The automobile industry provides employment for 4,000,000 men directly and an additional million men are kept busy supplying raw materials. The automobile industry furnishes employment, then, for roughly one-fifth of all "gainful" workers in the United States.

It is conceded that the automobile industry will be quicker in the return of normal business. Clearly, in the face of the road improvements needed, a pick-up in the automobile industry will be greatly retarded through the curtailment of road construction made necessary by the diversion of gasoline tax money.

The diversion of gasoline tax funds is intolerable to motorists for the following reasons:

1. The tax is equitable for road building purposes because it is assessed against those who use the roads, in proportion to such use, but it is inequitable for general or other special purposes. Such use grossly penalizes motorists.

2. Diversion even for worthy uses encourages the habit with lawmakers and opens the door to grabs for an endless variety of purposes.

3. Diversion of these funds breaks faith with motorists—repudiating the pledges of the lawmakers that the gasoline tax would be used exclusively for road building.

4. The legality of diverting gasoline tax funds is in question. Court attacks would be invited, stopping collection of the tax and tying up funds already collected.

5. Diversion of road funds would take away needed revenue which would have to be secured through other sources.

6. Modern highway requirements demand a dependable, fixed income for roads. This is provided by the gasoline tax. Diversion will cause confusion, waste and delay.

7. Gasoline tax funds provide employment; diversion adds to unemployment. Ninety per cent or more of the road dollar is eventually paid out for wages and salaries. Road and street building required the labor of three million persons in 1931.

8. Road construction has a direct effect on the prosperity of the automobile industry, which provides employment to 4,000,000 men and uses the products of 1,000,000 men additional. By lessening road building, diversion would decrease the demand for motors and motor products.

9. Divert the gasoline tax and road building costs or deficits may revert back to general taxes.

10. Diversion of gasoline tax would make the tax so unpopular that its usefulness would be destroyed. Then neither road building nor the purposes for which diverted can benefit.

11. By interrupting highway construction and maintenance, diversion of these funds would deny motorists the benefits of decreased operating costs to which they are entitled as payers of the tax.

American Legion *Backs* Road *Bil*

PASSAGE of the pending federal emergency highway construction bill, appropriating $136,000,000 for road work all over the nation, has been urged upon Congress by the American Legion as "an economically sound and definite measure" of unemployment relief, according to announcement from the War Against Depression Campaign headquarters in the Hotel Biltmore.

The Legion's united backing of the bill was made known in a statement [illegible] Henry L. Stevens, Jr., [illegible] national commander of the organization and general chairman of the campaign, who said that the Legion's legislative representatives in Washington had been directed to inform Senate leaders and the White House of its stand. The bill—H. R. No. 9642—has passed the House and been favorably reported out by the Senate Committee on Post Offices and Post Roads.

Under the stagger system, highway construction throughout the country, authorized by the bill, [illegible] more than 300,000 men to work seasonally, the statement from National Commander Stevens said. About a third of the states have been financially unable to match the federal appropriations for road work, and the fund made available by passage of the bill would enable them to begin needed improvements almost at once, it was said.

"Passage of the emergency highway construction bill at this time will be of almost immediate benefit to the country at large," Commander Stevens said, "and in urging its adoption the American Legion feels it is putting its strength behind an economically sound and definite measure of unemployment relief.

"Our great effort now is to put jobless men back to work, and the records of the United States Bureau of Public Roads show that from 75 to 90 per cent of the average dollar spent in highway construction goes ultimately to the wage earner, either directly or through employment in industries furnishing materials. No other type of public improvement gives such a large share of the expenditure to labor, and distributes its benefits so generally through the country.

"Our estimate that passage of this bill would put more than 300,000 jobless men back to work on the stagger plan is based on government statistics, proven by the past expenditures of federal highway construction funds. By its very nature the road work will be seasonal, but by using the stagger system of employment this great army of jobless men—jobless through no fault of their own and facing the future with discontent and despair—will be given the chance to work and support themselves and their dependents.

"Better roads always have meant better business, and no one can question the wisdom of the expenditure of government funds for such a purpose. We believe also that the example of the government will inspire the leaders of business and industry to loosen their purse strings and institute needed improvements and expansions, all of which will furnish jobless men with employ[illegible] and lead to the economic rehab[illegible] tion of our country.

"Unless this bill becomes [illegible] thousands of men will be adde[illegible] the ranks of the jobless, becaus[illegible] ployers all over the country wi[illegible] forced to discharge men now [illegible] gaged in road work."

The National Employment [illegible] mission of the American Le[illegible] which, in co-operation with [illegible] American Federation of Labor[illegible] Association of National Adver[illegible] and the American Legion Auxi[illegible] has been conducting the [illegible] Against Depression Campaig[illegible] put a million men back to wo[illegible] backing up the Legion's stan[illegible] urging passage of the highway [illegible] struction bill, the headquarter[illegible] nouncement said.

An obligation rests upon the [illegible] eral government to carry for[illegible] vigorously a program of needed [illegible] lic works. In quickening pro[illegible] on the Federal Aid highway s[illegible] a well-tested method of putting [illegible] to work will be used, declared [illegible] ator Trasker L. Oddie, chairm[illegible] the Senate committee on post [illegible] and post roads, in addressing [illegible]

A stretch of modern Federal Aid highway located east of Montrose on U. S. ro[illegible] No. 50, which will save motorists thousands of dollars in "mud tax" in years [illegible] come.

Senate on the emergency bill to provide $136,000,000 for Federal Aid road building.

Senator Oddie called to the attention of the Senate various statements of President Hoover recommending the policy of enlarged public works programs in periods of slack employment. In an address in St. Louis on November 2, 1928, President Hoover said: "These public works, which will provide jobs for an army of men, should, so far as practicable, be adjusted to take up the slack of unemployment if it should occur."

"The present bill is similar to the emergency measure of 1931 which provided for an $80,000,000 emergency highway fund. The total amount provided for Federal Aid highways, including the $136,000,000 bill for emergency construction, maintains federal participation in road building on par with that of 1931," continued Senator Oddie. "The Federal Aid method of road building is not changed by the emergency proposal, but the rate of accomplishment is accelerated. Funds advanced now to avoid a recession in Federal Aid road building and increased unemployment will be repaid out of future appropriations. They serve a twofold emergency purpose in that they provide additional needed highways at an earlier date, and they furnish additional employment at a time of dire need."

"The passage of the emergency road building bill by the House with the support of both parties indicates the non-partisan character of the measure," declared Senator Oddie. "Leaders of all political parties have acknowledged the benefits which improved highways contribute to the social and economic welfare of the public."

That relief of much unemployment will follow the stimulation of Federal Aid road building is clearly shown by the record of last year when states, counties and cities employed nearly a million men on highway work, he stated. In addition, for each man working on the highways there are two men behind the lines in allied industries. In the first breakdown of road expenditures the item of transportation takes $406 out of every $1,000, showing to what extent railroads and railroad workers benefit by highway building. Hearings before Congress showed that as much as $910 out of every $1,000 expended on some roads went directly to wage earners.

Senator Oddie, in co-operation with Senator Hayden, is seeking to have a definite date set for a vote on the bill in the very near future.

Of the $136,000,000 appropriation contained in the bill, the allocation would be as follows: Federal Aid highway system, $120,000,000; national forest highways, $5,000,000; improvement of national forest, $5,000,000; roads and trails inclusive of necessary bridges in national parks and national monuments, $3,000,000; Indian reservation roads, $1,000,000; main roads through unappropriated or unreserved public land, non-taxable Indian lands, or other federal reservations other than forest reservations, $2,000,000.

ROAD CHIEF SHOWS LABOR GETS MOST OF HIGHWAY MONEY

Labor gets $910, or about nine-tenths, of every $1,000 received by the contractor in building a concrete pavement, according to a statement issued by Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads, in testifying recently at the hearings of the Senate Committee on Appropriations.

This statement, resulting from an extensive study of all the costs of building concrete pavement, was a part of Mr. MacDonald's testimony showing the value of road building in providing jobs for the unemployed.

Mr. MacDonald explained: "The fact that so much of the road dollar, from 85 to 90 per cent, goes into labor, either directly or indirectly, is due to the fact that there are no intrinsically valuable materials used in road building."

The data presented by Mr. MacDonald show that of the $1,000 given to the contractor for building concrete pavements, $141 is spent directly by him for labor on the job. An additional $44.70 is spent for labor by him in getting on the job and for other miscellaneous items.

The contractor pays mills and quarries $675, which along with $139.30 spent by the contractor through other agencies, is distributed so that labor eventually receives another $724.30, making a total of $910 received by labor from each $1,000. This money is expended for wages in mills and quarries, in transportation of materials and equipment, in the production of fuel, in the manufacture of supplies and equipment, and so on.

In commenting on the fact that labor receives such a large portion of the money required for concrete pavement building, road builders point out that labor benefits as much in high type pavement building, with extensive use of machinery, as in the construction of low type roads where comparatively little machinery is used.

Sixty-two per cent of Kansas' 8,690-mile highway system is now surfaced, of which 14 per cent is hard-surfaced. This state is planning the construction of 100 miles of hard-surfaced roads in 1932. In Nebraska the highway commission plans to construct 126 miles of concrete pavement in 1932 and 774 miles of gravel surfaced roads. The total budget totals $7,520,000.

A beautiful piece of concrete pavement located west of Manzanola in Otero County on the Santa Fe Trail or U. S. route No. 50, constructed with Federal Aid funds. Photo by U. S. Bureau of Roads.

Rails and Trucks *Fit in* Industrial Pictur

"IF you quit using trucks on long runs and the railroads on short hauls, both can fit into the industrial picture," claims Walter A. Olen, president of the Four Wheel Drive Auto Co., Clintonville, Wis., one of the largest truck manufacturers in the United States.

Mr. Olen does not believe that truck regulation is a problem to be solved by the interstate commerce commission, but one for state regulation in the interest of the public. He further maintains that trucks are a benefit to the railroads just as horses were in their day, with this difference: The 12-mile radius of the horse has been extended to 60 by the truck.

In that measure the railroads must readjust their present operations. He continues: "United States government reports show that the range of operation of a team of horses is between 11 and 12 miles from a given base and the same is true of caterpillar and wheeled tractors.

Horses Fed Roads

"Railroads were built up under this type of transportation and adjusted themselves to it. No doubt this was the reason why railroads could develop a country profitably for a distance of 12 miles from the track. It was due to the cooperation of team transportation that enabled them to operate profitably that distance from the railroad and thus be feeders for the road.

"Now the new type of transportation is the motor truck that will operate profitably on an average of from four to five times as far from a given base in the same day; the influence of the carrier is thus extended from 12 miles to 60 miles and perhaps agriculture and industry would break even for a distance of as high as 100 miles from a railroad.

"It would take only about 180,000 miles of rails, if properly laid, to bring a road within 12 miles of almost every part of America. There are now over 250,000 miles. No doubt many of these railways have outlived their usefulness and I think that about 50,000 to 70,000 miles of track will eventually be abandoned and some rebuilt through sections of the country where they are needed to connect industrial sections."

Ton-Mile Values

In further elaboration of his argument, Mr. Olen states that horse-drawn equipment will move a ton on the average of four miles for $1, wheeled and caterpillar tractors belonging in this group. Under the most ideal conditions this type of transportation, he continues, may move a ton as far as 10 miles for $1.

"Motor trucks will move a ton from 20 to 40 miles for $1 with the railroads moving a ton on the average of 100 miles for that amount. They used to move it 127½ miles for $1, and probably with the new freight rates it will be brought down to 95 or 96 miles for $1.

"Barge transportation will move a ton 750 miles for $1. It is estimated that water transportation, when opened between Chicago and New Orleans, will save the business men of Chicago an average of $7,000,000 a year and the farmers of Illinois an additional $5,000,000.

"Lake transportation, when passing through locks, will move a ton 1,000 miles for $1, and where it is open water 1,250 miles for $1. Ocean-going steamers of heavier type move a ton 2,000 miles for $1.

British Experiment

"Flying machines are now able to transport goods on an equality with horse-drawn equipment; that is, they can move a ton profitably four miles for $1. No doubt this will be improved and they will be able to handle light freight over long distances. This would leave the railroads to handle the bulk and tonnage commodities on long distance hauls; that is, over 60 to 100 miles."

In conclusion, Mr. Olen states: "After the World War the British government undertook to develop its colonies, and the first thought was to build railroads. They appointed commissions and conducted an exhaustive investigation found that a railroad would de a country agriculturally and fr manufacturing standpoint profit for 12 miles on each side of track, that from 12 to 20 miles from the road agriculture and in try might break even, but be that railroads had no influence."

SELL THE PUBLIC

The grip on gasoline tax fund state highway departments mu continually tightened these da other sources of public revenue tinue to dwindle and autho look even more longingly to these supplies. Those states la the good fortune to have ga funds protected by constitu amendment are in a particularly nerable position. Among the not so protected and yet su ingly free from pressure is C nia. The principal reason, i opinion of C. H. Purcell, state way engineer, is to be found conscientious effort at public tion built around a carefully st program of future develop showing the people how the sary program for highway con tion and maintenance for the ten years is an essential scheme. With its attention fi a definite future developmen public will resist attempts of a istration to defeat such a pr In the opinion of Mr. Purcell highway departments are too to point to what they have a plished rather than stress the remaining to be done. The l the conclusion is evident and i chology decidedly in order highway departments could w ford to focus public attention essential highway work for th ing decade, which will requ full use of all gas tax revenue gineering News-Record.

Iowa has an $11,000,000 ro gram budgeted for 1932. Th gram includes 200 miles of pa and 675 miles of gravel surfa

Improved Road *Pay Motorists* Big Profit

THIS is not a plea for a bond issue for the construction of improved highways. But from perusal of the following benefits that accrue to the motorist from improved roads, it will be easily found that the saving in the cost of operating motor vehicles on heavy traffic roads is often great enough to pay the interest and retire bonds issued for highway purposes.

It has been found that people are strongly moved by intangible benefits from good roads such as comfort, convenience, social intercourse, freedom from mud, and the desire to make the home county a leader.

The following conclusions are taken from a report prepared by a special committee of the American Road Builders' Association.

Intangible benefits may be listed as follows:

(1) Improved social advantages through better intercourse between town and country, and bring country people closer together.

(2) The growth and prosperity of a section are improved through better transportation.

(3) Mail deliveries are bettered, police protection improved, recreation facilities provided, healthfulness of people increased, police protection afforded, home building facilitated, schools are consolidated for better instruction, and medical attention becomes more prompt.

(4) Personal pride in the good roads of a home county leads to loyalty and satisfaction.

Tangible benefits may be summarized:

(1) **Increase the value of land.** Land values on improved roads are much higher than on dirt roads because of the better transportation facilities afforded. The highway is part of the farming plant.

(2) **Lower motor vehicle costs.** The maintenance costs of motor vehicles is much less than on unimproved roads and the depreciation is reduced. This may amount to several hundred dollars a year saving for each motor vehicle owner.

(3) **Fuel costs are reduced.** The consumption of gasoline on improved roads is much less than on dirt roads. The saving in fuel offsets the gasoline tax.

(4) **Estimate of profit to the public.** Estimating a saving of two cents a mile traveled, which is conservative for the saving on surfaced roads over dirt roads, each motor vehicle owner saves $100 annually if he travels 5,000 miles a year.

(5) **More vehicles, more prosperity.** Bringing more people into a section introduces new people with money to spend, and it increases the business of the county.

(6) **Provides work for the unemployed.** Road building absorbs the unemployed labor in a section and thereby avoids the necessity for charity and gifts of money for the unemployed.

(7) **Increases growth of section.** Good roads are a major attraction to prospective settlers in the county. Growth follows road improvement and all property values increase.

(8) **Business of local merchants improved.** Merchants' business is improved, distributed more evenly over the year, and mail order competition is lessened by permitting buyers to examine goods before purchasing.

(9) **Farming made more profitable.** Economical transportation from the farm is a strong element in farming profits.

(10) **Safety of motor travel improved.** Crooked roads with narrow bridges and culverts, and pointed hills that do not permit a view of approaching vehicles are unsafe. Good roads are safer roads for the same traffic and protect the lives of the public. In 1930 there were 32,500 people killed and 950,000 injured on highways. Property damage by automobile accidents is estimated at a billion dollars annually.

(11) **Reduced hauling costs.** Trucking costs are reduced and roads can be traveled at all times of the year. This means much to a farmer trying to get his goods to market when prices are highest.

(12) **Savings in time.** Every citizen is affected by the time saved on highways. Congestion cost on a road in New Jersey is estimated at two cents a minute delay per car. The National Conference on Street and Highway Safety estimated the annual loss due to highway congestion at two billion dollars.

(13) **Tourist travel aids business.** A U. S. Department of Commerce study shows that for every dollar spent by a tourist in a section general business profits as follows: retailer, 25%; restaurant, 20%; hotel or camp, 17%; garage and filling station, 12%; transportation, 10%; theatre and amusements, 10%; confectionery, 6%. The retailer gets his volume from the spending of employes of other local businesses.

(14) **Good business policy in time of depression.** Jacob Viner stated before the Institute of Politics that the policy should be in times of business expansion to tax heavily, spend lightly, redeem debts; in times of business depression to tax lightly, spend heavily, and borrow money.

(15) **Spending bond issue money stimulates business.** Local business is stimulated through the release of bond issue money in the locality. Estimates of a bond issue in Jackson County, Mo., were as follows: local labor, 39%; local material, 32%; equipment and miscellaneous, 12%; land, 17%.

The state of California announces a road budget for 1932 totalling over $38,000,000 for construction and maintenance. Mind you, this for one year's work. And we have heard some folks ask why it is that Colorado can't have roads like California. Colorado's budget for 1932 totals $5,421,000.

Of the 3,400 miles of Colorado roads in the Federal Aid road system, only about 1,400 miles are improved.

We Need Prosperity -- One Way To Get I

By CHARLES DAVIS, Founder and President, National Highways Association

HOW shall we get prosperity? Only two things are needed, work and money. We must have both; one will not do alone. Will one bring about the other? If so, which? Obviously, we must have money to produce work and through it prosperity—another word for being busy. What is money and how is it produced? It has been various metals, paper and what we call credits. What are credits? Black or blue (never red) ink on the books of some financial institution. So money appears to be a product which can be manufactured in any quantity by smelting and refining, by printing or by writing. Therefore there seems to be no difficulty in the way of having as much money as we need. To produce what money we need will be simple and will cost in labor and material very little. But how much will we need? Here is where we are likely to differ, for those who control money and have the say do not need or want it, and those who need and want it do not control and cannot say. I can only give my own judgment, which is enough money to put to work 6,000,000 or more people now out of work and to do this as soon as possible.

This is a big order, but not half as big or as difficult as the one we carried out so well during the war. For that we manufactured over $20,000,000,000 of credits and paper—not gold or silver or other metals. And we made it as fast as we needed it. How long did it take for many more millions to be busy? A few months—maybe only a few weeks. And how prosperous we all were!—all, that is, but the poor fellows in the trenches. Having done this for war, how can anyone say that it cannot be done or that it is unwise to do the same thing for peace? It is, in fact, easier, for we would have the full, whole-hearted co-operation of everyone instead of the resistance and the compulsion of wartime. Better still, instead of waste and destruction of wealth, we would be creating wealth, and many of our dollars would do two or more dollars' worth of work towards that end. To accomplish this, part of our effort to eliminate unemployment and restore farm values should be to construct secondary or local farm-to-market roads throughout the nation. How best can this work proceed?

In the more than 3,000 counties in the United States there are approximately 6,300,000 farms. About 2,750,000 are on unimproved roads and about 2,000,000 on roads with but little grading or drainage. The rest are on gravel and other improved surfaces, including some pavement. A study of several counties indicates that road improvement on about 20 per cent of the total mileage will serve approximately 80 per cent of the population. Therefore, let us improve this mileage, since for all practical purposes these 600,000 miles of improved roads would bring us "good roads everywhere." The accompanying summary of costs shows how this can be done.

If the government issues $6,000,000,000 in bonds with the circula privilege attached, these will the needed money, which is ot wise unavailable under present conditions of unemployment. The is for Uncle Sam to pay half the —$3,000,000,000, and for the o half to be divided 50-50 between states and the counties — ma $1,500,000,000 each.

If the government lends the and county shares ($3,000,000, to them out of the proceeds of sale of so much of the $6,000,00 of United States bonds and take security state bonds and co bonds at 5 per cent, the state the county share of the undertak will be retired in 50 years by the ference between the interest pai the government (3 per cent or and the interest paid by the st and counties. This means tha the end of 50 years Uncle Sam h back to the states and counties securities he took as collateral the debts are automatically w out. No other plan has ever wo out so that the interest paid o borrowed money not only pays interest but also retires the pr pal. Such a result has never be fore been attained in either pr or public finance.

If state constitutions or laws be changed, this can be agre easily, thus avoiding delay. we agree on the goal to be g we can easily find the way. T the way business does if cond require it.

No new organization need b up. The Bureau of Public Ro the U. S. Department of Agric and the state highway depart are fully competent and orga

If money is borrowed as ind above, the cost per person p num, 62½c, is negligible. means an average of 200 m improved road per county, will be of direct benefit to cent of the population. What can be attained at so low a c Better Roads.

WHAT IT WILL COST

Here are the figures on the cost of improving 600,000 miles of county road according to the plan of Mr. Davis.

A total of 600,000 miles of road can be improved to the extent of $10,000 a mile at a total cost of $6,000,000,000.

It is proposed to divide this cost three ways, as follows: one-half, or $3,000,000,000, to be paid by the federal government; one-fourth, or $1,500,000,000, to be paid by the states, and the other fourth to be paid by the counties.

This reduces to approximately $30,000,000 per state and $500,000 per county, based on 3,000 counties.

With an average county population —the country over—of 40,000, the direct cost to every person of the population will be $12.50.

At 5 per cent interest, with the aid of government loans as explained, the average annual cost per county will be $25,000 and the annual cost per person will be 62½c.

Picture above shows a section of the magnificent new highway through Ute Pass, above Manitou in El Paso County, constructed by the Colorado Highway Department in co-operation with the U. S. Bureau of Public Roads. Elimination of sharp curves and steep grades, with gravel surface, now make driving a pleasure. Photo by H. L. Standley, Colorado Springs.

How Racketeers *Evade* Gas Taxes

TRUCKS of gasoline speeding, at night, across the Louisiana border, carrying gasoline from Texas, to evade the gas tax of both states. The same trucks returning the following night, carrying Louisiana-produced gasoline into Texas.

Other shipments of East Texas gasoline carried on tank cars to obscure points on the Arkansas shore of the Mississippi River, and moved by barge, under cover of night, to landings in Tennessee.

Dishonest farmers, cleaners and dyers, and road contractors, fraudulently drawing millions of dollars from state treasuries as "refunds" on gas for industrial and agricultural use."

Legitimate and supposedly honest oil companies conniving with or selling to tax-evading racketeers. Operators who are bootleggers in secret waiting for months in the councils of legitimate operators before discovery.

Gasoline price-wars carrying prices to ruinously low levels when legitimate establishments attempt to meet the prices of tax-evading price-cutters.

"Night riders" delivering bootleg gasoline even to established filling stations of recognized national companies.

Bootleggers "blending" kerosene with other petroleum products and selling it as gasoline.

Operators boldly evading the tax, then going "bankrupt" and shifting their operations to new names when caught by the tax collector.

Local operators preparing to bootleg gas in other cities, wherever the transportation rates and tax laws favor them.

The state of Oklahoma collecting from a 5-cent tax, in one month, less than 60 per cent of the revenue that formerly resulted in the corresponding month from a 4-cent tax.

Bootleggers rejoicing at every gas tax increase, and in some cases believed to have lobbied on behalf of "more stringent laws."

These are but a few of the many striking, fantastic and appalling phases of the racketeer's entrance into one of our greatest industries. —Excerpt from an article, "How Racketeers Steal Millions in Bootlegging of Gasoline," by Wm. A. McGarry, in Forbes Magazine.

Construction of 135 miles of paving and street surfacing is scheduled in Los Angeles during 1932. The city will spend $3,500,000 on maintenance of streets alone. This is nearly $2,000,000 more than Colorado spends on its Federal Aid road system of 3,400 miles for maintenance.

In Indiana it is planned to construct 450 miles of pavement. It is estimated that $13,000,000 will be expended on this program.

During the winter months the state of Michigan has been carrying on a $10,000,000 winter construction program. A large part of this work has been put under contract and the surfacing will be laid during the coming summer.

Distributors' *Relation to Highway* Industr

By E. K. HURST, President, Associated Equipment Distributors*

I AM well aware of the general attitude of contractors towards salesmen of equipment, materials, bonds or any of the other items which they require in their business. During the past ten years of my experience in conducting an organization dealing in construction equipment and materials, I have repeatedly had it said to me, albeit with the intent of being humorous, but with a rather definite tone of sincerity, that, "We contractors are working for the equipment and material men."

It is undoubtedly a statement of fact, based upon firm economic laws, that no unnecessary and useless business can long endure. The very admission of the continued existence of any individual or business organization is evidence of their ability to render a service to others.

May I be bold enough to state that there is no place in the scheme of things for the contractor unless he has some knowledge, ability and finances, which, used through a proper organization, can render a service of value to other individuals. It is not the fact alone that he can lay one stone upon another and create a building or move yards of dirt and create a road. Such building or such road must have a place in the scheme of things whereby it can be of service to other human beings not interested in any of the processes of its construction, but purely in the use of a completed structure.

Now, let's take the equipment man's position in this scheme.

