WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED
WESTERN HIGHWAYS BUILDER

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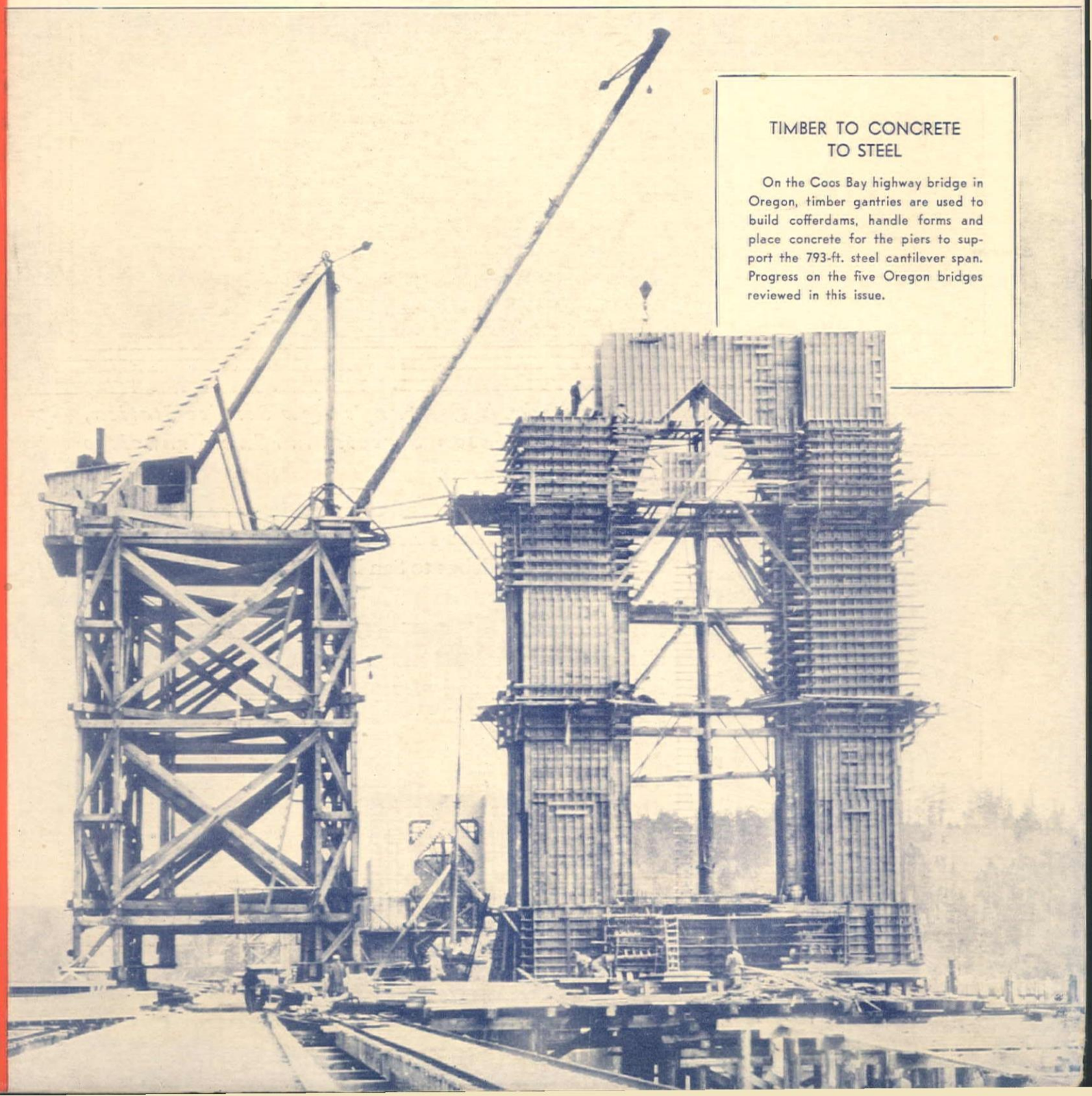

TIMBER TO CONCRETE TO STEEL

On the Coos Bay highway bridge in Oregon, timber gantries are used to build cofferdams, handle forms and place concrete for the piers to support the 793-ft. steel cantilever span. Progress on the five Oregon bridges reviewed in this issue.

IN THE....

Modern Manner

Architects:
D. D. STONE AND J. A. BAUR

Contractors:
LINDGREN & SWINERTON, INC.

"THE OLYMPIAN"

Associated Oil Company's New Service Station, Post and Mason Streets . . . . San Francisco

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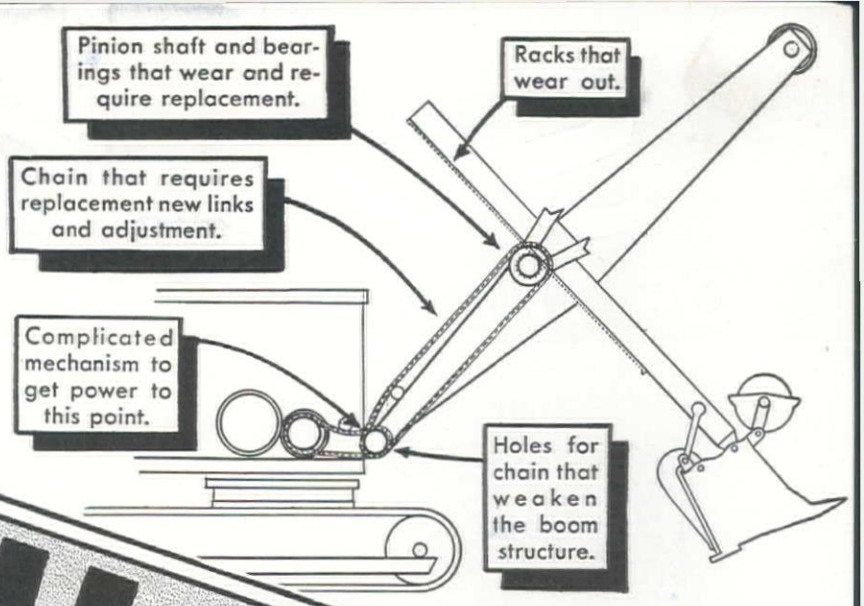

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Never before such Strength, such Rigidity, such Visibility, and such a Wide Range of Blade Adjustments . . .

● Picture a grader that will cut a higher bank or a steeper bank than any grader you ever saw—one that will reach farther outside the wheels for shoulder cuts—one that permits extremely sharp blade positions and—a grader on which you can get the blade from a ditch cut to high bank-cutting position in *40 seconds.* That's the new-type Adams Leaning Wheel Grader that is being so enthusiastically received.

Its wide range of working positions is made possible by a new, box-type frame construction which also affords remarkable strength, rigidity, and visibility. Quick, positive and dependable power-operated controls literally make all adjustments a matter of seconds.

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—the New-Type ADAMS GRADERS

ABOVE: Having backsloped the bank, this twelve foot blade machine is cutting a narrow flat-bottom for the ditch. Note the sharp angularity of the blade. Note also the new, all-welded box-type frame and "T"-shaped drawbar. Extreme simplicity gives the operator a clear view of the blade at all times.

●

AT RIGHT: The blade can be adjusted from ditch-cutting position to high bank-cutting position *without any adjustment of lift links.* With power-operated controls an experienced operator can make this blade adjustment in approximately 40 seconds. Can you do this with your grader?

"Partial Estimates"

● With most timely perspicacity the San Francisco Chamber of Commerce has deduced that two bridges are under way which will promptly change the entire traffic pattern of the city, and has registered concern. It could hardly be classed as a premonition. However, a committee has been appointed, so the matter is now well in hand.

● Only two of the eleven western states do not have laws regulating the licensing of engineering—in these two states the engineers are not as yet elevated to the sphere with barbers, plumbers and "Beauticians."

● How much do western contractors know about silicosis? Tunnel contractors should keep informed on this industrial disease which is frequently complicated by attendant law suits.

● The closing of the Boulder Dam project is about to reveal the truth of the future of Boulder City, which has been the subject of much difference of opinion. Can it be that the future of the town is behind it?

● The pictures of the Golden Gate Bridge work which accompanied the article in the July issue were used with the courtesy of the Standard Oil Co.

●

In October

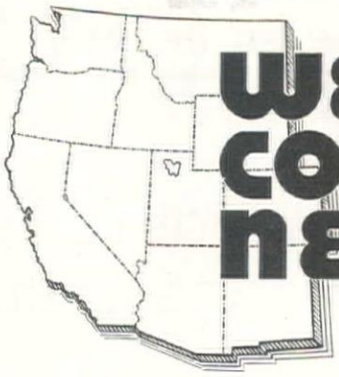
"Fifteen Years of Progress in the Western Water Works Field" will be the theme . . . it's the Tenth Annual Water Works Issue of Western Construction News. The contents of this number has been inspired by the fifteenth anniversary of the founding of the California Section, American Water Works Association . . . now the second largest group in the Association.

Changes in practice and methods during this period will be pointed out through typical examples of present-day methods in the West. The authors are those who have played an important part in this development.

Manufacturers, too, have played an important part. It will be well to note the progress they have made . . . the short-cuts, labor and time saving devices they offer. There'll be many stories of interest from them . . . Watch the advertising pages.

SUBSCRIPTION RATES

The annual subscription rate is $2 in the United States and foreign countries where extra postage is not required. To Canada and to foreign countries where extra postage is necessary the annual rate is $3. Single copies 25 cents.



WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER

J. I. BALLARD, Editor

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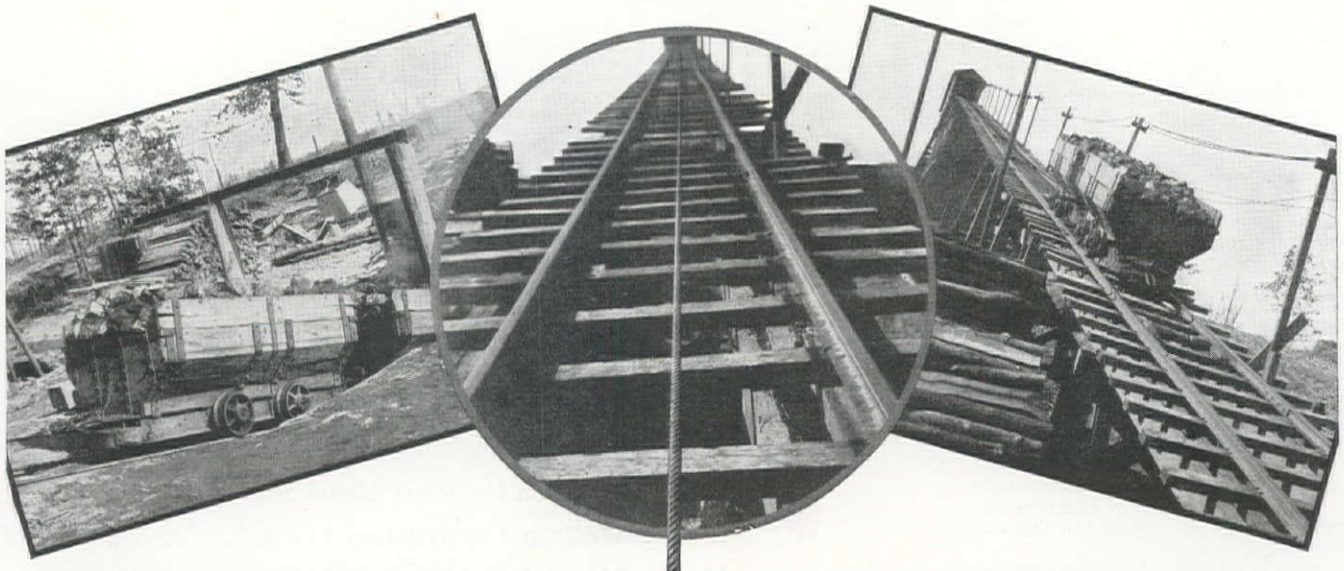

● Here (★) is another place where Tru-Lay Preformed wire rope has proved its superiority. For years this hoist rope was of the non-preformed variety—the operator using several different brands. All such ropes gave about the same service—an average of four months. Now Tru-Lay Preformed is used on this hoist job and its average service is 16 months.

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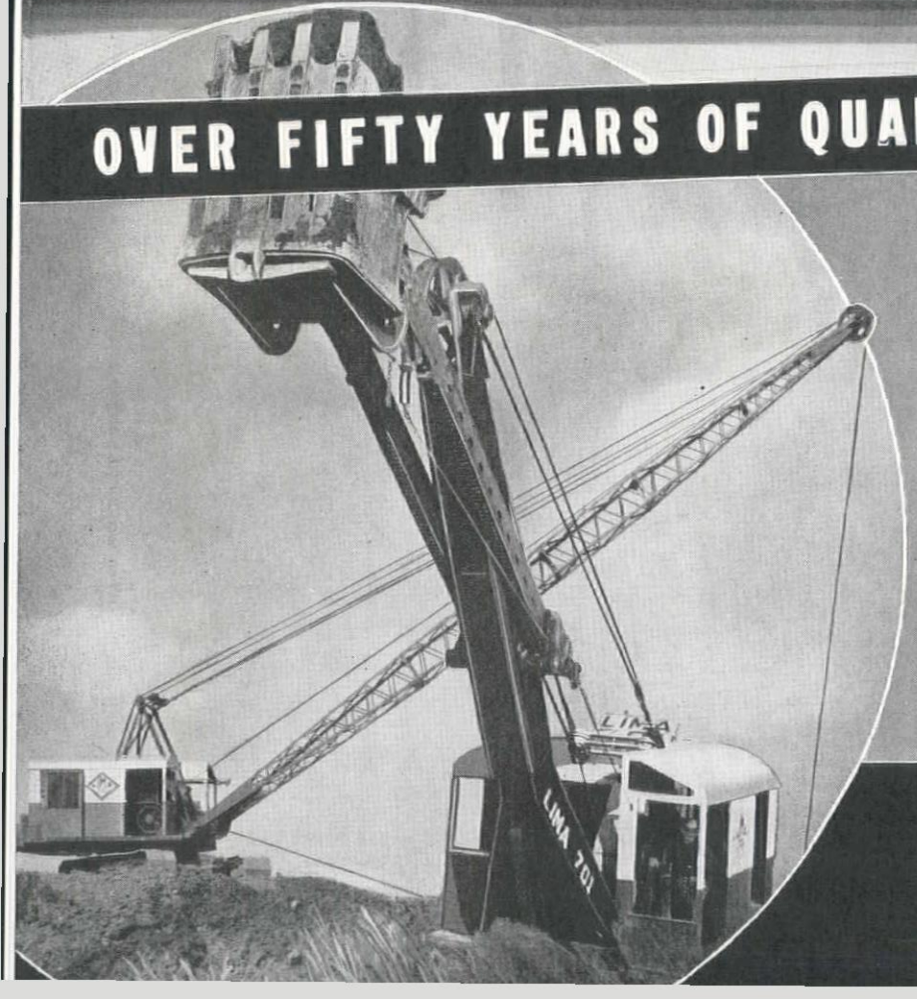

The fact that expert engineers incorporated in LIMA'S complete line of excavators many exclusive and advanced features that established new standards in design, is not the only reason they have proved the most popular shovel, dragline and crane on the market today.

Skilled mechanics, trained by an experience of over half a century in the quality workmanship required in locomotive construction; manufacturing facilities found only in a plant equipped to produce giant steeds of the rails; and an organization bearing an international reputation for service after sales, combine to make LIMA shovels, draglines and cranes the standard of quality wherever excavators are used.

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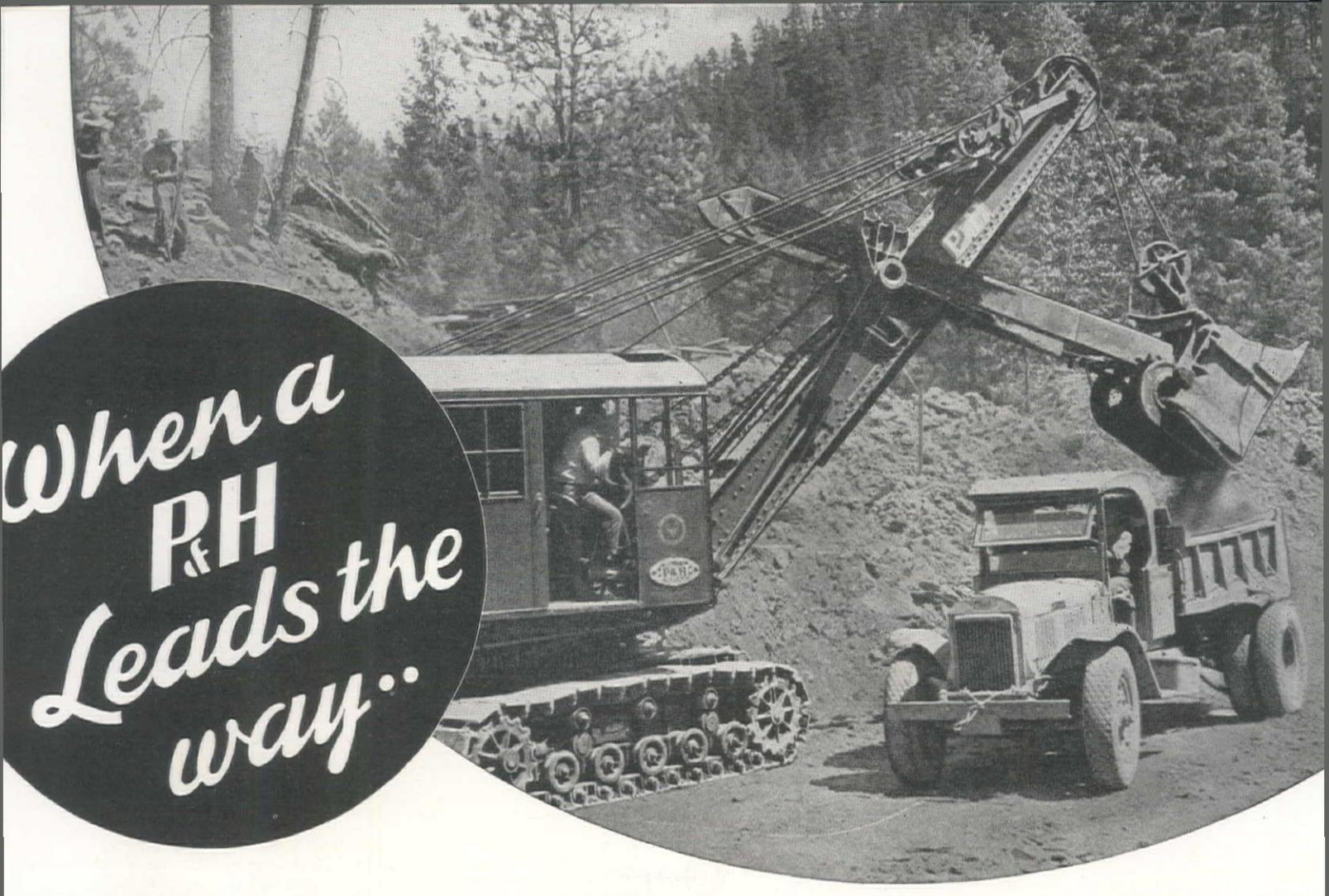

ALL ROAD EQUIPMENT MOVES FASTER!

● Your excavator is the spear head of attack on road construction jobs. If it fails, all equipment along the line may have to mark time. That's where P&H speed and stamina show up with continuous high speed production.

But it's not only freedom from breakdown that makes P&H performance so outstanding. It's *Split Second Control* with "Sure Feel" power clutches that protect frame, motor, drums and gears from disabling shocks . . . Super Smooth Swing Clutches that provide faster, more accurate dipper spotting . . . Rapid Reversing Crowd Planetaries that speed up the digging cycle. The P&H chain crowd enables you to grade faster—within 1 inch of floor level. And you can keep it up hour after hour because everything is designed for the easiest possible operation—to save tiring motions and get the most out of the day's work.

This year's road building jobs will be awarded on the basis of the lowest cost per mile. High speed equipment will figure in every bid. Contractors who have the advantage of these modern and advanced P&H features will be in the running on any job. That's why you should investigate them now. . . . There's a P&H working somewhere near you. We'll be glad to tell you where. Watch it hit its stride and see the difference. There's a model for every kind of road job. Write for details on specific sizes.

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Blasting NEWS

PUBLISHED BY

NO. 1 HERCULES POWDER COMPANY INCORPORATED WILMINGTON, DELAWARE

FILL SETTLEMENT BLAST

BLASTING AIDS ROAD BUILDING OVER SWAMPS

The demand for the Hercules 88-page booklet, *Accelerating Swamp Fill Settlement with Explosives*, indicates that county and city road departments are joining state highway departments in using explosives to speed road construction over swampy areas. Nine years ago, the method was virtually unknown and three years ago it was used by only a few state highway departments.

An important advantage of this type of highway construction, as pointed out in the booklet, is that it makes possible straight, direct routes between points over swamps, marshes, and peat bogs.

Direct route construction is only one of many advantages obtainable by using explosives in fill settlement that are listed in this informative booklet. Other advantages, together with actual procedure, are published in detail.

Accelerating Swamp Fill Settlement with Explosives is especially important right now, with so much road building in progress. Contractors and engineers may obtain copies by writing to the Hercules Powder Company, Wilmington, Delaware.

Mining Coal For Mechanical Loading

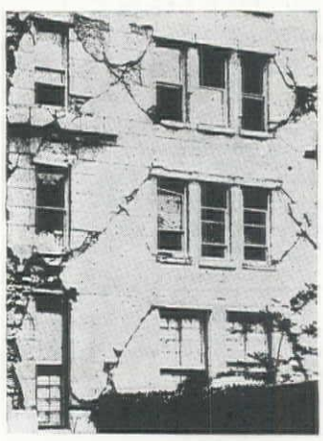
How a prominent coal company has developed mining systems to utilize to best advantage its shaking conveyors and scraper loaders is the subject of an informative article published this month in *The Explosives Engineer*.

The article, by one of the company engineers, describes methods used in driving entries, using shaking conveyors in rooms, using shaking conveyors in long face work, and the general application of scraper loaders.

Copies of this article will be sent free on request.

Hundreds Want Vibrations Book

Hundreds of quarry and open-pit mine operators, contractors, consulting engineers, municipalities, and insurance companies requested copies of *Vibrations Caused by Blasting and Their Effect on Structures*, as soon as publication was announced.



Earthquake vibrations, if sufficient to cause any damage at all, produce cracks which are at right angles to each other.

This book, by Dean Edward H. Rockwell, contains scientific and technical information that heretofore has been unavailable, and which is of great value in refuting some of the claims for damage alleged to be caused by blasting vibrations.

Undoubtedly many other individuals and firms have a distinct interest in the data presented. Copies are still available for free distribution to executives.

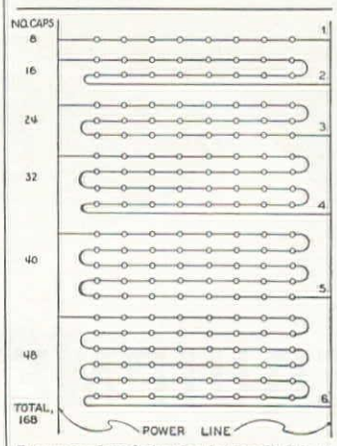


Diagram of graded series-in-parallel blast, showing how 168 electric blasting caps could be fired safely by a 50-cap blasting machine.

FIRING CAPS A NEW WAY

A blasting circuit, called the "graded series-in-parallel connection," makes it possible to load blasting machines greatly in excess of their ratings, a great help in many blasting operations.

This new method is fully described in a recent issue of *The Explosives Engineer*. The article points out that the graded series-in-parallel connection broadens the use of blasting machines for electric blasting, making it possible, for example, to shoot several hundred caps at one time from a 50-cap machine.

Copies of the article will be furnished on request.

Blasting In Metal Mines

Probably no metal-mining study of drilling and blasting practice is more complete than *Drilling and Blasting in Some American Metal Mines*, a book of 197 pages published by Hercules Powder Company.

This book, presenting a study of methods in 90 leading mines, represents the results of the work of the country's foremost mining engineers.

Drilling and Blasting in Some American Metal Mines is so arranged, illustrated, and tabulated that it can be used as an easy guide to help in the solution of blasting problems for properties of various sizes and characteristics.

The increasing importance of metal mining makes the book of unusual importance at this time. *Drilling and Blasting in Some American Metal Mines* is available free of charge, to men in positions to utilize it.

IMPROVED BLACK POWDER DESCRIBED

Just off the press is a booklet describing a new pellet powder that represents an important addition to the Hercules series. The new powder is called Pellet "D" and its distinguishing feature is a great reduction in the smoke and objectionable fumes usually associated with black powders and which has made them unsatisfactory for many classes of work. When using Pellet "D" the miners are enabled to return to the face much more quickly after the shot, work is speeded up, and output is increased. Pellet "D" produces clean, solid lump and a maximum of coarse coal.