I will concede as a basic principle, just as I previously stated, that unless somewhere or somehow this equipment distributor is in a position to do something for the contractor, which he cannot afford to do for himself, then he has no place in the construction industry. It would sound a little egotistic for me to attempt to outline the many services which, in my opinion, the equipment distributor renders to the contractor. In making any such statement it must of necessity be general.

For ten years we have sat on the sidelines and watched the road construction parade go by in Colorado, with its attendant expenditure of nearly $100,000,000. During that period we have seen many contractors land in the hands of the bonding companies, and at the same time we have seen equipment distributors and material men hanging on the ragged edge of bankruptcy. We don't pretend to offer a solution of the problem. In the accompanying article Mr. Hurst displays an unusual understanding of the situation. Because we feel sure that it will give Colorado contractors and material dealers food for deep thought, we are printing his paper in full.—*Editor.*

If I may presume that certain equipment is required in all construction work, then it is logical to start from the point where the contractor has a job to do. He recognizes the necessity for certain equipment. His next process is to determine where to buy this equipment and just which equipment to purchase. Say, for instance, that he needs a hoist.

There are hundreds of hoist manufacturers in the United States. Every single one of these manufacturers has built a particular type of hoist, not merely by working out the design of a hoist and then asking the public to buy it, but by making detailed and exhaustive studies of hoist requirements in actual fields of operation. They have seen hoisting jobs where certain faults in the equipment used needed correction. They have then proceeded to attempt to build a hoist that would eliminate the hoist problem they saw.

The contractor who is in the market for this hoist is necessarily anxious to get the one that best fits his ideas of what a hoist should be, and he wants to know just as much about hoists as possible, then the one, both from construction fulness and price, that best fit requirements.

Assuming that there were n tributor organizations and tha only place that he could get th formation satisfactorily would a visit to the various factori would find himself requiring a time and an enormous expen travel in order to visit all of various factories.

The equipment distributor, ever, brings right into his do complete information, and gen carries in stock complete mac so that by going only a shor tance he is able to examine, at expense, a large number of the ous types of hoists manufac In any given group of distribut a section, he would probably b to study quite thoroughly eve portant hoist manufactured where in the United State within a short distance of his

When he has finally exa through this distributor org tion, a complete list of imp familiar types of equipment factured, he purchases the one seems to fit best into his r ments from the standpoint of tion and price.

To that one man from wh makes the purchase he pays mission, or so-called profit, r perhaps, from ten to twenty o ty-five per cent of the purcha He may have visited a dozen utors. Only one of them g order for that particular equi The others have rendered much service to him as the on whom he makes the p Eventually, however, some buys a hoist from each of the ment distributors, but on ev every equipment distributor the same service, whether h the sale or not. What every tor has in that case, assumin are a dozen distributors wit

*Paper read before Association Contractors' convention at Mitchell, S. D., Jan. 6, 1932.

consults, is twelve employes completely at his command, who are spending their entire time investigating the methods and processes of construction and the equipment best suited for this construction work.

So the equipment distributor, gentlemen, is an employe of yours, working for you, presenting to you all of the knowledge he can gain, and for this service you are paying, in commissions on the purchases made, a sum far less than it would cost you to have within your own organization employes charged with the duty of accumulating and assimilating all of this information that is at your command. If he renders this service to you, or if you believe that he does, then you must agree that he has a place in the construction industry.

The equipment distributors' sales engineers, if they are sales engineers and not merely order-takers, make it their business to visit many construction jobs, keep up on processes of construction and to know something of costs through certain methods. This information and these suggestions which he collects as an investigator into the construction field, he is in a position to pass on to you for your information.

I would not be surprised if each of you admitted facts but that some time in your contracting experience, and perhaps many times, services of this character have been rendered to you by the equipment salesman which have made you money or saved you money far in excess of any commissions that you ever paid that salesman on such equipment as you may have purchased from him. He is again your employe, not on your regular payroll, but nevertheless the commission you pay becomes compensation for personal service rather than merely a commission paid for taking an order.

I might follow this with examples, discuss at some length the service the distributor is able to render and does after the equipment is sold. His parts stocks and expert mechanical service engineers are other contributions to the industry.

I am speaking only of the regularly established, legitimate, responsible equipment distributor, not the fellow with just a desk space and a catalog. We refer to these as curbsters and they rank about the same in the equipment business as the old-time sidewalk contractor with a shovel, a hoe and a mixing board does in the contracting business.

I'm going to inject right here a suggestion I've frequently heard. "The equipment distributor should be eliminated and the contractor be permitted to buy direct from the manufacturer with the equipment distributor's discount off." That may be a subject worthy of more discussion than time will permit. Let me repeat again that no industry can long endure unless it renders a service better and cheaper than can be done through some other method. "The laborer must be worthy of his hire."

The important manufacturers have all tried direct selling, and I have it on good authority that, at least in most lines, they have found it a more expensive method of distribution than through distributors. If it costs more, it must be added to the price the contractor pays—the ultimate user eventually pays the bill.

So far, this is merely a discussion to establish the place in the construction industry of the equipment and material distributor. His success, however, is bound up in, and dependent upon, the success of the contractor, and all other industries interested in the construction program.

A recent hurried survey was made in a neighboring state of the number of separate industries that were directly, and for business reasons, involved and interested in the construction field. This list showed ninety-five different industries in that state that are directly concerned.

It is, I believe, correct to say that these industries stand in a position of interdependency. The definite, economic principles that make for the success of any one of these various divisions of interested industries also make for the success of others. In other words, it is high time that we were eliminating the thought that any one of the various industries involved in the construction field can climb to success at the expense of any or all of the others.

I think we have come more and more to learn that our problems are mutual to the minutest detail; that co-operation should take the place of ill-advised competition. I am going to venture the statement that the old, existent notion that it was the contractor's salvation for him to develop a keen and unfair competitive condition between the equipment and material men, with the idea of buying at the lowest possible dollar, irrespective of the compensation included in the price for the equipment industry, was an error, and is being rapidly eliminated, and vice versa, the idea of the equipment and material men that they should sell their wares to the contractor at the highest possible price with the greatest amount of margin possible through misleading methods in their information to the contractor, was just as much in error and constituted unfair business practices.

There was, and still is to some extent, perhaps, a constant competition of wits between the contractor and the equipment and material distributor, as to which can take the most advantage of the other for his own personal gain and to the detriment of the other industry. I think we are rapidly coming to know, through years of carefully calculated experience, approximately what constitutes a fair margin of profit for the conduct of any business. This must, for the contractor, or any other part of the industry, include due consideration for the value of the service he renders and sufficient to cover the hazards connected with the business and the finances involved.

If, over a period of years of experience, the contractor or the equipment distributor really knows from definite knowledge that his costs of operation require, we will say, 15 per cent of the cost of the structure built, or the equipment sold, and that he must get his personal compensation and return on capital investment above that stated 15 per cent, then whenever a contractor takes a job that does not contain in it a profit of more than 15 per cent of his flat cost of construction, he becomes unfair competition to other contractors and is only kidding himself as to the value of such contracts to himself.

Similarly, the equipment distributor, knowing what his percentage of costs of operation are, who is frightened into cutting his prices to such an extent as to be below the necessary margin which constitutes his costs, plus a fair margin for his personal service and financial investment, is guilty of unfair competition and is likewise only kidding himself as he mounts the skids to certain disaster.

Now this tendency of the contractor to pound the equipment distributor or material distributor down and down by misinformation, or the contractor who insists on trading in old, obsolete and useless equipment at a price far beyond any reasonable value, had the effect of developing in the equipment and material portion

of the industry an attempted defense. This defense took the angle of adding to the quoted price of the article sufficient to anticipate a necessary price concession to certain types of buyers, either by way of discount or long trade-ins.

The definite result was the placing of a list, or quoted price, upon articles, not in any way representative of their actual value. As a result of this attempted defense on the part of the equipment men, the boomerang returned and struck them down through the development in the mind of the contractor, that since apparently there was no established real value in the prices quoted, there was only one way to buy at a right price, and that was to pound and pound and pound and trade and dicker and bargain until he had frightened the anxious salesman to cut to the very lowest penny.

The method some contractors have used to do that is what we normally call peddling prices. Unfortunately, sometimes this peddling of prices was not based upon fact. A contractor would say, "You are too high. I have a price a lot lower than that." Then the poor devil would figure and figure and cut some more. When the contractor thought that the salesman had gone about as far as he could, he would dismiss him without placing the order. The next salesman that arrived was put through the same process. Eventually the contractor would buy from someone, after having pounded the price down through this, which I believe to be an unfair and unethical practice, until it represented an actual loss to the equipment and material men.

Now, I am not laying the blame for this condition upon the contractor, neither am I going to admit that the fault lies wholly with the equipment and material distributor, but I do know that we could trace the results of this type of lack of co-operation and lack of proper relations between the contractor and equipment and material distributor, and find that it was the basic cause for many of the ills of the industry which have reflected detriment to not only the equipment distributor, but to the contractor as well.

The need is not to decide who won the war. The need is to decide what is the solution for the evils that we know exist. It doesn't come from a continuation of practices which pit the contractor and the equipment distributor against each other in a royal battle of wits, but it lies, if I can reason correctly, in the development of complete confidence and co-operation between all branches of the construction industry.

Just for a moment, may we examine what some of those are? Let's take some of the results of the long trade-in. I am going to use in this instance a tractor. A used tractor has a value. Just what that value is cannot be arbitrarily determined by either the contractor or the equipment dealer. It can be determined very closely, however, by complete co-operation between the two. The determination of that value, so far as the equipment distributor is concerned, is based upon just one thing, namely: "What can he sell it for to a legitimate, responsible and intelligent purchaser?" The basis for determination on the part of the contractor is, "What would he give for the particular tractor in question if he were buying one?"

Assuming, then, that by co-ordination and co-operation between the two, a definite value on that tractor can be determined, that ought to be the value of the tractor, regardless of who it is sold to. Let's assume that we decided that this particular tractor could be reasonably and readily sold to a responsible contractor for $1,000. It is quite evident that this equipment distributor must purchase the tractor for less than he can sell it, for he must be paid for his services in finding the purchaser, and perhaps financing the sale. Let's say that this margin should be 20 per cent. His quotation then to the contractor should be $800.

Now as a basis of absolute valuation, as that's what we are attempting to arrive at, he should be willing to give the contractor $800 for that tractor, either in cash or as an allowance on the purchase of new equipment. You may say that's an ideal situation, but nevertheless, I believe you will agree with me that it is correct logic. Now, let's suppose an equipment dealer comes along and offers this contractor $1,500 for this tractor, which he himself knows is at least $500 more than it can be sold for to a responsible contractor.

One of two things will happen. Either the list price of the new equipment offered for sale has been properly raised to take care of just that contingency, or the equipment dealer who takes that equipment in trade must find a place where he can sell it for $1,500 or more.

You may know that he isn't going to find that sale among intelligent, responsible contractors. He therefore goes out into the byways highways and drums up some fell who has no information with resp to values, and little money. He fi the fellow to whom terms is main thing—the fellow who doe take seriously the fact that obli tions made today have to be me the future. Therefore, he is trigued into the purchase of tractor at, perhaps, $1,800. He m a small cash payment down and haps he is able to go out and some township road building price of $60 a day.

The probabilities are, if he can enough of this day work he will for the tractor and even make a l money besides. Maybe the s thing happens again. By that he has built up a fairly good o without taking any risk or haza and up to that point the equip dealer has come out on the O. K. Along about that time fellow begins to look around. has gotten himself a car; he enough money to buy gasoline.

He begins to cast an anxious on the big jobs that are l awarded by the state, or by county, and he starts bidding them. Sometimes he bids too and goes broke, but he spoils the for the responsible contractor how. Sometimes he has devel into a pretty fair dirt mover an picks off a state job, has some g luck and makes some money That's a perfectly legitimate de opment and growth into the tracting business, but the poi that this one man represents one out of forty or fifty, per that have been started, financed developed through exactly the method.

The equipment dealer taking equipment in trade at a price above its value develops the ne sity of his financing the opera in fact, going into the contra business, for the profit he mak the equipment sold, and this fe and fifty others like him, all ev ally decide to break into the l fields of contracting, and you velop a super-saturation of the ket for road contracting.

Now you men, if any of you a the road business, may cuss me my ilk all you please for the pa contributed to that situation, beg of you to indulge in a litt trospection and find out wheth not you are not equally as g This trade-in proposition an

(Continued on page 14)

Distributors' Relation to Highway Industry

(Continued from page 12)

evils have become thoroughly recognized and understood throughout the entire construction industry. It does not confine itself to the road building end. I have merely used that as an illustration. It is an evil in every line of the construction industry. What is the solution? That, gentlemen, I do not know.

I should like to tell you in passing, however, that it is being given very careful and thoughtful consideration. It cannot be solved entirely locally. It is a national menace. There is at present an existing committee to study the problem and its solution. I happen to be one of the two representatives appointed by the Associated Equipment Distributors, which is the national equipment distributors' organization, comparable to the Associated General Contractors, to serve on the committee for a study of this problem.

Included on this committee are representatives from the Associated General Contractors and the Manufacturers' Association, and in the working out of the problem the United States Department of Commerce is giving us its hearty co-operation. The solution is not easy because we are constantly running up against the snag of violation of the Clayton Act by making agreements in restraint of trade. We have confidence, however, that through the co-operation of these various industries and assistance of the Department of Commerce, and through consultation with the Federal Trade Commission, we may be able to work out some very definite plans that will be of great assistance in pointing a way to solution of this most difficult problem.

May I also state, for your information, that this conference and this committee is an outgrowth of activities of the Associated General Contractors who initiated the move. I am sure that the contractors in general recognize its evils as firmly and as decidedly, and perhaps more so, than the equipment distributors themselves.

This is only one of the problems where the relations between the contractor and the equipment distributor needs decided improvement. Personally, after a rather careful study of the problem, together with the same interests that are working upon the trade-in situation, I am convinced that even more important than the trade-in is the question of credits.

Incidentally, no one contractor can solve it, and likewise, no one equipment distributor can instigate a credit system that will be a solution. But the question of the financially irresponsible contractor being a constant menace to the legitimate contracting business, as is now a fact, has its solution in definite co-operation between the legitimate and responsible contractors and equipment and material organizations from whom you purchase.

The first responsibility on public work lies, of course, with the contracting body—I mean with the public body which awards the contract. That's the place where we ought to start. Your Associated General Contractors have started and accomplished much in requiring pre-qualification and establishing classifications of contractors.

After the bond is once furnished by a good bonding company, it sort of eases off the situation so far as the material man is concerned, because he feels that he will eventually get paid even if the contractor goes broke. I am going to grant you that he ought not to give that consideration. He will find out that this "eventually-getting-paid" s t u ff is very costly business. So the really smart material dealer isn't going to jump into this extension of credit merely because the fellow has a bond up.

I said he isn't going to. I made an error. He is going to do it, and does do it; that is, some do, and will continue to do it just as long as they can hold enough of the legitimate responsible contractor's business on a basis that will pay a sufficient profit to make up the loss suffered and the chances taken through the financially irresponsible credit granting.

Your bonding company is going to keep on continually writing the bonds for those fellows just as long as they can get enough bond business at a high enough rate from the legitimate contractor to pay the losses on the irresponsible contractor and leave them a profit, and the sad part of the situation is that when the time arrives that this bond premium from the responsible contractor is not sufficient to cover the losses on the irresponsible contractor, they simply raise the rates of all bonds.

The material and equipment men are not quite so fortunate. They are not able, because of the number of them apparently, to voluntarily r their margins of profit sufficient take care of these losses, but th terial and equipment industry whole, eventually from economi cessity automatically and wi agreement or voluntarily unite tion, raise their cost of distrib on this type of material and e ment, and the man who has c and pays his bills will event pay those losses.

A couple of years ago we de we were going to just clamp on that thing, believing, as the C. committee had suggested, that was a very desirable mov the responsible and legitimate tractor, and that it would cut ou evil of irresponsible contractor ing financed by the equipment material men.

I am going to also tell you must have been very decidedly mature in my adoption of the I outlined, for it was the contr whom we believed, and still b to be the responsible and legit contractors, not all of them u stand, but some of them, wh fairly scalped us for even sugg that it could possibly be that cessity would ever arise whe would ask them to pay us in on past due accounts when d to give us trade acceptances; th would expect them to pay the counts when due, or be so pre tuous as to even assume that would ever give us another d worth of business if we ever ship them anything C. O. D.

Well, the natural result wa after a few contractors came i said, "That letter of yours c me, and just lost you three th dollars' worth of business," w gan to believe that after a weren't the saviors, alone, construction industry, and either we were all wet in acc the stated beliefs of the A. G. the matter, or else the A. G. failed to sufficiently sell it contractors.

I am treading on dan ground, but I am going to just the same. What I am af is that the contractor, not in Dakota, perhaps, but the con over in Pennsylvania, wants d credit arrangements similar outlined, adopted and carri specifically by equipment and rial salesmen, so long as the ment and material concerns those definite and specific terms apply only to the other

(Continued on page 20)

Minnesota State Highway No. 3—Wabasha to Lake City

Progressive Highway Departments are Helping to Relieve Unemployment by Carefully Planning their Road Construction Programs

Management in road building must now solve two big problems . . . give taxpayers the greatest return on their money with most miles of paved roads suitable for all traffic conditions . . . relieve unemployment most effectively by even distribution of work throughout the state.

Minnesota solved both problems this year by constructing low cost roads. The advantage of low cost roads is obvious . . . more miles of smooth durable paved roads per dollar invested, permitting wider division of road funds with more even distribution of employment.

Roads and pavements built with Standard Asphalt Road Oil not only can be constructed at low cost but because of their durability and resistance to traffic wear, can be maintained at a very small expense. Today, when every road building dollar needs to be used to the best advantage, not only in road mileage but also employment relief no highway builder can afford to overlook the advantage of Stanolind Asphalt products.

All of the states in the middlewest are relieving unemployment to the greatest extent.

STANDARD OIL COMPANY
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910 S. Michigan Ave. Chicago, Illinois

ASPHALTS FOR EVERY PURPOSE

NEWS OF THE MONTH

More than $283,000,000 will be expended in the eleven western states during 1932 for highways, streets and structures.

A brief outline of the state road programs in the western third of the United States in 1932 is given by S. J. Sanders, writing in the **Western Construction News,** as follows:

Arizona—The 1932 state highway program for Arizona calls for the expenditure of $8,590,000.

California—California Division of Highways, Sacramento, will spend $30,500,000 during 1932 for new highway work, including: $23,000,000 for 410 mi. of paving, 50 mi. of grading, 60 mi. of surfacing, and 30 bridges and grade separations; $6,000,000 for maintenance, and $1,500,000 for unemployment relief. In addition, $14,600,000 is represented by carry-over contracts.

Colorado—During 1932 about $8,250,000 will be spent by the Colorado State Highway Department for highway and bridge construction.

Idaho—The Bureau of Highways of the state of Idaho will expend $3,850,000 for highway construction during 1932.

Montana—The state highway program for 1932 calls for the expenditure of $4,000,000.

Nevada—The Department of Highways, Carson City, plans the expenditure during 1932 of $2,236,000 for grading, surfacing and oiling state highways.

New Mexico—$5,900,000 will be expended during 1932 for state highway projects in New Mexico.

Oregon—The State Highway Commission will spend $7,500,000 during 1932 for highways and bridges in Oregon.

Texas—The State Highway Commission will spend $45,000,000 for road construction in 1932.

Utah—State highway improvements during 1932 for Utah call for the expenditure of $4,100,000.

Washington—The 1932 state highway program for Washington will involve the expenditure of $12,000,000.

Wyoming—State highway projects in Wyoming during 1932 will call for the expenditure of $3,600,000.

Federal Program—Bureau of Public Roads program for the National Forests and National Parks in the western region during 1932 will involve an expenditure of $15,500,000.

Bonds have been voted for the construction of a $220,000,000 water supply project by Los Angeles. Construction of the first unit of the project will be started in 1932.

The U. S. Bureau of Reclamation has a program for 1932 which totals $15,000,000 for construction and improvements. Construction of a power plant near Palisade, Colorado, is one of the projects included in the program.

Improvements planned for the summer construction season by the Denver Municipal water works are estimated to cost $1,500,000.

Five contracts have already been signed for power to be generated from the Hoover Dam project, now under construction. These contracts call for more than $25,000,000 worth of current.

During 1931 a total of 1,005 miles of state highway was constructed in New York state at a price of approximately $47,000,000.

BONDS SOLD AT DISCOUNT STILL PURCHASE M

Although bonds for public provements occasionally mu sold below par, present low struction prices, which give th lar greater value, make it des to sell bonds even at a discount

Recently in St. Louis C Missouri, $1,500,000 worth of were sold for $27,750 below pa according to the county eng the money received from the sale will still build more co pavement than was planned the bond issue program was ad Concrete pavement is now built at costs which make the ent dollar worth $1.60, as oppo the one hundred cents of two ago.

Numerous cases have co light throughout the country communities have failed to n bonds because of low bids, w consideration being given t prevalent bargain prices in struction. Investors are looki bargains and it is to be exp without any reflection on the acter of the community, that prices should be lower.

COMPARATIVE STATEMENT
COLORADO STATE HIGHWAY DEPARTMENT
For the Month of February, 1931, and 1932

RECEIPTS	1931	193
U. S. Government	$ 85,186.46	$155,5
Gas Tax	307,500.00	272,4
Internal Improvement	5,600.00	1,8
Highway Receipts	2,310.82	13,9
Unemployment Fund		3,9
	$400,597.28	$447,7
DISBURSEMENTS		
Federal Aid Projects	$196.008.22	$199,2
State Projects	58,168.38	16,8
Maintenance	87,550.45	104,4
Maintenance Equipment	1,188.91	1
Property and Equipment	3,940.23	
Surveys	353.09	6,1
Traffic Signs and Census	457.25	1,
Administration	15,141.25	15,4
	$362,807.78	$344,

Oshkosh Reputation Proven by Long-Life Performance

The Use of Oshkosh 4-Wheel Drive Trucks Means Maximum Delivery Per Day at Minimum Cost. Ask any owner of an Oshkosh.

Some exclusive features of the Oshkosh 4-Wheel Drive Trucks—
Full floating double reduction axles front and rear.

Axle shafts of special alloy steel 2¼" in diameter, splined.

Double frame 7 x 3¼" thick, interlined with ¼" member

Cast steel one-piece front and rear axle housings assure maximum strength with minimum weight.

The front axle receives an equal share of the power, delivering tractive effort to front wheels equal to that applied to the rear unit.

Load distribution of 40% on front and 60% on rear enables both axles to utilize every ounce of power for tractive purposes.

Four-wheel brakes have been a feature of Oshkosh 4-wheel design in every model produced.

Sold and serviced in Denver—we will demonstrate to your satisfaction any time.

H. W. Moore Equipment Co.

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SAFETY-RESPONSIBILITY LAWS WOULD PROHIBIT HIGHWAYS TO RECKLESS

Approximately 100,000 reckless and financially irresponsible drivers would be prohibited from using the highways of the nation if every state enacted and enforced the Safety-Responsibility law, now in effect in eighteen states and four Canadian provinces, according to Rocky Mountain Motorists.

This statement is based on the excellent results secured under the Ontario Financial Responsibility law, which parallels closely the A. A. A. model bill.

"This law," says the statement, "compels the reckless operator to protect the public by establishing his financial responsibility by means of a certificate of liability insurance, or by means of the bond of a recognized surety company, or by a cash deposit. It prohibits the use of the highway to the operator whose recklessness has been proven but who has failed to establish proof of his financial responsibility for damages he may cause. Under the threat of loss of driving rights as prescribed in the law, the law is proving a strong incentive for the payment by a motorist of damages resulting from his careless operation of a motor vehicle."

Ontario figures show that during the first sixteen months of the operation of the law licenses of 4,351 motorists were suspended. Of this number, 1,642 regained their permits by proving their financial responsibility. Of the remaining 2,709, at least 2,500 were ruled off the highways.

"On the basis of the Ontario figures," continues the statement, "it can be conservatively estimated that if every state in the Union had the Safety-Responsibility law and enforced it, 152,000 motorists would be required to post proof of financial responsibility in the United States every year. If the Ontario percentages held, 95,000 careless and financially irresponsible motorists would be denied the use of the highways for failure to comply with the provisions of the law.

"Thus, while it would affect less than one-half of one per cent of the drivers, it would unquestionably strike at the criminal minority responsible for the large majority of motor vehicle accidents, and in course of time would bring this class under definite discipline and control."

PERMANENCE OR WAST

Recent figures given out by th S. Bureau of Public Roads indi that in 1931 approximately $ 000,000 was spent by countie county roads, while during the period the state highways com sions spent $1,000,000,000. In words, the counties spent on permanent, semi-permanent and porary, three-fourths as much a states.

It is well to remember tha state highway department closely supervised by the Fe Bureau of Roads, and that unde present system of allotment of way funds from the national go ment to the states, practically the money spent by the stat road construction goes into pe nent roads.

Just as the nation supervise states, so it is being realized th state highway department mu pervise the counties. In Minn a law has already been passed requires the gas tax which goe to the counties to be spent on ects which have been approv the state highway engineer, a also must pass on the projec fore they are paid for.

It is also pointed out that t tax returned to the counties la

COLORADO STATE HIGHWAY DEPARTMENT

Financial Statement, February 29, 1932

BALANCES

State Treasurer	$ 44,757.15	
County Time Warrants	8,583.42	
Revolving Fund	9,500.00	
Total Balances		$ 62,840.57

RECEIPTS

U. S. Government	$179,090.34	
Gas Tax	560,000.00	
Internal Improvement	2,200.00	
Highway Receipts	21,211.85	
Unemployment Fund	8,115.83	
Total Receipts		770,618.02
Total Balances and Receipts		$833,458.59

DISBURSEMENTS

Federal Aid Projects	$353,971.62	
State Projects	24,926.58	
Maintenance	160,811.40	
Maintenance Equipment	164.98	
Property and Equipment	3,020.41	
Surveys	11,546.22	
Traffic Signs and Census	3,020.19	
Administration	28,941.05	
Total Disbursements		$586,4

BALANCES 2/29/32

State Treasurer	$228,972.72	
County Time Warrants	8,583.42	
Revolving Fund	9,500.00	
Total Balances		247,0
Total Disbursements and Balances		$833,4

3% SPECIAL GAS TAX FUND

Receipts	$160,877.16
Disbursements	2,235.77
Balance	$158,641.39

amounted to $122,000,000 for the nation, and it is expected that this amount will grow rather than diminish.

It is being contended by the experts of the nation that county roads are of a temporary character, often going nowhere from nowhere, and the capital invested becomes wasted. You, yourself, know whether this county money was well spent in your county or not; whether it went for temporary roads, or permanent. Some of the counties have done well in laying out county roads, having them connected, and of such a character that they last.

On the other hand, the teaching of the Federal Bureau is that state money spent by the state highway commission under the supervision of the Federal Bureau, is capital invested.

MORE PAVEMENTS AT LOWER TAX RATE IS CITY PROBLEM

The demand for lower taxes in cities coupled with the need for more pavements must be met by better classification of streets and the adoption of less expensive types of surface where traffic is not heavy so that some type of surfaced street will be available for as many city dwellers as possible. This recommendation was made by a committee of the City Officials' Division of the American Road Builders' Association.

The committee recommends four classes of streets and three types of pavements approved for city work. Streets are classified into those in which (1) all cost is borne by abutting property, (2) cost is shared between abutting property and city, (3) property owners, city and county, share cost, (4) property owners, city, county and state, share cost. Pavements are classified as (1) those best for main thoroughfares, (2) a less expensive pavement for secondary thoroughfares, where preferred, (3) a much cheaper pavement for the whole width of outlying streets, or a curbless, narrow pavement to permit traffic now impossible at some seasons of the year.

"For every bit of pavement laid the whole city benefits greatly," declared Mr. Place. "On some streets, such as dead ends, the benefit is essentially local, but on other streets benefits affect ever-widening areas until on some main streets interstate traffic is affected."

The committee report stated that in 1930, out of $1,500,000,000 spent for highways, $1,000,388,000 came from motor vehicles. A minimum of 60 per cent of these tax receipts came from city-owned motor vehicles. A redistribution of motor vehicle tax money is recommended that will give to cities a proportionate share.

T. H. MAC DONALD, U. S. ROAD CHIEF, RECEIVES AWARD

Because of his outstanding contribution to highway progress, Thomas H. MacDonald, Chief of the U. S. Bureau of Public Roads for the last twelve years, has been presented the newly established George S. Bartlett Award.

The presentation was made at the opening session of the annual meeting of the American Road Builders' Association, which this year was held in Detroit.

The George S. Bartlett Award, created jointly by members of the American Association of State Highway Officials, the American Road

Builders' Association and the Highway Research Board, has a twofold purpose. It honors Mr. Bartlett, whose vision, energy and personality have made him a prime factor in the spread of modern highways. Secondly, it will honor each year some individual whose interest in highways has been of national benefit.

Mr. MacDonald's professional life has been devoted entirely to the cause of better highways since his graduation from Iowa State College in 1904. That year he began as an assistant in the newly created Iowa State Highway Commission. Shortly he became chief engineer of the commission and during the fourteen years he served in that capacity he became one of the nation's most proficient road builders.

When in 1919 a new leader was needed for the U. S. Bureau of Public Roads, Mr. MacDonald was appointed chief by Secretary of Agriculture David H. Houston. As highway engineer for Iowa, Mr. MacDonald successfully handled a new state task. With his assumption of the job as chief of the Bureau of Public Roads, Mr. MacDonald again found himself a pioneer, for the Federal Aid road construction policy was then less than three years in practice and it was a distinct departure from the ruling policy of the federal government during a century of non-participation in works of internal improvement.

Distributors' Relation to Highway Industry

(Continued from page 14)

Now, gentlemen, if this credit issue is a vital one, you can't enforce it on one man and overlook it on the other fellow, simply because he happens to be bigger and more important. A cash or other discount is not the solution. The irresponsible contractor cares nothing about that. It's a question of granting or not granting credit.

Time will not permit any further discussion of the specific points wherein I believe that the relations between the contractor and the equipment and material distributor can and should be improved for the mutual benefit of both, and no co-operation, no solution can possibly be of value unless they do take into consideration a co-operative mutual improvement.

I have touched just this. First, the equipment and material distributor and dealer has a legitimat place in the construction industry If he has, the problems of the co struction industry are mutual so f as the contractor and equipment di tributor are concerned, and the should be worked out and the sol tion found through the co-operati effort of all parts of the industry.

I mention two specific things up which, in my opinion, there is at th time the greatest need of solutio The trade-in evil, and the credit e I sincerely hope that in speaking frankly as I have, both in taking a giving blame for the situation, tha have not offended anyone.

You may not all agree with me any or part of what I have said, b if it is true, or if you agree in pa I can only hope for more definite operation between all phases of t construction industry, looking wards a solution of these proble and co-operation with the natio organization in solving those pr lems which are national and can be definitely settled locally.

Wyoming reports a total of miles of oil-treated roads of all ty to date. The program for 1932 cludes 520 miles of oil treatment 514 miles of gravel road.

PLANS BEING PREPARED

Proj. No.	Length	Type	Location
122-R3	11 mi.	Concrete Pav't & Overhead R. R. Crossing	Julesburg, east and west
145-D	6.5 mi.	Gravel Surfacing	East of New Castle
158-A2	.05 mi.	Concrete Bridge	Northwest of Manitou
245-AR, BR & C2	11.1 mi.	Concrete Pavement	East of La Junta
248-D	5 mi.	Gravel Surfacing	South of Buena Vista
260-A	6 mi.	Gravel Surfacing	East of Montrose
263-D	5 mi.	Gravel Surfacing	West of Ft. Garland
286-F	0.5 mi.	Concrete Pavement & Bridge	North of Greeley
294-C	8.5 mi.	Gravel Surfacing	East of Cortez
296-F	8 mi.	Gravel Surfacing	South of Pueblo
298-E2	0.1 mi.	Bridge	Wolf Creek Pass

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
57-R4 & 168-BCR	West of Lamar	4.801 mi.	Paving	Pueblo Bridge & Const. Co.	$130,690.50	100	57-R4 & 168-BC
68-B	South of Saguache	3.290 mi.	Gravel Surfacing	H. C. Lallier C. & E. Co.	74,428.75	57	68-B
71-C	Bet. Durango and Mancos	4.965 mi.	Gravel Surfacing	J. Finger & Son	86,146.75	100	71-C
79-B	East of Colorado Springs	12.248 mi.	Gravel Surfacing	Chas. B. Owen	143,370.05	100	79-B
134-E	East of Limon	5.052 mi.	Gravel Surfacing	Bedford & Woodman, Inc.	31,426.40	100	134-E
145-C	East of Rifle	14.901 mi.	Grading & Grav.	A. R. Mackey	271,703.80	62	145-C
149-E	Between Bennett & Strasburg	4.412 mi.	Gravel Surfacing	Edw. Selander	60,930.18	14	149-E
149-H	East of Deertrail	18.565 mi.	Gravel Surfacing	Hamilton & Gleason	240,319.15	100	149-I
150-C	West of Craig	6.893 mi.	Gravel Surfacing	J. Fred Roberts & Sons	120,139.05	69	150-C
150-D & F.L.P. No. 1	Between Elk Springs & Massadona	10.691 mi.	Gravel Surfacing	N. M. Monaghan	156,379.26	7	150-D & F.L.H.P.
151-A	Bet. Granby and Tabernash	6.663 mi.	Gravel Surfaced	J. H. Miller & Co.	76,909.90	100	151-A
158-A	Between Manitou & Cascade	4.062 mi.	Grading	Hamilton & Gleason	164,681.20	99	158-A
158-B	Bet. Hartsel & Florissant	10.319 mi.	Gravel Surfacing	J. H. Miller & Co.	133,380.70	75	158-B
181-A	In Idaho Springs	1.876 mi.	Paving	J. Fred Roberts & Sons	93,749.55	36	181-A
189-C	West of Hayden to County Line	7.534 mi.	Gravel Surfacing	F. L. Hoffman	115,356.94	100	189-C
211-B	South of Craig	2.725 mi.	Gravel Surfacing	Utah Const. Co.	93,720.40	100	211-B
242-D	Bet. Mack & Colo.-Utah Line	9.883 mi.	Gravel Surfacing	Hinman Bros. Const. Co.	124,552.36	100	242-D
245-AR	West of Las Animas	4.544 mi.	Grading & Oiling	Driscoll Const. Co.	94,398.85	100	245-A
248-C	Between Buena Vista and Salida	3.944 mi.	Gravel Surfacing	Pantle Bros.	48,820.50	52	248-C
258-I	Bet. Montrose & Gunnison	2.481 mi.	Gravel Surfaced	J. H. Miller	50,272.60	100	258-I
258-I2	East of Montrose	Concrete Box Culvert		Hinman Bros. Const. Co.	8,455.50	99	258-I
259-B	Bet. Gunnison and Parlin	9.587 mi.	Gravel Surfacing	Cole Bros.	184,503.00	69	259-B
263-C	East La Veta Pass	5 mi.	Gravel Surfacing	State Forces			263-C
265-E	West Bayfield	2.950 mi.	Gravel Surfacing	J. H. Miller & Co.	97,839.00	86	265-E
270-E	Bet. Del Norte & Monte Vista	8.663 mi.	Gravel Surfacing	Mountain States Const. Co.	102,199.10	71	270-E
278-D	West of Cheyenne Wells	21.913 mi.	Gravel Surfacing	A. R. Mackey	93,563.30	99	278-D
282-I	South of Craig	1.981 mi.	Gravel Surfaced	Utah Construction Co.	70,225.16	100	282-I
292-D	Bet. Wolcott and Avon	9.834 mi.	Graded Surface	Utah Const. Co.	159,143.40	88	292-D
295-E	South of Alamosa	7.627 mi.	Gravel Surfacing	Mountain States Const. Co.	71,049.56	95	295-E
296-AR&BR	South of Pueblo	4.372 mi.	Paving	New Mexico Const. Co.	154,509.00	72	296-A
296-D	South of Pueblo	8.348 mi.	Gravel Surfacing	Cole Bros.	84,815.10	100	296-D
298-E	South of South Fork	1.894 mi.	Gravel Surfacing	Grant Shields	92,279.20	0	298-E
298-F	East of Bayfield	5 mi.	Gravel Surfacing	Wood, Morgan & Burnett C. Co	66,920.85	100	298-F

INTERNATIONAL HARVESTER *Announces*

the New McCormick-Deering MODEL T-20

TracTracTor

THE MOST ACCESSIBLE CRAWLER TRACTOR EVER BUILT
Providing Remarkable Ease of Control, Great Power and Durability, with
SURPRISINGLY LOW MAINTENANCE UPKEEP
—Backed by an Outstanding Nation-Wide Service Organization.

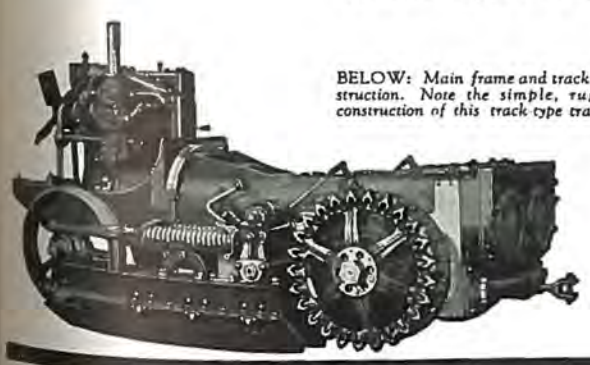
THE McCormick-Deering Model T-20 Trac-TracTor, with positive-grip tracks, provides cost-reducing power for many industrial and commercial uses. Here is a powerful tractor of unusual stamina. The rugged construction, combined with proved engineering practices and modern alloy steels, assures performance, economy, and durability that fully meet McCormick-Deering standards. Driver comfort and efficiency are provided for through the convenience of the controls and the roomy, upholstered cushion seat.

McCormick-Deering quality from radiator to drawbar vouches for the practical construction and economical performance of this new Trac-TracTor. The heavy-duty engine—with new carburetion features, ball-bearing crankshaft, removable cylinders, impeller cooling pump, all-enclosed governor, and other distinctive features—delivers an abundance of economical power.

Special oil seals protect the transmission, final drive, and track members against the entrance of dirt and other abrasive materials. Forty ball bearings are employed to reduce friction and avoid power loss. Efficient, quick steering control is provided through two single-plate steering clutches located in the rear compartment of the frame.

The McCormick-Deering Model T-20 Trac-TracTor is recommended to all branches of industry as an up-to-the-minute, quality unit which is completely in step with the strictest economy program. Full details will be supplied on request.

INTERNATIONAL HARVESTER COMPANY
606 So. Michigan Ave. **OF AMERICA** *(Incorporated)* **Chicago, Illinois**

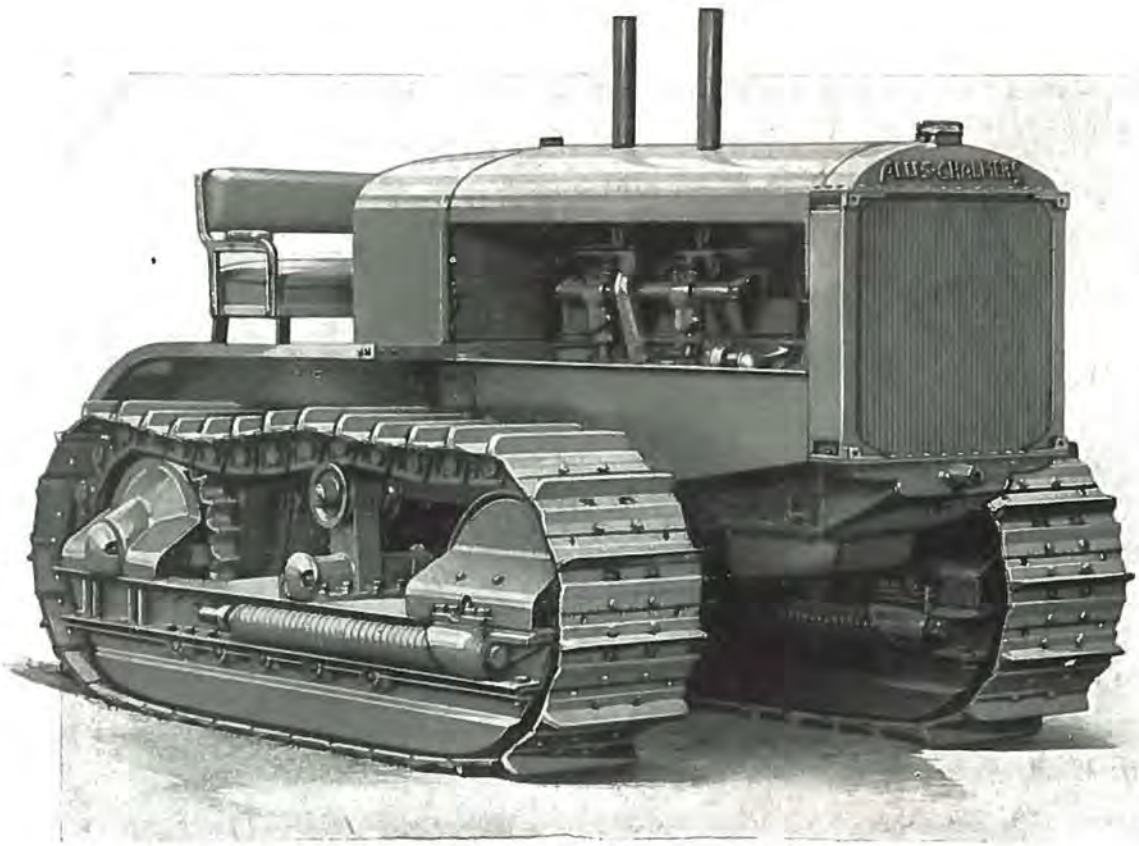


BELOW: *Main frame and track construction. Note the simple, rugged construction of this track-type tractor.*

Brief Facts: The track frame, rollers, sprocket, and idler are of scientifically treated steel alloys. The lower track rollers, which carry the weight of the tractor, have unusually large bearing surfaces. The bearings are fully protected from dirt by self-adjusting oil seals and felt washers. The roller shafts and thrust bearings are submerged in oil. A top track roller carries the weight of the track.

The front of the TracTracTor is mounted on a transverse spring. The track frame is free to oscillate so that the tractor frame is subject to no undue stress when operating over uneven ground.

Accessibility is another important feature. The clutch, transmission, steering clutches, steering-clutch brakes, and many other parts can be removed quickly for inspection or adjustment.



ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

PRODUCTS

Track-Type Tractors
Models "35"—"50"—"L"

Power Controlled Graders
Nos. "11" and "14"

Hand Controlled Graders
No. "10"

Motor Patrol Graders

Elevating Graders
Sizes 42" and 48" Power Operated or Take Off Drive

Track-Type Wagons
5½, 6, 7, 8-Yard Capacities

Wagon Tracks
For Replacement on All Types of Wagons

Wheel-Type Tractors
Solid and Dual Pneumatic and Various Types of Steel Wheels

all the POWER you'll ever need

—plus wide range of speeds, clean-cut design, clearance, durability—in the Allis-Chalmers Model "L."

We invite you to see this really modern tractor. Six cylinders. Six forward speeds—up to 6½ miles an hour. Same kind of responsive power, performance and durability as in the Allis-Chalmers "35"—only in a larger tractor.

Ask us for a demonstration

Wilson Machinery Co.

1936 Market Street Denver, Colorado

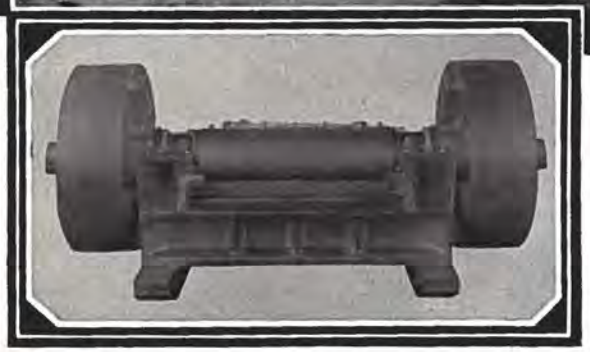
The Line of Quality

THE BRADFORD-ROBINSON PTG. CO., DENVER

COLORADO HIGHWAYS

Vol. XI May, 1932 No. 5

ON THE TRANS-CANADIAN HIGHWAY IN THE GREAT CANADIAN NORTHWEST



NOWHERE is it more necessary to have dependable equipment on the job than it is in the CANADIAN NORTHWEST. Railroad stations and service stations are often one hundred miles or more away from the crushing plant. *Dependable service is vital.*

So when the Provincial Government of British Columbia purchased their equipment, they put in a 1224 Primary and a 336 Secondary CEDAR RAPIDS CRUSHER.

Our new heavy duty 336 reduction crusher has met the test. *Large Capacity—Rugged Construction—Durability* and *Low Operating Cost* are outstanding features of its design. Its construction is characterized by—large centrifugally cast phosphor bronze bearings—special heat-treated chrome nickle alloy steel eccentric shaft—counter balanced flywheels—high grade electric cast steel frame and pitman—automatic and positive lubrication—precision machined parts—large oil reservoir—and many other outstanding features.

It is the ideal unit for stationary or portable plant installations, because it is less in weight and has smaller overall dimensions than any other type of reduction crusher. A profitable addition to your present plant. Obtain the maximum of efficiency in your reduction operations—use a CEDAR RAPIDS 336 REDUCTION CRUSHER.. Write today for full details.

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Iowa Manufacturing Company
Cedar Rapids, Iowa

"Performance Is What Counts"

H. W. MOORE EQUIPMENT CO. Distributors 120 West 6th Avenue, DENVER

Colorado Highways

Official Publication of the
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Denver, Colorado

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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. $2.00 A YEAR.

Our Cover Picture

ON the cover of this month's COLORADO HIGHWAYS there appears a view of the splendid new graded and graveled highway leading from Limon to Denver. Recently a contract was let by the State Highway Department for the oil surfacing of fifty-five miles of this main highway leading to the state capital from the east. It will be finished late in the smmer. However, plans have been made whereby traffic will use the greater part of the road through the tourist season.

Announcing the NEW
INTERNATIONALS
Models A-7 and A-8

POWERFUL • FAST • BIG • MODERN

TWO new International Trucks —Heavy-Duty Models A-7 and A-8—are now available. They are designed and built to meet the present-day demands for moving heavy loads with speed and unfailing dependability. They are unusually easy to handle.

These two new Internationals are built in 160, 180, 200, and 225-inch wheelbases.

The 6-cylinder engines of both of these new models are valve-in-head type. They have removable cylinders — an International feature that makes for remarkably low maintenance cost! Special three-point mounting cushions the power plant against road shocks, and permits its removal as a unit.

Five speeds forward and two reverse provide high speed for hard roads and tremendous pulling power for climbing hills and negotiating sand and soft roads.

There are four rear springs instead of the conventional two. These are of dual, semi-elliptic type, one mounted above and one below the rear axle on each side —assuring improved cushioning, and greater strength to absorb the enormous torque and driving stresses of the rear axle.

See the Models A-7 and A-8 now. Have the nearest of 183 Company-owned branches in the United States and Canada, or an International dealer, arrange a demonstration. In no other way can you get a true picture of the new truck-value these two new trucks represent. Write us for catalog.

A-7 and A-8 Features:

Rated Capacity: A-7, 5 tons; A-8, 7½ tons. Maximum Capacity, including cab, body, equipment, and pay load: 24,000 pounds.

Wheelbases: 160, 180, 200, and 225 inches.

Engine: Both models, 6-cylinder, valve-in-head type. Model A-7, 4½-inch bore x 5½-inch stroke. Model A-8, 5-inch bore x 5½-inch stroke. Engine features include removable cylinders, full pressure lubrication, oil filter, oil-type air cleaner, fuel pump, and downdraft carburetion.

Clutch: 15-inch, single-plate type.

Transmission: 5 speeds forward, 2 reverse.

Final Drive: Full-floating, double-reduction gear type.

Steering Gear: Irreversible cam-and-lever type.

Springs: Semi-elliptic front and dual semi-elliptic rear.

Brakes: 4-wheel, mechanical, internal-expanding type service brakes with vacuum booster. Ventilated disc type emergency brake on propeller shaft.

INTERNATIONAL HARVESTER COMPANY
OF AMERICA
(*Incorporated*)
606 So. Michigan Ave. Chicago, Illinois

INTERNATIONAL TRUCKS

Colorado Highways
"BETTER ROADS"

OLUME XI. MAY, 1932 NUMBER 5

Two Trains Needed to Haul Mile *of Concrete*

By E. E. DUFFY

O BUILD a mile of concrete pavement 20 feet wide more than 4,500 tons of material t be mixed together and molded the pavement strip. The equiv- t of two trains of more than 50 s each are required to move this terial.

lthough large paving mixers able of turning out a cubic yard resh concrete every minute gen- ly are used, the building of hard aced roads requires a surpris- y large amount of hand labor. d builders assert that in the end ost the same proportion of ey goes to labor in constructing rete pavements as to labor in ding low type roads entirely by d.

he production of a concrete pave- t not only begins in the quar- and cement mills, but also in factories where equipment and plies must be fabricated. Pav- mixers, cranes, trucks, railroad , cement kilns, explosives, sacks a thousand and one things must provided to bring the concrete ement into being.

ement is scientifically made from s containing certain minerals the manufacturing process is so ct that some 80 operations re- ing considerable hand labor are essary. To get the raw materials the cement used in a mile of con- e road an average of 400 pounds ynamite must be exploded in the quarries. After the materials have been carefully assembled 340 tons of coal, or its equivalent in oil or gas, must be burned to obtain the 650 tons of cement needed for a mile of pavement.

The production of sand and gravel, or crushed stone, also necessitates extensive use of labor. A little less than 3,865 tons, or about 90 carloads of these aggregates are needed for a mile of concrete. By weight, about five and one-half times as much aggregate as cement is used per mile.

Another item of importance to labor is the movement of all the materials and equipment to the scene of operations. Oftentimes the transportation cost runs as high as $6,000 per mile of pavement.

The placement of concrete is of such a nature that a large force of men is required for each paving mixer, usually upwards of 35. Subgrades must be prepared, some 5,000 feet of concrete forms must be continuously installed and removed, water must be supplied, the freshly placed concrete must be made as level as a floor, and it must be properly cured. This latter operation often requires the use of more than 200,000 gallons of water per mile, in addition to the 80,000 gallons used in mixing the concrete.

Recently the U. S. Bureau of Public Roads made public the results of a survey which showed that 91 per cent of the money given to contractors to build concrete pavement quite promptly finds its way into the pockets of workmen.

COLORADO HAD 308,458 MOTOR VEHICLES IN 1931

There were 51 fewer motor vehicles registered in Colorado in 1931 than in 1930, or 308,458 as compared with 308,509, a decrease of two hundredths per cent, according to Rocky Mountain Motorists, the local AAA club.

This statement is based on 1931 registration figures just received from AAA national headquarters, showing a decline of 731,548 motor vehicles for the country in 1931 as compared to 1930, a decrease of 2.8 per cent.