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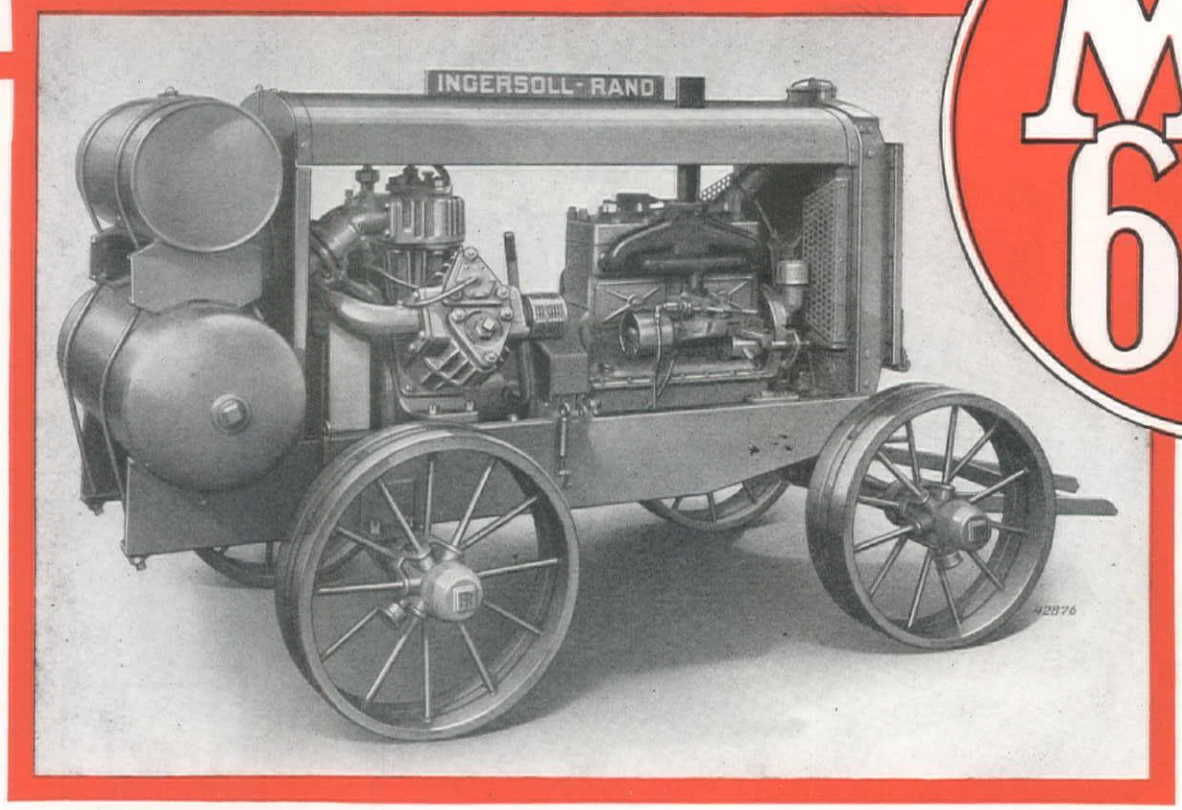

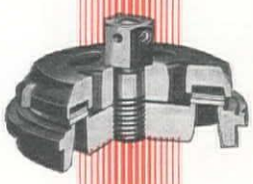

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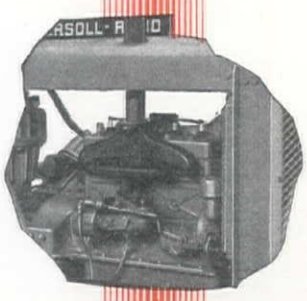

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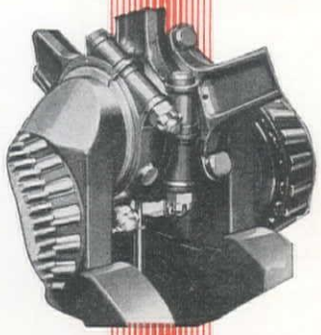

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This two-stage, air-cooled compressor has a capacity of 60 cfm at 100 lbs. pressure, ample for many contract or road building and maintenance jobs. It is driven by a Waukesha Gasoline Engine or an I-R Type "H" oil engine.

Air-cooling, two-stage compressor, inter-cooling and many manufacturing refinements all combine to insure absolute reliability and a substantial saving in fuel cost.

Six larger sizes available—all recognized types of mountings.

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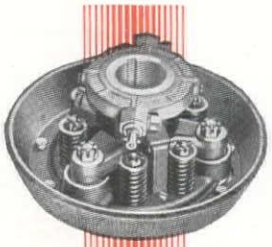

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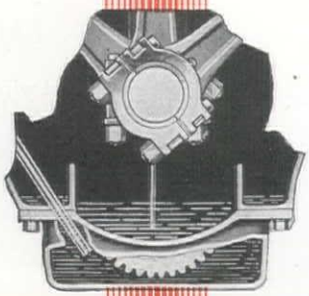
ROLLER-BEARING STEEL WHEELS



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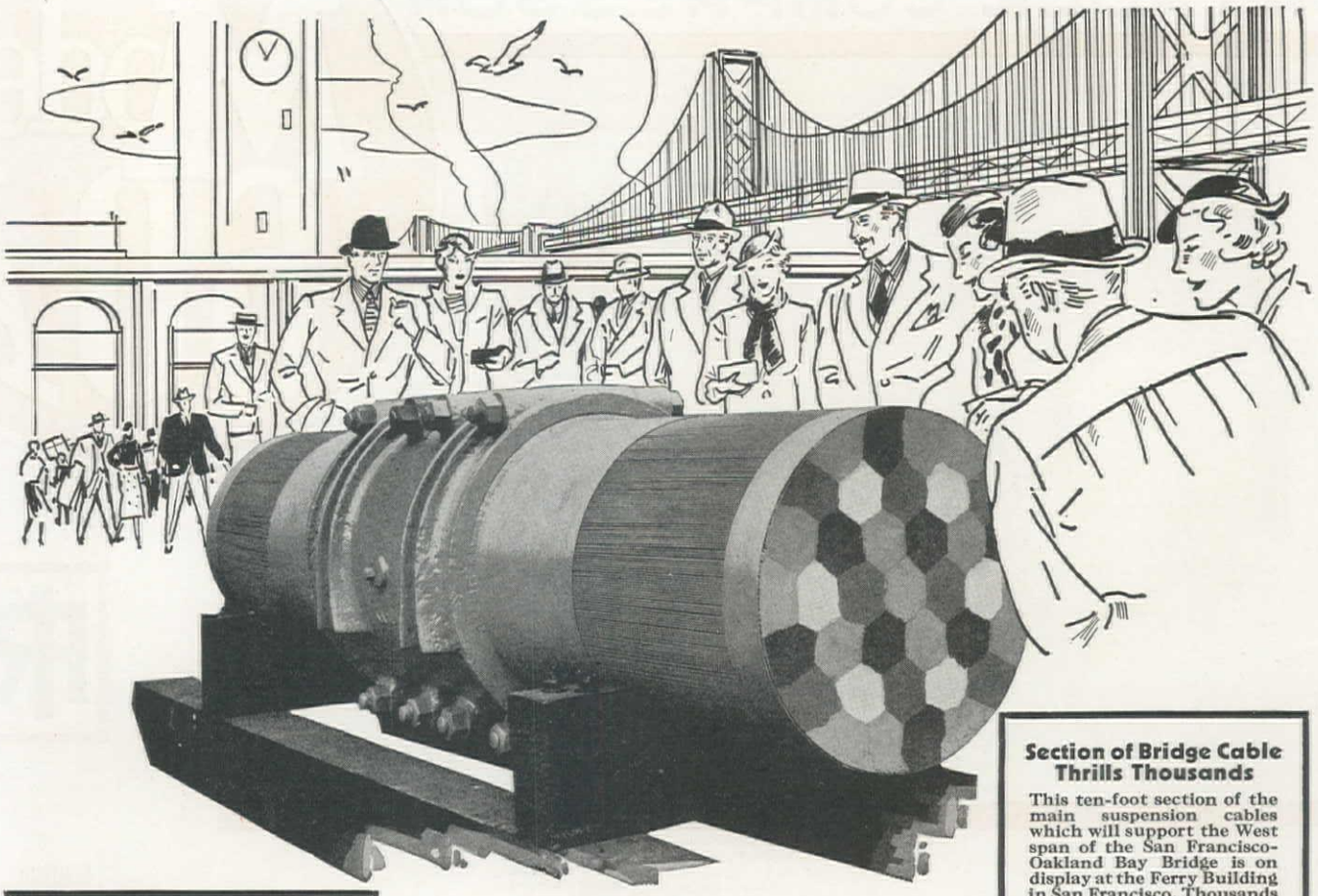

Section of Bridge Cable Thrills Thousands

This ten-foot section of the main suspension cables which will support the West span of the San Francisco-Oakland Bay Bridge is on display at the Ferry Building in San Francisco. Thousands gaze at it as they now rush to and from Ferry Boats, which are soon to be supplanted by the world's greatest bridge.

World's Largest Steel Contract

170,000 tons of steel, including the cables, are required for the superstructure, the general contract for which is held by the Columbia Steel Company, subsidiary of the United States Steel Corporation. Sister subsidiaries contributing their products are: American Bridge Co., Carnegie Steel Co., Illinois Steel Co., American Steel & Wire Co., National Tube Co., Tennessee Coal, Iron and R. R. Co., and Lorain Steel Co. The facilities and engineering skill of the United States Steel Corporation have combined with those of the California Toll Bridge Authority in the building of this great bridge.

Supporting the world's heaviest load!

The West Bay crossing of the San Francisco-Oakland Bay Bridge (greatest in the world) actually consists of two enormous suspension bridges. Two gigantic cables will support the double-deck superstructure, weighing 80,000 tons. They will be capable of supporting an additional 35,000 tons of "live-load"—trains, trucks, automobiles, passengers and freight. Each of these cables will be 28¾ inches in diameter and consist of 37 strands, each containing 472 No. 6 gauge galvanized Plow Steel grade wires, a total of 17,464 wires. Total length of wires 69,000 miles—weight 18,700 tons.

Specify TIGER BRAND WIRE ROPE

The same steel wire, the same facilities and experience which are producing the cables of the San Francisco-Oakland Bay Bridge, produce the famous TIGER BRAND Wire Rope. ***Whether it be for suspension bridges or elevators, whether for use in the construction, mining, logging, oil, or marine industries, there are TIGER BRAND Wire Ropes specially designed to do the job better and more economically.*** TIGER BRAND Wire Ropes are made on the Pacific Coast by the Columbia Steel Company in its own modern plant. Columbia engineers will gladly assist you in the selection of the wire rope best suited for the job at hand.

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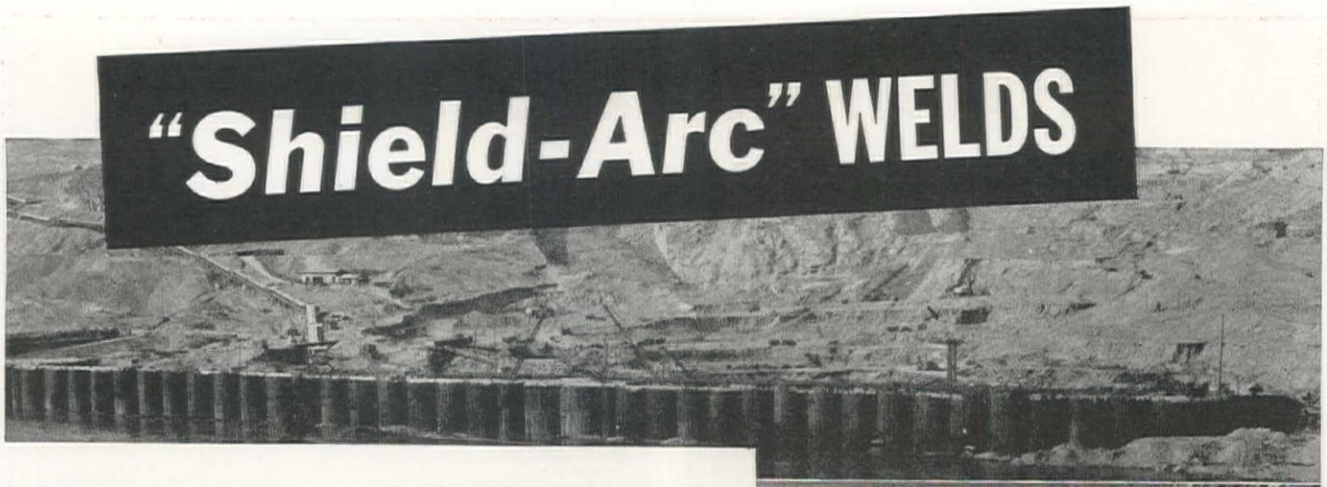
United States Steel Corporation Subsidiaries

Export Distributors: United States Steel Products Company, New York



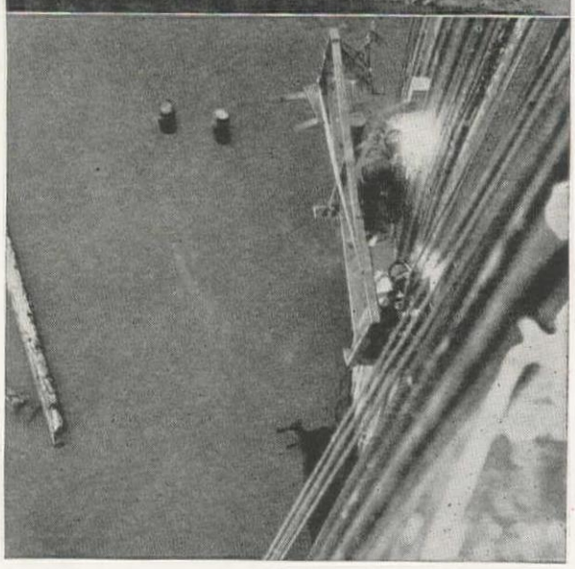
WORLD'S LARGEST COFFERDAM

TYPICAL of hundreds of examples of "*Shield-Arc's*" ability to save time and cut costs is Mason-Walsh-Atkinson-Kier Company's use of Lincoln "*Shield-Arc*" welders and "Fleetweld" electrodes to weld the horizontal joints in the steel piling of the Grand Coulee cofferdam. In the construction of buildings, bridges, docks, pipe lines, water mains, dams or any other type of project "*Shield-Arc*" welding proves a definite aid to better construction for less money.

Before you compile your next bid find out from Lincoln how much you can cut construction costs by "*Shield-Arc*" welding. Often Lincoln can point the way to worthwhile savings which result in successful bidding for highly profitable contracts.

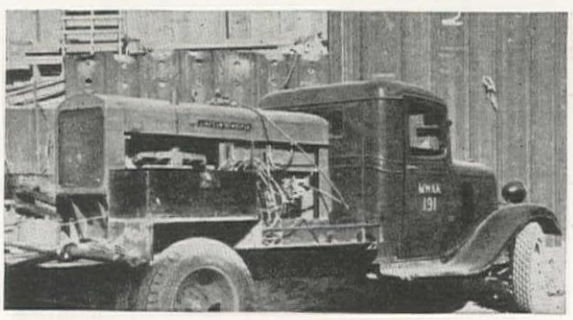
Also Lincoln can show you how to cut the cost of repairs to your equipment as much as 50%. On many a job the savings made by "*Shield-Arc*" in repairing worn or broken equipment has more than paid for the welder. Find out now how much "*Shield-Arc*" welders can add to your profits on every job. Ask THE LINCOLN ELECTRIC COMPANY, CLEVELAND, OHIO. Largest Manufacturers of Arc Welding Equipment in the World.

W-152



With "Lincontrol," an exclusive "Shield-Arc" feature, these men can regulate their welding current without leaving their work—and without use of extra cables or portable rheostats.

One of the Lincoln "Shield-Arc" gasoline engine driven welders on the job at Grand Coulee. The automatic idling device, exclusive with Lincoln, cuts fuel costs as much as 35%.



LINCOLN

"SHIELD-ARC" WELDERS

LAD "I see where an archeologist says that Europe once touched America."

POP "More than *once*, Lad, more than once. And let that be a lesson to you not to get mixed up with welding machines that give only promises when you know that the '*Shield-Arc*' is guaranteed three ways to deliver more welding per dollar."

Tunnels in the mountains must meet accurately

Synchronize is a Big Word—But!

— Synchronize is the word for it because it means "making various forces work together in perfect unison." And that just about describes the modern development of explosives into controlled force.

So completely has it been possible to synchronize controlled force with understanding of physical elements to be overcome that nowadays, blasting can get a result that combines safety and economy with accomplishment that doesn't vary from the blue print by a hair's breadth.

Controlled force involves more than selecting the right explosive or the right grade. It involves more than selecting the right blasting accessories.

In any job—mine or quarry, road or tunnel, mountain or forest—there is a combination to be brought together—synchronized—in control. It concerns both the blaster and the explosives maker. It demands knowledge (1) of the physical problems in the burden to be moved and (2) how best to direct the control of the force that moves it.

For years, Atlas has preached—and practised—the doctrines of controlled force as is evidenced by the number of blasting practises now standard (in both product and method) first introduced by Atlas.

Atlas representatives have an unusual background of experience to offer when called in to seek the solution of any blasting problem.

ATLAS POWDER COMPANY

THE DIVISION

Everything for Blasting

Seattle, Wash. Portland, Ore. Spokane, Wash.

San Francisco, California
Cable Address—Atpowco
Wilmington, Del.

Los Angeles, Calif. Salt Lake City, Utah Butte, Mont.

Other Offices:

Allentown, Pa.	New York, N. Y.
Boston, Mass.	Philadelphia, Pa.
Denver, Colo.	Picher, Okla.
Houghton, Mich.	Pittsburg, Kansas
Joplin, Mo.	Pittsburgh, Pa.
Kansas City, Mo.	St. Louis, Mo.
Knoxville, Tenn.	Tamaqua, Pa.
Memphis, Tenn.	Wilkes-Barre, Pa.
New Orleans, La.	Wilmington, Del.

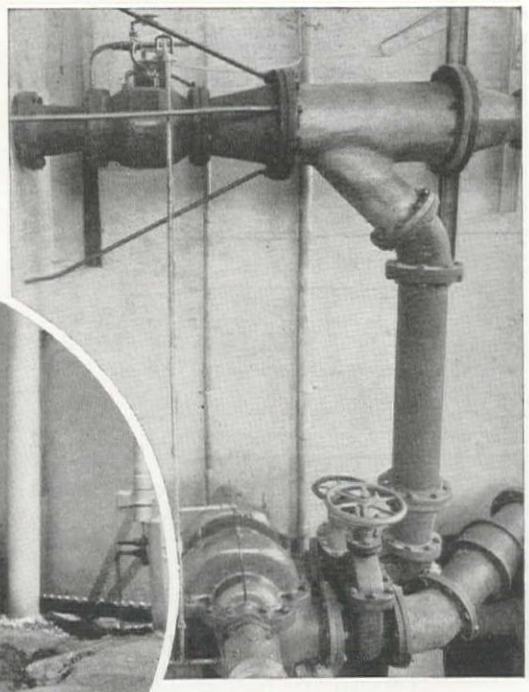
ATLAS EXPLOSIVES

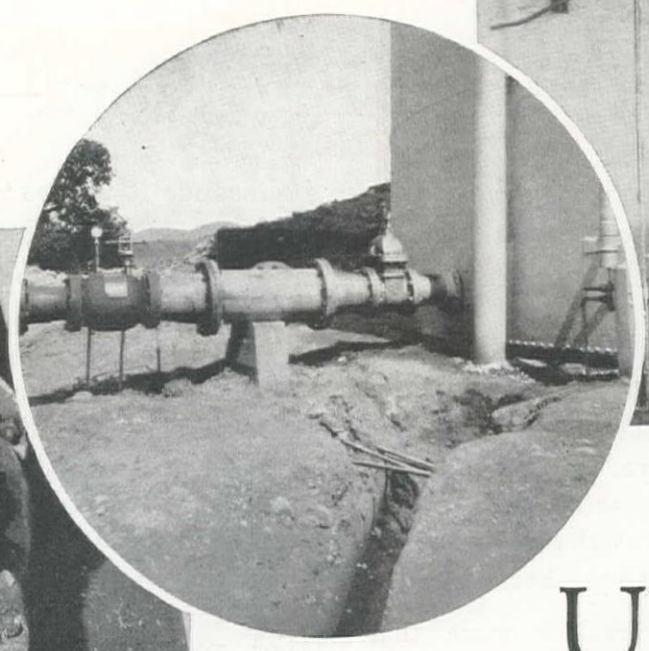
ATLAS EXPLOSIVES

When writing to ATLAS POWDER COMPANY, *please mention Western Construction News.*

Dependability, with Protection

for Every Part of the Water Works System





Upper right: Main line check valve for protection of two centrifugal pumps. *Circle:* Altitude valve for regulation of water level in tank. *Above:* Surge suppressor in pit for protection of long discharge line from excess pressure.

Complete descriptions given in our new bulletin No. 29. Copies mailed upon request.

UTMOST dependability under all conditions of service, complete protection to all parts of the water system and maximum hydraulic and mechanical efficiency—these are the desirable attributes of water works valves without regard to the size or extent of the installation. Pelton valves are designed to meet these basic requirements and are installed only after most thorough analysis of the actual conditions to be met. Their success is a matter of operating records in many parts of the West.

The accumulative experience of Pelton engineers, gained over a period of more than fifty years, is readily available to those confronted with any type of valve problem. Consultation and proposals are offered without obligation, and your inquiry is invited.

THE PELTON WATER WHEEL COMPANY

HYDRAULIC ENGINEERS

120 Broadway NEW YORK | **2929 Nineteenth St. SAN FRANCISCO** | **Paschall Station PHILADELPHIA**

Pacific Coast Representatives for BALDWIN-SOUTHWARK CORPORATION, DE LA VERGNE ENGINE CO., CRAMP BRASS & IRON FOUNDRIES CO., and LARNER ENGINEERING CO., of Philadelphia, Pa.

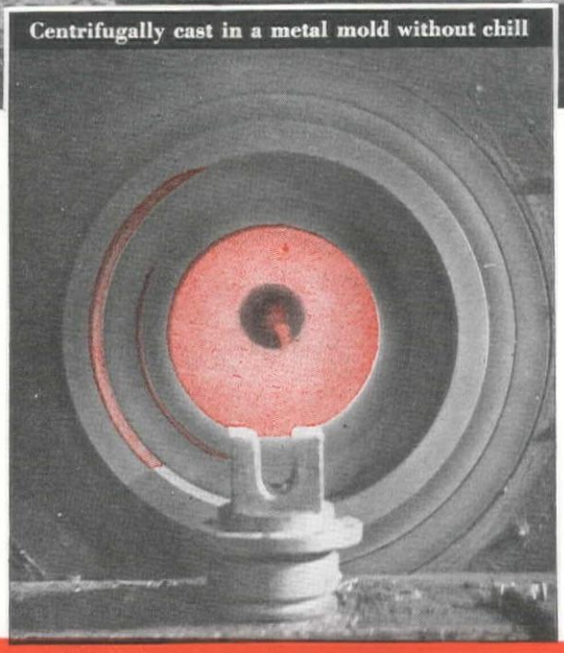
PELTON

In writing to THE PELTON WATER WHEEL CO., *please mention Western Construction News.*

IMPACT RESISTANCE DOUBLED

Installation of Super-de Lavaud Pipe at Asbury Park, N. J.

Centrifugally cast in a metal mold without chill



THE Super-de Lavaud Process is widely regarded as the most outstanding development in the manufacture of cast iron pipe since the introduction of centrifugal casting. It is a basic metallurgical advance—the first successful commercially practicable method of casting gray iron in a metal mould without chill. Pipe produced by this process attains a metal structure close to perfection for pressure pipe purposes. It is tough, yet ductile, and impact strength is doubled without impairment of tensile and bursting strength. More than eight million feet of Super-de Lavaud Pipe have been sold and installed. Ask for booklet describing the Super-de Lavaud Process.

U.S. SUPER-de LAVAUD PIPE

CAST WITHOUT CHILL IN A METAL MOLD

UNITED STATES PIPE AND FOUNDRY CO., General Office: BURLINGTON, N. J.

Foundries and Sales Offices throughout the United States

He "Saved"—with a Bargain Tire

LITTLE LESSONS IN FALSE ECONOMY

Again we say—
Beware of FALSE ECONOMY

Tragedy seldom strikes so dramatically when you "save" a few dollars on cheap equipment. Frequently you're not aware of your mistake until repair bills begin to pile up—as, for instance, when you buy cheap Water Meters. Then you realize, too late, that repairs, upkeep, depreciation and actual replacement far offset the few dollars "saved" on purchase price . . . not to mention the lost revenue of inaccurate water meters. Beware of false economy . . . invest in Trident or Lambert Meters, built on the principle of interchangeability, backed by a generation of reputation for sustained accuracy, workmanship, materials. We make all types of these "Pioneers in Meter Progress"—send for catalogs to the Neptune Meter Company (Thomson Meter Corp.), 50 W. 50th St. (Rockefeller Center), New York City . . . or . . . Neptune-National Meters, Ltd., Toronto, Canada.

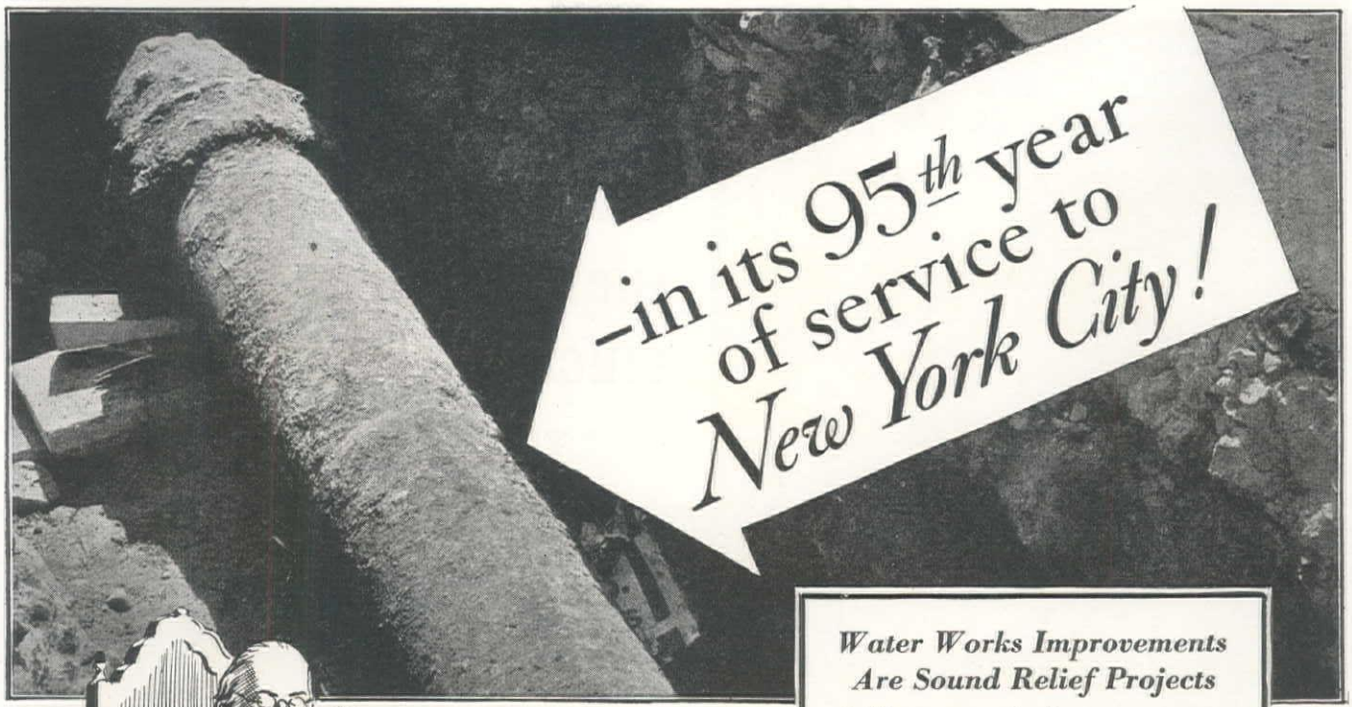
TRIDENT STYLE 3-DISC METER

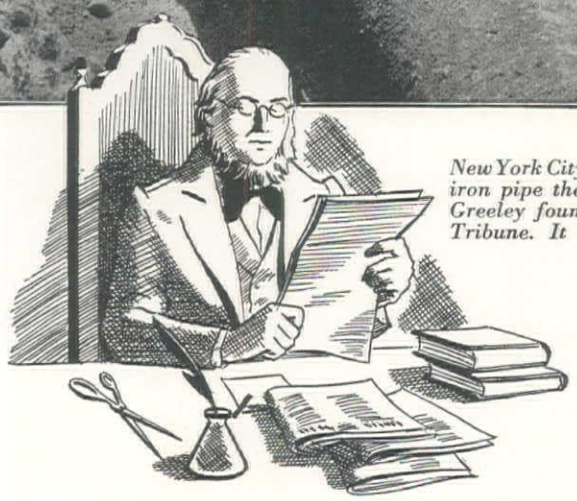
For services between the capacity of the smaller Trident Disc Meter and the larger Trident Crest, Compound or Protectus Meters. Interchangeable Parts. Oil-Enclosed Gear Train. Delivery adjustment. 40 to 100 lb. pressure.

Trident & Lambert WATER METERS

Never grow obsolete . . . Over 6 million made and sold

In writing to NEPTUNE METER COMPANY, *please mention Western Construction News.*





New York City laid this cast iron pipe the year Horace Greeley founded the N. Y. Tribune. It is still in use.

Water Works Improvements Are Sound Relief Projects

1. Water supply improvements constructed with cast iron pipe are self-liquidating.
2. Approximately 75% of the cost of manufacturing, distributing and installing cast iron pipe, including raw materials, goes directly to workmen.
3. Manufacturing and installing one mile of 6-inch cast iron pipe gives approximately 1000 man-days of employment.
4. For every 100 tons of cast iron pipe manufactured, the railroads handle approximately 1000 tons of raw materials.

UNDER a New York City pavement at the intersection of East Broadway and Montgomery Street lies a cast iron water main that was laid in 1841. A section exposed to cut in a valve, at the time the above photograph was taken, proved to be in excellent condition, good for generations to come. Some of New York's 4500 miles of cast iron mains are more than a century old.

In evaluating bids, engineers rate the useful life of cast iron pipe at 100 years, far beyond that of any other pipe practicable for underground mains. The long life of cast iron pipe is attested to by mains still in use here and abroad after one, two and nearly three centuries of service. Cast iron has long been the standard material for water and gas mains.

Cast iron pipe *costs less per service year* and *least to maintain* because of its effective resistance to rust. It is the one ferrous metal pipe for water and gas mains, and for sewer construction, that will not disintegrate from rust.

Municipal officials may never again be able to modernize, enlarge or extend water distribution systems, or build new supply lines, at the low costs and favorable financial terms existing today.

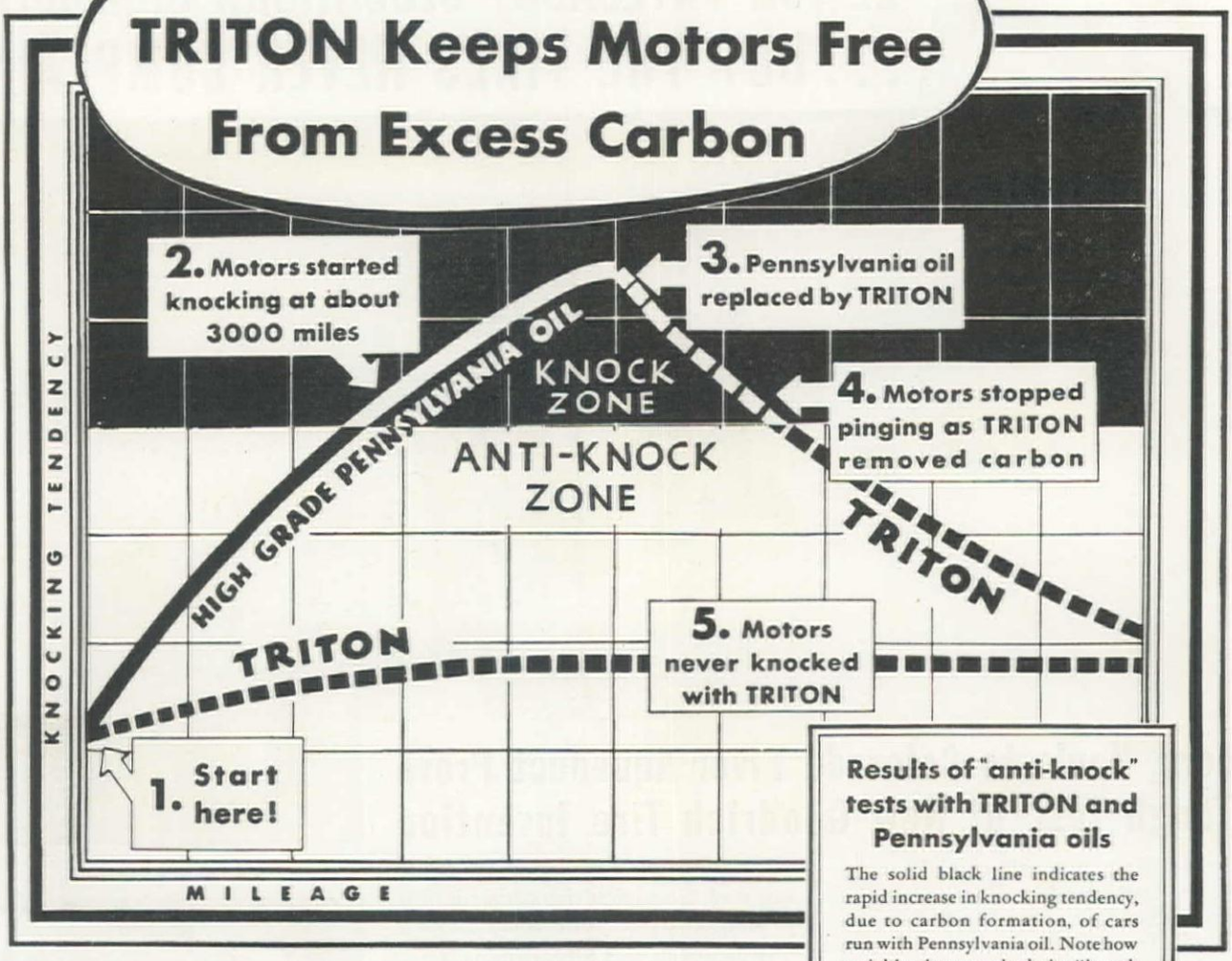
For further information, address The Cast Iron Pipe Research Association, Thos. F. Wolfe, Research Engineer, 1015 Peoples Gas Building, Chicago, Ill.

CAST IRON PIPE

METHODS OF EVALUATING BIDS NOW IN USE BY ENGINEERS RATE THE USEFUL LIFE OF CAST IRON PIPE AT 100 YEARS

TRADEMARK REG.

Tests Show How TRITON Keeps Motors Free From Excess Carbon



Results of "anti-knock" tests with TRITON and Pennsylvania oils

The solid black line indicates the rapid increase in knocking tendency, due to carbon formation, of cars run with Pennsylvania oil. Note how quickly they reached the "knock zone." The top line shows that when the same cars were filled with Triton they rapidly escaped from the "knock zone" because Triton cut down their carbon deposits.

The bottom dotted line shows Triton formed so little carbon the knocking tendency of the cars was practically unchanged . . . enabling the gasoline to deliver its full anti-knock value.

12 cars run over 100,000 miles prove Triton actually takes carbon out of motors...reduces or eliminates carbon "ping"!

AS SHOWN by the chart, these tests proved that a motor run with Triton does not develop a carbon knock.

They further showed that Triton has such a low carbon "equilibrium point" that it removes carbon from motors which have been run with other oils!

This exclusive feature of Triton means smoother operation for the life of the motor, increased power, lower gas consumption.

Triton is made by Union's Patented PROPANE Process and is *100% Pure Paraffin-base*—entirely free from low-grade materials. It has greater stability in the crankcase..minimizes sludge..has longer life..reduces engine wear..cuts overhaul and repair bills.

Try Triton for 3 months and note, how, with each successive oil change the engine runs smoother, gives improved performance, and greater economy.

Triton is available in 1 and 5 quart cans or in 53 gallon barrels. Try it next time you buy oil.

UNION OIL COMPANY

Relative Amounts of Carbon formed by Triton, Western and Eastern Oils

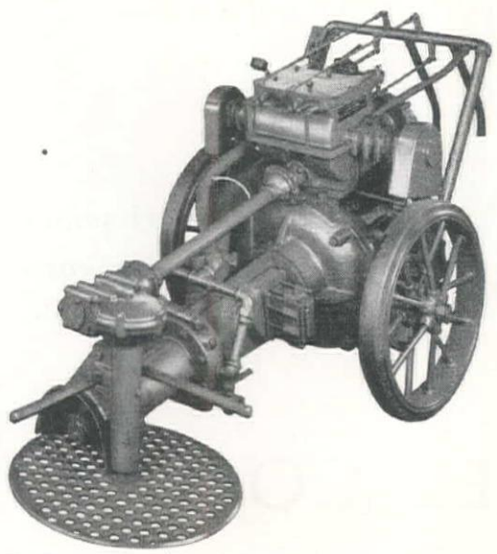
—the reason TRITON is the first "Anti-knock" Motor Oil

TRITON
MOTOR OIL
100% PURE PARAFFIN-BASE

OBTAIN THESE SAVINGS IN PLACING CONCRETE

When completed, Wheeler Dam will be over a mile long. Floating mixing plants offered the simplest and most practical means to mix and place concrete for a dam of this size. Three of the four mixing plants are shown above. Each is served by one Portable Fuller-Kinyon Pump. Fuller-Kinyon Pumps are the only conveyors capable of unloading barges. Note how the cement barge is located to avoid interference with the handling of aggregates. Another pump handles cement for the Lock, which will be seen at the upper left of the illustration.

FLEXIBILITY - SPEED - RELIABILITY - LOW COST



Fuller-Kinyon Portable Cement Pumps are the only conveyors capable of handling cement under all plant conditions. They unload box cars and barges and recover cement from simple storage sheds with equal facility. For additional information on the advantages of these conveyors write for our bulletin.

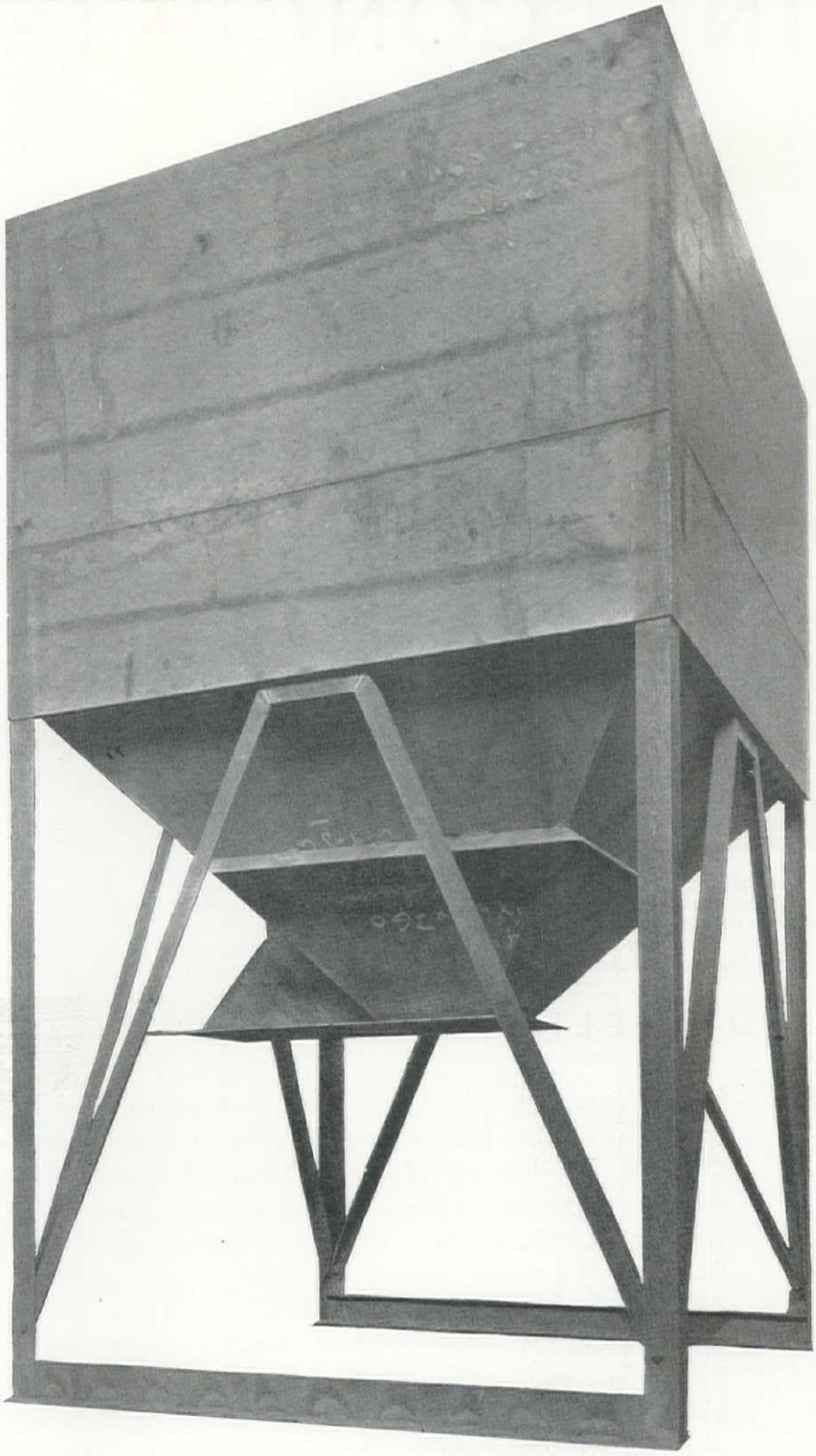
Many millions of barrels of bulk cement have been handled by Portable Fuller-Kinyon Pumps in building the World's greatest concrete structures. They have proved that the design and arrangement of concrete mixing plants may be based solely upon economy and convenience in handling aggregates and placing concrete, by eliminating the necessity for straight line and short distance cement conveying. As at Wheeler Dam, they have permitted the economical use of bulk cement where it would otherwise be impractical. Their capacity and rapid movement, under their own power, have assisted in establishing new records in the placing of concrete, as at Norris Dam where only two pumps were required to unload cement from box cars.

Fuller Company
CATASAUQUA, PENNA. U. S. A.

Pacific Coast Branch Office
564 Market Street, San Francisco, Calif.

When writing to FULLER COMPANY, *please mention Western Construction News.*

Portable Steel Bins for Paving Jobs



WHEREVER Asphaltic Concrete is specified and the drier fed by belt and bunker method, these bins, of welded and bolted construction, are found to be convenient, time-saving, and therefore money-saving.

•

THE illustration opposite shows one of these Portable Steel Bins, fabricated by Western Pipe & Steel Co. of California for Union Paving Co. of San Francisco. Dimensions 8′ x 8′ x 14′. Gate and Conveyor not shown.

•

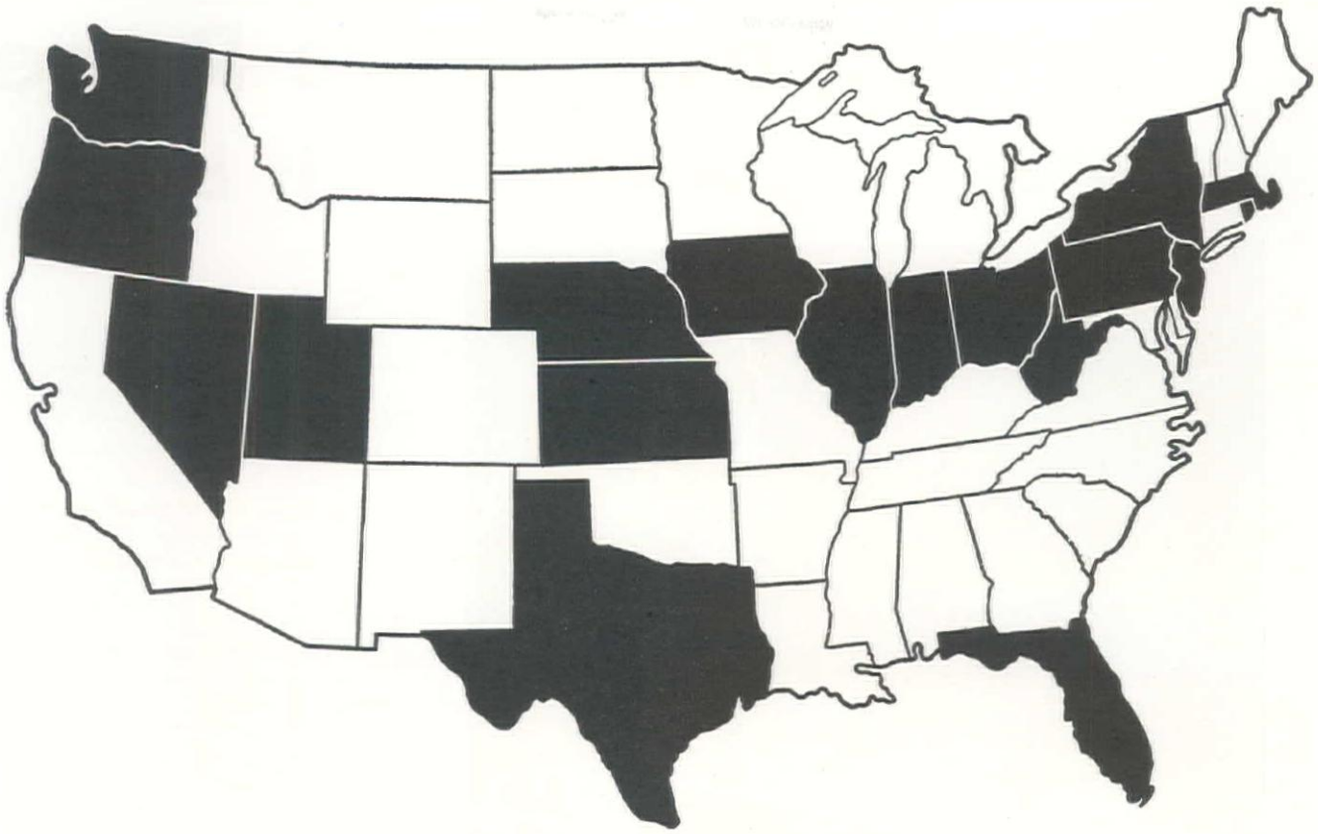
WRITE or telephone any of the company's offices for details.

WESTERN PIPE & STEEL COMPANY

OF CALIFORNIA

LOS ANGELES SAN FRANCISCO FRESNO BAKERSFIELD PHOENIX

Affiliated: HARDINGE-WESTERN COMPANY



Experience of 18 States shows

concrete saves $114 to $469 per year per mile surface maintenance

NOW you can settle questions about surface maintenance costs with *actual figures* —compiled from *all* states that publish comparable data.

Official records covering more than one hundred thousand miles of pavement for periods up to 14 years reveal these averages:

Type of Pavement	Total Mileage	Average Surface Maintenance Cost per Mile per Year
Concrete	*40,388.4*	*$105.74*
A	998.3	220.26
B	1,692.3	244.34
C	2,309.1	281.80
D	16,441.2	315.09
E	2,356.8	322.57
F	1,985.9	345.47
G	18,336.9	369.38
H	8,206.7	382.97
I	2,446.4	438.65
J	5,118.8	575.51

More detailed data, by states, may be had by writing for report entitled "*Road Maintenance Costs as told by Available State Highway Records.*"

And the Public Wants Concrete

Concrete is demanded by motorists because it is swift but safe, non-skid, easily visible at night, most pleasant to drive on . . . and because it saves money in gas, oil, tires and car repairs.

Concrete is the standard by which all roads are judged

PORTLAND CEMENT ASSOCIATION

Dept. 108 816 W. Fifth St., Los Angeles, Calif.
564 Market St., San Francisco, Calif.

PORTLAND CEMENT ASSOCIATION

Please send me "Road Maintenance Costs as told by Available State Highway Records."

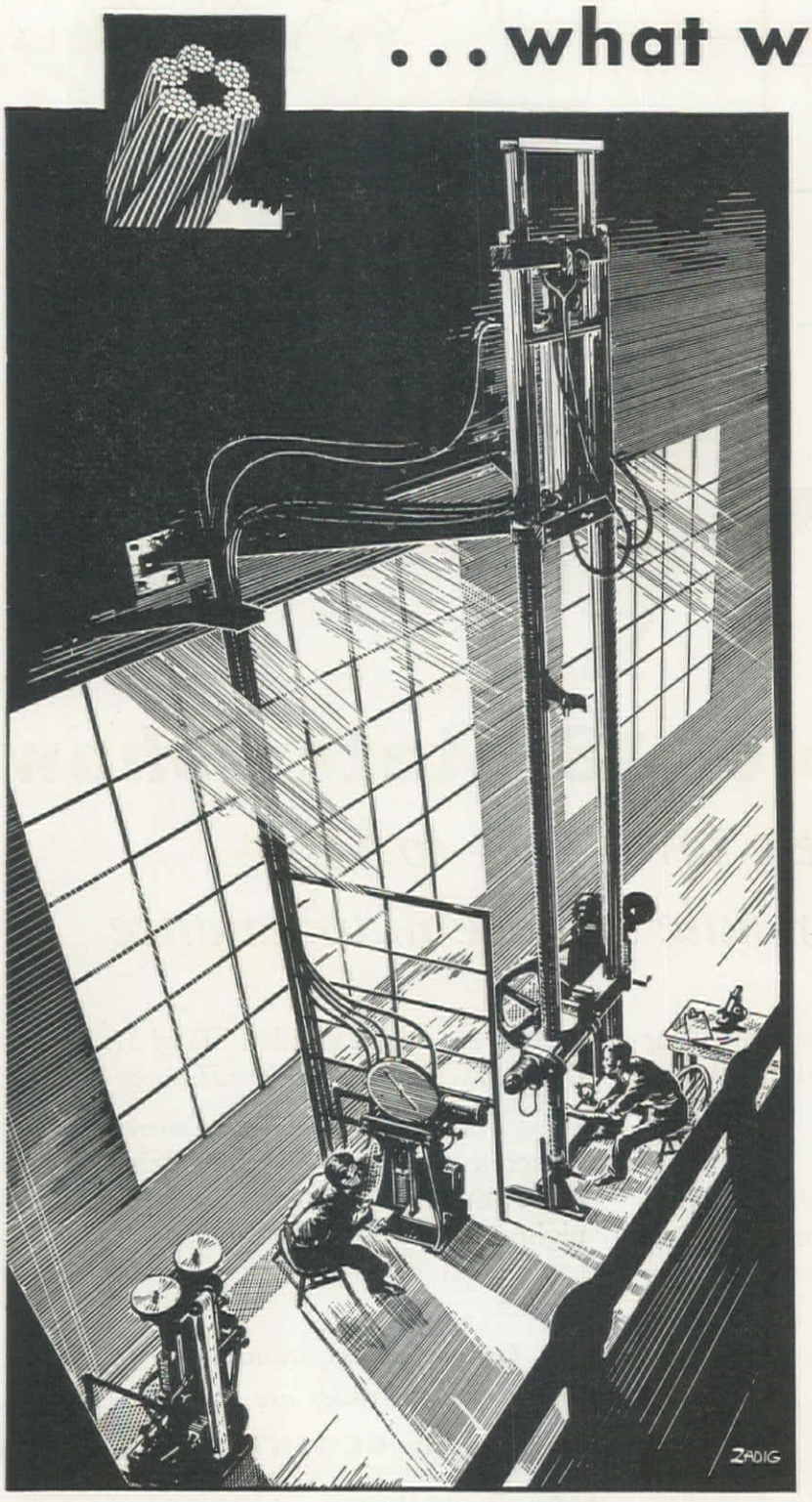
Name.....