Of the total of 25,814,103 motor vehicles registered at the close of 1931, there were 22,347,800 passenger cars and 3,466,303 trucks. The total compares with 26,545,281 motor vehicles registered in 1930.

The AAA club statement declared that New York continues to lead in the number of motor vehicles with a total of 2,297,249.

California is in second place with 2,043,281 motor vehicles; Pennsylvania is third with 1,741,942; Ohio fourth with 1,710,625, and Illinois fifth with 1,612,770.

In addition, a total of 349,930 trailers are registered in the 44 states that register this type of vehicle.

Also, there are 172,250 tax-exempt motor vehicles used by agencies of federal, state and local governments.

Farmers own 18 per cent of all passenger cars and 26 per cent of the trucks, according to Rocky Mountain Motorists, the local AAA club.

Good Roads *Lead to* *Best* Fishin' Spots

By UNCLE JOSH EDWARDS

YES, sir, I've got the fever. To grease and oil up the old bus and strike for the open road. Just as I've done for the past 15 years. And, my, what a lot of fun. Maybe Chuck, Bill and I won't go quite so far, nor will our itinerary be as elaborate as in some former years, on account of the depression.

Yes, siree, we're going fishing. And won't that be something. We have been told that the Parvin game and fish boys have planted 20, 30 or maybe its 40 million trout in the streams. And we certainly don't want to miss the opportunity of catching our share. The greatest sport on earth.

Where will we go? Well, let's see. There's North Park, Middle Park and South Park. Then there's the Arkansas and the Gunnison rivers. We could go to Grand Mesa, or if we didn't want to go quite that far we could stop over around Aspen and the Frying Pan. If not, we might try the Wagon Wheel, Creede or Lake City territory. And then again we might change our minds and go into the San Luis valley, where we have made some mighty good catches in times gone by.

Another spot that attracts a good many fishermen is the Trappers Lake country over around Meeker. And up on the White river the fly casters have had a lot of good luck in years gone by. There's no reason why we couldn't go back and do as well. At least, Rollie Parvin, Colorado's genial game commissioner, puts it that way.

To reach the various places mentioned above we will be able to travel over some of the finest mountain highways in the United States, or the world, for that matter. A glance at a folder recently published by the Colorado Association shows over 2,000 miles of graded and gravelled roads leading to the various recreational spots, where fishermen and vacationists can find accommodations at reasonable rates.

In our own case we will carry a camp outfit. That's more to our taste. We like to search out the more remote places. We like to leave the beaten track and hike for the "big ones" in quiet spots.

Over paved routes one may now travel smoothly and quickly into the heart of the Colorado Rockies. It wasn't thus eight or nine years ago. Today Colorado has good roads always to any part of the state. Good roads save time and car expense. Trips that formerly took a full day to make now can be travelled in five and six hours.

Along all these routes the vacationist will find hotels, resorts and cabins to suit any taste and thousands of inviting camping spots. Today we have superb highways that will take you to the very summits of Pikes Peak and Mt. Evans, each well over 14,000 feet high; or along amazing high-gear roads to dozens of world-famous wonders, such as the Mesa Verde and the Chief Ouray highway.

These roads have been constructed to meet the exacting specifications of the U. S. Bureau of Public Roads. They are wide, smooth and free from sharp turns. In the old days, curves were sometimes so sharp that it was necessary for a driver to back up several times in order to get his car around them. Steep grades on the main routes of the state also are a thing of the past.

In making the trip to the North Park country, the motorist today can travel over the beautiful highway of Cameron Pass to Walden. The road is gravelled the entire distance from Fort Collins to the Jackson county seat, the heart of one of the greatest trout fishing centers in the state. Another route into this vacation land starts from Granby and over Willow Creek Pass. Here we find a "spanking brand new" highway, as smooth as a floor and gravel surfaced for a distance of 20 miles.

To appreciate these roads of today one should compare them with the trails, which were called roads, of a few years ago. I can remember a trip made over the Willow Creek road five years ago. It took us three hours to travel a distance which can now be driven in 30 minutes.

And then take the road down the Colorado river from Granby to Hot Sulphur Springs and on to Kremmling. The present route takes you through Byers Canon. The old road took the motorist over Parshall hill and what a hill in wet weather. Ask any old-timer about that "baby" and he'll tell you about keeping the wheels of his car in the ditch on one side of the road to keep from sliding

Showing a section of the new road being constructed by the Forest Service over Willow Creek Pass, leading into the North Park country from the Colorado River, near Granby.

the other. Gravel? Yes, in the er bed a mile away. But not a n of anything on the hill but slip- y mud. In dry weather the road s a series of deep ruts. Ten miles hour was good time.

Yes, sir, motoring in Colorado to- y is a pleasure. It is no longer arduous task. Broad, smooth, faced roadways have replaced al- st everywhere narrow, crooked, e-way mountain trails. This ac- nts for the fact that we have 10 ermen on the streams today ere we had only one a few years o.

To our fine road system may be ribed one of the reasons for the t that Colorado today is one of brightest spots upon the finan- l map of the nation.

During the past 10 years over 00 miles of Colorado roads have en graded and gravel surfaced. er 700 miles have been surfaced h concrete and oil mix.

"Today motor travel even in the st rugged mountain regions of lorado is no longer a pioneering enture, but rather a glorious, e and carefree outing over boule- rds (often cut from solid rock) ere new scenic thrills await you every turn," recently said Dr. B. Rastall, executive head of the lorado Association.

That's quite true. We remember time when a trip over Wolf ek Pass was an adventure never be forgotten, especially if you ppened to meet another car com- from the opposite direction. ce we saw a man from Iowa stop car on the Knife-edge in the

One of Colorado's modern oil-surfaced highways, leading east from Denver. By the end of 1932 it is expected this oil surfacing will be extended a distance of 90 miles east of the Capital city.

Mesa Verde Park and call for a relief driver from the park headquarters to drive his machine across the famous cliff. Now we have boulevards across these once "danger" spots.

This was true of almost every mountain pass in the state. Over Berthoud Pass a few years ago there was a road bad enough to try the nerves of the most expert driver. Today it's wide, smooth and safe.

On every principal national highway you now approach Colorado over good roads. After crossing the Colorado line you travel over paved or oil-processed roads nearly all the way to the entrance to any mountain region. As you probably know, an oil-processed road is not a mere oiled road; it is a highway on which is laid a deep top of thoroughly mixed oil and gravel, which quickly packs and hardens into a veritable pavement with a dustless and delightfully easy-driving surface.

Once you get into the mountains you find yourself in a land where Nature solved the road surfacing problem ages before it occurred. Most of Colorado's mountain soil is decomposed granite, which packs into a firm, smooth roadbed as soon as traffic begins on a new grade. It simply can't get muddy or slippery. Where other soil occurs, this granite material is nearly always nearby for surfacing; but in the few big mountain valleys that require it, more elaborate surfacing is provided.

Because of this remarkable advantage, Colorado has developed miles and miles of safe but spectacular mountain highways as rapidly as they could be graded.

And the work of improving these roads continues from year to year as funds become available. This work includes the construction of new routes and the reconstruction of old roads which have become obsolete through increased traffic and the development of modern high-speed automobiles.

Surveys conducted by the State Highway Department show that during the last decade traffic has increased more than 100 per cent on the main routes of Colorado. Estimates prepared, based upon past records, by the department indicate that this traffic will increase by 45 to 60 per cent during the next decade.

In order to facilitate the movement of this huge amount of travel plans are being made by the road officials for further improvement of the main arterial road system, with a result that the next ten years will see as great an improvement as the past decade.

Statistics gathered by the U. S.

(Continued on page 11)

ection of the newly completed standard Federal Aid highway on Kenosha Pass in k County, constructed by the State Highway Department, eliminating the steepest de between Denver and the western slope. The old grade over this two-mile section was almost prohibitive in low for most cars.

Highway Leading into Logan, N. D.

North Dakota Highway No. 9

N. D. State Highway No. 9

North Dakota Highway No. 9

One Case of Where the Public

THE Public Pays, and in most cases, now pays less for good surfaced, safe easy riding roads, which are low in cost, durable, and economical in the long run on account of low maintenance cost.

All of the progressive road builders, states, counties and municipalities have developed far beyond the experimental stage, bituminous wearing surfaces of different types designed to take care of the traffic required of highways and roads.

In accomplishing this, the engineers have seriously taken into consideration the different types of construction, and the cost of materials and construction. To secure these results, they have used Standard Asphalt Road Oil and Stanolind Cut Back Asphalts on thousands of miles of roadway. Such

Billings	Des Moines	Grand Rapids
Cheyenne	Detroit	Green Bay
Davenport	Duluth	Huron
Decatur	Evansville	Indianapolis
Denver	Fargo	Joliet

ASPHALTS FOR

State Highway No. 9, Ward County

N. D. State Highway No. 9

State Highway No. 9 Leading to Sawyer

N. Dakota Highway No. 9

Is Paying Less and Getting More

roads can be constructed not only at a low cost, but because of their durability and resistance to traffic wear, can be maintained at a very small expense.

No highway builder can afford to overlook the many advantages of roads built with Standard Oil Company (Indiana) Asphalts and Asphalt Road Oil . . . smooth, easy riding, durable, low in first cost, and low in maintenance cost. Write for our Cut Back Asphalt Booklet. It is a valuable handbook on low cost road building.

STANDARD OIL COMPANY
(INDIANA) (105)
910 South Michigan Avenue Chicago, Illinois

Kansas City	Milwaukee	Saginaw
La Crosse	Minot	Sioux City
Mankato	Peoria	St. Louis
Mason City	Quincy	St. Joseph
Minneapolis	South Bend	Wichita

EVERY PURPOSE

$125,000,000 *Federal Road* Fund Allotted

THE Secretary of Agriculture on Oct. 15 apportioned to the states $125,000,000 previously authorized for Federal Aid in road construction for the fiscal year ending June 30, 1933. In making the apportionment 2½ per cent was first deducted for administration. The remainder was then apportioned on the basis of area, population and mileage of rural post roads in the various states. From the apportionment to each state there was then deducted one-fifth of the emergency advance funds apportioned last December. The net apportionment available for new projects amounts to $105,875,000.

The new funds are available to the states for immediate obligation of projected construction. The apportionment has been made 2¼ months in advance of the usual date so that the states may get an early start on plans for next season's construction.

The Bureau of Public Roads, through which Federal Aid funds are administered, has indicated a desire to accept policies designed to increase employment and to protect labor. Among the acceptable policies are the fixing of a fair minimum scale for unskilled labor and restrictions giving preference to local unskilled labor and to citizens of the state in which work is being done. If legal, the use of Federal Aid will be allowed where labor is employed direct and where such projects can be carried on economically to provide local employment. Restrictions as to hours per day and days per week in order that workers may be continuously employed are also acceptable. The Bureau of Public Roads will not accept the disbarment of a contractor from the award of a contract because he is a nonresident of the state, provided he is the lowest responsible bidder, nor will it accept the limitation of materials to those produced within the state.

Last season Federal Aid road work was greatly accelerated because the regular authorization of $125,000,000 was supplemented by an emergency authorization of a loan of $80,000,000. At the peak of the season more than 155,000 men were engaged on Federal Aid work.

The new apportionment is as follows:

Apportionment of Federal Aid for the Fiscal Year 1933, Available October 15, 1931

State	Amount
Alabama	$ 2,250,169
Arizona	1,556,080
Arkansas	1,846,477
California	4,121,029
Colorado	1,988.953
Connecticut	687,401
Delaware	529,375
Florida	1,437,372
Georgia	2,753,344
Idaho	1,330,448
Illinois	4,476,553
Indiana	2,698,897
Iowa	2,799,805
Kansas	2,889,065
Kentucky	1,994,012
Louisiana	1,537,800
Maine	944,168
Maryland	895,409
Massachusetts	1,511,244
Michigan	3,338,014
Minnesota	2,976,273
Mississippi	1,907,440
Missouri	$ 3,314,41
Montana	2,230,17
Nebraska	2,256,04
Nevada	1,392,75
New Hampshire	529,37
New Jersey	1,463,48
New Mexico	1,732,34
New York	5,342,50
North Carolina	2,550,00
North Dakota	1,710,93
Ohio	3,971,69
Oklahoma	2,553,03
Oregon	1,763,26
Pennsylvania	4,640,667
Rhode Island	529,37
South Carolina	1,469,60
South Dakota	1,765,76
Tennessee	2,302,15
Texas	6,770,22
Utah	1,223,56
Vermont	529,375
Virginia	1,992,38
Washington	1,681,21
West Virginia	1,162,21
Wisconsin	2,640,71
Wyoming	1,359,00
Hawaii	529,375
Total	$105,875,000

Work on 10 miles of grading and gravel surfacing located between Hartsel and Florrisant is nearing completion by the J. H. Miller Co., Denver contractors.

An example of gravel-surfaced highway located near Avon in Eagle County, constructed under Federal Aid specifications. Photo by H. L. Jenness.

How Grand County, Colorado Cuts Drainage Costs . . .

ts off to Grand County! This is another of the any progressive Colorado counties showing the y to drainage economy and lower highway sts, with lower taxes.

e photograph shows a GOHI Corrugated Cul- rt installed in Grand County in 1921 on what is w Route 40. After 11 years of heavy service, parently it is in as good condition as the day it s put in the ground.

OHI Culverts meet the most difficult drainage demands. Strength for any depth fill. Flexibility that prevents failure from freezing or settling earth. Corrosion-resistance that keeps them on the job long after ordinary culverts have to be replaced. Normally, GOHI Culverts outlast the roads. The reason—the 99.90 per cent Pure Iron-Copper Alloy base metal from which we fabricate them.

Before you install any culvert, get the facts about GOHI. Write TODAY.

DENVER STEEL & IRON WORKS CO.

A Colorado Concern—Culvert Headquarters

VEST COLFAX & LARIMER STREETS DENVER, COLORADO

GENUINE OPEN HEARTH IRON GOHI MARK TRADE PURE IRON - COPPER ALLOY REG U S PAT OFF

GOHI
PRONOUNCED "GO-HIGH"
Corrugated
CULVERTS

rt copper-bearing pure iron requirements in all ted specifications for corrugated metal culverts

NEWS OF THE MONTH

Fifty men are being given employment on a standard Federal Aid project located on LaVeta Pass. The project is located on the east slope of the pass. A steam shovel and 15 trucks, a compressor and a variety of small tools are in use on the job. Prospects are that the job will run most of the summer.

A large Pioneer crushing plant is being operated east of the town of LaVeta getting out gravel for use on the Walsenburg-LaVeta trunk highway.

Three-quarters of a mile of concrete pavement located in the city of Sterling is being laid by J. Fred Roberts & Sons under a state contract. The contract price was $20,740 for the completed project, which will be paid for from "3-per cent" funds allotted to cities from the gasoline tax. The project is located on State Road No. 2.

Pueblo Bridge & Const. Co. were low bidders on a 60-ft. concrete bridge to be constructed over Sand Creek, located three miles north of Canon City on S. H. No. 6. The bid price was $6,012.08. Fourteen other contractors bid on the job.

Twenty-two contractors bid on F. A. project No. 296-F on May 12. The project consists of 7.486 miles of grading and gravel surfacing located south of Pueblo on State Road No. 1. Charles B. Owen of Denver was the successful bidder with a price of $67,507.15. The engineer's estimate was $90,012.90. Owen bid 12 cents for common excavation and 48 cents per ton on crushed gravel. This is one of the lowest prices ever received by the highway department for these two items. There is 139,700 cu. yards of unclassified excavation and 17,765 tons of gravel in the project.

The Denver Steel & Iron Works Co., Denver, were low bidders on a 53-ft. steel and concrete bridge to be constructed over Bear Creek near Evergreen on State Highway No. 73 in Jefferson county. The total bid price was $9,761.95.

Collections from state motor vehicle fees dropped $88,013 the first four months of 1932, according to a report by James Pullar, state motor vehicle supervisor. The collections for the first four months of 1932 were $1,503,784, as compared with $1,591,797 in the same period in 1931. Denver county showed a loss of $25,157.

The report shows the registrations for the state were 215,015 automobiles, 21,806 trucks, 203 trailers and 478 motorcycles. Last year on May 1 the registrations were 216,989 automobiles, 23,618 trucks, 121 trailers and 586 motorcycles.

Denver county this year has registered 68,477 automobiles, 4,370 trucks, 104 trailers and 191 motorcycles. Last year on the same date the registrations were 68,596 automobiles, 4,341 trucks, 57 trailers and 257 motorcycles.

Denver paid $457,070 in fees this year and $474,652 last year in the same period.

Following the decision of the Colorado supreme court the State Highway Department collected approximately $78,000 in refunds from the gasoline tax department.

Accountants of the city and county of Denver were busy for several days on the task of determining how much of the gasoline used by municipal vehicles on which the state tax of 4 cents a gallon had been withheld, was consumed on street and highway work. The state supreme court ruled that cities and counties must pay the state gasoline tax on all fuel used in public vehicles except those engaged in highway construction and maintenance.

Traffic is now moving over four and a half miles of concrete pavement located south of Pueblo on State Road No. 1. This project was constructed by the New Mexico Const. Co. The cost of this Federal Aid project was $154,509. Completion of the project eliminates one of the worst stretches of road between Pueblo and Walsenburg.

Hamilton and Gleason, Denver contractors, have moved their outfit off the completed grading and graveling project between Manitou and Cascade on Ute Pass.

Eight and one-half miles of gravel surfacing located between Del Norte and Monte Vista has been completed by the Mountain States Const. Co.

Twenty-two miles of gravel surfacing located west of Cheyenne Wells has been completed by A. R. Mackey.

The Mountain States Const. Co. also have completed seven and one-half miles of gravel surfacing located south of Alamosa.

Showing a section of the new Federal Aid highway over Yellow Jacket hill recently opened to traffic. This can be traveled in any sort of weather. Photo by U. S. Bureau of Roads.

OD ROADS LEAD TO BEST FISHIN' SPOTS

(Continued from page 5)

reau of Public Roads show that annual travel of vehicles on the deral Aid system in the 11 west- states amounts to 8,400,000,000 es. Vehicles from outside of the te constitute an average of 15 per t of this traffic.

These figures give some idea of tremendous amount of traffic t moves over our roads each year. Yes, we have good roads and we proud of them and not ashamed invite our friends to come and joy themselves in cool, colorful lorado.

Rapid progress also is being made N. M. Monaghan, contractor, on and one-half miles of grading gravel surfacing near Elk rings on U. S. route No. 40n, lo- ed west of Craig. It is expected s project will be completed be- e the heavy tourist traffic starts.

Fred Roberts & Sons are near- completion of seven miles of gravel surfacing on the same road west of Maybell.

"MUD ROAD TAX"

Only 4 per cent of the country roads in the United States have been hard surfaced. There are 2,500,000 miles of highways that are still mud roads and subject to the "mud road tax" paid by the motor vehicle owners in the form of higher operating costs, increased depreciation and greater upkeep expense. "We pay for our roads whether we have them or not" is held to be axiomatic by careful students of highway economics.—American Road Builder.

Posting of state highway markers has been completed in Denver, according to Highway Engineer Vail. Crews are now working on routes leading into the state from the east, north and south. As rapidly as possible the work of marking will be extended to the western slope. More than $100,000 will be expended on this work by the highway department during the next three or four months. Of this sum $25,000 has been donated by state employes to relieve unemployment. The signs and posts are Colorado products.

It is estimated that construction and maintenance of roads in Colorado is now giving employment to over 3,000 men.

Colorado gasoline tax receipts for 1931 totalled $6,857,517.26, according to Oil Inspector James Duce. Total expense of the inspector's office for the year was $67,378.69. Refunds for last year reached the unprecedented total of $730,354.88, of which $565,158.28 went to farmers. Industries received $45,942.40; contractors, $62,731.72, and aviation, $6,299.64. In addition to the foregoing, the State Highway Department was refunded $30,486.56, the counties $25,468.76 and the cities and towns $1,974.24. The number of refund claims totalled 49,273.

Of the net amount collected, there was $1,625,695.09 distributed to the counties. This was divided on the basis of Federal and state mileage in each county.

The State Highway Department's share of the 1931 gasoline tax was $4,400,501.10. This is the department's principal source of revenue.

PLANS BEING PREPARED

Proj. No.	Length	Type	Location
122-R3	11 mi.	Concrete Pav't & Overhead R. R. Crossing	Julesburg, east and west
145-D	6.5 mi.	Gravel Surfacing	East of New Castle
248-D	5 mi.	Gravel Surfacing	South of Buena Vista
260-A	6 mi.	Gravel Surfacing	East of Montrose
263-D	5 mi.	Gravel Surfacing	West of Ft. Garland
286-F	0.5 mi.	Concrete Pavement & Bridge	North of Greeley
294-C	8.5 mi.	Gravel Surfacing	East of Cortez
298-E2	0.1 mi.	Bridge	Wolf Creek Pass

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
58-AR 216-AR&B	Between Holly and Granada	7.825 mi.	Gravel Surfacing	State Forces			58-AR 216-AR&B
68-B	South of Saguache	3.290 mi.	Gravel Surfacing	H. C. Lallier C. & E. Co.	$ 74,428.75	63	68-B
145-C	East of Rifle	14.901 mi.	Grading & Grav.	A. R. Mackey	271,703.80	60	145-C
149-E	Between Bennett & Strasburg	4.412 mi.	Gravel Surfacing	Edw. Selander	60,930.18	34	149-E
150-C	West of Craig	6.893 mi.	Gravel Surfacing	J. Fred Roberts & Sons	120,139.05	69	150-C
150-D & F.L.P. No. 1	Between Elk Springs & Massadona	10.691 mi.	Gravel Surfacing	N. M. Monaghan	156,379.26	22	150-D & F.L.H.P. No.
158-A	Between Manitou & Cascade	4.062 mi.	Grading	Hamilton & Gleason	164,681.20	99	158-A
158-B	Bet. Hartsel & Florissant	10.319 mi.	Gravel Surfacing	J. H. Miller & Co.	133,380.70	77	158-B
181-A	In Idaho Springs	1.876 mi.	Paving	J. Fred Roberts & Sons	93,749.55	41	181-A
248-C	Between Buena Vista and Salida	3.944 mi.	Gravel Surfacing	Pantle Bros.	48,780.50	62	248-C
258-I2	East of Montrose		Concrete Box Culvert	Hinman Bros. Const. Co.	8,455.50	99	258-I2
259-B	Bet. Gunnison and Parlin	9.587 mi.	Gravel Surfacing	Cole Bros.	184,503.00	69	259-B
262-ER	West of Walsenburg	0.465 mi.	Gravel Surfacing	W. A. Colt & Son	20,736.75	10	262-ER
263-C	East La Veta Pass	5 mi.	Gravel Surfacing	State Forces			263-C
265-E	West Bayfield	2.950 mi.	Gravel Surfacing	J. H. Miller & Co.	978,39.06	86	265-E
270-E	Bet. Del Norte & Monte Vista	8.663 mi.	Gravel Surfacing	Mountain States Const. Co.	102,199.10	92	270-E
278-D	West of Cheyenne Wells	21.913 mi.	Gravel Surfacing	A. R. Mackey	93,563.30	100	278-D
292-D	Bet. Wolcott and Avon	9.834 mi.	Graded Surface	Utah Const. Co.	159,143.40	88	292-D
295-E	South of Alamosa	7.627 mi.	Gravel Surfacing	Mountain States Const. Co.	71,049.56	99	295-E
296-AR&BR	South of Pueblo	4.372 mi.	Paving	New Mexico Const. Co.	154,509.00	73	296-AR&BR
298-E	South of South Fork	1.894 mi.	Gravel Surfacing	Grant Shields	92,279.20	0	298-E

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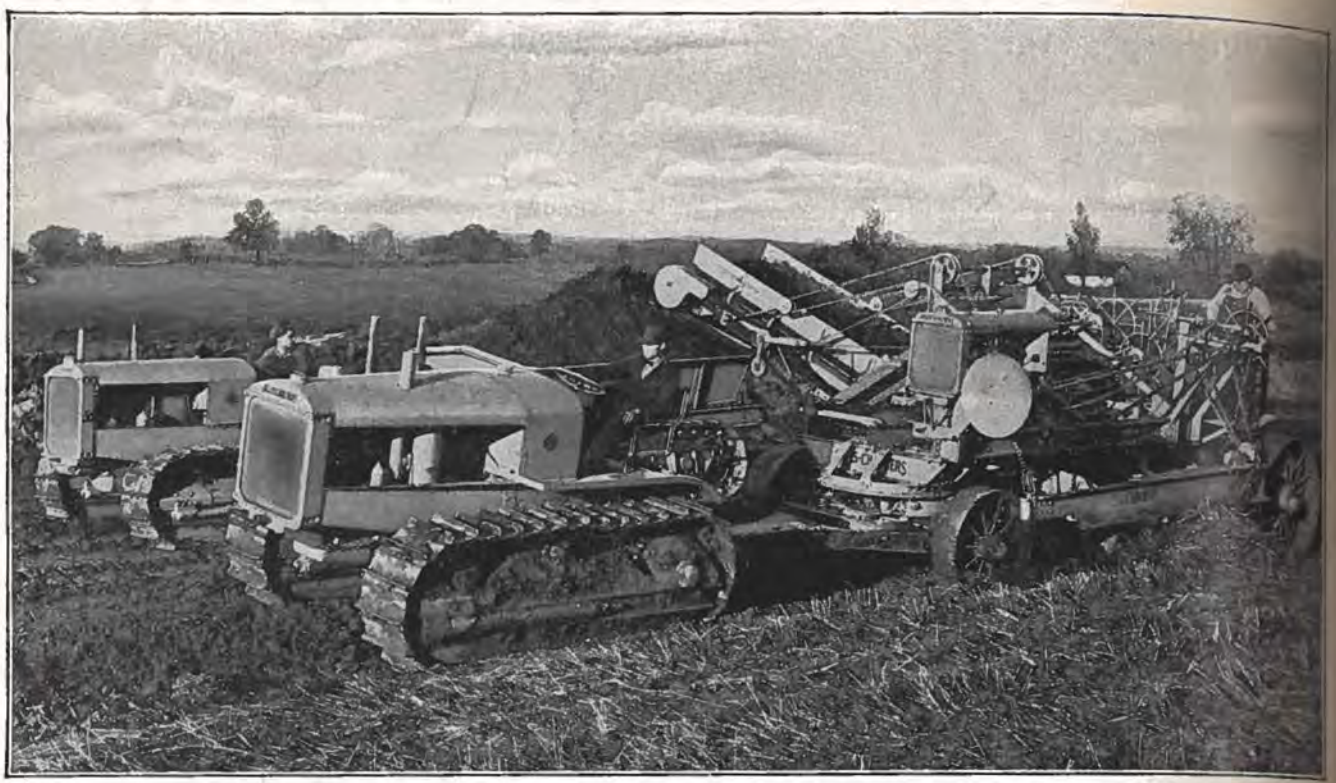