Address.....

City..... *State*.....

In writing to PORTLAND CEMENT ASSOCIATION, *please mention Western Construction News.*

Tomorrow's Wire Rope ...what will it be?



TO MAKE CERTAIN that Roebling Wire Rope will give the user the highest obtainable degree of safe, economical service, Roebling has enlisted the aid of the finest and most complete research, testing and manufacturing facilities. The Roebling fatigue testing machine shown is an example. John A. Roebling's Sons Company of California. San Francisco, Seattle, Los Angeles, Portland.

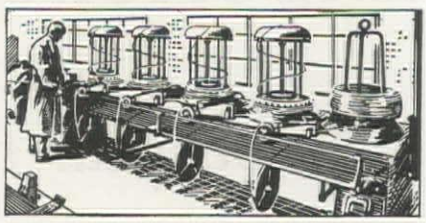
"Some people tell me the world is completed. But I say that behind the scenes, in research laboratories now humming with activity, the world is just in the making."

(From address of a famous industrial executive)

And so in the Roebling Laboratory, one of the country's most modern and completely equipped industrial research units, goes on the ceaseless work of improving Roebling Wire Rope... of developing the wire rope of the future.

The 40,000 lbs. capacity "dynamic" fatigue testing machine shown to the left is one of the relatively unknown and costly pieces of equipment in this laboratory. The mechanism at the extreme left of the picture is an automatic regulator and recorder... the only machine of its kind in existence for making fatigue tests of long sections of wire rope.

A WIRE DRAWING MILL ...IN A LABORATORY!



An experimental wire mill... right in the Roebling Laboratory. A duplicate, on a small scale, of Roebling's main wire drawing plant. The continuous 5-head wire drawing machine shown is part of the equipment in this experimental wire mill.

ONE OF AMERICA'S FINEST INDUSTRIAL RESEARCH UNITS

An exterior view of the 3-story building devoted entirely to Roebling Research.

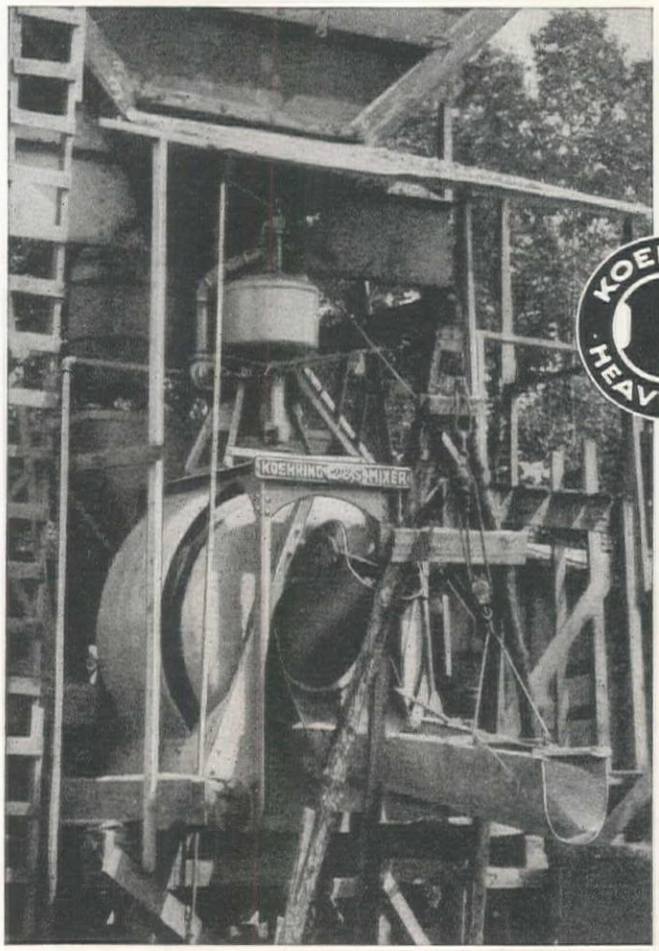
ROEBLING ...THE PACEMAKER IN WIRE ROPE DEVELOPMENT

KOEHRING

HEAVY DUTY CONSTRUCTION

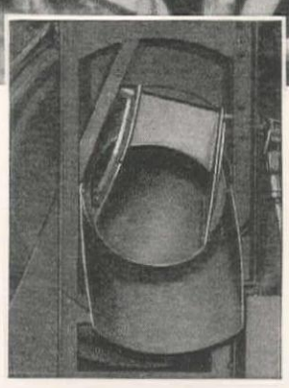
MIXERS

28-S • 56-S • 84-S



KOEHRING HEAVY DUTY Concrete Construction Mixers are used on a great variety of large volume concrete projects — locks, dams, bridges, power plants, sanitation and water works projects, etc.

Compact design permits minimum installation space. *High speed charging and discharging insures maximum production.* Heavy Duty Construction results in continuous operation.



The Koehring Flow-Line discharge greatly decreases discharge time — substantially reduces abrasive wear and permits an unbroken, natural discharge flow of concrete.

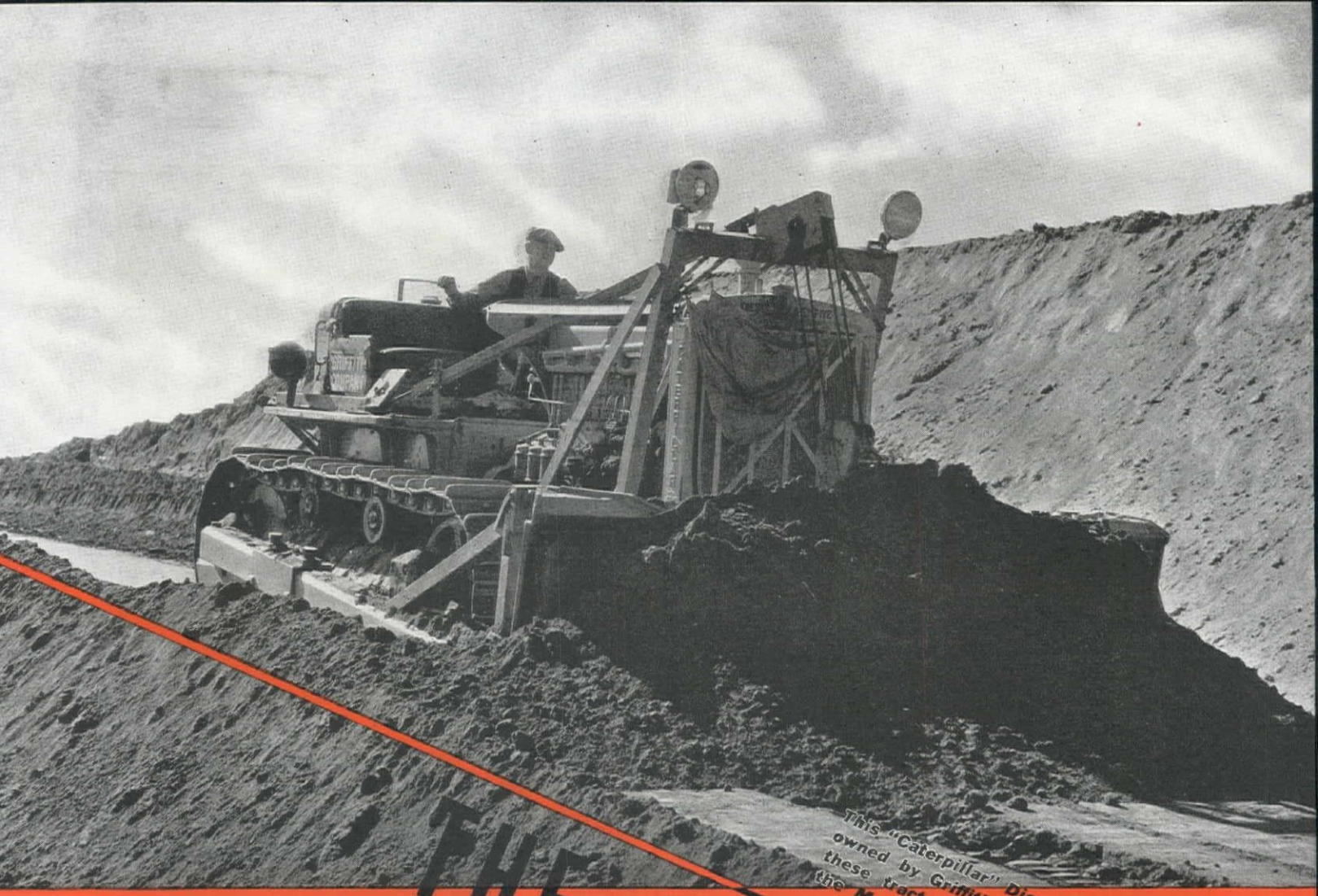
KOEHRING COMPANY

Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks

3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

HARRON, RICKARD & McCONE CO., San Francisco, Calif.-Los Angeles, Calif. L. A. SNOW CO., Seattle-Spokane CRAMER MACHINERY CO., Portland

In writing to KOEHRING COMPANY, *please mention Western Construction News.*



This "Caterpillar" Diesel Seventy-Five Tractor, owned by Griffith & Co., is one of a fleet of these tractors cutting dirt-moving costs on the Metropolitan Aqueduct job.

THE SHOW-DOWN FEATURES NEW IDEAS

The contractor who is equipped with "Caterpillar" Diesel power makes his schedules, enters his bids, plans his work with assurance. For he knows that low fuel costs, low up-keep expense and dependable performance make schedules and profits safe. Your dealer can give you figures on the new power standards they have set up, and a SHOW-DOWN on what they can do for you.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL

WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER

August, 1935 Vol. 10, No. 8

J. I. BALLARD, Editor
G. E. BJORK, Northwest Editor
H. W. PYERITZ, News Editor
R. P. BRYAN, News Editor

Construction Must Lead Development of the West

UNLESS the aggressive, looking-ahead attitude usually accepted as characteristic of the West is growing decadent, there should be less of the critical, cautious attitude toward the large-scale construction projects now being built. The West has always built for the future, and then realized that future because of these preparations, and not in spite of them. More than any other section of the country the West owes its growth and development to engineering construction. Beginning with railroad construction, there has followed dam construction, harbor construction, aqueduct construction, hydroelectric construction and highway construction,—construction and more construction. At any time when the West becomes conservative over the returns to be gained from construction works then is the time for the folding of tents and the tipped-toed exit.

For example, the allotment just made for the start on the program for the California state water plan, will be signal for the usual chirping of critics as to the inadvisability of starting such a large-scale undertaking with only part of the financing assured. It seems a fair assumption to make that the far-visioned planners who started the first trans-continental railroad were not sure of their financing, either. The same parallel applies to the other gigantic projects under way in the West today. For the most part they fail to have the support and appreciation they deserve,—Grand Coulee, Boulder Dam, Golden Gate Bridge, the All-American Canal, the Colorado River Aqueduct and the Casper-Alcova project. What is the worst criticism usually inveighed against them? "Well, the project is all right but it is about ten years ahead of its time." Rather than a fault, that may be considered a favorable factor, for unless improvements are built ahead of their need, there is no need for the improvements.

The West has only started its ultimate growth and, as in the past, the building of engineering projects will mark the opening of new growth. This is fortunate for the construction industry. In fact, only as the industry sells the value of its services can the region enjoy the reward.

Western Construction News believes firmly in the future of the western region, and further, that growth will follow directly as physical improvements provide the water, power and conveniences for the rising tide of population that may be expected, and must be prepared for. There is no project building or planned which is so large that it does not fit perfectly in the master plan for the ultimate West. For our part we are going to adjust rose colored glasses when viewing all phases of western construction.

●

Two Engineers

STRANGELY alike in careers and at the same time fundamentally different in characteristics were the two prominent western engineers—D. C. Henny and William Mulholland—who died last month. Alike, because each was born in a foreign country, came to the West early in his life, entered a phase of water development work and followed it to wide recognition and distinctive achievement in his chosen field. Different, because one represented the analyst in engineering science and the other represented the doer. To one, the apeal of the art was the study of a problem in all its phases, patiently eliminating errors and inaccurate deductions, to arrive finally at the answer which represented the closest approach to correctness which the uncertainties of engineering permitted. To the other, the accent was heavy on the urge to overcome obstacles, and accomplish results. One, the judge weighing the evidence of the case before arriving at the verdict; the other the prosecutor, driving, always driving to get things done. Engineering has, and needs, both types. The West was fortunate in having the abilities and energies of these two engineers expended on its ever present problem of water supply development.

A Few of the Answers

No more vital matter confronts the contracting industry of the West at present than the plans for handling the work-relief money which is to be spent for highway construction. The uncertainties involved have the highway program of the states seriously impeded while studies are made of the restrictions which have been placed on these funds. As a service to the many elements of the construction industry that are vitally concerned with the initiating of this new highway program, the answers to some of the vital questions are printed on another page of this issue, in so far as these answers can be stated at this time. It is rather apparent that many angles of the program will have to be worked out as the work gets under way, but the catechism may be of assistance in eliminating some of the uncertainties which contractors have to face.

●

Plans for Regional Planning

Initial steps have been taken to organize a regional planning commission for the San Francisco Bay area, to study and assist in the coordination of rapid transit, highways, recreational facilities and other activities which are distinctly regional in character. The idea is so fundamentally sound and the results which could be achieved are so patently needed that there should be whole hearted, energetic public support, which probably will not be forthcoming.

●

More Water and Safety

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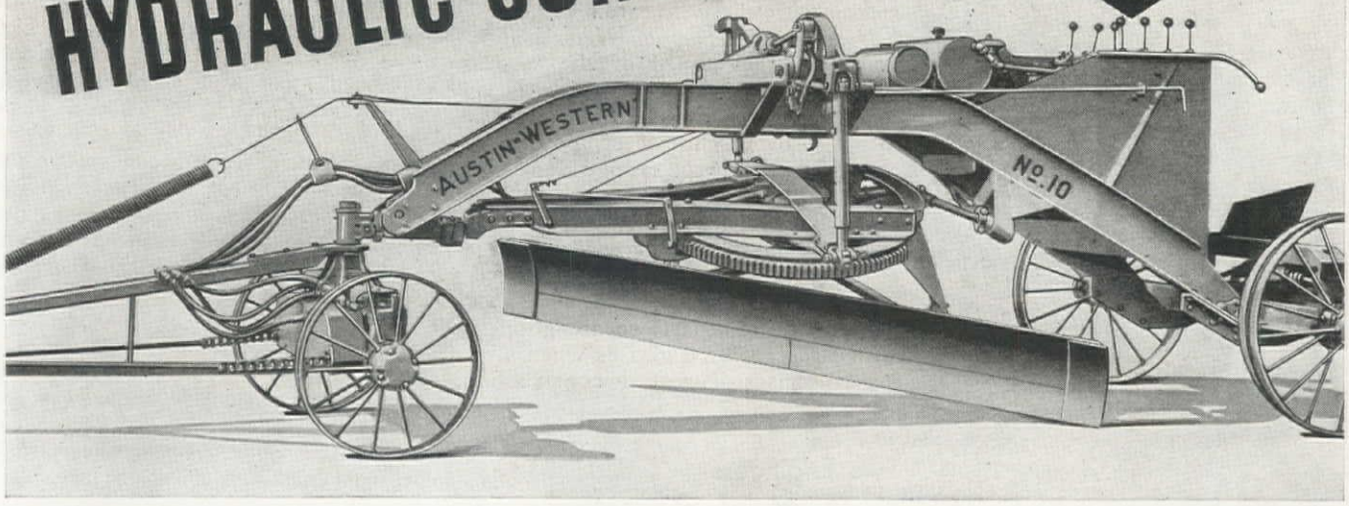

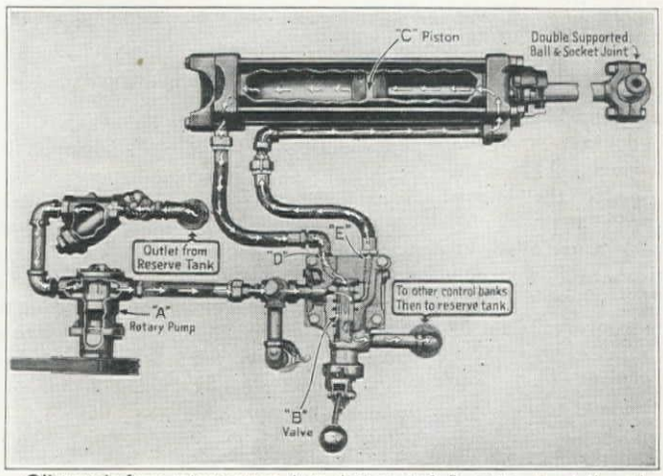

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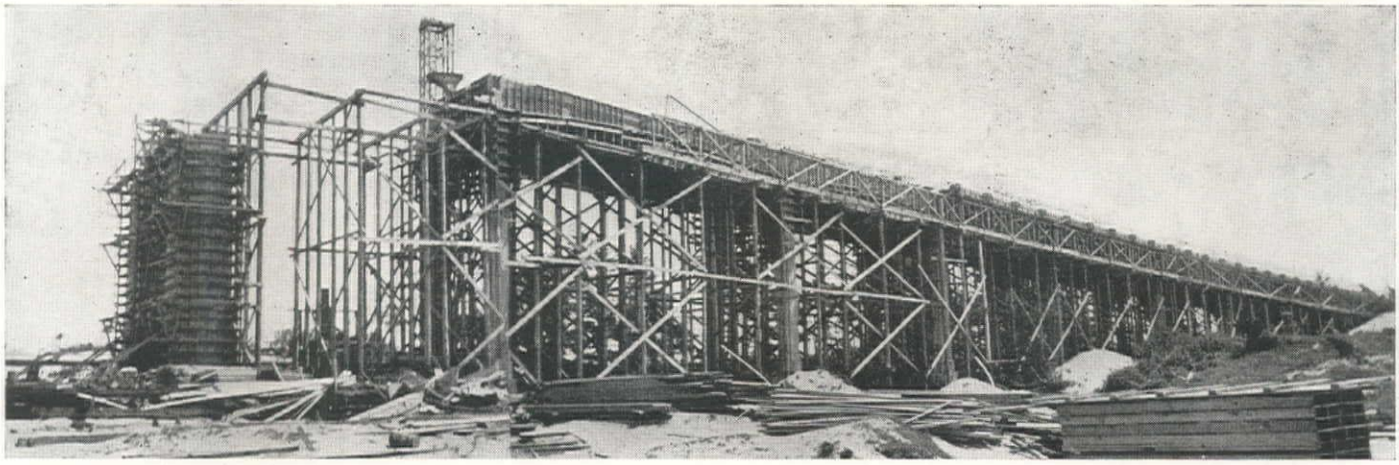
WESTERN CONSTRUCTION NEWS

AUGUST, 1935



Falsework for long viaduct for south approach of the Yaquina bridge. This section consists of 600 ft. of concrete viaduct and five concrete deck arches.

Many Types of Bridge Construction Feature Work on Oregon Coast

Review of progress on important coast highway program—Foundation work and concreting program on Yaquina Bay span described—Methods and present activity on other structures outlined

AMONG the notable bridge construction projects now under way in the west are the five structures being built for the Oregon State Highway Department over major waterways along a 102-mi. section of the Oregon Coast Highway. During the past year since construction was started, rapid progress has been made on all of these bridges, the individual structures being from 30 to 60% completed by July 15.

These bridges, containing various types of design treatment and navigation clearances, are being built at a total cost of $5,600,000, financed through a PWA grant and loan. Provisions are being made, however, to refund the 70% loan immediately with state highway bonds. When completed, these bridges, which are a part of one of America's most scenic highways, will eliminate the remaining toll-free ferries which have been traffic obstacles on the Coast Highway between Columbia River and the California Redwood Highway. (See January, 1934 issue of *Western Construction News* for brief description and illustrations of these bridges).

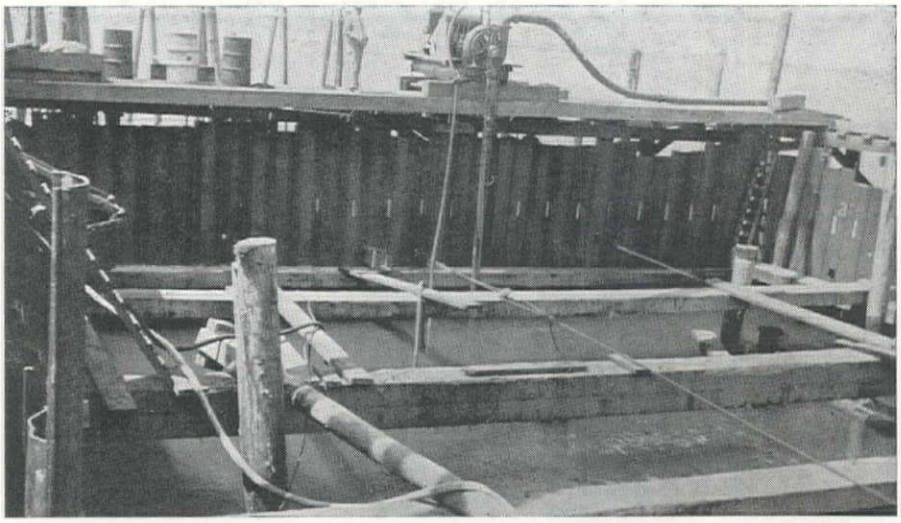
The most northerly structure is located at Newport, 155 mi. south of Astoria at the mouth of Columbia River, and crosses Yaquina Bay. The other crossings include: Alsea Bay at Waldport, Suislaw River at Florence, Umpqua River at Reedsport, and Coos Bay at North Bend. Separate contracts for each bridge, awarded between April and July in 1934 on the low bids submitted, are shown in the accompanying table:

Bridge	Contractor	Bid
Yaquina Bay—		
	Gilpin Construction Co. and General Construction Co.	$1,357,587
Alsea Bay—		
	Lindstrom & Feigenson, Parker & Banfield, and T. H. Feigenson	685,040
Suislaw River—		
	Mercer-Fraser Co.	491,646
Umpqua River—		
	Tuefel & Carlson Co.	551,234
Coos Bay—		
	Piers, Concrete work—Northwest Roads Co.	1,529,438
	Steel cantilever span—Virginia Bridge & Iron Co.	593,880
	Total	$5,208,817

Major construction quantities for the five bridges include: 110,850 cu. yd. of concrete, 442,000 lin. ft. of piling, 5,100 tons of reinforcing steel, and 6,400 tons of structural steel.

Yaquina Bay span

The crossing at Yaquina Bay is made at a point about ¼ mi. from the Pacific Ocean near the shore end of jetties located on both sides of the harbor entrance. The main channel crossing near the north shore is a 660-ft. half-through steel arch span providing a vertical navigation clearance of 138 ft., and is flanked on either side by a 350-ft. steel deck arch span. The approach from the steep north shore consists of a reinforced concrete viaduct



Type of open cofferdam construction used for the two main piers (2 and 3) of the 600-ft. arch span of the Yaquina Bay bridge.

284 ft. long on a 4% grade. The south approach, which is on a 5% grade, consists of a 600-ft. reinforced concrete viaduct and five concrete deck arches ranging in span length from 160 to 265 ft. The bridge has a 27-ft. roadway and an overall length of 3,260 ft.

The north approach viaduct and piers for the adjacent 350-ft. steel arch span are founded on rock, the balance of the substructures rest on wooden piles. Piers 1 to 9, inclusive, which support the steel and concrete arches, will be constructed in open caissons of steel sheet-piling with the seals placed by tremie. No difficulties have been encountered except in the construction of piers 2 and 3, which support the main 600-ft. arch span, and extend to El. —50.

In placing pier 2, the northerly one, an attempt was made to construct the pier in an open unbraced steel sheet piling cofferdam which was driven through 30 ft. of sand and gravel into the foundation rock. When the caisson had been excavated by clamshell bucket to the lowest level and was pumped out to El. —47 in preparation for placing the concrete seal at the bottom, a blowout occurred at the bottom and on one side of the cofferdam. The external pressure caused the foundation rock, into which the sheet piling had been driven, to break inward along a width of several piles. The lower ends of these piles were torn from their position in the wall and bent inward several feet.

Material which came through the break into the cofferdam was excavated and a bracing system was constructed inside the piling. This bracing consisted of 18-in. I-beam walers at 14 ft. centers and 10 in. I-beam struts which were installed at 5-ft. intervals for the lower 25 ft. A tremie concrete seal was then placed to a depth of 26 ft., imbedding the bracing members and ends of the piles where the blowout occurred. In pulling the piles, those which are embedded in the foundation concrete will be burned off flush with the outside surface of the seal by a diver.

Pier 3 is being constructed in an open steel sheet pile caisson braced similarly to that provided for pier 2. However, this pier differs in design, being supported on 676 wooden piles driven to El. —80, or a depth of 30 ft. below the bottom of the foundation. Prior to driving the wooden bearing piles the area inside the cofferdam was excavated with a clamshell bucket from El. —20, the original ground level, to El. —45 through finely graded sand and gravel mixed with sea shells. At this point an inflow of fine material occurred and all efforts to excavate the lower 3 ft. of the foundation area proved futile. In an attempt to stabilize the movement of the material the two outer rows of wooden piles were driven but this had little effect in reducing the rate of flow of the incoming sand.

Following an unsuccessful attempt to excavate inside of these wooden piles with a clamshell bucket, the balance of the piles over the entire foundation area were driven and a 6-in. centrifugal pump installed to pump the fine material from the cofferdam. The intake of the pump is moved to various locations among the closely driven piles and during the first two weeks in July the foundation material was pumped out to El. —47. With all of the piles in place the material has become more stabilized and it is expected that foundation will be dredged to required elevation without further difficulty by July 25 to permit placing the tremie concrete seal.

Progress—The work completed to date includes: eight deck spans, all footings, and two columns of the south approach viaduct; the south pier (No. 9) supporting the southerly 160-ft. concrete arch; the entire north approach viaduct including the 134-ft. tower at the end of the smaller steel arch span; placement of concrete in the north pier (No. 2) of the main arch up to El. 9.5, which is the base of the concrete column; excavation nearly completed and piles driven for piers 3 and 4, the main channel piers extending to El. —50; excavation completed and piles driven for pier 8, which supports the 160-ft. concrete arch. As soon as the steel piling has been pulled from pier 2, it will be driven at pier 7 which is just at the waters edge on the south side of the bay.

Piers for the main span of the Yaquina Bay bridge were built in steel sheet-piling cofferdams.

A floating concrete plant equipped with a 1-yd. Koehring mixer and a batching plant consisting of Butler bins and scales is mounted on a large barge. Concrete is delivered directly

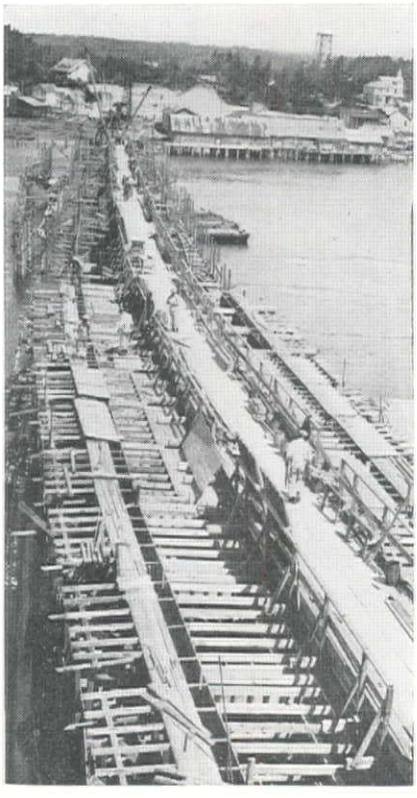
Sketch of Yaquina Bay bridge as it will appear when completed.

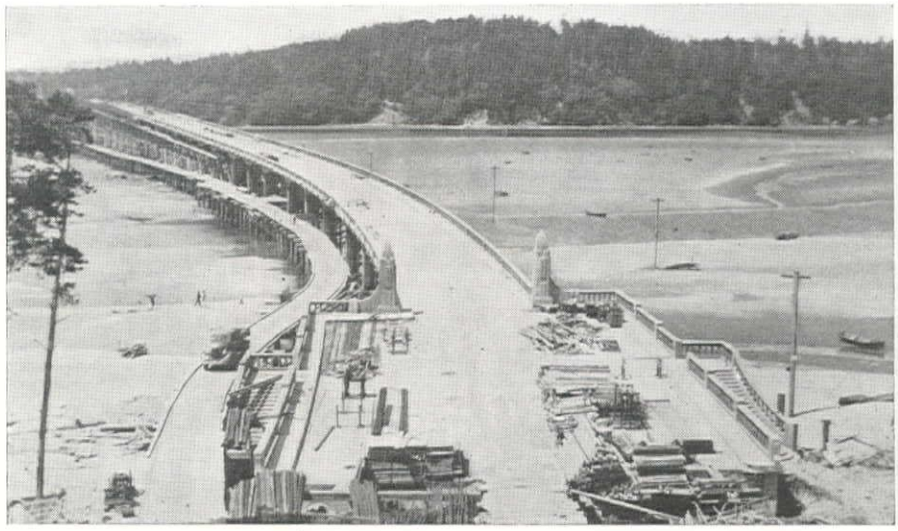
from this plant to the channel piers or to trucks equipped with bathtub bodies. In pouring the south approach structure the barge is anchored near the present ferry landing and concrete is trucked about one mile to the site of the work. For the columns and floor deck the concrete is dumped from the truck into a skip which elevates it to the required elevation where it is distributed by hand buggies. The concrete for the north approach was handled similarly. A timber trestle, about ¼ mi. long erected several years ago to facilitate construction of the north jetty, provided an excellent runway on which the concrete trucks operated in conveying concrete from the floating mixing plant anchored alongside the trestle to the elevator at pier 1.

Aggregate is produced from a pit at Independence, Ore. near Salem, and is shipped 90 mi. to a tidewater landing at the upper end of Yaquina Bay in bottom-dump railroad gondolas. The material is unloaded into track hoppers over a Link-Belt conveyor belt which delivers the aggregate to a 200-ton barge located adjacent to the track. Sacked cement is also loaded on a barge at this point. The aggregate barges are towed to the mixing plant where the material is unloaded into the bins over the mixing plant with a clamshell bucket. No storage is provided since sand and gravel is delivered from the pit as required. The average output of the mixing plant amounts to about 22 cu. yd. per hr.

To facilitate construction of the piers and concrete arches, a timber pile bent trestle has been erected out

Extensive falsework for the Suislaw River bridge which is 1,650 ft. long, featuring two 156-ft. tied concrete arches.





South approach of the Alsea Bay bridge. The structure was about 60% completed on July 15. A construction trestle, shown on the left, was used for handling all concrete by trucks from a central mixing plant.

to the mid-channel pier from the south shore and provides a roadway for delivery of material and supports the two tracks for the timber gantry crane on which is mounted a boom for reaching the floor deck. This 75-ft. high gantry is mounted on two obsolete railroad flatcars operating on tracks having a 25-ft. gage.

The concrete arches will be erected on timber falsework supported on wooden piles. These arches are designed to provide a heavily reinforced skewback hinge immediately above the arch abutment. In pouring the arch ribs only a portion of the concrete in the hinge section, which is only a few feet long, depending on the length of span of the arch, is poured, the cross-section being of such area as to cover the center reinforcing steel. After the deck slab and columns have been placed above the arch and the falsework removed to permit necessary deformation of the arch rib to take place and to transmit the dead load stresses into the arch ribs, the outside reinforcing steel is welded to the dowel ends of the reinforcing steel in the full rib section above and below the hinge area and concrete is poured around the smaller interior concrete section to the full rib dimensions.

All concrete is electrically vibrated and forms for all exposed surfaces are lined with ¼-in. plywood. Handrail members are of precast concrete and fabrication is under subcontract to J. F. Rhyner, who has subcontracts for this work on all five bridges.

The 350-ft. steel arches will be erected on timber falsefork. The 600-ft. steel span will be erected without the use of falsework by cantilevering out from abutment piers 2 and 3. The excess weight over the center channel will be carried by means of cables and turnbuckles anchored to the bases of piers 1 and 4 which support the flanking arches. Steel is furnished by Virginia Bridge & Iron Co. and erection will be done under subcontract to F. M. Holtzer & Co. of Los Angeles. Steel for the 350-ft. span is already on hand and erection will be started immediately after pier 2 has been completed.

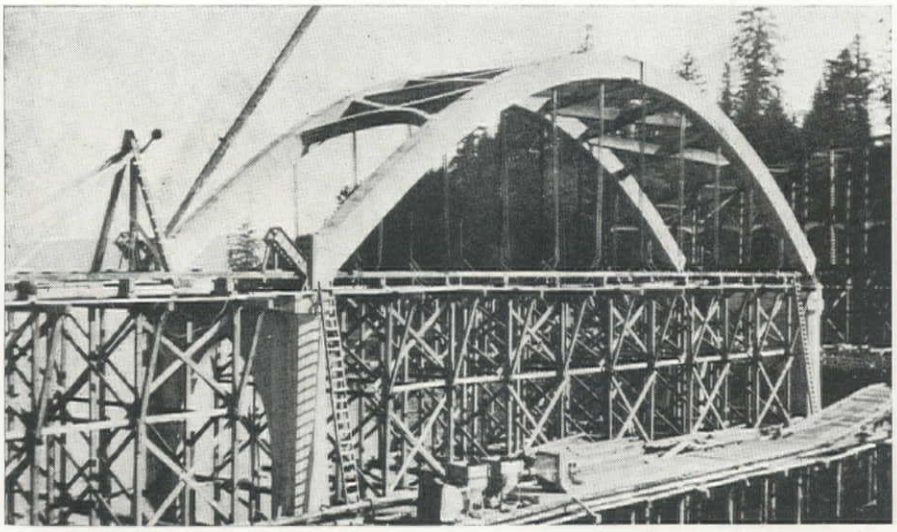
Personnel — The staff of General-Gilpin Construction Co. of Portland includes: Otto Herman, general superintendent; A. B. McEachern, assistant superintendent; T. H. Orme, engineer; and R. P. Stockwell, office engineer. The state highway department staff includes: R. A. Furrow, resident engineer; Ivan D. Merchant, principal assistant engineer, R. G. Barnes, F. F. Redfield, and L. L. Lewis, assistant engineers. Melville E. Reed and assistant C. E. Stewart are resident engineer inspectors for the PWA.

Viaduct for Alsea Bay Bridge

The Alsea Bay bridge crosses the mouth of the waterway immediately north of Waldport at a point about ¼ mi. from the Pacific Ocean. This bridge has a total length of 3,028 ft. and consists of three groups of three arches each, with concrete approach viaducts from either shore. The south approach is 1,352 ft. long and the approach from the steep north bank is only 114 ft. in length. The central group of spans consist of three reinforced concrete bow string arches, the center span providing a horizontal clearance of 210 ft. and a 70-ft. vertical clearance; the flanking spans have a 143-ft. horizontal clearance. At either end of this group are three 150-ft. reinforced concrete deck arch spans.

The structure starts at El. 13 on the south shore and rises to El. 73 over the center of the main channel and joins the roadway of the new highway approach at El. 64 at the crest of the low hills bordering the north shore of Alsea Bay. The roadway is 24 ft. wide, 3 ft. less than provided on the other bridges, with 3½-ft. sidewalks on each side.

The concrete plant is located on the south shore immediately adjoining the end of the bridge and consists of: two 14S Smith mixers, one being powered with an electric motor, the other with



One of the four 154-ft. concrete tied arches for the Umpqua River bridge. The main span is 430-ft. steel swing draw. Work on the structure was about 50% completed on July 15.

a gasoline engine to facilitate operation in case of power interruptions; two single-batch, manually operated, Johnson batchers; aggregate bunkers with a capacity of 200 cu. yd. located over the batching equipment; a cement storage bin located on the ground level. Aggregate is obtained from pits on the ocean beach at Ten Mile and is hauled by truck to open storage piles at the mixing plant, or directly to the mixing plant bunkers, a steep ramp providing access to the top of the bins. The sand and gravel is fed to the batchers by gravity and cement is delivered to the weigh bins by means of a belt conveyor.

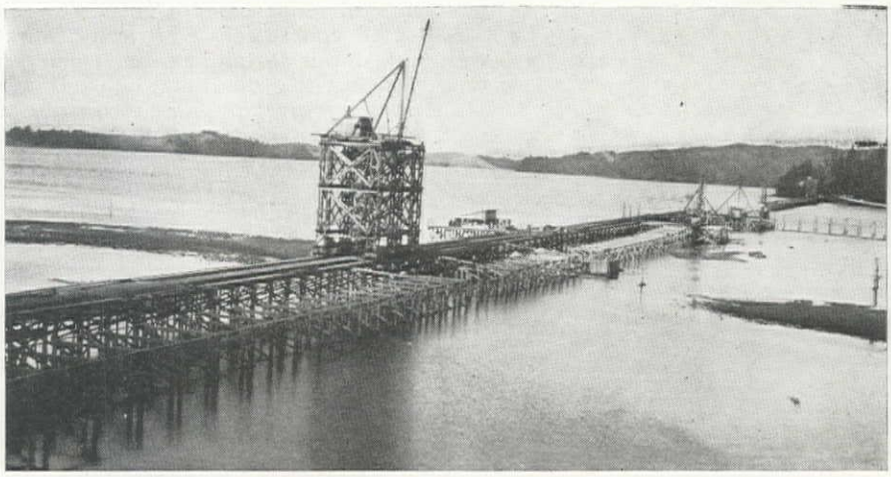
All foundations, excepting the most northerly pier and approach bents, rest on wooden piles and are constructed in open sheet steel-piling coffer-dams. A pile trestle construction roadway was first built completely across the bay paralleling the bridge location on the downstream side at El. 12 and all construction materials, including seal concrete and all pier concrete below El. 9.5 was transported over this temporary structure. All concrete for the deck and girders and for piers above El. 9.5 is hauled out in light trucks having special bodies equipped with dump chutes on both sides over the falsework on a specially constructed runway built in 6-ft. sections. This runway is supported by U-shaped steel fittings spaced at 5-ft. centers which extend through the slab concrete between the reinforcing steel bars and rest on 3 by 12-in. timber supports which are built into the deck form.

Construction was started in May, 1934 and completion was originally scheduled for December, 1935, but due to additional work the completion date will be delayed several months. This additional work includes rip rap work around foundations made necessary by scouring action of the currents in Alsea Bay and required foundation changes which will increase the amount of the contract work from $685,040 to about $812,000.

On July 15 the entire Alsea Bay structure was about 60% completed, with the various phases of the work in the following construction stages: all underwater work was completed except three piers at the north end which are in various stages of completion and which will be finished by early fall to permit winter construction to proceed; other piers supporting the concrete arches have been poured to El. 9.5; falsework and forms have been erected and part of the concrete in each of the three southerly 150-ft. arches has been poured; and the south 1,170 ft. of the viaduct has been completed, including sidewalks and handrails and forms have been stripped.

Personnel—The construction staff of the contractor includes: Don Rowe, general manager; Henry Borghorst, foundation superintendent; A. Lindstrom, super-structure superintendent; and E. R. Goldsapp, office manager. The state highway department is represented by: Marshall Dresser, resident engineer; W. A. Wanless, and Frank Moore, assistant resident engineers; and A. E. Johnson and Kenneth Klein, engineering inspectors. A. E. Eberhart and J. R. Dickson, assistant, are resident engineer inspectors for the PWA.

Long construction trestle, falsework and timber gantry (see front cover) used in construction of Coos Bay bridge. Main channel crossing is spanned by a 793-ft. steel cantilever.



Suislaw River bridge

The Suislaw River bridge is located midway between Yaquina and Coos Bays, the bridge site being about 4 mi. from the mouth of the river. The structure will be 1,650 ft. long, the shortest of the five crossings, and consists of two 156-ft. tied reinforced concrete arch spans on either side of the channel span and twenty reinforced concrete deck spans varying in length from 42 to 70 ft. The channel span is of steel, a double bascule lift, of 140 ft. clear opening. The architectural details consist principally of four pylons, two at each end, and four spires located at the north and south ends of the tied arches. The pier house details of the bascule spans are of the same general design.

Construction was started in August, 1934 with the building of the concrete plant, temporary buildings, office, saw mill, etc. which are located on the south shore. Active work started on the bridge proper in September and rapid progress has been maintained. All underwater work from the south bascule pier to the south shore was completed by April 15 and the bascule piers will be completed by August 1 when erection of the bascule spans will start. On July 15 the entire structure was about half completed with completion scheduled in January, 1936.

The construction program provides for building the south half of the bridge first, beginning with the south arch and progressing towards the shore. This was necessary because the ferry route crossed the line of the bridge. As soon as the south arch has been completed and forms removed, the ferry will be rerouted under this arch which will permit the falsework for the north span to be erected and construction carried toward the north shore.

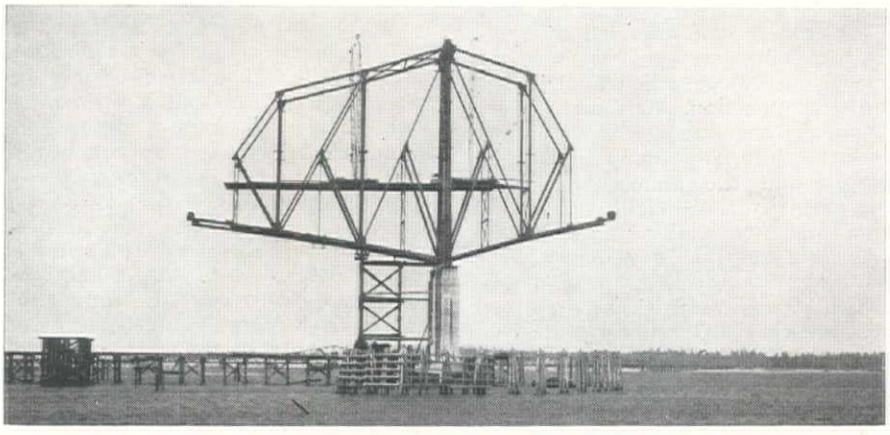
Construction methods differ on this structure from the other four bridges in that wooden sheet piling is used on all cofferdams, rather than steel. Falsework to El. 8, which is above high-water, is of the heavy conventional design. Above El. 8 the falsework is made up of 4 x 4-in. posts and 4 x 6-in. caps placed at 4-ft. centers. The wooden sheet piling which is salvaged

from the cofferdams is used as stringers to support the light falsework. The advantage claimed by the contractor for this type of work is chiefly the ease in dismantling.

A. A. Acheson is the superintendent in charge of construction for Mercer-Fraser Co., contractors of Eureka, Calif. C. A. Jordon is resident engineer for the state highway department and the PWA is represented by W. M. Pinkney, resident engineer inspector and John Meagher, assistant.

Swing span for Umpqua River bridge

The Umpqua River bridge is located near the north center of the city of Reedsport and spans the river from the mainland on the south to Bolon Island on the north shore. From the island to the north mainland near Gardiner the bridge will consist of a 1,600-ft. creosoted pile trestle carrying a reinforced concrete deck. The call for bids for construction of this trestle over Smith channel has not yet been advertised. An open cut, about 140 ft. deep, involving 226,000 cu. yd. of excavation is now being made through

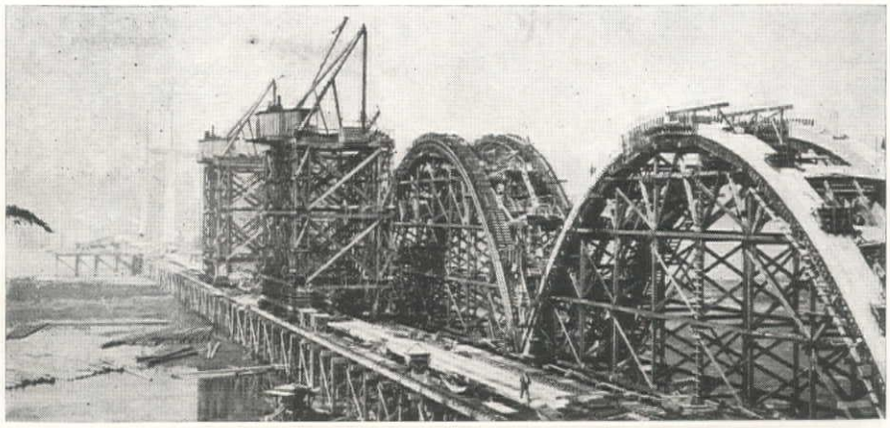


Starting steel erection on the cantilever span for the Coos Bay bridge main channel crossing. This steel section has a total length of 1,708 ft. overall with a 793-ft. center span.

Bolon Island. It was originally planned to provide a 600-ft. tunnel across the island which rises to El. 170.

The bridge over the main channel, under contract to Tuefel & Carlson of Seattle consists of: a 430-ft. steel swing draw span providing two clear openings of 195 ft. each; four 154-ft. reinforced concrete tied arches, two of these on either side of the swing span; two 42-ft. reinforced concrete deck girder spans comprising the north approach; and a south approach, 1,072 ft. long, consisting of twenty one reinforced concrete girder spans ranging in length from 42 to 70 ft. Except for three piers adjacent to Bolon Island, where solid rock is encountered, all piers will rest on timber piles.

The plan of construction provides for building the south approach, the southerly two tied arches and the swing span followed by the two tied arches on the north side of the swing span; then the north approach as a final unit. An industrial railroad, supported on a



Construction procedure on the concrete deck arch spans on the Coos Bay bridge. There are thirteen of these arches ranging from 151 to 265 ft. in span. Four of the timber gantries were used, two on either side of the main channel.

pile trestle, was constructed parallel to the line of the bridge from the south end to the main river channel. In constructing the mid-channel pier a pontoon bridge of barges was used as a temporary roadway. Two 15-ton derricks equipped with 80 and 105-ft. booms, a converted gas-electric 1¼-yd. Bucyrus-Erie crawler crane, and a 40-hp. electric hoist with a 70-ft. boom are used for handling concrete and in setting forms, which are fabricated in large units in the framing shop on the south shore. Concrete is mixed at the south shore bunkers and hauled in ¾-yd. buckets by truck to the placement site where the buckets are hoisted by crane for depositing the concrete into the forms.

In general, this structure is about 50% completed with the following work finished on July 15: four of the main channel piers; fifteen of the required twenty-one approach spans on the south end; swing span steel fully erected and unit nearly completed; arch rings poured on the south tied arches; and timber pier protection at swing span construction prior to erection of swing span steel. This crib structure, extending 200 ft. upstream and downstream from the pier was used to support the steel span during its fabrication.

The staff of Tuefel & Carlson is composed of: L. G. Murray, general superintendent; Clark Beiswanger, carpenter foreman; and George Tuefel and Harold Ahlstedt, timekeepers. The state highway department staff includes: D. R. Smith, resident engineer; L. D. Kelsey, assistant engineer; and F. F. Ford and H. B. Rupert, inspectors. The PWA representatives are: Homer S. Wall, resident engineer inspector; and Robert W. Neale, assistant.

Coos Bay Bridge

The most southerly of the five bridges crosses Coos Bay from Russell Point on the north to a landing below the city of North Bend on the south shore, extending a total distance of 5,337 ft. This bridge, being built at a total cost of $2,123,318, is the largest of the five under construction in this program and consists of: a central steel cantilever span, 1,708 ft. in overall length providing a 793-ft. main channel span between the anchor arms, under separate contract to Virginia Bridge & Iron Co.; a series of seven concrete deck arches varying in span length from 151 to 265 ft., flanking the north end of the cantilever span; a series of six concrete deck arches ranging from 170 to 265 ft. on the south end of the main span; a concrete approach viaduct at the north and at the south end. All piers and concrete work is under contract to Northwest Roads Co. The main channel opening has a maximum height of 140 ft. over a horizontal distance of 366 ft.

Work was commenced on the concrete structures in July, 1934 and is being carried on from both sides of the bay. Two pile trestles, which provide a 12-ft. truck deck and dual standard gage tracks which support two traveling gantry cranes were erected parallel to the bridge from each shore to the main span piers. These gantries, two on each side of the bay, are 32 by 60 ft. in area and 61 ft. high and are surmounted by stiff-leg derricks with 80-ft. booms capable of raising concrete to El. 135 in 2-yard buckets. The notable feature of these gantries is that, being mounted on standard railway tracks, they can be moved readily by their own power in a few minutes from one pier to another. They are used in cofferdam construction, excavation, erection of forms and falsework and in pouring concrete.

These gantries are constructed to straddle with ample clearance the truck deck so trucks can operate beneath them.