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COLORADO HIGHWAYS

Vol. XI June - July, 1932 No. 6-7

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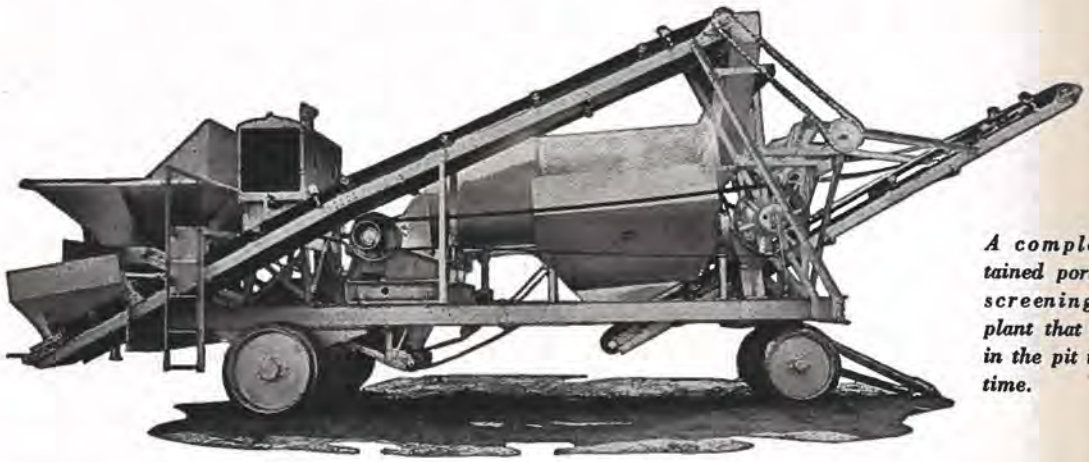

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2. Feed hopper of 3½ cu. yds. storage capacity is mounted at the end of the plant so that it can be fed directly from shovel in the pit. Charging height from ground is 8′ 10″.
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4. Hydraulic jacks are built into the lower side of the truck beams on the end of the plant. Road clearance is 18¾″ and wheelbase is 19′. Overall height is 14′ and overall length is 42′. Has short turning radius.
5. Truck is made of 10″ 30-pound I beams properly balanced and reinforced with cross members. Standard steel disc roller bearing wheels.
6. A 14″ belt conveyor (185 FPM) takes the crushed material from below the crusher and puts it back into the conveyor leading to the screen—a closed circuit on conveyors.
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8. Cone on lower end only as front part is taken care of by 1½-yard surge hopper mounted directly below the front end of the screen.
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12. Feeder clutch and delivery conveyor clutch are mounted on front end of the plant, thereby centralizing all controls in one place. Gear arrangement and clutch controls for the revolving screen are the same as we are using on our standard OPO's.
13. All controls at front—uses standard OPO drives—about 35 chain and 10 sprockets on entire plant—standard parts used.
14. 18″ feed conveyor (300 FPM) mounted on side of plant takes materials discharged from automatic feeder and carries them to top of plant, where they are discharged directly into the screen.
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Colorado Highways

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Our Cover Picture

Here we have a view of U. S. Route 285 running north from Denver, leading through Loveland, Fort Collins, and one of Colorado's richest irrigated sections. This is one of the most heavily traveled roads in the state, and is the direct route from Denver into the Rocky Mountain National park area.

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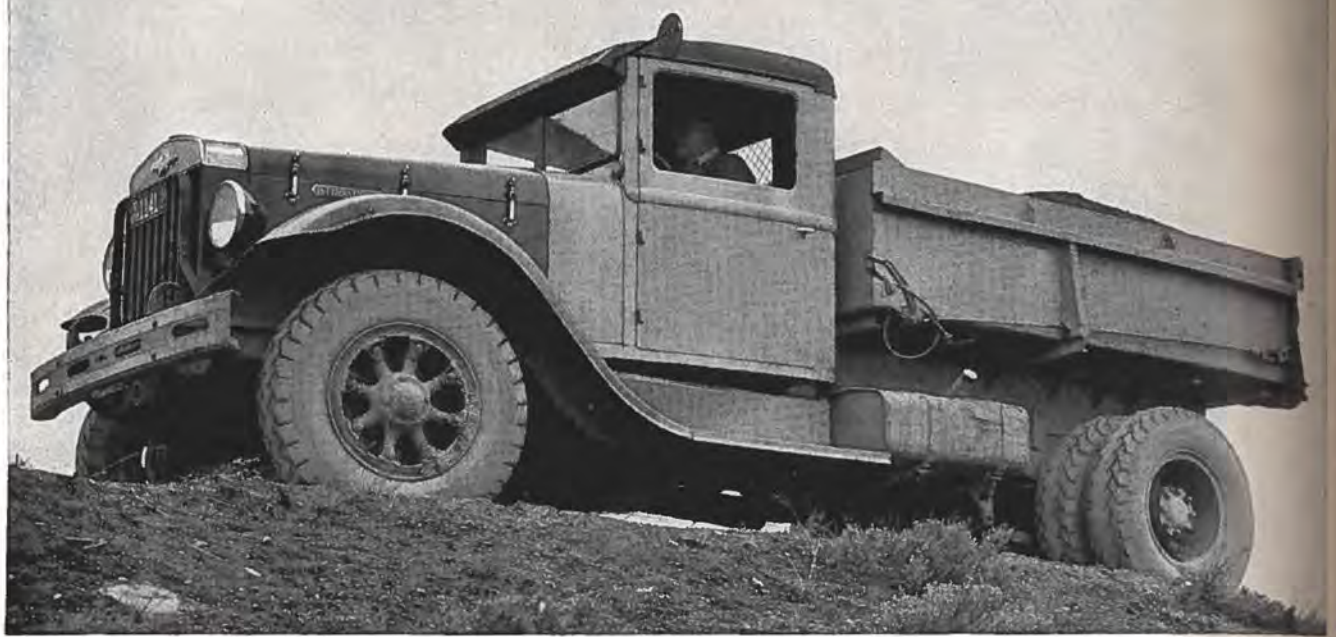

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Colorado Highways
"BETTER ROADS"
OLUME XI. JUNE-JULY, 1932 NUMBERS 6 AND 7

EDITORIAL

S. GAS TAX IS REASON AGAINST ATE DIVERSION.

Motorists are now paying a huge share of the cost general government expenses unrelated to roads. e Federal gasoline tax of one cent a gallon is ex- ted to bring in $130,000,000 from motorists. Fed- l taxes on motor vehicle sales, accessories and rts, lubricating oil, tires and tubes, will cost motor- another $100,000,000.

The increased cost of motoring, therefore, is $230,- ,000 a year.

In return the Federal government is giving the d users $125,000,000 through Federal Aid for high- ys. This is $105,000,000 short of the motorists' tributions to the Federal government.

Highway authorities in general are of the opinion t the new Federal taxes will reduce the volume of tor usage. This will mean that the highway in- mes of many states, particularly those with gasoline x rates of four, five, six and seven cents a gallon, ll suffer reductions in income. The American Auto- bile Association estimates there will be 1,500,000 er cars in use in 1933 than now, largely because of h taxes. There were 730,000 less motor vehicles in 31 than in 1930.

In the face of reduced income, many highway build- maintain it would be folly for states to use motor- s' money for any other purpose than road construc- n. Roads are inadequate for present traffic de- nds. Properly built roads lessen travel costs and tend motoring. More money is needed for roads, economy's sake, not less. It is further claimed: th must be kept with motorists; bonds issued ainst gasoline tax income must be protected; that r the best interests of the country, motoring must stimulated, not thwarted.

HAT PRICE ECONOMY?

(By WILLARD CHEVALIER,
Publishing Director, Construction Methods)

All over the land merchants, manufacturers and nks are looking hopefully to the day when the con- mer's dollars will come trooping into the market ace in greater numbers; they are watching for the evival of business." But business must wait upon e buyers, i. e., the consumer with dollars to spend.

The consumer's dollars are born of his earnings, ther as wages, salaries, interest or dividends. And ring the last year or more private business has been bit shy on earnings. So consumers' dollars from at source have been rather scarce. Then, too, it is difficult for private industry, especially the manufacturer of consumer goods, to pay out more wages and salaries without at the same time producing more goods that must be bought.

But the construction of public works has been providing the wherewithal to keep a lot of consumers in the market place, and to do it without producing any more goods to be bought. In other words, the public works programs have provided a most helpful backlog of buying power during the recession of private industry.

Now, we are told by some of these merchants, manufacturers and bankers that we should suspend or curtail our public works construction. They want to "slash governmental expenditures." They do not distinguish between administrative expenses and capital investments. They just want to "cut the cost of government," to stop the provision of essential community facilities, to add to the roll of the unemployed some more of the consumers who still are able to buy their goods. And all this is to "reduce the burden of taxes."

Well, are taxes going to be less burdensome when they are collected to pay a dole than when they are applied to the employment of consumers in the creation of useful and permanent improvements?—Reprinted from Construction Methods, March, 1932, issue.

CAMPS FOR UNEMPLOYED.

The California division of highways has established two camps where men are given the privilege of doing part-time work on highway improvements for board and room. Each camp has a capacity of 250 men, and is located so as to provide sufficient opportunity for hand labor on maintaining and improving adjacent sections of the highway.

ROAD WORK HELPS.

Seventy-five per cent of the construction of roads goes to labor and the present cost of labor is far below par. How many think it advisable to continue the ranks of unemployment by discontinuing road work and turn them and their families over to the Red Cross and county for support?

Some motorists are placarding their cars with posters carrying the title of a moving picture, "Merrily We Go to Hell!" So far as my acquaintance with the owners of these cars extends the placards seem to be very appropriately placed.—Exchange.

Engineer *Tells Story of* Wolf Creek Road

(By J. E. MALONEY, Assistant Engineer, State Highway Department)

IN describing the location of the Wolf Creek Pass road, and the incidents which lead up to it, I begin with the first trip the State Highway Commission made over the range in 1910. In that year, during the month of July, Messrs. Allan, Tully and myself made a trip from Denver by way of Tennessee Pass, Grand Junction, Montrose to Placerville, Naturita, and to the west and south of Lone Cone to Dolores, thence to Mancos, Durango, Pagosa Springs to the junction of the east and west forks of the San Juan River, up the east fork road, which was a traveled road at that time, and on up over Timber Hill.

We were compelled to put up at the foot of Timber Hill over night, obtaining a span of mules the next day to help us over Timber Hill. From the top of Timber Hill we went to Elwood Pass, then down the Alamosa River into the San Luis Valley, thence to Alamosa. This strip of road from the east fork of the San Juan River to the top of Elwood Pass contained a great many stretches of very steep grades, especially the grade up Timber Hill.

In 1913 a flood washed this section of the road out from the base of Timber Hill to the junction of the forks of the San Juan River. There was much discussion as to the rebuilding of this road, many routes being proposed. The people of the southwest corner of the state being very much interested in having an outlet to the east, were pushing this outlet.

Mr. Herr, who was a member of the State Highway Advisory Board at that time, was a resident of Durango, and he and Senator West and others were active in urging the rebuilding of the connection from the San Juan Basin to the San Luis Basin.

The first state highway designated by the Highway Advisory Board followed the line of the east fork of the San Juan River to the top of Elwood Pass, thence down to the Alamosa River to a connection with Road 15, thence to Alamosa. This was afterwards changed so as to read, the west fork of the San Juan River to Wolf Creek Pass, thence up Wolf Creek Pass to the top of the Divide, and the connecting road was declared from the top of the Divide down to meet the Alamosa-Creede road at South fork, which is the present location.

Surveys were started by a man from Alamosa, who was unfortunately killed while surveying the east fork of the San Juan River.

In March, 1913, the State Highway Advisory Board organized a construction committee consisting of Messrs. Fred Catchpole, County Commissioner of Archuleta County; Lige Morse, County Commissioner of Alamosa County, and R. Chisholm, County Commissioner of Rio Grande County. This committee was in charge of the work, getting surveys completed, and construction work started on the Elwood Pass road. These men were assisted by W. W. Reilly, Civil Engineer of Monte Vista, and his assistants. In company with this construction committee and their engineers, we made trips over all of the proposed routes from Alamosa to Elwood Pass, down to Timber Hill, and skirting around Silver Creek, to get distance enough to build a grade down on the east fork of the San Juan River; also along the crest of the Divide from Elwood Pass to Bonita Pass, thence on down to East fork. We also continued along Bonita Pass to the base of Silver Pass, around Treasure Mountain to the top of Windy Gap, thence on to the base of Windy Gap Hill to the road along the west fork of the San Juan River; also, from the top of the Divide, east, down the fork of the Rio Grande River to South fork, connecting with the Alamosa-Creede road at that point.

At a meeting on April 15, 1914 the State Highway Advisory Board had under discussion the Elwood Pass Road, and took the following action:

"In the matter of the Elwood Pass road, we have taken this matter up with the present Board of Construction and with the County Commissioners of Rio Grande and

One of Las Animas County's splendid highways, leading into the Stonewall country, a widely known recreational area in Southern Colorado.

neral Counties. The present rd of Construction desires to tinue in office, and finish the d. A conference was had with . Herr, member of the Board of struction, Senator West, and . Reilly, and the matter of the struction of the road was dis- sed, but no definite arrangements de. We will take this matter up her with Mr. Herr and the pres- Construction Board, and arrive some definite conclusion."

Shortly after this, Mr. Ehrhart, te Highway Commissioner, in- ected me to meet with the Con- uction Board at Alamosa, and go r the several locations proposed h them, and, after making in- tigation of the different routes, lecide upon a location of the road ore coming back to the office.

Following these instructions, I nt with the Construction Board ing the months of June and July r the surveys that had been le, and in July took the trip from gosa Springs up the west fork of San Juan River to Chapson's nch. Mr. Chapson outfitted us h horses and pack animals, and made the trip. Mr. Wyman of verton, who at that time was su- visor for the State Highway De- rtment, accompanied us.

We started from the west fork of San Juan River, climbing the l to Windy Gap, and from that nt we followed the survey line und the base of Treasure Moun- n, Mr. Chapson taking his horses d camping outfit over the top of easure Mountain. Mr. Wyman d myself made our way around base of the mountain, and the llowing night we camped in the cinity of Silver Pass.

The following morning we made r way to the top of the mesa, and ined Mr. Chapson and the outfit. e then proceeded to Silver Pass, ence down from Silver Pass to the uth fork of the Rio Grande River. e made this trip the latter part of ly, 1914, camping on Treasure ountain. We then went down to ox Canon on the south fork. Com- g back, we left the south fork and ent over Pass Creek, up the trail the headwaters of Wolf Creek ass on top of the Divide—from here we intended to go back to Windy Gap, thence down to the unty road on the west fork of the an Juan River.

However, upon arriving at the ead of Wolf Creek Pass, I asked r. Chapson the name of the creek, nd if there was a trail down where we could travel with the horses. He said there was not, that if we want- ed to go down, we would have to take the horses around another way. Mr. Wyman and I left him at that point early in the morning, and started down Wolf Creek Pass on foot. I had an aneroid barometer with me which gave us our approxi- mate altitudes, and by timing our- selves going down, we could make some approximation as to the fall of the creek. Climbing up and down the canon and over fallen timbers, we reached the west fork of the San Juan River about 5:30 p. m. Then we walked to Chapson's house for supper. That evening we met the construction committee at Pagosa Springs and discussed the various routes.

There was considerable difference of opinion, but I strongly advised the selection of Wolf Creek route, and a survey to fully determine its feasibility. We started W. W. Reilly on the survey, and this route was finally determined upon.

From the top of the headwaters of Wolf Creek Pass, we went down to the south fork of the Rio Grande River, following that stream into the town of South Fork, joining the main road from Alamosa to Creede, following along the main road through the towns of Del Norte, Monte Vista to Alamosa.

There was not a great deal of dif- ference in the mileage of the various routes. There was considerable dif- ference in the estimated cost. How- ever, the primary consideration leading to the selection of the road up the Rio Grande and over Wolf Creek Pass was that this road would serve the other communities along the line, and give us a good connec- tion to the San Juan Valley at a reasonable cost.

Another advantage in the selec- tion of the Wolf Creek Pass road was, it was several hundred feet lower in elevation than Elwood Pass, and 300 feet lower than Bon- ita Pass, and about the same eleva- tion as Silver Pass.

It is interesting to note that the D. & R. G. W. R. R. Co., in their surveys for the broad gauge connec- tion from San Luis Valley to the San Juan Valley, ran their line up this same south fork, crossing Silver Pass and dropping to the west fork of the San Juan River.

Construction work was started on the west side of Wolf Creek Pass and prosecuted as vigorously as available funds would permit during the next two seasons, and the work was sufficiently advanced so that opening ceremonies took place on August 21, 1916. With the funds available, of course, the road was narrow, and there were a few steep grades and sharp turns.

Since that time, improvements have been made, and we can at last see the completion of a modern road over the top of this divide.

DRIVE SLOWLY OVER OIL ROAD, DEPARTMENT SAYS

Attention has been called repeat- edly to the advisability of driving slowly over newly spread road oil, but many motorists persist in driv- ing for at least a distance sufficient to get their vehicles splashed up be- fore they slow down, a highway de- partment bulletin states, in publish- ing a formula that is recommended for use in removing the splashed oil.

"Apply a mixture," the formula reads, "of one part lubricating oil to four parts of gasoline. Allow this to remain on the splattered surface for about five minutes, then wash off with mild soap and water. This should be done before the oil or tar has hardened."

The highway bulletin also calls attention to the fact that even after gravel has been spread over the newly applied oil, a sudden turn of a steering wheel in a car moving at fast speed is likely to result in a slip and the car going out of the control of the driver. Slow speed is highly important until the freshly treated surface has become "set," the bulletin stresses.

OREGON RETURNS TO MACHINERY

The new state highway commis- sion of Oregon has announced aban- donment of the policy of construct- ing roads by hand labor as a means of providing relief for unemploy- ment. The commission has assigned two reasons for its action. First is the inefficiency of labor thus em- ployed, and second, the fact that Federal Aid cannot be obtained for projects constructed by hand labor. The Oregon highway commission paid out $72,000 a week for hand la- bor as a relief measure, and it was estimated that for the cost of one mile of road built by hand labor, eight miles could have been built by contract with the use of machinery. —The Improvement Bulletin.

State *Operation of* County Roads

By GOV. O. MAX GARDNER, State of North Carolina

Editor's Note—During recent months there has been much discussion among road officials and motorists throughout the country on the subject of state and highway finances. In several states, notably Virginia, Maryland, Pennsylvania and North Carolina, laws have been enacted giving the state highway departments jurisdiction over county road systems. At different times such a law has been discussed in this state. In this connection we wish to state that Governor Gardner's interesting article is printed only for the information on the subject that it contains, and that we are not advocating state supervision of county roads in Colorado.

The 1931 General Assembly of North Carolina enacted several reform and reorganization measures which both friends and opponents conceded to be legislation of a revolutionary nature. This General Assembly placed the complete responsibility for the operation of the state constitutional six months public school term on the state itself instead of the counties and districts, and accepted the principle of state support from sources other than ad valorem taxes on property. Another Act, known as the Local Government Act, placed upon the state the supervision of the incurring of public debt by all local governmental units of North Carolina. Upon the Local Government Commission, created under this Act, devolves the duty of seeing that local boards of three or five men in the courthouses and city halls of North Carolina no longer have the power to mortgage the future of their communities by plastering unlimited mortgages on the property of their taxpayers through unrestricted issuance of bonds and tax anticipation notes. It also passed the University Consolidation Act under which the University of North Carolina, located at Chapel Hill, the North Carolina State College of Agriculture and Engineering, located at Raleigh, and the North Carolina College for Women, located at Greensboro, are consolidated into the University of North Carolina.

Perhaps the most revolutionary act of our last General Assembly, however, was its legislation by virtue of which the state itself assumed the complete maintenance of the 45,000 miles of county and township roads which were outside of the state highway system. I say that this was perhaps its most revolutionary action because of the fact that local road administration was inherently the weakest link—the most cumbersome and most inefficient service rendered by the counties and townships of my state. Generally speaking, counties did not have any accurate information as to the amount of their road mileage, as to its cost, or as to the status of their indebtedness for roads.

In the capital city of the State of Virginia, however, I do not believe that one would lose caste in using the term "revolutionary." Throughout the history of this commonwealth its leaders have consistently removed the stigma from the terms "revolutionist" and "rebel."

The progressive legislation enacted in my state within the past two years was not accomplished without a great deal of hard work and a stubborn fight. It is my observation that no one is ever persecuted for advocacy of a progressive program until progress cuts across established and well-accepted policies. But, whenever a progressive program cuts into the status quo, there generally follows a declaration of political war.

To my mind, it is an interesting observation that during this present period of storm and stress, of economic depression, of hardships suffered by the high and low, many programs and many policies have evolved that lead to new ways of looking at our generally accepted and well-crystallized public policies. I say we have developed new ways of looking at those things which in normal and prosperous times we had settled down to accept as fixed and permanent and essentially woven programs. This period has been provocative of more original thinking and has developed more new points of view than any period of similar length in my lifetime or yours. Except in this kind of period, I do not believe that it would be possible to focus the thought of people chiefly interested in making money on the importance of a man's idea who was himself thinking in terms as far removed from their interests as this thing you call government is.

We have, of course, had a terrific deflation in business in all our states; indeed, throughout the entire world. This deflation has destroyed many individual businesses and industries. It has raised the serious question of whether our system was sound, whether it could survive. Yet I tell you frankly that I think that the more permanent injury that has come in our civilization has come in the deflation of human character, the frozen mobility of the country. America of the 1929 period had come to regard the superfluous as if it were the necessary. The past three years have put more stress and strain on the moral character of the American people than they have put on our economic system or on the ability of business to survive.

I have just said that this period has been provocative of new points of view, new outlooks, and new ways of doing many things for which we already had a well-defined pattern. I have cited for you the wide range of new legislation of an important nature undertaken and carried through in my state. I wish to discuss with some particularity the pioneering work which we have undertaken in state support and state maintenance of every

A view of one of the new oil-surfaced roadways leading out of Denver, constructed by the City of Denver.

le of public road of every character in rth Carolina. You will be interested, think, in getting a picture of the old nation as it developed and out of ich the new program emerged.

For the first half century after the se of the war between the states, rth Carolina was a plodding, poverty-den, agrarian state. Financially, we re poor. Educationally, we were back-rd—really among the last half dozen tes of the Union. We did not have a ll-balanced social program. We did ve a willingness to work. From father son to son again, it was hard, back-aking work to get just a little farther ead. For the first 20 years of this cen-ry, however, we made a substantial, terial advance. We developed cotton nufacturing until our textile industry ood shoulder to shoulder with that of e State of Massachusetts. In the Pied-ont section we developed a furniture in-stry second to Grand Rapids, and a wer industry with wide ramifications. e developed the first position in to-cco manufacturing. And we educated r children.

Growth of State's Composite Debt

Beginning with the close of the World ar and continuing for 10 years, my te prospered in every way, especially the production and accumulation of ealth and in raising the standard of liv-g of all classes of its people. From 19 to 1929, the tax bill of North Caro-a grew from $23,500,000 per year to ghtly above $100,000,000. In 1921 the te embarked upon a broad program of rmanent improvements. The foremost em in this program was a $50,000,000 nd issue for construction and improve-ent of a primary system of 5,500 miles state highways. At about the same me the counties began to issue bonds r the construction and improvement of secondary system of county roads. In ss than 10 years they had issued $125,-0,000 of bonds for roads. The cities nd towns had obligated themselves for 75,000,000 for street improvements. The stricts and counties and state combined pent more than $90,000,000 of borrowed oney for the erection of rural and urban chool buildings. On the whole, for every ublic dollar spent out of public revenue, he state and its subdivisions had an ad-itional 50 cents to spend, raised from orrowed money. The composite debt of he state grew from $100,000,000 in 1920 o $550,000,000 in 1929.

It is unnecessary to suggest that we ere traveling faster than our ability, as easured by our earning power, war-anted. Like the man whose family con-istently lives somewhat beyond his in-ome, we found ourselves beginning to make plans to shift our tax burden from ne shoulder to another. At the begin-ing of this period, that is, between 1919 nd 1921, we undertook a rather thor-oughgoing reorganization of the tax tructure of North Carolina. We made a tate-supervised revaluation of all tax-ble property, which resulted in increas-ng its tax value from a little more than 1,000,000,000 to a little more than $3,-000,000,000. We adopted a state income ax, and refined and increased our fran-chise and license tax schedules. At this ime land and property were paying bout 85 per cent of the total tax bill. This reorganization tended to lighten the burden on property, but our increased spending and the increased revenue nec-essary therefor combined to increase the absolute sum paid by property from year to year.