The construction quantities for the Coos Bay bridge include: 192,000 lin. ft. of piling; 48,000 cu. yd. of concrete; 2,085 tons of reinforcing steel; and 3,450 tons of structural steel.

Supervision of construction is being carried on for Northwest Roads Co. by E. C. Panton, superintendent, assisted by P. Woodburn. The state highway department engineering staff includes: Raymond Archibald, resident engineer; and assistant engineers, L. Jensen, L. Smitton, R. Kennon, R. McGilvra and R. Simpson. The PWA staff includes: S. M. P. Dolan, resident engineer inspector; and assistants, E. L. Vinton and J. J. O'Farrell.

State engineering organization

The bridges were designed and are being constructed under the direction of R. H. Baldock, state highway engineer of Oregon, and C. B. McCullough, bridge and assistant state highway engineer. Plans were prepared under the supervision of O. A. Chase, chief bridge designing engineer, and Claude H. Darby and Raymond Archibald who were in charge of the designing staff. W. A. Reeves is office engineer and assistant to McCullough in the bridge department. Construction is under the general supervision of G. S. Paxson.

C. C. Hockley is state engineer of the Public Works Administration and R. H. Corey is state engineer inspector for Oregon and Washington.

Survey of Damage In Colorado

As soon as a survey can be completed to determine the extent of damage caused by the recent floods in Colorado, reconstruction work on highway bridges will be started in fifteen counties where the damage occurred. Recently, a delegation of county commissioners from this area visited Washington for enlisting Federal assistance in this reconstruction work. The Bureau of Public Roads will cooperate with the state highway department in restoring the structures on important state routes, and will set aside $500,000 for this purpose.

The damage to county roads and bridges has been estimated at about $2,000,000. Reports have been completed from nine of the affected counties and show that 298 bridges have been destroyed which have an estimated replacement cost of $1,270,000. In Morgan County the Bijou Creek flood was reported to have cut a channel so wide that the new bridge will be nearly 3,000 feet long and has been estimated to cost nearly $100,000.

Solving the Problem of Co On the Colorado River

Tests over a four-year period result in decision to use coal-tar pitch cutback for concrete curing under severe desert conditions—Value of white coating over coal tar demonstrated in lowering temperature in concrete exposed to sun

By LEWIS H. TUTHILL
Testing Engineer, Metropolitan Water District

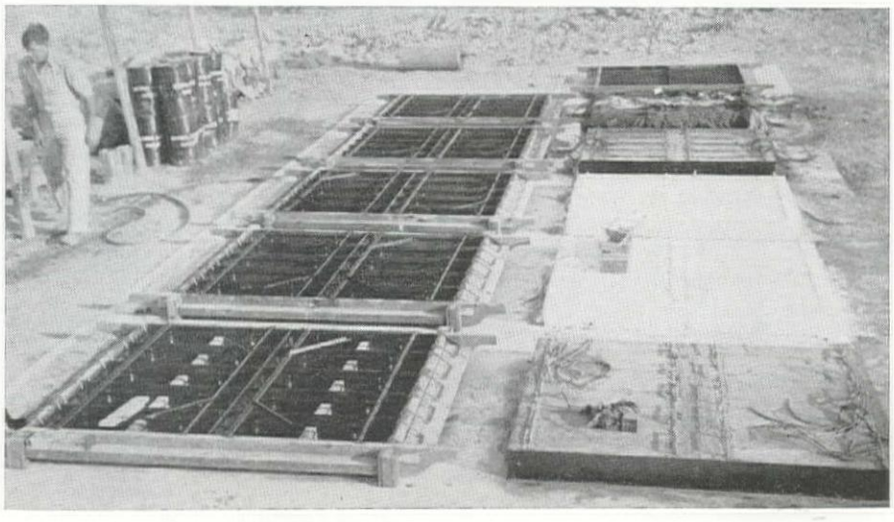
THE CURING of newly placed concrete was early recognized as one of the most important steps in the construction of the Colorado River Aqueduct, now under construction by the Metropolitan Water District. Nearly 4,000,000 cu. yd. of concrete are involved in this work, all of which is cast in slabs and shapes of relatively thin minimum dimension and, consequently, are particularly susceptible to the detrimental effects of casual or insufficient curing. As the curing of concrete is principally a matter of preventing it from drying out, this factor takes on special importance, and at the same time becomes more difficult in the arid location of most of the project.

For the majority of days in the year this location is characterized by relatively high temperatures, low humidity or dry winds, all of which tend to accelerate evaporation. On many days the midday temperature is 80° to 115° F., relative humidity of 10 to 40% is common, and the almost unceasing winds intensify the difficulty of maintaining moisture under these conditions. Because the aqueduct could never be any better than the concrete of which it was built, it was therefore imperative that an assuredly effective solution be found and demonstrated for the curing of the concrete.

Thorough curing is essential if the physical properties of concrete are to be developed, which are necessary in a satisfactory and successful structure of this type All the desirable properties of concrete would be seriously impaired by improper and insufficient curing. Such properties are durability, impermeability, resistance to abrasion, and strength, the latter not only for the support of loads but for resistance to cracking from stresses induced by volume change caused by changes in temperature and moisture content.

For these reasons, during 1931-2-3-4, series of tests of various methods of curing concrete were carried out under actual desert location conditions. These tests were run on many compounds and combinations of compounds for use in the surface sealing method of curing exposed surfaces of concrete by preventing the original moisture in the freshly mixed concrete from being evaporated.

Fig. 2—Construction and arrangement of field test slabs (left) from which data for Curve No. 3 were obtained. Completed and backfilled (right) exposing only surface, to simulate a continuous canal lining slab.



ncrete Curing Aqueduct

Western conditions place unusual significance on the problem of curing concrete, because of the high temperature and low humidity combination which is characteristic for the large areas of desert and semi-arid sections. This problem applies not only on aqueduct construction but is of equal importance for highway slabs, bridges and all other types of construction where relatively thin sections of concrete are used. Because of the volume of work (4,000,000 cu. yd.) and the cost involved, it was feasible for the Metropolitan Water District to carry out investigations on the curing of concrete on a most comprehensive scale, and the results are highly significant and important to all engineers and constructors in the West, concerned with the use of concrete. This article by Mr. Tuthill, a well known concrete technician of this region, is considered one of outstanding value.—Editor.

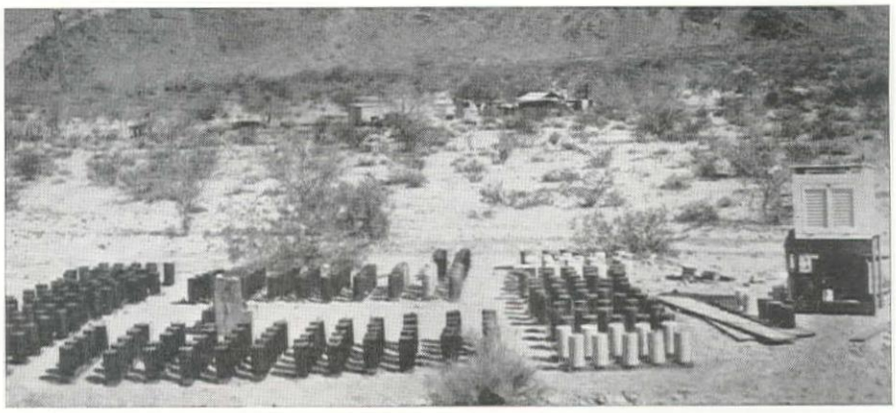


Fig. 1—Exposing the coated 6x12-in. concrete cylinders to typical desert conditions. In the white slatted box is Weather Bureau equipment for observing temperature and humidity. Scales used to obtain frequent weights of the specimens to determine the moisture lost from the concrete were kept under the box in the center.

Tests in 1931

The first tests were made in 1931 on 12-in. slabs cast in the field. Each was cured in a different manner, or with a separate brand of sealing compound. Specimens were later taken from these slabs and tested for compressive strength. The results of these, in differentiating between methods or materials, were largely obscured by the massiveness of the slabs and the fact that all were perfectly cured on the underside in contact with the previously water-soaked subgrade. The subgrade under each of these slabs was only 27 sq. ft. in area, but was found to be moist, upon inspection, one month, one and two years later.

An effort was made to compare the effectiveness of different curing methods applied on these slabs by running freezing and thawing tests on pieces cut from the top and bottom of each.

This test proved to give no more distinctive comparison than the compressive tests. However, these durability tests did definitely show the higher quality of concrete in the thoroughly cured bottom of the slabs, and the superiority of a perfect uninterrupted 14-day water and burlap cure to a single coat of asphaltic sealing compound.

The difficulty in maintaining an uninterrupted 14-day water cure under these conditions prompted the following conclusions which were the most important obtained in this series:

1—"That although a 14-day water and burlap cure was shown to be definitely superior, the extreme vigilance and close attention required to maintain 100% effectiveness practically assures poorer results under the best of construction conditions in the desert area."

2—"That *effective* sealing coat methods appear to have a particular merit in desert applications due to the small amount of attention required after application, and to their continuous effect."

Tests in 1932

On the basis of the second conclusion above, the 1932 program was planned to determine the relative effectiveness of various asphaltic and other sealing compounds offered commercially for curing concrete, using specimens without curing compound and others cured in a moist room as controls and standards of comparison.

Because of the unsatisfactory results obtained in 1931 from compressive tests as an indicator of the sealing value of curing compounds, and because of the effect of variable moisture content upon the compressive strength of the same concrete, it was decided to base the future comparisons not on compressive strength, as before, but upon the limitation actually placed by the particular sealing compound upon the measured loss of water from green concrete specimens coated at the age of 24 hr. Concrete cylinders 6 x 12 in. were used for the reason that they could be: (1) coated on all surfaces, (2) weighed before and after exposure and the loss in weight at any time would be the water permitted by the sealing compound to be evaporated from the concrete, (3) made up and coated under controlled laboratory conditions then transported to the field for typical exposure.

This differential weighing of several specimens similarly sealed with each compound tested, proved to be a very definite and incontrovertable means of determining the relative effectiveness of the various means used to seal the original water in the specimens. From these new tests the principal conclusions were: (1) application of some method of positive and effective curing is essential, (2) one coat of any preparation investigated is ineffective as a seal under the arid exposure to which the specimens were subjected, (3) two coats may or may not accomplish this purpose according to the materials used.

The only product which gave evidence of sealing value by visible moisture retained in the specimens after 28-day desert exposure, quickly deteriorated after this period. By this retention of moisture it was shown that a reasonably good and dependable cure could be obtained under these extreme conditions by two coats of a properly selected material. This was not however a satisfactory situation because it was desired to maintain the moisture in the concrete for much longer periods if possible, and because competition was essential when calling for bids for furnishing the sealing compound. Consequently all vendors and manufacturers were urged to improve the sealing value and durability of their products. It was decided to include coal tar pitch and water gas tar as well as asphalt compounds in the series of sealing compounds to be investigated the following year. :

Tests in 1933

The 1933 curing compound test program not only included 27 different materials supplied by nine manufacturers and vendors, but also combinations in two coat treatments so that in all over 60 different applications were made, each on a set of five 6 x 12 in. green concrete cylinders, 24 hr. old in the moist room. In addition to the usual asphalt emulsions and cutbacks which were submitted as having been

improved in their sealing properties since last tested, there were seven light colored materials and four coal and water gas tar pitch compounds.

Figure No. 1 shows this group of over 300 specimens as arranged for typical aqueduct locations exposure. Here the mean maximum daily temperature during exposure of the slabs in June and July was 103° F. which varied from 101° F. to 113° F. The average relative humidity was 27%. This varied between a maximum range of from 11% to 55% at 6 A.M. to a minimum range of from 5% to 37% at noon and 6 P. M.

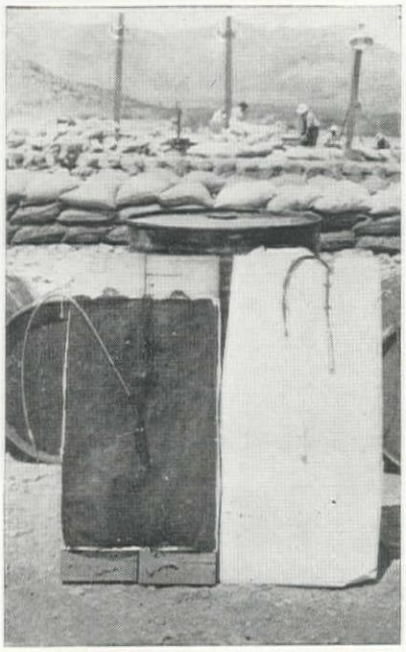
Representatives of concerns contributing samples for the test were present when the specimens were coated and observed them and the results subsequently. These men acquainted themselves with the test procedure in detail and all expressed themselves as satisfied with the execution of the tests and with the authenticity of the order of the results shown in the following table.

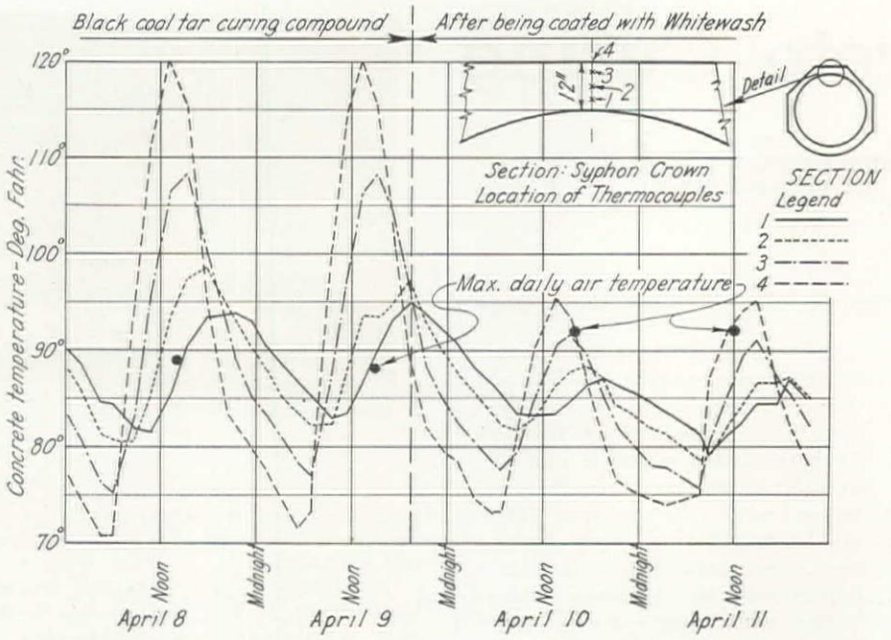
Relative sealing value of best brand of each type of sealing compound in June-July, 1933 exposure at Hayfield:

No.	Type of Sealing Compound	No. of Coats	Water Evaporated from Each 6x12" Cylinder in Lbs. 7 Day	28 Day	60 Day
48	Coal tar pitch cutback	1	.204	.578	.996
44	Coal tar pitch cutback	2	.146	.314	.535
50	Water gas tar cutback	1	.318	.852	1.188
51	Water gas tar cutback	2	.244	.562	.930
64	Asphalt emulsion	1	.332	.690	.91
65	Asphalt emulsion	2	.276	.572	.75
31	Asphalt cutback	1	.426	1.050	1.392
32	Asphalt cutback	2	.288	.672	1.092
39	Light colored	2	.486	1.032	1.396
26	14 days in moist room	0	0	.886	1.32
27	No cure—full period exposure	0	1.303	1.62	1.76

Here again two coats were proved greatly superior to only one coat but most important was the conspicuous superiority, in both sealing value and durability, of an ordinary refined coal tar pitch thinned to a sprayable consistency with coal tar naphtha.

Fig. 2—Arrangement of thermometers in taking temperatures plotted on Curve No. 2 showing effect of color on surface temperature.





Curve No. 1—Effect of whitewash on black sealing compound in reducing temperature of concrete in the crown of the siphon section at Fan Hill, April, 1934.

Tests in 1934

No significant tests of sealing compounds were made during 1934. Occasionally new or modified compounds were submitted with impressive claims and credentials but each proved to be inferior to the coal tar pitch cutback which was found best the previous year.

Throughout the investigations of sealing compounds an important place was given to light colored materials due to the lower heat absorption of a light colored surface as compared with that of a black bituminous coated one. However, light colored materials failed so completely as sealing compounds that the use of a coating of whitewash over the effective black sealing compound was investigated.

Consequently a section of the experimental monolithic siphon built at Fan Hill in the Spring of 1934 was whitewashed over the sealing compound in April with the startling reductions of concrete temperatures shown on Curve No. 1, as measured by resistance thermometers embedded at various depths in the concrete.

A few weeks later at Division No. 3 Headquarters when temperatures were higher, additional independent tests were made on the effect of surface color on temperature in connection with test slabs which were cast under typical aqueduct construction conditions as a part of a cement and concrete investigation. The results of these tests are show by Curves No. 2 and No. 3. The apparatus used in collecting the data of Curve No. 2 is shown in Figure 3. That used in collecting the data of Curve No. 3 is shown in Figure 2.

In both cases conspicuous reductions in temperature are effected by coating the black surface with whitewash. In Curve No. 2 the test results show the aluminum painted surface midway between the effect of completely black and pure white surfaces. This shows the great importance of absolute whiteness. The purpose of the reduction of temperatures is of course to minimize expansion and subsequent contraction stresses which are the cause of most cracking. The striking effect of white surfaces compared with black in this respect is shown on Curve No. 3.

On the inside of the closed sections such as tunnels, siphons and cut-and-cover conduits, which are naturally protected from the arid conditions outside, the water cure is considered most desirable. On an experimental section of conduit constructed at Fan Hill various means were tried to produce a satisfactory water cure with the minimum consumption of water. Several types of fog making devices and direct water sprays were observed in action. A continually moist concrete surface was the condition considered essential for best results. All fogs failed to condense on the surface of the concrete during the most important first seven days simply because it was impractical to create a fog which would be warmer at the concrete surface than the concrete itself. Many small nozzle sprays proved inefficient because of frequent plugging of the small openings. Most satisfactory results were obtained by hand sprinkling with a fine mist spray or with intermittent use of large opening reaction nozzles capable of wetting a large area in a fraction of a minute.

Specifications for material

On the basis of the 1933 tests it was decided to use plain unbranded coal tar pitch cutback as a sealing com-

pound wherever this method of curing concrete was used. Construction specifications require that the district furnish the material and that the construction contractor apply it. The following specification for coal tar pitch cutback was prepared and competitive bids were received:

"The coal tar pitch cutback shall be composed of 75% by weight of refined coal tar pitch thinned to a sprayable consistency with 25% of solvent coal tar naphtha. The cutback shall contain no volatile mineral spirits or other petroleum products and shall be free from water, ammonia, and tar acids, or other objectionable matter, as shown by standard A.S.T.M. methods. The coal tar pitch shall have a melting point of from 105° to 110° F. as determined by the cube method. The solvent shall be a heavy solvent naphtha distilled entirely from coal tar and shall have a flash point (new Tagliabue closed tester, A.S.T.M. D93-22) not less than 100° F.

"The sealing value of the coal tar pitch cutback shall be such that five 6-in. dia. x 12-in. concrete specimens, weighing approximately 30 lb. each, coated at the age of 24 hr. with the first of two coats of the sealing compound at the rate of 300 sq. ft. per gallon each, and at an interval of approximately 6 hr., shall not lose more than 0.5% of their newly coated weight due to evaporation in the course of 96-hr. exposure in an atmosphere continuously maintained at from 100° to 105° F. and at 10% to 15% relative humidity. Further exposure in this atmosphere for an additional period of four days shall not result in a total loss of more than 0.75%."

It will be noted that the second paragraph of this specification is a performance test. So far as is known, no contemporary laboratory has written a successful specification for bituminous sealing compounds, based on physical and chemical tests of the ingredients alone as in the first paragraph of the above specification, which would properly include all acceptable materials and exclude all those of poor sealing value, without a performance test requirement. With a performance test the physical requirements need only cover the general type and proportion of ingredients desired. Nothing else matters greatly as long as the fundamental ability of the material to serve the desired purpose is proved in an acceptance performance test which is adequately representative of conditions under which the product is to be used.

For the performance test described above a small, constant high temperature, low humidity room has been installed in the district's laboratory at Banning. Many parallel tests between field and desert room exposure have shown the test room to be equally and as dependably selective, within the period of an acceptance test, as the natural arid exposure.

Whitewash dry material giving the best general results to date is a mixture of approximately 80% hydrated lime, 18% calcium chloride, and 2% calcium stearate. This is mixed to a thin cream consistency and sprayed with best results with a double line gun from a pot containing a mechanical agitator. In this dry windy climate the apparently large percentage of calcium chloride is required to keep the newly applied whitewash from drying to a powder before it can harden. The calcium stearate takes the place of the customary soap or casein ingredient used to make the newly and properly applied whitewash stick and lay without running and to make it tougher and more waterproof when it has hardened.

Construction specifications

Construction specifications for curing require that all outside and exposed surfaces be cured with two coats of sealing compound followed by one (or two coats if necessary) of whitewash.

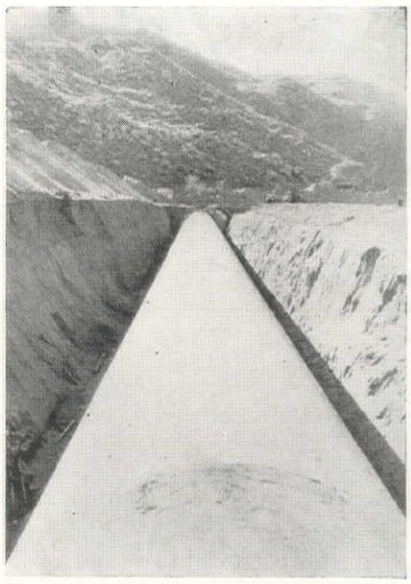


Fig. 4—Completed aqueduct conduit before backfilling, showing whitewashed surface.

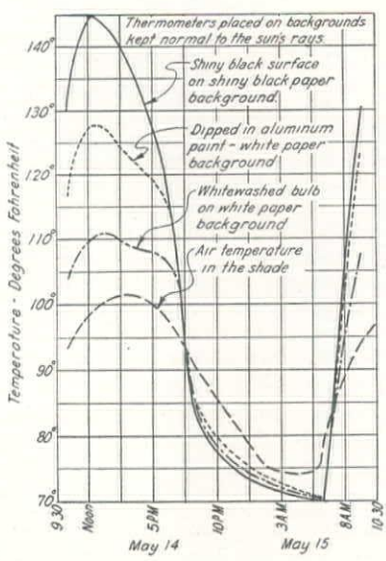
Surfaces finished or stripped before late afternoon must be kept wet under burlap until that time, for, both coats of sealing compound and one coat of whitewash may only be applied and must be completed between 2 hr. before sundown and 3 hr. after sunrise in order not to expose the black surface to the sun, which would harmfully increase the temperature of the concrete. Discolored whitewash must be given a second coat as soon as possible.

Requirements for the water cure inside the closed sections are very simple. The surface of the concrete must be kept continuously wet for 14 days from the moment the forms are stripped. In order to improve the coverage of the water, and to reduce drying after the 14-day period to a minimum, a permanent bulkhead is required at the beginning of each continuous section and another must be moved forward immediately behind the inside forms. Backfill is to be completed as soon as the concrete strength is sufficient, which is usually in three or four days. This reduces temperatures and makes them uniform, thereby improving the efficiency of curing procedure inside and out. District engineers and inspectors are keenly aware of the importance of proper concrete curing under the conditions of this project and as a consequence these specified curing requirements are being carefully adhered to with excellent results.

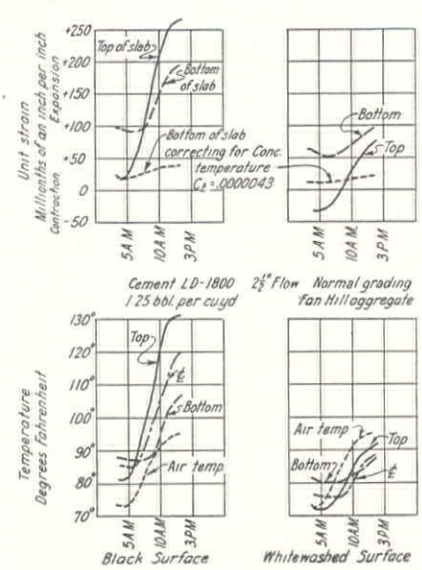
Acknowledgment

All designs and investigations for the Metropolitan Water District are under the direction of Julian Hinds, assistant chief engineer. Construction operations are under the direction of J. L. Burkholder, assistant general manager. James Munn is general superintendent. All operations are under the general direction of F. E. Weymouth, general manager and chief engineer.

Curve No. 2—Effect of color on surface temperatures measured as shown in Fig. 3.



Curve No. 3—Effect of surface color on temperature and volume change within a concrete slab exposed as shown in Fig. 2 (right).



A Few of the Answers

. . . Information for Contractors Studying the New Highway Program

Everyone interested in highway construction is studying the new regulations which will govern the expenditure of $61,000,000 of work relief funds in the West. To assist in clearing up some of the more obvious questions involved in the method of handling this work on highways and grade separations, *Western Construction News* is presenting the following catechism on this subject. These answers are not to be taken as official but may be considered to represent the latest, unofficial opinions obtainable on the points raised.—Editor.

1. Q—Why have new restrictions been placed on the use of the $61,500,000 of funds from the Federal work-relief program which will be spent for highway and grade crossing work in the eleven western states?

A—Because they are essentially relief funds rather than construction funds. They are to be used to provide work for persons now on the relief rolls. This major object is defined in the Relief Appropriation Act.

2. Q—Will the work be carried out by contract?

A—An Executive order (Regulations No. 3) provides four methods for carrying out the work, (a) force account, (b) fixed price contract, (c) limited fixed price contract, and (d) management contract. Opinions expressed by Bureau and state highway officials indicate they had no desire to deviate from the established practice of the fixed-price contract based on competitive bidding on specified units submitted on complete drawings and specifications.

3. Q—By whom will the funds be administered?

A—Through the regular agency of the U. S. Bureau of Public Roads, under the regular highway act. Thus, there is no change in general practices or policy, except for the new restrictions as to the fixing of a man-hour per dollar-expended ratio. Further, the Bureau is utilizing all existing services of the state highway departments, according to the usual practice, which will help speed up the start of work on the various projects.

4. Q—How fast will the money be spent?

A—Just as fast as plans can be completed the work will be put out for bids and all phases pushed as rapidly as possible.

5. Q—Is relief labor required to be used?

A—Yes, in general, 90% of all labor used must be obtained from the relief lists, through the local office designated by the U. E. Employment Service.

6. Q—Who is to determine whether the relief applicant is fitted for the work to be done?

A—The contractor is to be the final judge of this matter. However, he will be asked to be somewhat charitable, especially at the start, and give the benefit of the doubt to the man until he has definitely proven unfit.

7. Q—How about the skilled labor needed for the jobs?

A—This will be the big hurdle, especially on jobs in localities where skilled help is not to be found on the relief rolls. The contractor has the 10% factor to be used to his best advantage.

8. Q—Will it be necessary to wait until the men from the relief rolls get to the job before determining their fitness for the work?

A—No. In fact, it will be a help to all concerned if the contractor examines and interviews the men at the employment office and, possibly, on the larger jobs, it might be helpful to appoint someone to keep in contact with this office to interview men and advise on the type of help needed.

9. Q—Is the much talked about figure of $1,400 per man-year of employment going to actually govern this work?

A—Yes.

10. Q—Is there any possible exception?

A—An alternate plan is provided, by which individual states may elect to underwrite the relief load which would be carried by this fund granted to the state for highway work, and guarantee that it will provide the employment which would have been secured if the $1,400 per man-year rule was used.

11. Q—What advantage to the state does the alternate plan provide, and what effect may it have on highway construction?

A—The funds which the states are now programming include: (1) state funds, (2) regular Federal Aid funds and (3) Work Relief funds. The first two classifications are free from the new restrictions being discussed. The work-relief funds, of course, are to be expended under the $1,400 rule. The number of man-years to be provided by each state with the relief money is the total amount of work-relief funds divided by $1,400. Unless local funds are provided, the entire relief funds for a state would have to be spent on types of highway work, such as grading or drainage, which requires a relatively high percentage of labor and, thereby, seriously disrupts a balanced state program.

Now, if the state is willing to guarantee to the Federal Government that its entire highway program will provide the man-years of labor determined above, the man-year restriction will be lifted from the combined program. That is, the state could lump all highway funds, including the relief funds, and could lay out a program which would include paving and other types of work involving high material costs, as well as work which is relatively high in labor costs. Under this plan the contractor would not operate under the $1,400 restriction, and the responsibility would be up to the state to secure the required man-years of work on its highway program.

12. Q—Are western states considering this plan?

A—Yes, several are studying it with their entire office staff working to determine whether it could be done, with final advantage to the state.

13. Q—Mention one specific example of benefit to a contractor if the alternate plan were put in effect by a state.

A—The 90% restriction for labor from relief rolls could be reduced, at the state's discretion and might be placed at, say, 80% or less, with possibly no restriction of filling the positions for skilled labor. There is no Federal requirement for relief labor on alternate-plan projects, but the state will have to make some requirement to be able to make good its guarantee.

14. Q—Returning to the matter of carrying out work under the work relief restrictions, what requirements will be contained in the specifications relative to hours and wages?

A—The usual ones concerning minimum wages and maximum hours will be definitely stated, as in recent work.

15. Q—Will there be any change in the estimate of quantities?

A—No. The same care will be used in providing estimates of quantities and bids will be called in unit items, as in the past.

16. Q—Then what new restriction will be written into the contract to cover the matter of man-hours of work per dollar of money spent on the job?

A—The specifications will specifically state the number of man-hours of work which are to be used on the job.

Figuring man-hrs.

17. Q—As a matter of general information, how will this figure be determined?

A—An example can best be used to indicate this process. First, based on a 130-hour month, one man-year equals 1,560 hours. The $1,400 item divided by 1,560 gives 90c, which is the permissible expenditure from the Federal work-relief funds per man-hour of employment given. Now, if a job is estimated to cost $85,000 for construction with a $5,000 engineering cost, the total cost of the job at $90,000 is divided by 90c and the result indicates that this project will be required to produce 100,000 man-hours of work. In this particular case the job would be advertised with a specification requiring this amount of employment to be given. Further, the regulations will require that if the bids submitted are in excess of the estimated cost of the project they must be rejected unless the state adds the additional funds.

18. Q—O. K. so far. Now, there are the usual specifications on minimum wages, with the additional requirement on the number of man-hours to be employed on the job. How does the contractor go about getting those man-hours used up on the job? Or, how does he figure on the method of doing the work to meet these specifications?

A—The specifications will not restrict construction methods. This is entirely up to the contractor.

19. Q—Suppose the job is figured in the ordinary way and then the man-hours which would be consumed on the work figures out to be only 90,000 instead of the 100,000 required, then what is to be done?

A—It is up to the bidder to change his work method and plan for prosecuting the work to get in the required hours.

20. Q—Will the state have anything to say on the manner the contractor is working, in so far as it pertains to the consuming of man-hours of employment?

A—The specifications will not specify the manner of doing the work, whether by hand labor or by machine. The Bureau has indicated that it is concerned only with the final result, *except* it will not tolerate any absurdities such as men being paid to sit on the fence, just to make up the required hours.

21. Q—Well, suppose the job gets well along before anybody realizes that the man-hours have fallen far behind the requirement of the specifications?

A—Such a situation is impossible because weekly reports are to be submitted indicating the progress on the work and the corresponding number of man-hours of employment.

22. Q—Of course, these reports on man-hours consumed are relatively meaningless if there is not a corresponding estimate made of progress on the work. Will the engineers provide a weekly progress estimate to check against the man-hours estimate?

A—This point has not been determined, but state highway departments will no doubt provide such estimates if they are found to be useful.

23. Q—All right, suppose in spite of all weekly reports the job ends up with less man-hours consumed that the specification required?

A—The penalty will be based on (1) the actual final cost of the job per man-hour figure and (2) the amount of the bid as to the hourly rate of the penalty.

Penalty explained

24. Q—That appears rather complicated. Isn't it correct that the man-hours for any job are figured on the estimated cost?

A—Yes, that is right. As the best figure available at the time bids are called, the engineer's estimate is used to fix the man-hour provision which is a part of the contract, as ($90,000—90c per man hr.—100,000 man-hr.). However, the actual final cost of the job is the basis for establishing the final requirement for man-hours used. For example, if the job just referred to actually cost only $60,000 (contractor's "final estimate") and the contractor's bid was $75,000; then, the ratio $60,000 divided by $75,000 multiplied by 100,000 man-hours fixes 80,000 man-hours as the figure actually required by this job. Now, assume that, at the end of the job, the contractor used only 75,000 man-hours of labor, he would be penalized 5,000 man-hours at an hourly ratio which is fixed by the ratio of his bid ($75,000) divided by the estimated cost of the job ($100,000), or 75c per hour. He would be penalized in this case 5,000x75c, or $3,750 at the conclusion of this hypothetical case.

In other words, the contractor's bid does not affect the required employment figure, as it appears in the contract, but it does establish the hourly rate of pay used in calculating the penalty, if a man-hour deficiency exists at the conclusion of the job. On the other hand, the final cost of the job determines the final man-hour requirement, as a direct proportion between the final cost and the contractor's bid.

25. Q—And if the job ends up with a surplus of man-hours, what happens?

A—The state is permitted to utilize this surplus, by corresponding reductions in the man-hour requirement on subsequent projects. The contractor, however, does not benefit from the surplus on his own contract.

26. Q—If a contractor has two jobs in the same state under way, will he be permitted to use excess man-hours on one job to balance a deficiency in man-hours in the other job?

A—No.

27. Q—Is there any distinction between man-hours of skilled labor and unskilled labor? In other words, will there be any premium obtained by employing men in the higher wage classification?

A—No.

28. Q—What about the grade crossing program?

A—Individual projects are to be selected with preference given in order of relative traffic hazards and existing unemployment.

29. Q—Does the $1,400 per man-year rule apply on these projects?

A—Yes, but there is an alternate requirement that 40% of the total cost of the project, including property cost, engineering and railroad work, shall go to persons directly employed on the project. Otherwise the general rules concerning taking of workers from relief rolls, hours, wages, etc., are about the same as for the highway. Incidentally, labor costs included in the railroad work would be credited to the contractor as a part of the required 40% labor.

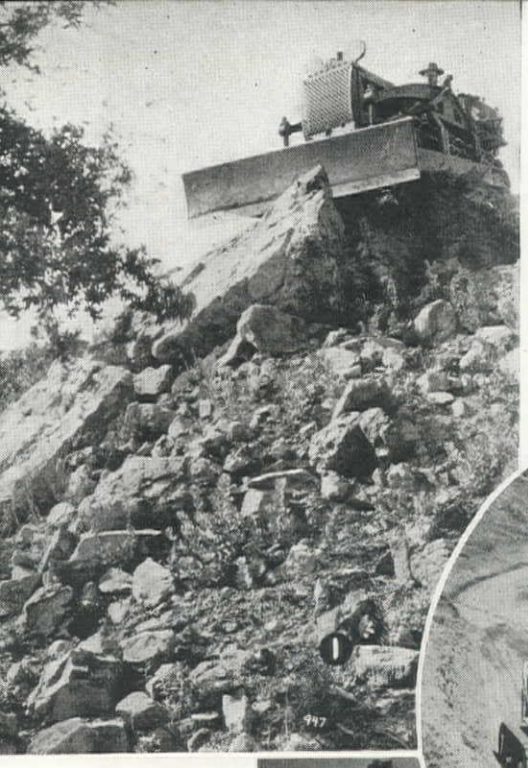
30. Q—If any state elects to take the alternate plan for the highway work, does this also cover the grade crossing funds?

A—Yes. The state may so elect.

31. Q—What will be the first work to be started under the new program?

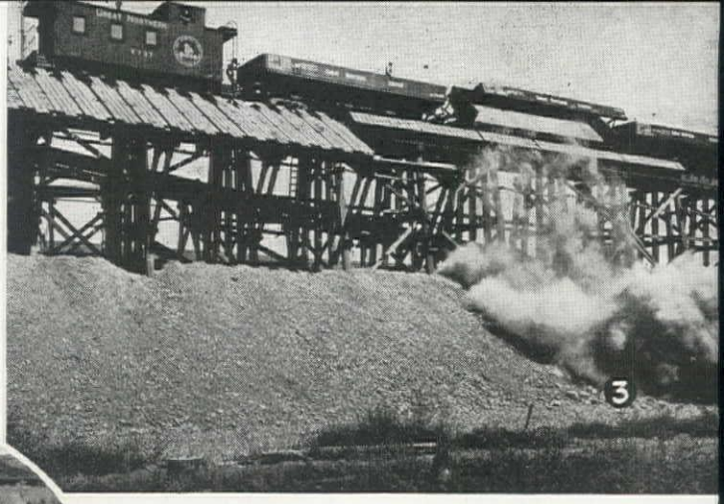
A—It is quite possible that one or two of the states may call bids on a few small jobs in a week or so, to get a line on the procedure and to get test questions settled. On the other hand, some of the states with larger programs may have to spend several weeks in intensive study of the feasibility of taking up the alternate plan, before they will care to start any work.

On the Construction



1 — In the Santa Barbara National Forest a Cletrac Model 55 works at trail building on a rocky point.

2—In Colorado, on a state highway project near Granby, a Caterpillar 75 and a 12-yd. LeTourneau Carryall are at work for Charles Switzer, contractor, of Arvada, Colo.

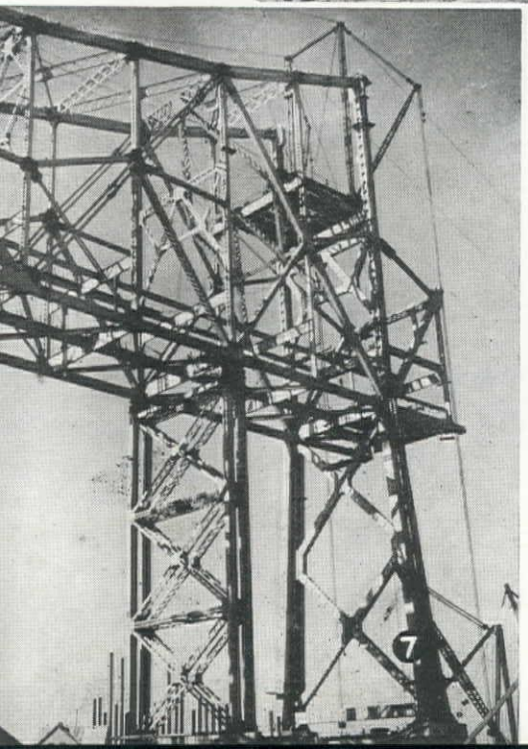


3—Dumping rock into the upstream toe of the Fort Peck dam. This rock is brought in a distance of 70 miles.

4—Handling a 60-ft. section of reclaimed 30-in. steel pipe with a timber carrier. This work was in connection with the San Francisco $12,000,000 program of waterworks improvements.

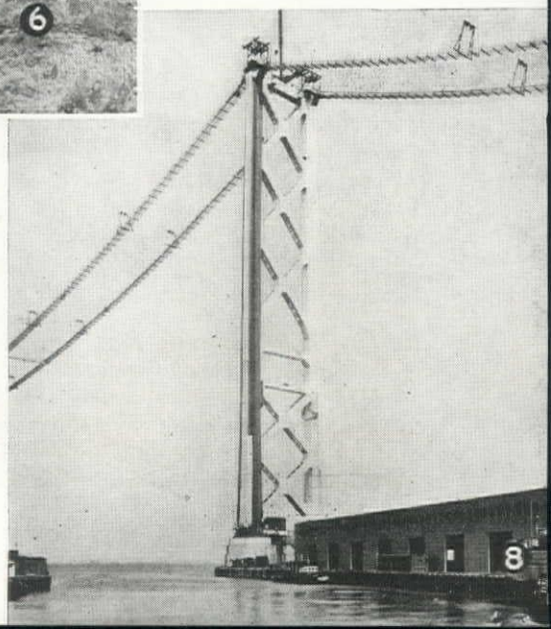
5—Driving piles to carry the new Bay Crossing line of the Hetch Hetchy system across the lower end of San Francisco Bay.

6—In opening up a new oil field near Bakersfield, Calif., Jack Shields, contractor, used a Caterpillar diesel and blade grader.

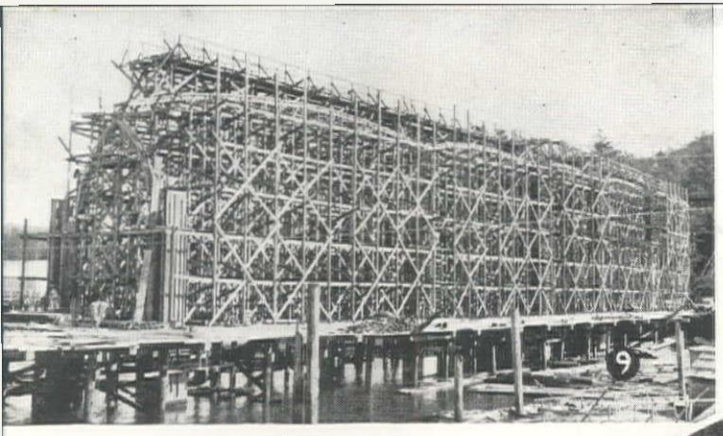


7—Starting the cantilever span for the east channel crossing of the San Francisco-Oakland Bay Bridge. This 55-ft. panel is the beginning of the 1,400-ft. span which will weigh 12,700 tons without paving, about twice as much as any other cantilever.

8—Aluminum paint is being used for the final coat of the San Francisco-Oakland Bay Bridge after a controversy which lasted for many months. The complete treatment includes two coats of red lead, followed by a coat of black graphite paint, with the aluminum paint finishing the work.

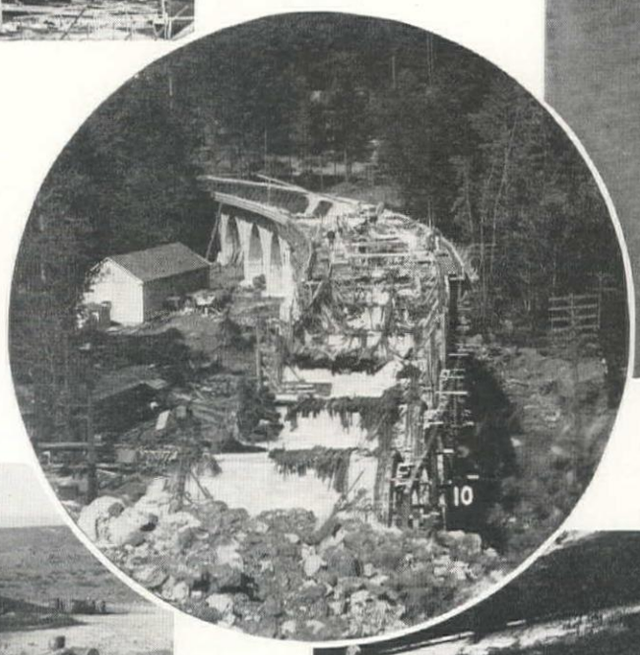


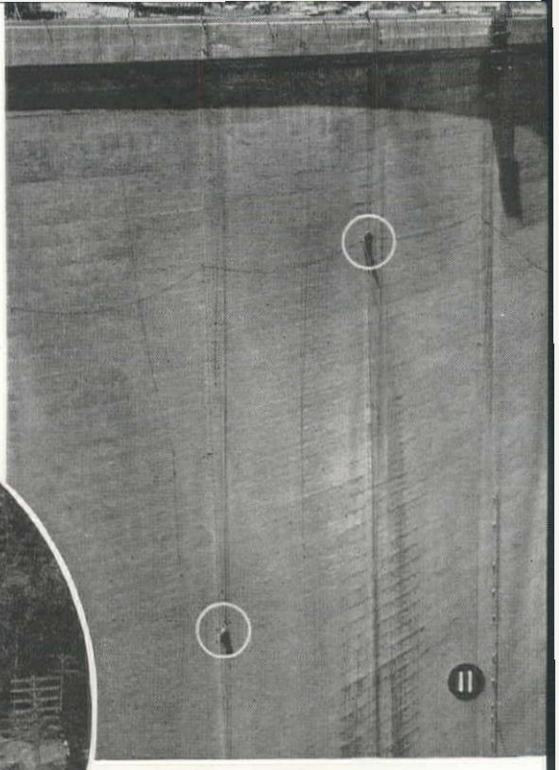
Western Front



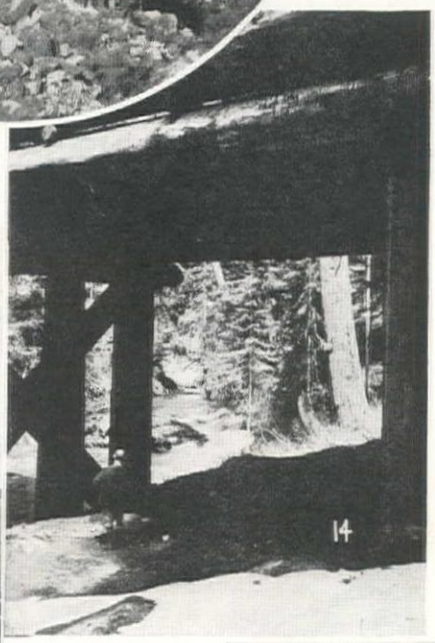
9—A forest of timber false work used by Mercer-Fraser Co. on the approach spans for the Siuslaw river bridge along the Oregon Coast highway.

10—Tanner Creek concrete viaduct, an important unit in the railroad relocation on the Bonneville project.





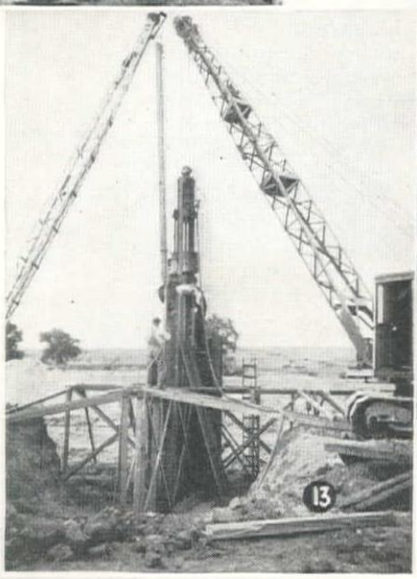
11—Suspended from ropes on the face of Boulder dam, these two workmen (indicated by circles) are making minor patches and reading grout pressure meters.



12—Highway screening plant of Walter Denison, contractor, on a 10.75-mi. project for the New Mexico Highway Department east of Carlsbad.

13—On the Cherry Creek dam for Denver Flood Control, M. E. Carlson, Denver contractor, is using a Bucyrus-Erie 37-E crane with a No. 1 Vulcan hammer to drive sheet piling for the cut-off.

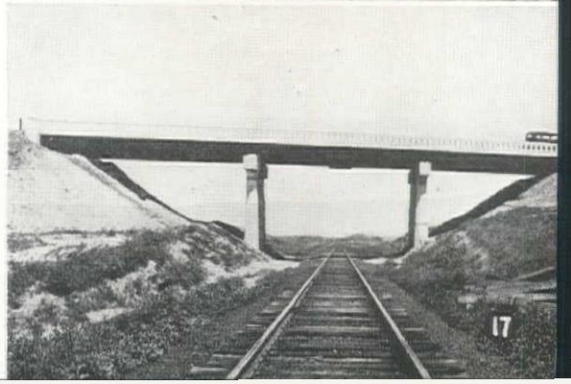
14—Massive log-stringer bridge over Cougar Creek, Rainier National Park, designed by the National Park Service and built by J. D. Harms, Seattle.



15—On Bonneville dam excavation work this 30-yd. Le Tourneau buggy indicates the action of the oscillating axles in distributing the load on the sixteen 13.5 x 20 tires.

16—Highway grading by Skousen Bros., Albuquerque, on an 18.55 mi. project in New Mexico.

17—Highway grade crossing structure built by the Colorado Highway Department over the C. B. & Q. tracks near Yuma, consisting of three steel I-beam spans. Edward Selander, Greeley contractor.



Moving Mountains of At the Fort Peck Dam

Four giant dredges pumping through pipe lines up to 14,000 ft. long and using five 28-in. pumps in tandem are placing over 3,000,000 cu. yd. of fill per month—Dredging equipment is described and methods of operation reviewed.

By D. A. D. OGDEN, Captain
Corps of Engineers
Fort Peck Dam Project

WITH FOUR DREDGES pumping hydraulic fill material at the rate of more than 3,000,000 cu.yd. per month, over 20% of the 100,000,000 cu.yd. volume in the Fort Peck Dam will be in place before the end of the 1935 working season. This important structure is being built on the upper Missouri River about 20 miles southeast of Glasgow, Mont., under the direction of the Corps of Engineers, U. S. Army, as Project No. 30 under the 1933 PWA program. The general features of the project have already been described in this journal and this article will be confined to a review of the dredging equipment, pipe lines and plan of operation for the 1935 and 1936 seasons.

Briefly, the dam site occupies a valley about 8,000 ft. wide between hills which rise as a bluff to a height of 350 ft. on the east bank and to a height of 160 ft. on the west bank, followed by a more gradual rise of another 100 ft. in elevation in a distance of two miles to the west. The river, within the area of construction, has a general minimum depth of 5 ft. and a maximum velocity of 4 miles per hour during the low flow season. Its flow varies from 3,000 to 154,000 sec. ft., with a maximum predicted flood of 300,000 sec. ft.

The soil composing the valley floor is river alluvium of clay beds, sand and silt with large areas of river sand suitable for borrow pits both above and below the dam site. Under the actual site for structure, the Bearpaw shale, a dense marine formation which forms the east bluff, lies at a maximum depth of 150 ft. below the river bed. The intervening material consists of clay, gravel, sand and loam.

The dam will rise to El. 2,270 (M.S.L.) with a maximum height of 242 ft. above the river bed at El. 2,028. Plans provide a 20-ft. freeboard when the reservoir is full. The structure consists of a main river section 9,000 ft. long and a 11,500-ft. dike section up the plateau on the west bank. Construction is by the hydraulic fill method and 100,000,000 cu.yd. of material are required. Gravel toes are designed to retain the fill both up- and downstream.