Even before the breakdown in business and the crash of values in 1929, it was apparent to thoughtful observers that property owners were being required to give up too much of their earnings in taxes. While the state itself was levying no tax on property, the counties and municipalities were consistently and continuously increasing local levies. The effort at property tax relief took various directions. The state aid fund for the public schools, which supplemented county property tax levies, was more than doubled in 1927 and then was doubled again in 1929—relief to the property taxpayer. The State Highway Commission was continuously taking over additional county road mileage from the counties into the state system, relieving the burden on property and increasing it on gasoline.

State Control of Roads Proposed

In my inaugural message to the 1929 General Assembly I recommended that the state assume the complete cost of maintenance of all county roads, provide the revenue from an increased gasoline tax, and relieve the counties of this burdensome responsibility.

In the beginning of many movements, however, we fail to accomplish our entire purpose. The 1929 General Assembly did not follow this recommendation. It did increase the gasoline tax and it set aside $3,000,000 out of the highway fund to be apportioned as state aid to supplement county revenues for the maintenance of roads or for payment on their road debt obligations, which stood at $100,000,000.

Of course, this relief was well intended, but frankly it did not reach the spot. Nine-tenths of it was devoted by the counties to road debt service. More roads continued to be built by the counties and the local tax burden on property for roads did not show any substantial reduction.

I became thoroughly convinced that my original recommendation offered a sound solution to our problem. By 1930 the economic situation was, of course, substantially changed. We began to realize that we had had a surfeit of spending and were beginning to take our first steps in the paying era. The task was to convince the public mind that the counties and townships were too small in area, too widely diffused in economic ability, ever to be efficient units for road administration.

North Carolina has always been a "state's rights" state. Yet after mature thought and conference, I turned my eyes to Washington for assistance. As the outcome of a conference with the Secretary of Agriculture and later with the Chief of the Bureau of Public Roads, I was able to enlist the enthusiastic assistance of the Bureau of Roads in a thorough study of our problem with a view to finding a practical way to solve it. We were convinced, mind you, that we were spending too much for county roads, that the burden of support of these roads fell unfairly on the owners of property, and that we deserved better roads than we had. The chaotic bits of information we had about the cost of county road construction and maintenance and debt and mileage was convincing that we had a tremendous amount of work to do merely to find out where we were at. Official reports in the possession both of the state authorities and the Bureau of Public Roads indicated that our county mileage in North Carolina was in excess of 67,000 miles. We agreed that we did not know either in Raleigh or in Washington how correct this figure was. Our first step was to find the facts.

The Federal Bureau agreed to collaborate in and direct a physical and financial survey of our county systems, and to report the findings. When the roads in each county were clocked with speedometers, the survey found that instead of having a total of more than 67,000 miles, as we had led ourselves to believe, we had by accurate measurement only 45,090 miles. It was but natural, of course, that the amount of mileage reported by the counties should have been exaggerated, because the budgets set up annually for roads had some relation to mileage, and because the state aid road fund which they had participated in for two years was allocated partially on the basis of mileage, and they had a very strong incentive to magnify the mileage. But the facts were that not many of the counties had any very clear information about their actual mileage. But few counties had any recent maps of the layout of roads. As you know, the Bureau of Roads undertakes every five years to secure, by visitation and by reports, the local road mileage of every state. We had access to their reports and also had independent reports. In one county (and this is typical) which reported under an affidavit 1,760 miles showed, they found, when the speedometer was applied, a total of 778 miles.

Variations Disclosed by Survey

The survey found that the condition of county maintenance varied (and this is very significant in our state) all the way from very satisfactory standards in a few of the best managed and wealthiest counties to hopelessly inadequate standards in a growing majority of rural agricultural counties—especially in some 15 or 18 counties which maintained roads through township road commissioners. You realize, of course, that traffic demands necessarily require a larger total expenditure for roads and a larger per mile expenditure in certain counties than in others. While we recognize this fact, we did not feel that a total expenditure in one county of 54 times the expenditure in another county was justifiable; and we did not believe that an average per mile cost of $688 in one county and $14 in another county, that is, an expenditure of 49 times as much per mile in one county as in another, was justifiable or equitable to the taxpayer.

Another question which was intimately bound up with the road question was that of county prisoner maintenance. In North Carolina we had the chain gang system. It was a vicious system which was breaking down of its own inherent weakness, and wrong. Prisoners sentenced to serve terms, who were not sent to the state penitentiary, were assigned to county chain gangs. Forty-seven counties operated chain gangs. The remaining 53 counties assigned their prisoners on a contract basis to those counties maintaining chain gangs. The tax burden on property for maintenance of prisoners and chain gangs had reached at this time a total of $1,289,000 per year. The survey showed that the cost of penal administration was being made a charge on local road maintenance and that the cost of these prisoners was being given over to the cost of the road itself. We

did not believe it an indication of efficiency that the average maintenance cost per mile in the 47 counties operating chain gangs should be $182, while the average per mile cost in the other counties was $90. The survey indicated that in many of the poorer-managed counties no satisfactory records of maintenance cost were kept by local authorities, and that it was, therefore, impossible for the public to discover the ways in which its taxes for roads were being spent. In fact, in some instances it was found that the township systems were so nearly independent that no records of their expenditures were kept at all by the county financial officers.

Within 10 years, I say, the counties had made a total investment of $125,000,000 in county roads. One hundred millions of this investment was still on the books in the form of bonded debt. The survey pointed out that the bonded indebtedness of counties for roads represented a sum far in excess of the present worth of all county roads, and suggested the primary importance of conserving and protecting this investment.

Its most fundamental conclusion can perhaps best be stated in its own language. Summing up the economic and physical difficulties in the way of efficient administration under county control, it said: "First, the county unit is not sufficiently large to include areas of rich and poor development; and second, the area of the county and the extent of its mileage are not sufficient to permit full utilization of the force and equipment necessary for efficient operation."

Foundation of New System

The conclusions and recommendations of the survey clearly indicated the desirability of giving up the smaller administrative units for a larger administrative unit, and that was the very foundation of the North Carolina road system. The practical objections to this proposal were: First, it had never been done in any other state — the inertia against change. Second, it meant the abolition of more than 150 local boards, and the removal of between 500 and 600 local officials—all of whom had, of course, some prestige in their own communities. I was invited by Governor Pollard to address the General Session, and the one thing that was brought up in opposition to the state maintenance and control of all the county roads of Virginia was that it invaded the sacred precincts of local self-government, and that was one dominant issue in Virginia similar to the problem in North Carolina. Third, it raised the fear that the local communities would have no voice or control in local road problems; in other words, it was charged that it would destroy self-government. Fourth, it aroused the fear and resentment of the road machinery salesmen and contractors.

I omitted to say that in describing the nature, classes and adequacy of road building and maintenance equipment owned by the counties, the report stated that some counties were largely oversupplied with machinery and others hopelessly undersupplied, and that road equipment was in many instances of the heavier and more expensive types pressed on them by road salesmen—types not suited for efficient and economical maintenance of county roads, that is, dirt roads. The survey pointed out that some counties had enough machinery of the heavier types to maintain not only their own mileage, but also the mileage of every adjoining county as well within 50 miles of that county. It suggested that this might account for the unusually large expenditure for gasoline and oil, which averaged $20 per mile for the entire state.

In making plans for a fundamental change in support and maintenance of county roads, we were favored by this fortunate situation: Our State Highway Commission, beginning in 1921 and continuing through 1929, had done such an estimable job of highway construction as to gain nationwide recognition for itself and for North Carolina. And may I say in this connection that we spent $175,000,000 for road construction in North Carolina, and there has never been an intimation from any source, from any party, directly or indirectly, of the misapplication of the spending, or fraud, or corruption in the expenditure of a single dollar of the $175,000,000. I am speaking now of the construction of state highways, that is, the main arteries of traffic. In this period the Commission had spent all told $175,000,000 in construction. It had largely completed this task. It was faced with the necessity of deflating its organization and forces or entering new fields. We had completed our construction program; we were entering the maintenance period.

The administration proposal to the General Assembly, therefore, was that the state itself take over through State Highway Department under the Highway Commission the complete job of maintenance and construction of all county roads; that the General Assembly make an appropriation out of the state highway fund of $6,000,000 annually for this purpose (for the preceding year the counties had spent $8,250,000; we asked the General Assembly to appropriate $6,000,000 and do the identical job with $6,000,000 that the counties had spent $8,250,000 for); that the county commissioners be prohibited from levying any tax whatever on property for county road maintenance or construction; that the State Highway Commission itself be reorganized before undertaking this task.

Declares Plan Gives Satisfaction

As the bill came down to the time of voting, the opposition really melted. It was passed with only a handful of opponents in the House and some seven or eight in the Senate. The Act was put into effect July 1, 1931. We have had not quite nine months of operation under it. It is not too early, however, to draw definite conclusions or to predict how it will stand up in the future. I do not hesitate to say that our people as a whole, both those who favored it and those who opposed, are finding the utmost satisfaction in its operation. No small part of this comes from the fact that they are traveling over the best country roads they have ever traveled over and their tax bills do not contain one cent of levy for road maintenance. **The war against the status quo always comes to an end in the victory of an informed and efficient public service.**

I might say parenthetically that wherever country roads are dependent for maintenance on property taxes, with the present heavy burdens property is carrying and with the difficulties of collecting this tax and the hardships in paying it, they are likely to be in grave danger. To support the county roads in these several states, I am satisfied that unless some scheme similar to this is contemplated for the protection and salvaging of the county roads in this country we will be in grave danger before many winters pass.

There is really no comparison between state maintenance and average county maintenance. State maintenance is incomparably superior. My state transports more public school children than any other state in the Union. This year we have transported 15,000 more pupils than last year—a total of 212,000 pupils—and we were transporting them this year over roads that were maintained by the state and controlled by the state. Yet the cost of transportation is at least $350,000 less this year than last year, on the authority of the state superintendent of public instruction. This is a by-product of state maintenance that was not at all anticipated when we wrote into the bill the definite requirement that county roads serving public school truck and bus routes must be well maintained, and were so well maintained that it saved $350,000 the first year of operation.

County Road Machinery Bought

As to cost, for the first eight months of this fiscal year, slightly under $4,000,000 of the $6,000,000 appropriated was spent. But I would call your attention to the fact that in this $4,000,000 is included an item of $785,000 for the absorption of new and better adapted machinery and equipment for county maintenance. When the state took over these county roads, we took over the county road machinery and brought it all together; and there has never been collected under one tent in all this country such a menagerie of machinery as we had there assembled. Two-thirds of it was found to be valueless, and the first thing that the state did was to buy $785,000 worth of new machinery, to supply an inventory cost on hand for the counties of $2,800,000 worth of machinery.

In addition to this, the $350,000 saved on public school transportation is actually more nearly than anything else an additional saving on road maintenance. Another important result obtained under state maintenance of state highways and of county roads is this: Under the old regime, neither the Highway Department nor the county road officials, working more or less independently, naturally did not give a great deal of concern to a proper integration of the two systems. Intersections where the state system stopped and the county system commenced oftentimes presented real problems and real dangers to the traveling public. This is being largely eliminated. You cannot tell where the state system ends or where county system begins except as to the character of the material on the road, and not the construction.

You may fairly ask the question whether North Carolina would be willing to go back, to give up state maintenance of roads or state operation of schools. My answer is that in both of these services we have had this year perhaps the most satisfactory standards we have ever had. The total expenditure for the two services has been decreased almost $6,000,000 per year and the tax burden on property, the heaviest tax burden in the state has been reduced $12,000,000 as the result of the action of one General Assembly.

Minnesota Is Rapidly Accomplishing a Complete and Skillfully Constructed Highway System

IN constructing over 5,000 miles of bituminous treated roads, the highway department of Minnesota has developed and proved methods of construction that are low in first cost and low in maintenance. These roads are durable and easy riding. They will handle heavy traffic and withstand the severe Minnesota winter weather.

Hundreds of miles of Minnesota roads are constructed with Standard Asphalt Road Oil. Roads and pavements built with Standard Asphalt Road Oil meet the requirements for durable low cost roads. When properly constructed and processed, either road-mixed or pre-mixed, they give full value.

If you are interested in low cost improved roads ask about Standard Asphalt Road Oil or Stanolind Cut-Back Asphalt.

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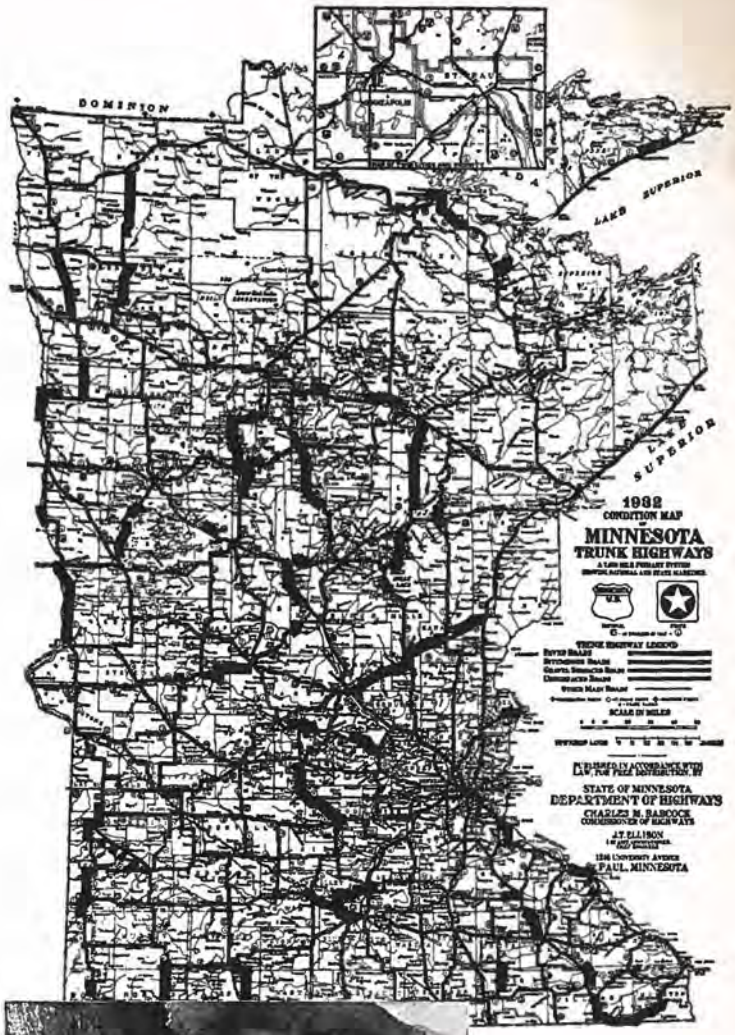

Minnesota Highway No. 3

Minnesota Highway No. 9

ASPHALTS FOR EVERY PURPOSE

Five Major *Road Projects* Started

WITH the awarding of contracts for the construction of five major road projects, Colorado's highway program for this year was given added impetus on August 1st. On this date Highway Engineer C. D. Vail announced that contracts had been approved for $295,733 in new work.

Funds for this work will be provided from Federal and state budgets. None of it will be taken from the emergency appropriations made available by congress recently. Bids for these projects were taken before the unemployment relief act was signed by the President, and the regulations governing the construction of the five jobs do not conform to the relief act.

Three of the projects were awarded to the Driscoll Construction Company of Pueblo as follows:

Virginia Dale to Wyoming line, northwest of Fort Collins, 13.1 miles of oiling, to cost $30,250.

Siebert to Stratton, on Highway 40, 14.42 miles of oiling, to cost $29,265.

Alamosa to La Jara, 13.88 miles of oiling, to cost $21,851.

Contract also was let to J. B. Bertrand, Inc., Denver, for the construction of 11.17 miles of concrete pavement between La Junta and Hadley, to cost $195,925.

Contract for the construction of a bridge on Wolf Creek Pass, to cost $16,482, was given to the M. L. Harvey Company of Canon City.

Equipment has already been moved to all of these projects and full crews of men will be given employment within a short time. The work will be rushed to completion, according to Mr. Vail.

Announcement was made by Mr. Vail that bids will be sought at once on thirteen other Federal Aid projects. These projects will be constructed with funds from the Federal unemployment relief appropriation. Several thousand men will be given employment under these contracts in all parts of the state.

The thirteen projects for which plans have been made and on which bids will be sought immediately are as follows:

New Castle to Glenwood Springs, surfacing six miles, $190,000; east of Colorado Springs, six miles of paving, seven miles oiling, $157,000; Rapids hill construction, one mile in Big Thompson canon, $26,000; Cortez east, eight miles of construction, $116,000; Montrose east, five miles of construction, $85,000; bridge over Poudre river, north of Greeley, and a half mile of paving, $50,000; Buena Vista south, five miles of surfacing, $120,000; Burlington to state line, fourteen miles of construction, $124,000; Julesburg west, eleven miles of paving, $230,000; Fort Garland to Blanca, five miles of construction, $48,000; Leadville to Malta, seven miles of construction, $40,000.

A tentative budget is being prepared to cover the other two million dollars available from the government under the relief act.

It was announced that contracts for all projects under the emergency appropriation will require the paying of a minimum wage of $4.50 to labor and the staggering of employment so as to make it impossible for any one man to have more than thirty hours' work a week.

With the work already laid out it is expected that 5,000 men will be given employment in various parts of the state by the highway department. All projects authorized under the emergency appropriation must be completed by July 1, 1933.

The emergency bill provides 132 million dollars for highway construction, and Colorado's share is $2,229,000. This sum can be used to match Federal Aid and will give the state nearly 4½ million dollars for the building of new Federal Aid highways.

Engineer Vail set a minimum wage of 50 cents per hour on all highway work in 1931. Under the present emergency work the scale will be 60 or 65 cents an hour.

COMPARATIVE STATEMENT
COLORADO HIGHWAY DEPARTMENT
For the Month of June, 1931 and 1932

RECEIPTS	1931	1932
U. S. Government	$ 794,607.48	$ 114,896.58
Gas Tax	363,100.00	309,500.00
Internal Improvement	3,100.00	900.00
Highway Receipts	3,902.08	4,081.76
Bus Receipts	19,188.96	16,689.85
Private Carrier Tax	.....	18,099.22
Unemployment Fund	.....	49.50
	$1,183,898.52	$ 464,216.91
DISBURSEMENTS		
Federal Aid Projects	$ 864,586.45	$ 281,950.36
State Projects	109,180.33	126,737.20
Maintenance	109,163.21	120,525.89
Maintenance Equipment	23,872.48	44,977.93
Property and Equipment	4,011.74	618.29
Surveys	2,949.15	2,876.20
Traffic Signs and Census	1,396.74	8,759.73
Administration	17,931.48	15,815.16
County Tax Audit	.....	525.94
	$1,133,091.58	$ 602,686.70

NEWS OF THE MONTH

complete line of track wagons, uding bottom dump, end dump, pipe, and industrial track wag- has been added by the Allis- lmers Tractor Division, Milwau- for distribution through the pany's track-type tractor deal- A catalog on the complete line Allis-Chalmers wagons is now ilable on request to the Wilson chinery Co., Denver distributors.

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nternational Harvester Co. has t issued a new catalog, "Interna- al Trucks for Contractors." It es latest information on all of the ernational line of trucks. If in- ested in a new truck, write the nver branch of this company for ther particulars.

Ten or twelve years ago Peterson, irley & Gunther were quite prom- nt as road contractors in Colo- do. Some of the early road con- cts in this state were carried out this firm. Just at present they engaged in the construction of the Madden Dam in the Canal Zone. The contract involves the moving of over 1,000,000 yards of material.

Have you been receiving the Thompson Mfg. Company's little "magazet"? If you haven't, be sure to send them a request. It's called "Highways of Happiness." Of course, on the last page you will find a word or two about Toncan culverts. But that's all right. It is worth the time and the trouble.

A high speed truck mixer for both the contractor and the commercial concrete plant is offered in the 1932 Jaeger 1 and 1½ cu. yd. of the Jaeger Machine Co., mounted on the 1932 Ford chassis. George Mefley, of the H. W. Moore Equipment Co., Denver, can furnish full particulars to anyone interested in this type of equipment.

A new motor grader with power-operated controls is now being marketed by J. D. Adams Co. as an addition to its line of hand-operated models furnished with McCormick-Deering tractors.

And now we come with four-wheel drive industrial tractors. Such a machine has recently been put out by the Massey-Harris Co., Inc., of Racine, Wis.

Colorado State Highway Department's fleet of FWD trucks was enlarged by nine more four-wheel drives through their recent truck award to the Liberty Trucks and Parts Company, Inc.

The nine trucks are to be fitted for year-round road service, road building, road maintenance and snow removal. All of the trucks are to be equipped with underbody road scrapers and will be on the job in every season of the year. All of the trucks are equipped with special cylinder heads to compensate for the high altitude of this continental state and special radiators are provided for efficient cooling on the warmest days.

STATE HIGHWAY DEPARTMENT

Financial Statement, June 30, 1932

BALANCES:		
State Treasurer	$ 44,757.15	
County Time Warrants	8,583.42	
Revolving Fund	9,500.00	
Total Balances		$ 62,840.57
RECEIPTS		
U. S. Government	$ 686,473.98	
Gas Tax	1,779,000.00	
Internal Improvement	13,400.00	
Highway Receipts	51,485.98	
Unemployment Fund	17,059.58	
Bus Tax	16,689.85	
Private Carrier Tax	18,099.22	
Total Receipts		2,582,208.61
		$2,645,049.18

DISBURSEMENTS		
Federal Aid Projects	$1,214,564.03	
State Projects	297,397.12	
Maintenance	603,973.53	
Maintenance Equipment	96,566.49	
Property and Equipment	5,241.35	
Surveys	31,431.13	
Traffic Signs and Census	23,427.36	
Administration	95,296.74	
County Gas Tax Audit	1,668.88	
Total Disbursements		$2,369,566.63
BALANCES 6-30-32		
State Treasurer	$ 257,399.13	
County Time Warrants	8,583.42	
Revolving Fund	9,500.00	
Total Balances		275,482.55
Total Disbursements and Balances		$2,645,049.18

3% SPECIAL GAS TAX FUND

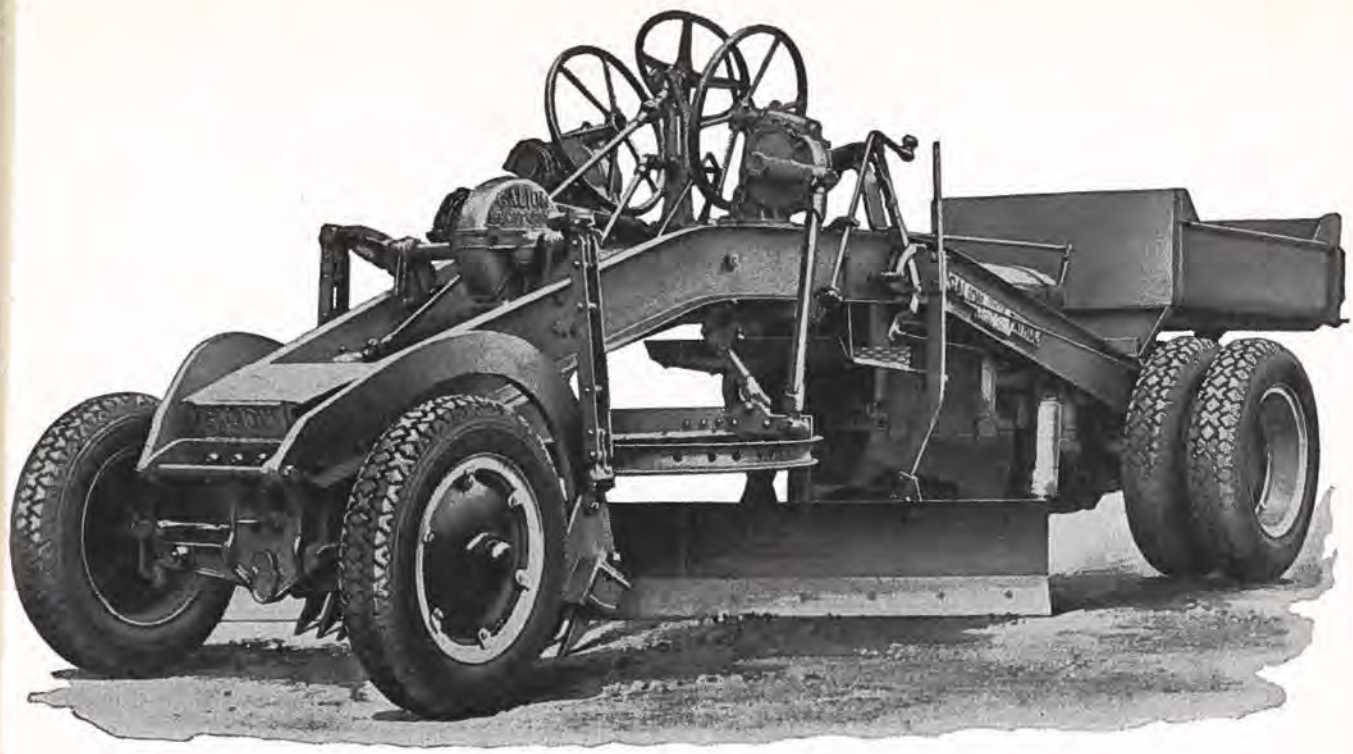
Receipts	$ 212,877.16
Disbursements	31,765.23
Balance	$ 181,111.93

PLANS BEING PREPARED

Proj. No.	Length	Type	Location
248-E	6 mi.	Gravel Surfacing	South of Leadville
286-F	0.5 mi.	Bridge & Paved Approaches	North of Greeley
294-C	8.5 mi.	Gravel Surfacing	East of Cortez

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
15-B2	East of Sterling	18.553 mi.	Oiling	Driscoll Const. Co.	$ 31,742.05	19	15-B2
58-AR, 216-AR&B	Between Holly and Granada	7.825 mi.	Gravel Surfacing	State Forces			58-AR, 216-AR&B
68-B	South of Saguache	3.290 mi.	Gravel Surfacing	H. C. Lallier C. & E. Co.	74,428.75	89	68-B
134-AR&C	West of Burlington	11.174 mi.	Oiling	H. C. Lallier C. & E. Co.	111,217.20	13	134-AR&C
138-D	East of Steamboat Springs	5.381 mi.	Gravel Surfacing	H. C. Lallier C. & E. Co.	109,301.06	31	138-D
145-C	East of Rifle	14.901 mi.	Grading & Grav.	A. R. Mackey	271,703.80	90	145-C
145-D1	Bet. New Castle & Glenwood Spgs.	Detour		A. R. Mackey	13,261.00	29	145-D1
149-C, D, F, G	Between Denver and Limon	36.902 mi.	Oiling	M. E. Carlson	120,324.35	21	149-C,D,F,G
149-E	Between Bennett & Strasburg	4.412 mi.	Gravel Surfacing	Edw. Selander	60,930.18	83	149-E
149-HR	Between Denver and Limon	18.419 mi.	Oiling	Hamilton & Gleason Co.	48,898.60	0	149-HR
150-C	West of Craig	6.893 mi.	Gravel Surfacing	J. Fred Roberts & Sons	120,139.05	91	150-C
150-D & F.L.P. No. 1	Between Elk Springs & Massadona	10.691 mi.	Gravel Surfacing	N. M. Monaghan	156,379.26	62	150-D & F.L.H.P. No. 1
158-A	Between Manitou & Cascade	4.062 mi.	Grading	Hamilton & Gleason	164,681.20	100	158-A
158-A2	Between Manitou & Cascade	0.039 mi.	Concrete Bridge	Pueblo Bridge Const. Co.	30,959.80	26	158-A2
158-B	Bet. Hartsel & Florissant	10.319 mi.	Gravel Surfacing	J. H. Miller & Co.	133,380.70	90	158-B
181-A	In Idaho Springs	1.876 mi.	Paving	J. Fred Roberts & Sons	93,749.55	91	181-A
248-C	Between Buena Vista and Salida	3.944 mi.	Gravel Surfacing	Pantle Bros.	48,780.50	100	248-C
258-I2	East of Montrose		Concrete Box Culvert	Hinman Bros. Const. Co.	8,455.50	99	258-I2
259-B	Bet. Gunnison and Parlin	9.587 mi.	Gravel Surfacing	Cole Bros.	184,503.00	88	259-B
262-ER	West of Walsenburg	0.465 mi.	Gravel Surfacing	W. A. Colt & Son	20,736.75	88	262-ER
263-C	East La Veta Pass	5 mi.	Gravel Surfacing	State Forces			263-C
265-E	West Bayfield	2.950 mi.	Gravel Surfacing	J. H. Miller & Co.	97,839.06	87	265-E
270-E	Bet. Del Norte & Monte Vista	8.663 mi.	Gravel Surfacing	Mountain States Const. Co.	102,199.10	100	270-E
278-AR&C	East of Cheyenne Wells	8.409 mi.	Oiling	W. F. Pigg & Son, Inc.	53,452.67	61	278-AR&C
292-D	Bet. Wolcott and Avon	9.834 mi.	Graded Surface	Utah Const. Co.	159,143.40	91	292-D
295-E	South of Alamosa	7.627 mi.	Gravel Surfacing	Mountain States Const. Co.	71,049.56	100	295-E
296-AR&BR	South of Pueblo	4.372 mi.	Paving	New Mexico Const. Co.	154,509.00	100	296-AR-BR
296-F	Between Pueblo & Trinidad	7.486 mi.	Base Course Grav. Surf.	Chas. B. Owen	74,257.86	78	296-F
298-E	South of South Fork	1.894 mi.	Gravel Surfacing	Grant Shields	92,279.20	51	298-E



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THE ECONOMY MAINTAINER FOR 1932

A machine heavy enough to remove corrugations, fast enough to get to the job for a full day's work, and complete enough in itself to carry all necessary hand tools and patch material for a complete maintenance job. With the operator directly over the moldboard, the finest of fine grading is assured.

THE DUMP BODY—One and one-third yd. capacity, automatic operation and can be regulated with spreader chains for even spreading of gravel or patch material. Controlled from driver's platform.

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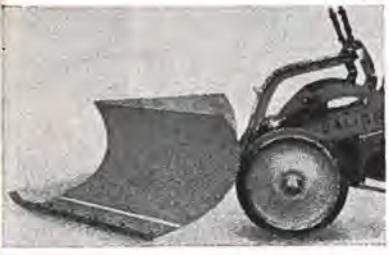

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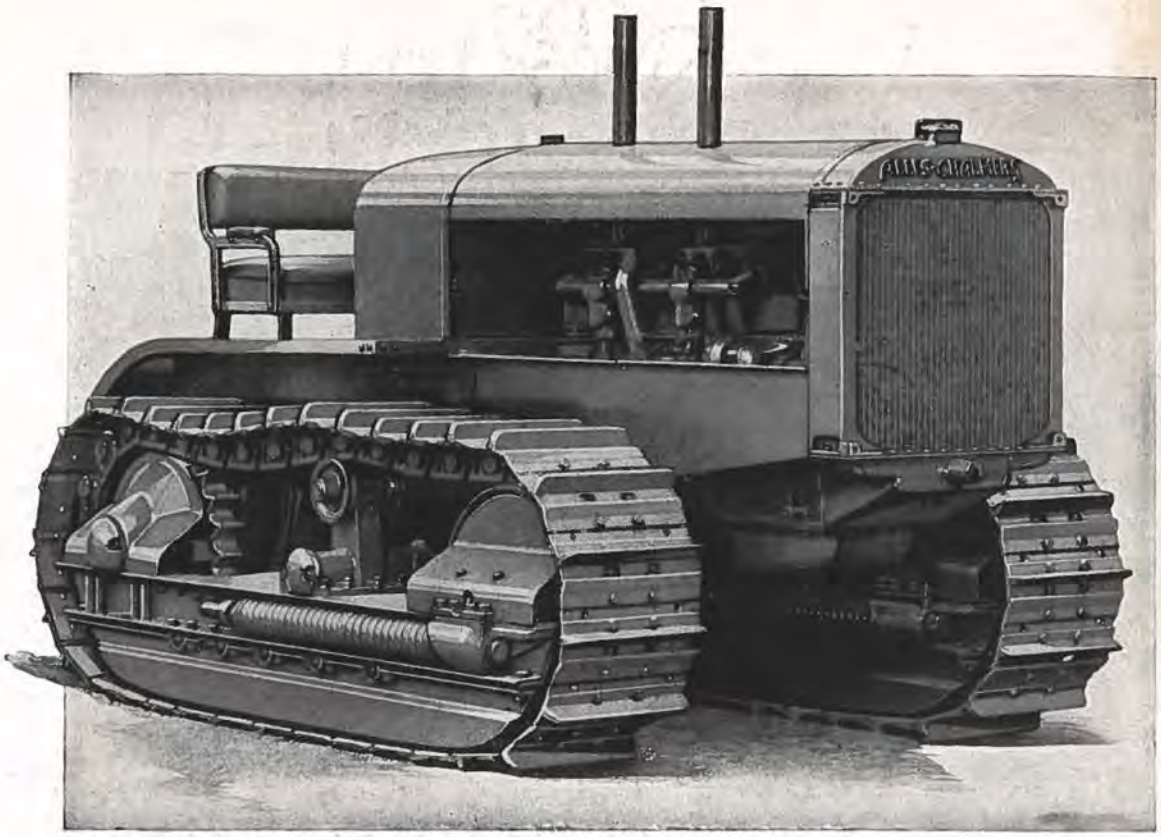

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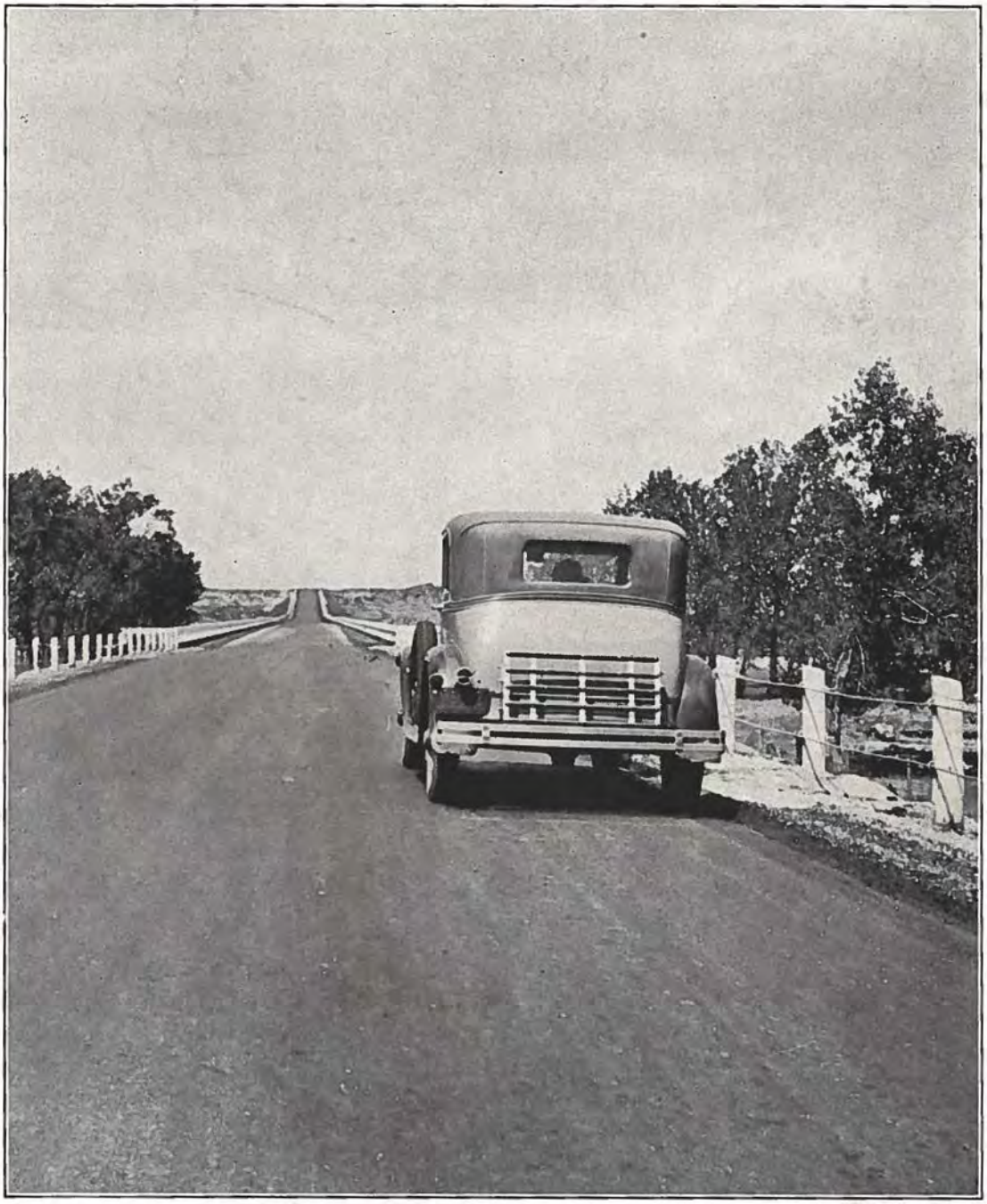
COLORADO HIGHWAYS



Vol. XI September, 1932 No. 8

GALION

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Colorado Highways

"BETTER ROADS"

Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
Denver, Colorado

Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY
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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

A VIEW of the newly completed oil surfaced highway leading east from Denver to Limon on U. S. Highway No. 40, is shown on the cover of this month's COLORADO HIGHWAYS. Construction and oil surfacing of this stretch of road was one of the largest projects undertaken by the Colorado Highway Department. The project included fifty-five miles of grading and oil surfacing. This beautiful highway was constructed from gasoline tax revenue. To continue this work, vote NO on Amendment No. 6 at the November election.

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Colorado Highways
"BETTER ROADS"
VOLUME XI. SEPTEMBER, 1932 NUMBER 8

Vote *No* on Amendment No. 6

IF the gasoline tax amendment passes and becomes a part of our state Constitution, the following condition of the roads will be the result:

Several counties will receive practically all the tax om the road fund, leaving the smaller counties with ardly any money for the upkeep of their roads.

Now, fellow voters, analyze this situation from our own individual viewpoint.

Do you want better roads in some of the larger ounties and absolutely no decent roads in the mountains and far-away places in the state where you take our pleasure, sightseeing, fishing and vacationing, or ould you rather keep the roads as we now have hem?

A very vicious measure is facing you, voters of olorado, in the gasoline tax amendment to our Constitution. On the face of this amendment, it looks as though it were made to reduce the cost of gasoline one ent per gallon and that it might be a saving to the ublic.

Remember, this is a constitutional amendment which, if passed by the people, becomes a part of the Constitution, and can only be repealed by the vote of the people. It will destroy that part of the present Constitution which requires the County Commissioners, in times of flood or other destruction, to rebuild roads and bridges thus destroyed, if necessary for the preservation of life and property.

Should floods occur, such as we have had the last three months in Colorado, large portions of the state would be isolated because all authority for such work would be taken away from counties, and the state would have no right to help unless damage occurred on approved state highways. Millions of dollars already invested in roads would be practically lost because of lack of maintenance.

The hidden clause in the measure which provides, "No county in the state of Colorado shall levy in excess of one mill on the dollar for road and bridge purposes," deprives every county of the right of local self-government. All counties, no matter how wealthy or poor, are placed on a parity, and the right to say how they shall conduct their county affairs will be taken away from them.

If the Constitution is amended—many, many counties in Colorado would not be able to purchase sufficient lumber to refloor their bridges and culverts. Almost forty counties would have to throw the maintenance of the road on the state.

If you vote yes on this amendment instead of no, it will take at least four years to repeal it again after you have found out its injustice. And in a period of four years, those roads that are in fairly good condition now would return to their primitive state of cow-trails.

So read the amendment closely for yourself. Find that tricky phrase. It is not what it seems. It isn't made clear to the voter. It is the reapportionment of the money that ruins the small counties.

Our present Constitution, which should be left as it is, intends each county to be the judge of its expenditures for roads, bridges and schools, and for the protection of its people.

The principle of distribution of the 27 per cent of the gasoline tax is according to the miles of state and Federal roads in each county. The percentage may or may not be right, but the principle is. As it now stands, the exemption of over $700,000 is taken from the entire collection before distribution.

Under the amendment, the cost of collection, which may be increased to 10 per cent, while now limited to one per cent, together with the exemptions belonging to each county, will undoubtedly be taken out before the distribution is made, which, in many large counties, where the farmers have tractors, will reduce the gasoline tax materially.

Fellow voters, study this proposed amendment from all sides. Don't let selfish interests fool you. Now, voters, it's up to you to investigate this measure carefully, now that we have pointed out its tricky parts.

We should leave the law as it stands. Because the fairest tax that can be imposed is on gasoline for vehicles using the roads. When times were good, the people spent millions for roads that allowed access to every part of Colorado.

Eleven million dollars were spent for paved roads, of which Eastern Colorado has all but a few miles. Just recently feeder roads—oiled or paved—have been built to draw trade from Wyoming, Nebraska, Kansas, Oklahoma, and New Mexico. While they connect with the main north and south highways on the Eastern Slope, all Colorado paid for them, not merely the places where located.

Vote NO on Amendment No. 6 at the November election.

Gas Tax Change *Means Curse* to Road Program

THE proposed Constitutional Amendment concerning gas tax has many features requiring careful study. The mere suggestion of reduced taxes may, if close study is not made, lead us into error.

The amendment proposes to distribute gas tax income to the county on the basis of the amount sold in each county, Denver's share to be used on Denver's Mountain Park system and upon Federal Aid roads.

Each county except Denver is to receive one-half of the revenue upon gas sales in the county to be used on county roads, the balance to go to the State Highway Department.

County road levies are restricted to one mill.

Without entering into the small county-large county dispute on distribution of gas tax, or denying the merits of reduced taxes or desirability of some other than the present manner of revenue distribution, we believe several serious questions arise which must be answered before voting upon the amendment. They are:

I. Should such detailed tax provisions be placed in the Constitution where, with changing conditions, great difficulty of repeal would be met?

II. Would a reduction of 1c in the gas tax inure to the benefit of 300,000 Colorado motorists or to three or four large oil concerns, and would gasoline continue to be sold to local motorists at from 1c to 7c per gallon more than across the Kansas and Nebraska state lines?

III. Will not the customers of Denver business interests object to Denver's share being segregated and will they not believe this to be a Denver move, and the good-will of the trade in the state which is being improved yearly receive a set-back through bickering over the distribution of gas tax money?

IV. What would the adoption of this measure do to our road program?

The following explanation of this feature is given:

The Department now receives annually from the gas tax		$4,200,000
Under the proposed amendment the Department will receive		2,925,000
A loss to the Department of		$1,275,000
176,495,000 gallons of gasoline were shipped into the counties of Colorado in 1931.		
The total gas tax collected was		$6,857,517
The refunds amounted to	$730,289	
And the collection expense	67,379	
		797,658
Leaving a balance for roads of		$6,059,859
Which is a net for each 1c of tax or		$1,514,962
Hence the maximum proposed amendment of 3c will produce		$4,545,000

In round figures the 4c tax produces $6,000,000 and each 1c produces $1,500,000 and 3c will produce $4,500,000.

To arrive at the amount the Department will receive under the proposed amendment, first take the Department's 100% of the tax on the gas sold in Denver, or		$1,350,000
And from the total gas tax revenue of	$4,500,000	
Deduct Denver's 100%	1,350,000	
Which leaves a balance of	$3,150,000	
Of which 50% goes to the Department, or		$1,575,000

When you go on a vacation in Colorado you find such roads as this built out of gas tax revenue in the most mountainous sections. Passage of Amendment No. 6 will eliminate available funds to build and maintain these beautiful highways which attract thousands of tourists to Colorado every year.

otal for the State Highway Department of $2,925,000

receipts of the Department would then be as follows:

Tax $2,925,000
rnal Improvement Bus Tax, etc..... 75,000

Total $3,000,000

Deduct from this the Department's fixed charges follows:

intenance $1,800,000
inistration 175,000
npensation Insurance..... 25,000
veys, etc..... 50,000

Total $2,050,000

ich leaves a balance for construction on state projects to meet the Federal Aid and to repay emergency relief of only..... $ 950,000

The amendment provides that the gas tax on Den- sales must be used in the Denver Mountain Parks tem of highways and/or to meet Federal Aid. nver's gas tax amounts to $1,350,000, or $400,000 re than the Department would have left after fixed rges are deducted.

The counties must have money to maintain and struct their 60,000 miles of county roads, which y are now doing with their share of the gas tax ney, and in addition are maintaining about 5,500 les of the state highways other than the Federal highways which the Department maintains.

The proposed amendment would limit the counties' d and bridge levy to one mill. Assessed valuations re and are decreasing. Each county will receive % of the gas tax on gasoline sold in the county.

To show how the proposed amendment would ect the smaller counties, the following is an ex- ple:

ELBERT COUNTY

les of county roads..... 1,692

iles of state highways:

Federal Aid..... 54
State 75
— 129

Total 1,821

bert County's tax under 4c tax $22,675
bert County's tax under amendment 13,050

Loss ..... $ 9,625

ASSESSED VALUATION

esent road and bridge revenues, $14,044,000 @ 3 mills..... $42,132
mendment @ 1 mill..... 14,044

Loss $28,088

otal county loss will be..... $37,713

his is the difference between the present rev- enue $64,807
nd the revenue under the amendment..... 27,094

From the above, Elbert County would still have 692 miles of county roads to construct and/or main- in and 75 miles of state highways to maintain. 7,094 being the revenue under the amendment and ith 1,692 miles of county roads, the average expen- tures per mile would be $16, which would not main- in the county roads, and hence the 75 miles of state highways, other than Federal Aid, would be thrown back on the Department to maintain.

Millions of dollars have been spent by the taxpayers of Colorado on roads of this type—it is to save this investment that thousands of motorists will vote against Amendment No. 6 at the November election.

Other counties will have to do the same thing and the result will be that the Department will have to maintain the state highway system of 9,200 miles. The Department is equipped to maintain only 3,433 miles.

To equip the 150 additional patrols needed to maintain the 5,767 miles would cost..... $1,125,000
Salaries and operation would cost..... 1,080,000

A total of $2,205,000

We have shown the Department would be short $400,000 of complying with the requirements of the amendment, for maintenance must be done to protect the roads we have improved in the past.

Now, if the Department has to take over the maintenance of the state highways now being done by the counties, for maintenance must be done, the balance of $950,000 which the Department would have left after deducting the fixed charges would only go a part of the way in doing the job, as $2,125,000 would be required the first year to equip and operate.

There would be no construction work done and maintenance only partly done.

This would be the result if the proposed amendment becomes a part of the Constitution, and immeasurable damage will result before it can be repealed.

Vote NO on Amendment No. 6 at November election.

Tax Motorists *for* Roads Only

(By FREDERIC E. EVERETT, President American Association of State Highway Officials)

TWO short years ago, the phrase "diversion of road funds" was quite unknown to the average motorist. Then, only $15,000,000 of the money contributed by motorists to road building through gasoline taxes and motor license fees was used for purposes other than road building.

But today it is a different story. The diversion in states in 1931 was $20,000,000—in 1932 it will total no less than five times that amount, $100,000,000! But the diversion in states is only a start. The Federal government through its newly imposed taxes on gasoline, oil, sales of automobiles, parts, accessories and tires and tubes, will add at least $150,000,000 in diversion—a total of a quarter billion dollars!

Just why people should pay $250,000,000 of the expenses of general government, simply because they own automobiles, is puzzling, particularly so to those who must pay this charge.

Diversion Burdens Wrong People

Most diversion occurs through the abuse of money paid out by motorists through the gasoline tax. Diversion makes the gasoline tax a class tax, something it can't possibly be in respect to the principles under which it was created. The gasoline tax is really not a tax but a toll whereby a service charge is collected from motorists in proportion to their road usage. As a road toll it is equitable and fair. But when it is forced to become a class tax it is extremely unfair, for it loads too much of the costs of general government on people of moderate and insufficient resources. Car registrations reveal that most automobile owners are of limited means, else there wouldn't be some 25,000,000 motor vehicles in operation. The bulk of these motor car owners pay property taxes, so why tax them again for the general expenses of government.

Motorists Bear All State Road Costs

Strangely, the idea has gotten around the country that taxes on property largely pays for highways. This is an erroneous belief and is flatly contradicted by reports of the U. S. Bureau of Public Roads. The facts show that motorists have assumed practically all the costs of building state highways and in addition one-fourth of the costs of building local roads. Motorists have gallantly assumed this great road task. They realized that they could not wait for property to build the needed roads.

When the gasoline tax was inaugurated in 1919, the road job looked well nigh hopeless. But soon the gasoline tax demonstrated its productivity. The money it gathered was immediately converted into good roads, motoring increased, more road funds accrued and so in a few years the nation began to see that the road problem could be licked. Gradually increases were brought into gasoline tax rates; the tax was finally adopted by every state. Today the tax averages four cents a gallon for the country as a whole, plus the one cent Federal tax. Some states have taxes of five, six and seven cents a gallon. The road burden has been removed from property.

Pay Taxes Willingly for Roads

There is only one reason why motorists have been able to afford these high tax rates. That is the reduction in car operating costs brought by the improved roads. Engineers know definitely through tests and studies that "good" roads have reduced car operating costs at least one cent a mile over the costs of driving on poor roads. Likewise, they know that first class pavements are two cents a mile cheaper to drive over than poor roads. These savings are definite; the motorist who drives his yearly mileage mostly over intermediate type or first class pavements is saved as much or more than he pays out in motor taxes. If he didn't he would never have permitted gasoline tax rates to increase; in many cases the motorist would not have permitted states to adopt the levy at all.

So when this road financing machine, built up and nursed along by motorists themselves, is used for collecting money for general purposes, the motorist rebels, as should anyone inclined to be fair. Diversion is a breach of faith. States are diverting road money right now where, when the tax was adopted or increased, motorists were assured that the money would be used for roads only.

Diversion is short sighted. Many states have financed road bonds with gasoline tax income. Diversions in these states would automatically make the bonds an obligation of property, with the possibility of higher property taxes. In some instances, diversions have been made effective in states as a sort of palliative to the demand for government economy. The issue of economy has been avoided simply by taking money from road funds, thereby reducing road construction, without any attempt at eliminating luxuries, fripperies, non-essentials and inefficiencies.

Can't Stop Road Building Now

During the last decade the United States has made amazing road progress. Yet the road problem is still a problem. There are scarcely 150,000 miles of rural pavements. Thousands of miles of heavily traveled roads are in need of better surfaces, from the standpoints of economy, convenience and safety. If 100,000 miles of first class pavement were to be built in the next five years, along with the many safety devices needed, there would still not be enough for 1937 needs. The present investment in roads must be protected.

(Continued on page 12)

Maintain Our Roads

THE Maintain-Our-Roads campaign begun recently by the American Road Builders' Association is receiving the enthusiastic support of all Federal, state and county public highway officials. The campaign is under the direction of C. N. Conner, engineer-executive of the American Road Builders' Association.

The general public is being asked to preserve the nation's investment in highways and also to keep the public roads safe, comfortable and economical for motor vehicles by providing sufficient funds for proper maintenance.

The public clamor for reduced taxes and decreased governmental expenditures has brought about a serious situation in many sections of the country where road work, including maintenance, practically has been stopped.

A survey of the attitude of state highway departments shows that active support in the Road Builders' campaign will be given by the states. Attention is called by state highway officials to the immense cost of restoring the roads to their former condition if they are allowed to go down in the present emergency. Continuous maintenance is being urged by the states in conferences with county officials and in statements to the public. The cost of maintenance is shown to represent but a small part of the motor vehicle owner's return in reduced tire, gasoline and vehicle maintenance costs, which amount to more than half of the cost of motor vehicle operation.

The New York state highway budget while reduced in total amount appropriates exactly the same sum for maintenance as in previous years.

An official of a middlewestern state says: "It is imperative that the user of the roads be given proper return for his gasoline and license taxes."

One state which has temporarily abandoned construction is now devoting all of its highway funds to maintenance.

The National Rural Letter Carriers' Association, the members of which cover 1,250,000 miles of highway daily, representing the travel of 43,000 rural letter carriers, is one of the large groups joining in the battle to maintain our roads.

The 3,000 counties in the United States have been enlisted in the campaign to reach the public ear with an appeal for proper maintenance of county roads. Twenty-two organizations of county highway officials affiliated with the county highway officials' division of the American Road Builders' Association will actively promote proper highway maintenance. Every county has a large investment in highways. To preserve this investment and to secure adequate service from the highways together with minimum operating costs for motor vehicles, adequate and timely maintenance is absolutely essential. Neglect of proper maintenance for only a few months can result in a condition of disrepair that may necessitate reconstruction of the roads that is much more expensive than maintenance.

Progressive maintenance is advocated as a means of adding a definite increment of improvement in addition to keeping the roads true to type. Such maintenance improvement keeps the roads just a little bit better than is required for traffic. There is no investment in the highway before it is needed to meet traffic demands.

The "Maintain - Our - Highways" campaign includes conferences and public addresses before meetings of road builders and national and civic organizations for the purpose of providing them with information to present to the public. Full newspaper and magazine cooperation is assured. Special material is in preparation for the use of county newspapers. Stickers will be used on letters and motor vehicle windows. Posters on road maintenance will be placed in county courthouses and in gasoline filling stations. Letters are being mailed to all county and state highway executives asking them to do their part in meeting the maintenance situation on the highways.

Results of the campaign will be manifested in public savings and economy that will reduce highway transportation costs and lighten the tax burden on the property owner.

MOTOR VEHICLES NOW NECESSITIES

There was a time when bathtubs and electric lights were luxuries. A decade ago motor vehicles were luxuries; now they are necessities to all.

Consider the school teacher and the mechanic who live in the country and drive many miles to work. Bear in mind the congestion in cities that has been relieved due to the development of automobile transportation permitting people to live comfortably in localities otherwise inaccessible. The motor bus and the truck now offer new transportation facilities that have added value to real estate in many new localities.

Good roads and motor vehicles, the one useless without the other, are both necessities to modern life just as are electric lights and bathtubs.

Vote NO on Amendment No. 6 at the November election.

Revenues from four-cent gas tax built this road, through one of Colorado's rocky canons. Passage of Amendment No. 6 will leave regions like this with nothing but cowtrails. If the motorist does not pay for the maintenance of these roads the burden will be thrown on the real estate owner.

Economy Keynote of Penn State *Road Plan*

SINCE an act of the Pennsylvania legislature approved by the governor in June, 1931, increased the mileage of the system of state roads from 13,562 to 33,767 miles, an active start has been made on the improvement of the township roads taken over by the state. In a paper presented at the annual conference on highway engineering at the University of Michigan, Samuel Eckels, chief engineer Pennsylvania Department of Highways, reviewed the reasons for placing these roads under state control and described the reorganization of the state forces to care for their new duties as well as the methods of reconstructing the roads taken over.

Township-Road Problems

Prior to the act of the legislature, of the 90,000 miles of public roads in Pennsylvania exclusive of city and borough streets, 75,000 miles was the responsibility of township officials. The 1,514 second-class townships, each with three road supervisors, had control over 73,000 miles of this amount.

Many of the counties in Pennsylvania have a small and decreasing population; and, in addition, several counties contain great areas of mountain and forest lands which have a very small taxable value. At the same time, an increase in the volume of traffic on the main state roads—some of which have been improved to the extent of widening to three and four lanes—has brought an increase of traffic to the minor roads. Thousands of miles of township roads with little if any artificial improvement developed into carriers of a greater volume of traffic than the main roads of 1911.

As a result, a large number of the townships were burdened with road-tax levies of from 15 to 20 mills, and many had rates between 20 and 30 mills. In 1930 the entire road tax collected in the 1,514 second-class townships was $14,037,369.11, representing an average tax of 10.87 mills on a total valuation of $1,313,394,250.63. This tax provided an average of only $187.08 per mile for construction and maintenance of the township roads. Road improvements of particular moment, therefore, were restricted to the small number of richer townships. In hundreds of others the road funds were so small that the roads could barely be maintained in a passable condition.

The Tax-Relief Program

A study undertaken in 1927 by the department of highways, with the cooperation of the township supervisors, resulted in the designation of a 20,000-mile primary system of township highways. Governor Gifford Pinchot advocated that the state assume a larger share of the township road-tax burden and affirmed that if state-aid and state-reward grants were discontinued and work requirements on the state system were not increased, a large mileage of township roads could be taken care of out of current revenues. A bill to transfer the designated system to state control, introduced in the legislature by the governor, was passed in amended form and approved by the executive, and the roads became the responsibility of the state on August 15, 1931. The routes taken over include about 4,900 miles that had been improved in some manner by local authorities; but the majority of these improvements had been neglected as to maintenance and required immediate attention.

In the improvement of this extended mileage the matter of costs is of extreme importance, from the standpoint of both availability of funds and keeping costs consistent with volume of road use. Volume of traffic and limitation of funds both made impossible improvement of the light-traffic routes to the standards of primary and secondary state routes.

Reorganization and Plans

For the new work, the field forces of the highway department were reorganized. The eight former engineering districts were expanded to twelve, with an engineer and staff assigned to each. A maintenance superintendent with assistants was placed in immediate charge of the roads in each county, with some exceptions. Each superintendent has a state-owned office, repair shop, storage shed and equipment in accordance with his needs.

An important requirement of the program is low-cost engineering. There is, of course, greater difficulty in reducing engineering costs for contract construction than for work by department forces, but in either case there should be some reasonable relation between construction and engineering costs. On department-force work the preliminary survey consists of a chained and referenced center-line. The foreman establishes lines, widths and grades by eye or with string-lines as the work progresses.

Rural-Road Progress

Work on the rural-road system was begun in each county, except Philadelphia county, on August 15, 1931. The work was carried on largely by department forces, as it was not possible to prepare detailed plans, advertise for proposals and award contracts for the large mileage in the short time available. Furthermore, the contractors operating in Pennsylvania had little experience in the proposed class of construction and many of them were unwilling to undertake it. Under the stress of depression and critical unemployment, work on rural roads has been utilized for local relief. Only the nucleus of an experienced organization is placed on these projects, and local unemployment committees investigating the most needy cases recommend to the men in charge those worthy of employment.

The 1931 construction program was authorized in three groups. Of the first group of 1,700 miles begun on August 15, 1,644 miles had been completed by the end of the year. Of a second group of 666 miles authorized in the latter part of November, a total of 109.75 miles was completed the same year. The mileage of these two groups was prorated among the counties on an equal percentage basis. For example, on the 1,700-mile program, 8.5 per cent of the mileage in each county was authorized for construction.

EVERY CENT FOR LABOR

EVERY DOLLAR that is spent for construction today goes in full amount into labor, and every cent of each dollar that is to be used for construction under the relief bill now in Congress will go into wages, whether of the shirtsleeve or the white-collar worker. This fact needs emphasis not only because many people believe that a large part of the money will leak away in waste, but also because a flood of false assertions on the subject has been spread over the land.

The facts are simple. Roughly, half of the construction dollar goes to labor on the job. Most of the remainder goes to pay for material, tools and fuel, which cost in turn is due to labor, as the intrinsic value of the ultimate raw materials in the ground is too small to count. The residue goes to pay for supervision, planning, surveys, insurance—all of them again representing wage payments. Profit is non-existent under present-day business conditions, for everyone is bidding at or below cost. Even capital investment is disregarded, as is shown by the accounts of numerous corporations, whose plant investment has shown no earnings for months past. The price of steel, for example, is wholly made up of labor wages, in mine or on railroad or at the mill.

Beyond this, however, the same dollar works more than once to create employment, since the wage payments are promptly turned over for food, clothing and shelter, and in this process give new employment to mill hands, store clerks and transportation men, whose wage-earnings again put others to work supplying their needs. Thus, not only is it glaringly untrue that the construction dollar reduces to a small fraction of wages, as the Secretary of the Treasury recently tried to induce Congress to believe, but after every cent of the dollar has gone to the wage-earner many additional dollars of employment, wages and new production are brought into action as the result of its expenditure.—Engineering News-Record.

The Wrong Road

The end of the depression may be just around the corner . . . but it certainly is not on millions of miles of rural roads.

Good roads are as essential to the future prosperity of the country as railroads were in its early development. Road building is the one branch of public construction that should not be curtailed now.

Construction of roads now means that hundreds of thousands of men are given work . . . that roads built now will cost less . . . but what is most important, such roads will bring lasting benefit to millions of people and provide for the future development and prosperity of the nation.

Of approximately three million miles of roads in the entire country, over two million miles are still unimproved . . . the building of roads must go on.

Better roads bring better business.

For BETTER ROADS Vote No on Amendment No. 6 in November

NEWS OF THE MONTH

One of Colorado's most important roads leading east from Denver—Denver to Limon—is now oil surfaced for a distance of eighty miles. Work on this highway was completed the fifteenth of September. Fifty miles of the route was surfaced with plant-mixed oil surfacing material. Experts claim it to be one of the finest pieces of road surfacing in the West. Plans are now under way by the highway department for extending the surfacing east and a short distance west of Limon.

Highway Engineer Vail has received many letters of commendation as a result of the splendid piece of oil surfacing which has just been completed between Denver and Limon. The work of constructing a new highway between these two points was started in 1931, when work of grading and preparing the sub-grade for oiling was finished. Oil surfacing was carried out this year.

Road projects authorized under the terms of the Emergency Relief Act, passed by the last congress, are fast getting under way in Colorado. Under the provisions of this act Colorado receives $2,258,613 from the government. This appropriation was made for new road construction so as to furnish employment to the unemployed.

No state funds are used on these projects. It is all paid for out of funds allotted to Colorado by the Federal government. So Coloradans should bear in mind that when they pay their property taxes not one cent of the money goes to the payment for roads now being constructed by the highway department under the Emergency Relief Act.

With the exception of a small amount received from the internal improvement fund and bus tax, all receipts of the State Highway Department in Colorado are derived from the gasoline tax and the Federal government. For this reason there has been a determined effort made to prevent the diversion of these funds to purposes other than the construction and maintenance of our highways.

Despite the drouth and extreme lack of rainfall in all parts of the state, major state and Federal roads in Colorado have been maintained in better condition this past summer than in previous years, according to reports received by Highway Engineer Vail from motor clubs and chambers of commerce located in various cities. This result is attributed to the splendid co-operation which the patrolmen have given the department heads in the handling of this work.

One of the most important meetings in the history of the County Commissioners' Association will be held this year, according to officials of that body. Already commissioners are meeting in groups in their various districts, and it is expected that many problems will be brought before the general convention for solution. The annual meeting this year will probably be held in December. Care of those who will be in need before the winter is over and the unemployment situation will be the most important problems facing the commissioners.

A beautiful new piece of gravel-surfaced roadway recently completed by the State Highway Department with Federal Aid funds is located between Salida and Buena Vista. This route has been straightened, several bad curves eliminated and the grade evened. Residents of the two cities report that the driving time has been reduced at least thirty minutes between the two points. The new road is located west of the Arkansas River and thus the cost of an expensive steel bridge over the river was eliminated.

And while on the subject it might be called to the attention of the residents of Chaffee County, and all other counties of the state, that such important road projects will be a thing of the past should the gas tax amendment No. 6 be adopted at the November election.

On another page of this issue of COLORADO HIGHWAYS appears a detailed statement of what will happen to the state road fund should amendment No. 6 be adopted. It is of vital interest to every motorist, businessman and good roads booster in the state.

The people of Colorado have more than $60,000,000 invested in the state highway system. This represents one of the most important business investments in which this state has ever been involved. It is a business investment, for over these roads travel thousands of tourists each year, over them travel millions of dollars' worth of farm produce which must reach its market at the right time and in good condition, over them travel doctors, lawyers, merchants—the whole gamut of society.

Individual counties have been asking for aid to be obtained through the state's borrowing from the Reconstruction Finance Corporation, and loaning it to the counties. This money can be used to build county roads, and thus spread a lot of work over the state at this time when work is needed.

SOCIAL LIFE NOW DEPENDS ON ROADS

Most anyone will admit that highways play an important part in the social and business life of the nation. Questioned as to just how the benefit is derived, most people are hazy.

Just suppose there were no highways, or that the road you now use either did not exist or perhaps was full of bumps and mudholes. What would you do about the poor road—or no road?

Out of the six million farms in the United States, three million are on unimproved roads and two million more have only a dirt road, according to Chester H. Gray, of the American Farm Bureau Federation, in testifying before a United States Senate committee on roads. Only about one-sixth of the farms of the United States are on surfaced highways.

Good roads have done more to aid living conditions in the country than any other agency. The highway is as essential to agriculture and merchants who sell the farmers supplies as the railroad and steamboat are to industry, Mr. Gray believes.

Vote NO on Amendment No. 6 at the November election.

STATE HIGHWAY DEPARTMENT

Financial Statement, August 31, 1932

BALANCES:			**DISBURSEMENTS:**		
State Treasurer	$ 44,757.15		Federal Aid Projects	$1,878,159.82	
County Time Warrants	8,583.42		State Projects	519,070.41	
Revolving Fund	9,500.00		Maintenance	875,809.55	
Total Balances		$ 62,840.57	Maintenance Equipment	232,083.64	
			Property and Equipment	5,730.75	
RECEIPTS:			Surveys	37,847.93	
U. S. Government	$1,121,475.38		Traffic Signs and Census	47,218.77	
Gas Tax	2,460,900.00		Administration	129,930.74	
Internal Improvement	15,200.00		County Gas Tax Audit	2,468.05	
Highway Receipts	62,107 67		Total Disbursements		$3,728,319.66
Unemployment Fund	17,076.08				
Bus Tax	16,689.85		**BALANCES 8-31-32**		
Private Carrier Tax	18,099.22		State Treasurer	$ 29,085.69	
Total Receipts		3,711,548.20	County Time Warrants	7,483.42	
			Revolving Fund	9,500.00	
Total Balances and Receipts		$3,774,388.77	Total Balances		46,069.11
			Total Disbursements and Balances		$3,774,388.77

3% SPECIAL GAS TAX FUND

Receipts	$ 242,077.16
Disbursements	64,961.22
Balance	$ 177,115.94

Tax Motorists *for* Roads Only

(Continued from page 6)

Thousands of miles of roads have been advanced to the stage where immediate paving is necessary to take advantage of the preparatory investment. Roads already completed must be adequately maintained. During the last five years automobile registrations increased 40 per cent—road construction only 13 per cent. Is the use of road funds for other purposes compatible with motor needs?

Diversion Takes Dollars from Workmen

Then there is the all-important matter of employment. Probably no industry surpasses road building in the immediate and widespread distribution of dollars to workmen. A recent U. S. Bureau of Public Roads survey shows that in constructing a concrete pavement approximately 90 per cent of the money spent goes quite directly to labor. For every man employed directly on the road job the equivalent time of two additional men is needed to supply materials and equipment. Stop road building and more men are thrown out of jobs. This increases the call for public assistance and the depression becomes more deeply rooted.

Protect the Highway Transportation Industry

The highway transportation industry is composed of automobile manufacture, operation of filling stations and garages, bus and truck operation, road building and the manufacture and supplying of road equipment and materials. In 1931 this industry went along, all in all, under flying colors. But this year it is different. Road funds have been reduced through diversion. Road income has been curtailed through excessive taxation of motor vehicle operators, for when the expenses of motoring become too high, less use is made of motor cars. This business of highway transportation normally furnishes employment for nearly 8,000,000 people, one out of every six workers in the country. Why, then, let Federal taxes and state diversions impede this greatest employer of men?

From all over the country co reports of reduced income from ga oline taxes and motor vehicle licen fees. Pennsylvania, for example, e pects a 10 per cent drop in highw revenues for the year.

Lessened incomes from the sources mean that highway buildi is to suffer even without diversio that if states plan to keep up a se blance of new highway constructi they must retain road funds f roads. In the face of reduced roa funds, and the new quarter of a b lion dollar burden imposed on m torists by the Federal governmen diversion becomes distinctly ba business.

Plans are being made by the Bu reau of Public Roads for the oil sur facing of Berthoud Pass highway This is one of the show roads of th nation. Another of the Bureau's prize highways is that leading fro Estes Park over Milner Pass t Grand Lake in Rocky Mountain Na tional Park. Both of these road have been enjoyed by thousands o tourists this past summer.

PLANS BEING PREPARED

Proj. No.	Length	Type	Location
248-E	6 mi.	Gravel Surfacing	South of Leadville
286-F	0.5 mi.	Bridge & Paved Approaches	North of Greeley
294-C	8.5 mi.	Gravel Surfacing	East of Cortez
2R-No. 13	10 mi.	Surfacing	South of Walsenburg
2R-No. 14	1 mi.	Pavement	South of Trinidad
15-C	12 mi.	Surfacing	East of Fleming
9-B	10 mi.	Surfacing	West of Loveland
248-E	4 mi.	Surfacing	South of Leadville
216-C	2 mi.	Bridge & Surfacing	West of Holly
260-B	2 mi.	Surfacing	East of Cimarron
253-E	2 mi.	Bridge & Surfacing	West of Mt. Harris
254-E	4 mi.	Surfacing	West of Parshall
285-A	14 mi.	Surfacing	N. E. of Hudson
298-G	3 mi.	Surfacing	West of Piedra
298-H	2 mi.	Surfacing	South of South Fork
299-C	1 mi.	Bridge & Approaches	South of Grand Junction
278-E	15 mi.	Surfacing	West of Kit Carson
240-C	2 mi.	Surfacing	West of Wolcott
134-G	10 mi.	Surfacing	West of Seibert

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
15-B2	East of Sterling	18.553 mi.	Oiling	Driscoll Const. Co.	$ 31,742.05	100	15-B2
58-AR 216-AR&B	Between Holly and Granada	7.825 mi.	Gravel Surfacing	State Forces		100	58-AR 216-AR&B
68-B	South of Saguache	3.290 mi.	Gravel Surfacing	H. C. Lallier C. & E. Co.	74,428.75	100	68-B
134-AR&C	West of Burlington	11.174 mi.	Oiling	H. C. Lallier C. & E. Co.	111,217.20	66	134-AR&C
134-B2D2E2	Between Seibert & Stratton	14.421 mi.	Oil Processed	Driscoll Const. Co.	29,265.35	65	134-B2D2E2
E-134F1	East of Burlington	11.665 mi.	Gravel Surfacing	M. E. Carlson	72,787.96	0	E-134-F1
138-D	East of Steamboat Springs	5.381 mi.	Gravel Surfacing	H. C. Lallier C. & E. Co.	109,301.06	51	138-D
144-G2	North Fort Collins	13.196 mi.	Oiling	Driscoll Const. Co.	30,251.10	65	144-G2
145-C	East of Rifle	14.901 mi.	Grading & Grav.	A. R. Mackey	271,703.80	95	145-C
145-D1	Bet. New Castle & Glenwood Spgs.	Detour		A. R. Mackey	13,261.00	84	145-D1
149-C, D, F, G	Between Denver and Limon	36.902 mi.	Oiling	M. E. Carlson	120,324.35	71	149-C,D,F,G
149-E	Between Bennett & Strasburg	4.412 mi.	Gravel Surfacing	Edw. Selander	60,930.18	87	149-E
149-HR	Between Denver and Limon	18.419 mi.	Oiling	Hamilton & Gleason Co.	48,898.60	95	149-HR
150-C	West of Craig	6.893 mi.	Gravel Surfacing	J. Fred Roberts & Sons	120,139.05	91	150-C
150-D & F.L.P. No. 1	Between Elk Springs & Massadona	10.691 mi.	Gravel Surfacing	N. M. Monaghan	156,379.26	73	150-D & F.L.H.P. No. 1
158-A2	Between Manitou & Cascade	0.039 mi.	Concrete Bridge	Pueblo Bridge Const. Co.	30,959.80	77	158-A2
158-B	Bet. Hartsel & Florissant	10.319 mi.	Gravel Surfacing	J. H. Miller & Co.	133,380.70	100	158-B
181-A	In Idaho Springs	1.876 mi.	Paving	J. Fred Roberts & Sons	93,749.55	100	181-A
245-A2B2C2	Bet. LaJunta & Las Animas	8.442 mi.	Paving	J. B. Bertrand	197,925.38	81	245-A2B2C2
258-I2	East of Montrose	Concrete Box Culvert		Hinman Bros. Const. Co.	8,455.50	100	258-I2
259-B	Bet. Gunnison and Parlin	9.587 mi.	Gravel Surfacing	Cole Bros.	184,503.00	88	259-B
262-ER	West of Walsenburg	0.465 mi.	Gravel Surfacing	W. A. Colt & Son	20,736.75	100	262-ER
263-C	East La Veta Pass	5 mi.	Gravel Surfacing	State Forces		100	263-C
263-D	Fort Garland to Alamosa	4.268 mi.	Gravel Surfacing	Pantle Bros.	39,261.15	0	263-D
265-E	West Bayfield	2.950 mi.	Gravel Surfacing	J .H. Miller & Co.	97,839.06	100	265-E
278-AR&C	East of Cheyenne Wells	8.409 mi.	Oiling	W. F. Pigg & Son, Inc.	53,452.67	99	278-AR&C
292-D	Bet. Wolcott and Avon	9.834 mi.	Graded Surface	Utah Const. Co.	159,143.40	91	292-D
295-AR2 & E3	South of Alamosa	13.878 mi.	Oiling	Driscoll Const. Co.	21,951.00	99	295-AR2&E3
296-F	Between Pueblo & Trinidad	7.486 mi.	Base Course Grav. Surf	Chas. B. Owen	74,257.86	81	296-F
298-E	South of South Fork	1.894 mi.	Gravel Surfacing	Grant Shields	92,279.20	70	298-E
298-E2	South of South Fork	0.066 mi.	Bridge	M. L. Harvey	16,482.45	21	298-E2

CEDAR RAPIDS

"Straight Line" Portable . . . Crushing and Screening Plant

The Utmost in PORTABILITY, CAPACITY and EFFICIENCY

A completely self-contained portable crushing, screening and loading plant that can be set up in the pit in a very short time.

The Reasons for Its Capacity and Performance Record

Climax 90 HP 1,000 RPM engine with Vortox air cleaner twin disc clutch. Snub pulley and belt tightener.

Feed hopper of 3½ cu. yds. storage capacity is mounted at the end of the plant so that it can be fed directly from shovel in the pit. Charging height from ground is 8′ 10″.

A special 20″ feeder feeds the material from the feed hopper and is adjustable to 4″ or 6″ strokes.

Hydraulic jacks are built into the lower side of the truck beams on the end of the plant. Road clearance is 18¾″ and wheelbase is 19′. Overall height is 14′ and overall length is 42′. Has short turning radius.

Truck is made of 10″ 30-pound I beams properly balanced and reinforced with cross members. Standard steel disc roller bearing wheels.

A 14″ belt conveyor (185 FPM) takes the crushed material from below the crusher and puts it back into the conveyor leading to the screen—a closed circuit on conveyors.

Standard 936 or 924 Cedar Rapids Crushers.

Cone on lower end only as front part is taken care of by 1½-yard surge hopper mounted directly below the front end of the screen.

9. New style double strength pulling tongue on front of plant—very easily attached to truck or shovel.
10. All-weather Goodyear solid dual tires on roller bearing disc steel wheels—front tires 34″ x 6″ and rear 40″ x 7″.
11. 24″ x 22′ conveyor, 300 FPM, discharges the finished product from the screen and surge hopper directly into waiting trucks, plenty of clearance (9′ 0″) for truck loading.
12. Feeder clutch and delivery conveyor clutch are mounted on front end of the plant, thereby centralizing all controls in one place. Gear arrangement and clutch controls for the revolving screen are the same as we are using on our standard OPO's.
13. All controls at front—uses standard OPO drives—about 35′ chain and 10 sprockets on entire plant—standard parts used.
14. 18″ feed conveyor (300 FPM) mounted on side of plant takes materials discharged from automatic feeder and carries them to top of plant, where they are discharged directly into the screen.
15. Revolving screen is standard 10′ screen, 48″ diameter, with perforations to suit.

Years of manufacturing and engineering experience in the material producing field are behind this new portable unit.

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