The purpose of the dam is to store the excess flood waters of the Missouri River, releasing them at such a rate as to maintain navigable depths in the river below Sioux City, Iowa, during the period of low water. Incidentally, floods will be reduced on the Missouri River and water and power made available for irrigation.

A description of the general features of the project, the town and preparatory work appeared in *Western Construction News*, December, 1934 and the method of driving the four diversion tunnels was reviewed in the issue of April, 1935. A calendar of the important dates since the project was started appears on another page.

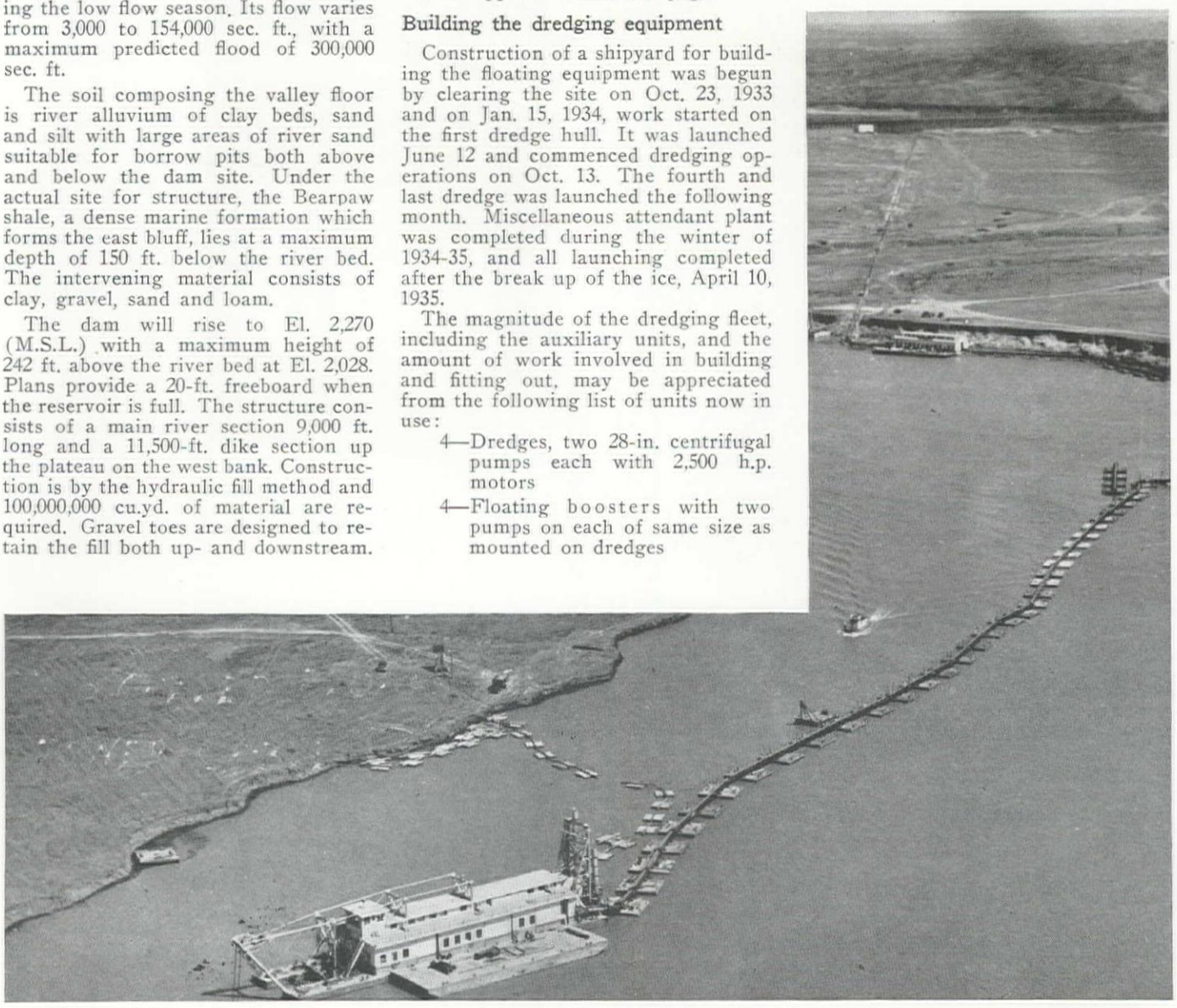
Building the dredging equipment

Construction of a shipyard for building the floating equipment was begun by clearing the site on Oct. 23, 1933 and on Jan. 15, 1934, work started on the first dredge hull. It was launched June 12 and commenced dredging operations on Oct. 13. The fourth and last dredge was launched the following month. Miscellaneous attendant plant was completed during the winter of 1934-35, and all launching completed after the break up of the ice, April 10, 1935.

The magnitude of the dredging fleet, including the auxiliary units, and the amount of work involved in building and fitting out, may be appreciated from the following list of units now in use:

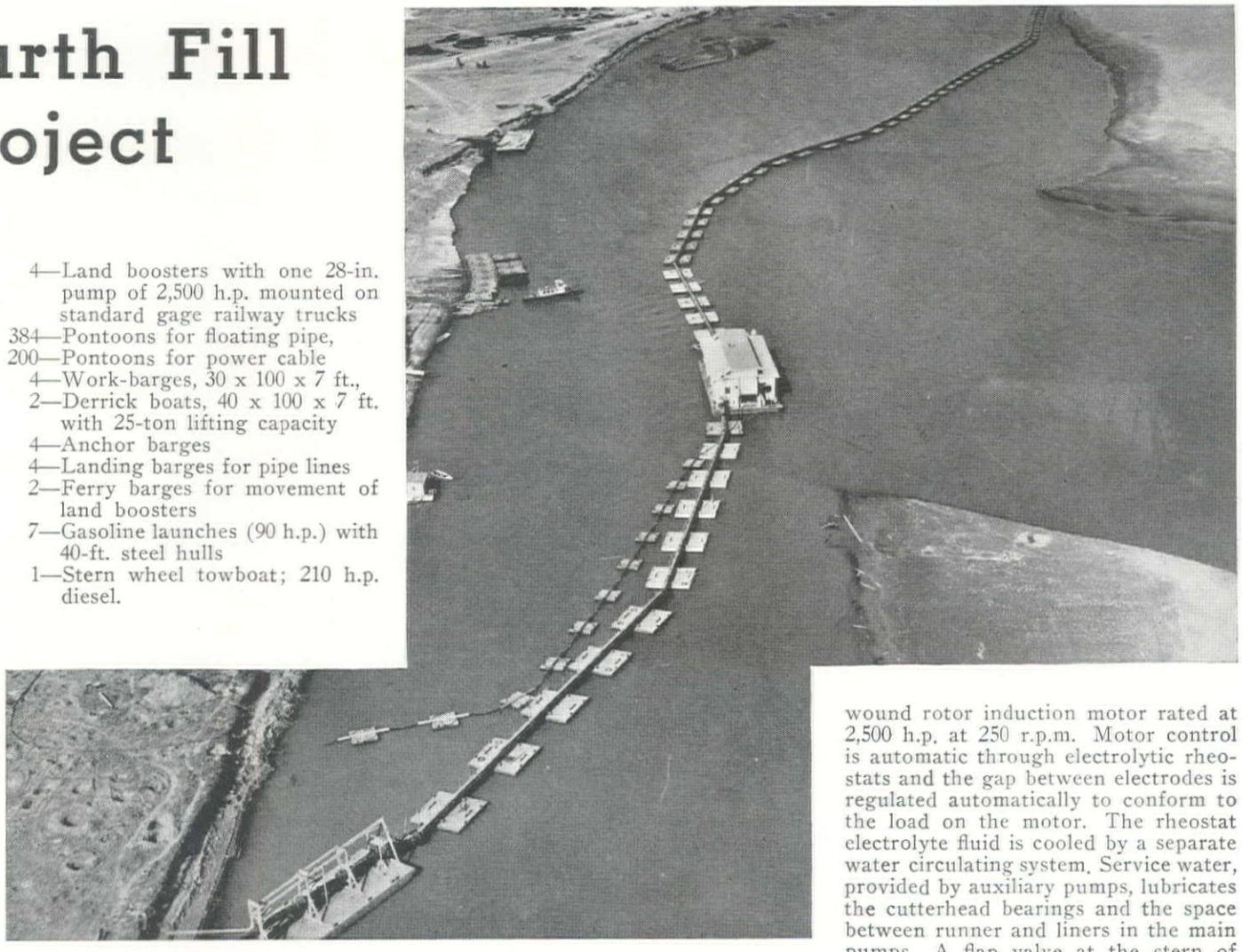
4—Dredges, two 28-in. centrifugal pumps each with 2,500 h.p. motors

4—Floating boosters with two pumps on each of same size as mounted on dredges



Earth Fill Project

4—Land boosters with one 28-in. pump of 2,500 h.p. mounted on standard gage railway trucks
384—Pontoons for floating pipe,
200—Pontoons for power cable
4—Work-barges, 30 x 100 x 7 ft.,
2—Derrick boats, 40 x 100 x 7 ft. with 25-ton lifting capacity
4—Anchor barges
4—Landing barges for pipe lines
2—Ferry barges for movement of land boosters
7—Gasoline launches (90 h.p.) with 40-ft. steel hulls
1—Stern wheel towboat; 210 h.p. diesel.



One of the dredges (lower left) in operation showing the 28-in. discharge line extending to the booster plant at the far bank and the land line extending to the dam in the background. Note the small pontoons carrying the power cable from the shore.

Landing barge (foreground, above) which supports the connection between the floating line and the land line. The floating booster plant is shown in the middle of the picture with the electric cable supported on the line of small pontoons.

The 210-h.p. diesel towboat, "John Ordway," was built in the government boatyard at Gasconade, Missouri, launched in June, 1934, and started the 1,400-mi. trip up the Missouri River the following month. Due to the unprecedentedly low water she was unable to complete the trip before winter; wintered on the bank at Mobridge, S. D.; set out again when ice conditions permitted on April 20, 1935, and arrived at Fort Peck on May 18, 1935. The seven launches were purchased by contract and shipped in by rail.

The "Dredge Gallatin," launched in the spring of 1934, was placed in operation in the fall to dredge deep water in front of the launching ways and a slip for use as a winter harbor. Her operations on this work afforded an opportunity to test out the dredging equipment. The 843,300 cu. yd. thus dredged was the first material placed in the dam. As fast as the harbor slip was dredged, new launchings filled it with additional floating plant. The slip was completed on Dec. 23, 1934, and all completed plant moored for the winter. Two derrick boats and four work barges were completed and launched in April, 1935. The fill crews spent the winter laying tracks for booster cars, and leveling off the initial areas in the base of the dam for placing the first dredging discharges. A soil survey of the borrow pit was completed. Based upon this information, dredging plans for the coming season were prepared. This plan required laying of pipelines, extensions of power lines, and construction of service roads in borrow pit and at the damsite. Abutments were prepared for the fill by scarifying the surface and installing french drains and sheet pile cutoff walls where required. Construction of dredging spillways was started. Both borrow pit and damsite were ready for the season's work on April 1, 1935. The ice broke up on April 10, and the river was clear a few days later.

Description of the dredging plant

A dredge consists of a wood hull 40 x 170 x 9 ft. On the forward end is mounted a 7-ft. diameter cutter head on a ladder 75 ft. long. It is turned by a 700 h.p. electric motor. Two pumps, coupled in series, each driven by a wound rotor induction motor rated at 2,500 h.p. at 250 r.p.m. Motor control is automatic through electrolytic rheostats and the gap between electrodes is regulated automatically to conform to the load on the motor. The rheostat electrolyte fluid is cooled by a separate water circulating system. Service water, provided by auxiliary pumps, lubricates the cutterhead bearings and the space between runner and liners in the main pumps. A flap valve at the stern of each hull protects the dredge and booster from backwash. The spuds used on the dredges are of cast steel 32 in. in diameter, 75 ft. long and weigh 29 tons each.

Pumping equipment on the floating boosters is similar to and interchangeable with that on the dredges, except that there is no equipment for cutterhead, spuds or swing wires. Land boosters, weighing 200 tons overall, contain the equipment for one pump.

While the dredge is operating in the borrow pit, the floating booster is placed in the line in a dredged slip about halfway between the dam and dredge. The land booster is placed on railroad tracks parallel to the gravel toes.

All power for the dredging plant is electric supplied at 6,600 volts from a feeder distribution system, off the main transmission line built from Great Falls. It is supplied through 1,000 ft. of three-conductor power cable of 750,000 circular mils area. The entire cable is 5 in. in diameter including the rubber insulation. This cable is reeled on a wooden drum 12 ft. in diameter on the stern of each dredge and floating booster and carried to the shore connection on small pontoons. All items of dredging plant are connected by telephone, for which a separate cable is strung along the power pontoons.

Preparatory to digging, the dredge is set with the cutterhead lowered to proper depth, generally 45 ft. below water surface. Lines, for use in swinging the dredge about a spud as a pivot, pass from the swing wire drums on the dredge along each side of the ladder through swing sheaves on each side of the ladder head to anchorages placed at suitable distances on a line approximately perpendicular to the axis of the cut.

When the dredge is ready to dig, the port spud is dropped, the starboard spud lifted and engineers of dredge and boosters are signalled to start pump motors. The cutterhead motor is started by the dredge operator. The swing motor is operated until the cutterhead is crowded into the bank. The dredge operator watches the gage indicating vacuum at the No. 1 pump and discharge pressure. The vacuum increases with the load of dredged material drawn through the suction pipe until the breaking point of the vacuum is reached.

The dredge operates most efficiently when near the vacuum breaking point. Operators, therefore, crowd the bank to keep within close range of this point. The Fort Peck dredges generally operate on from 21 to 25 in. of mercury vacuum. Dredge runners have a large number of controls to operate and gages to watch. These include swing motor lever, swing drag lever, cutterhead motor control, ladder hoist and brake, hoist lever and brake for each spud, vacuum gage No. 1 pump, discharge pressure gage, swing motor power gage, No. 1 main motor power gage and tachometer, and pressure gage for lubricating water on the cutterhead bearing. The development of competent runners requires the serving of a long apprenticeship. Capable runners are a valuable asset to the dredge owner. Besides the captain and the chief engineer, one shift of a dredge crew consists of runner, mate, shift engineer, striker, 2 oilers, 5 to 7 deckhands, and an engine room crew of three on each booster.

When the dredge has pumped all material within reach of her swing from a given spud setup, she is advanced by walking forward on her starboard spud and takes a new cut.

Operations for the 1935 season

The filling operations of the 9,000-ft. section of the dam within the river valley have begun with two sections between the banks of the Missouri River and the hills, leaving a channel 800 ft. wide, into which the river will flow until it can be turned into the diversion tunnels. It is planned to build the fill in these two sections to a height of approximately 100 ft. above the stripped base of the dam, requiring 17,911,000 cu.yd. of fill on the left bank and 32,593,100 cu.yd. of fill on the right bank. During the year 1935, two dredges will pump into each of these two sections of the dam. Since the yardage on the left bank is considerably less than that on the right bank, this assignment will change to three dredges on the right bank and one on the left in 1936.

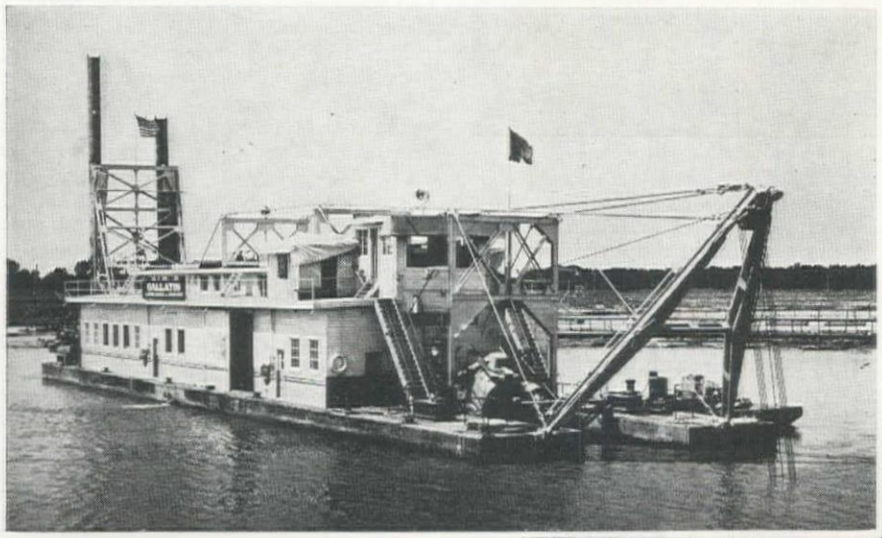
Dredging assignments are so adjusted that suitable material is supplied from the borrow pits. The dredges start at the outer limit of the borrow pit and work toward the dam, pumping through a 28-in. pipeline supported on wood pontoons. Ball joint couplings are used to connect the sections of pipe. A special landing barge connects the floating line with the land line. The land line, also of 28-in. diameter, carries the discharge to the floating booster placed in a dredged slip approximately halfway from the dredge to the point of discharge. The floating booster is coupled to the land lines by a few sections of floating pipeline. Another section of land line carries the material to the land booster placed on tracks just outside the gravel toe of the dam. From here the material is pumped up to the distribution system on the dam. The total lengths of pipeline for one dredge has reached 14,000 ft. Dredges are at all times working up on their pipe lines.

Pipe and power lines are located so that no pipe lines are crossed and power is available at all times within reach of the 1,000-ft. cable reeled on the stern of the dredge. A tongue of land 1,000 ft. wide is left through the center of the borrow pit until the last stage of dredging in order that the regime of the river will not be disturbed.

Characteristics of pipe lines

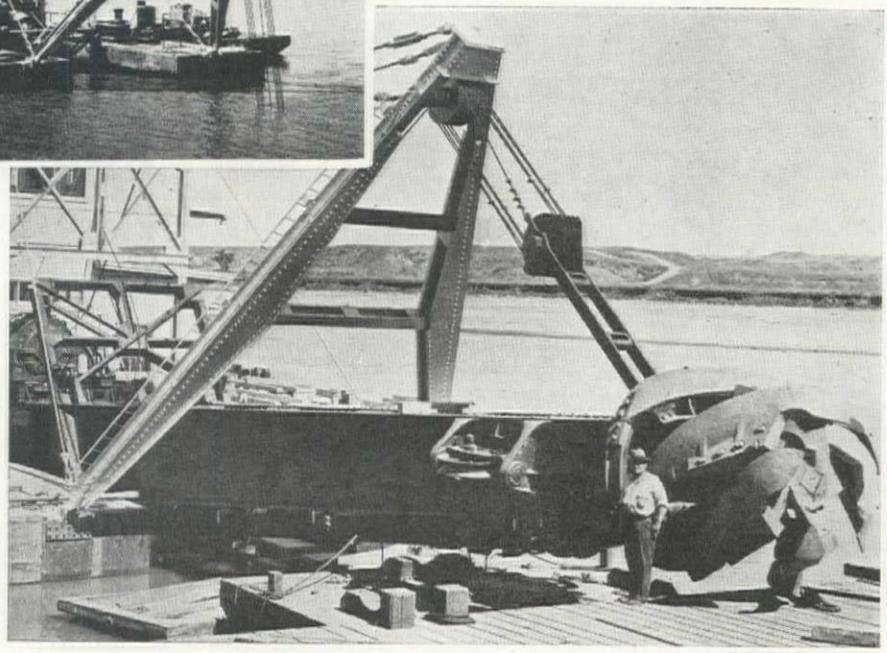
Pipe for floating and land lines is of rolled steel ¾-in. thick and 28 in. inside diameter, with machined flange connections. Land line pipe is in 12-ft. 6-in. lengths. The floating line is in 30- and 40-ft. lengths with ball joints. Pipe for distribution lines on the fill is ½ in. thick and is used in 12-ft. 6 in. sections. Sections are slightly rounded at one end and flared at the other to give a ball-and-cone joint, permitting a 15° flexibility at joints. Ball-and-cone pipe is coupled with a clamp and turnbuckle coupling.

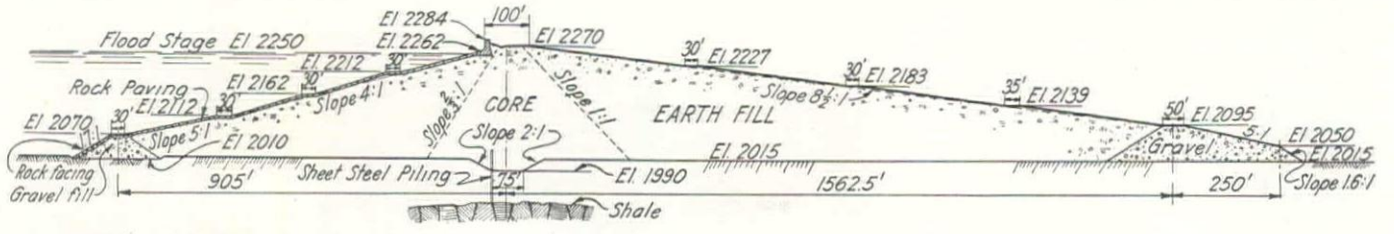
Flap valves are used on land lines to prevent backwash, and shutter valves are used on the fill to switch discharges.



Dredge Gallatin, the first unit launched in the spring of 1934. Dredge hulls are 40x 170x9 ft.

Cutter head 7 ft. in diameter on the end of a 75-ft. ladder is rotated by a 700 h.p. motor.





Remarkable airview of the dam site looking upstream, showing filling operations during July. The loop of railroad trestle marks the toes of the fill. The water from the dredge lines can be plainly seen on the beaches flowing toward the core section marked by the dark line of the sheet-pile cutoff. A plug of sand, with timber spillways, is maintained near the channel to allow the fill to be raised while the channel is kept open during the 1935-1936 seasons.

Maximum section of the Fort Peck Dam showing principal dimensions and elevations above mean sea level.

Reducing wyes from 28-in. to two 21-in. pipes and from 21-in. to two 16-in. pipes are used, and a limited amount of these smaller size pipe is used for bracket lines. These pipe are ¼ in. thick. Shutter or pocket pipe is used in a few special situations.

The dam is built by discharging the material conveyed by the pipe lines at the gravel toes and building up a slope or beach toward the central portion of the dam or core. The inside slopes of the gravel toes are blanketed with 3 ft. of sand in advance of pumping to prevent the escape of large quantities of water. Riverside slopes of the inner ends of the dam are protected by levees thrown up by dragline and bulldozer.

Water from discharge pipes deposits gravel and sand on the beach, carrying finer materials into the central pool where an area of still water permits the deposit of fine sand, silt and clay to form the core. The level of the core pool is regulated by a spillway through which excess waters are discharged into the Missouri River. By regulating the level of and amount of water in the core pool the character of the material settling out is closely controlled.

A dense stable fill, relatively impervious to water, is required. This material first forms as a soupy, semi-liquid, but gradually consolidates and compacts at the bottom of the pool. The core is 440 ft. wide at the base of the dam, and narrows gradually to 75 ft. near the crest. It comprises about 18% of the volume of the dam. A soil inspection force takes daily samples from beach, core, and spillway discharge water. Daily surveys measure the amount dredged from the borrow pit. From the soil survey in the borrow pit, borrow pit dredging measurements, and the laboratory results of samples taken from the dam, up-to-the-minute information is available as to the material being placed. This information is also valuable in determining how the core pool and spillway level should be regulated.

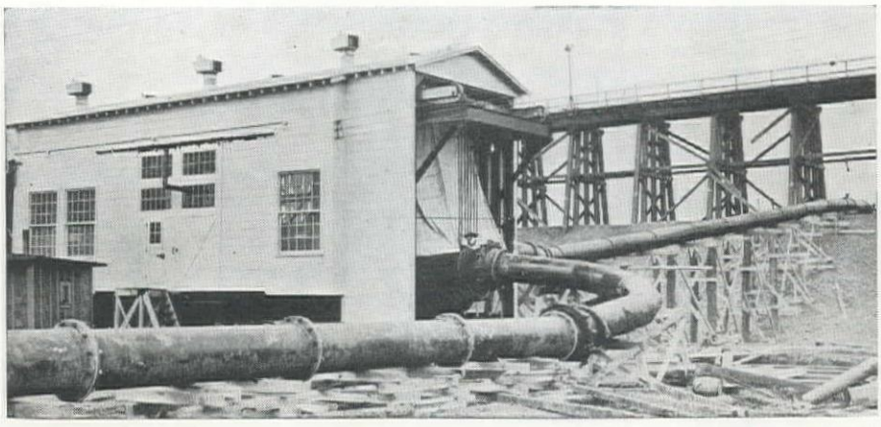
Spillways for the surplus water consist essentially of a series of lines of 3-in. wakefield piling 9 ft. long. A caulked apron with side walls on light piling extends between the lines of sheeting. At the upper line of sheeting a heavily braced frame is built in which 3 x 8-in. planks are placed as stop-logs. The horizontal depth of apron is 17 ft. 6 in. and the height of each lift is 4 or 4½ ft. Lifts are in overlapping pairs so the discharge may be turned through one side while the construction forces are completing the next lift on the other. The spillway crest provided for the discharge from each dredge is 20 ft.

To retain the unconsolidated core at the river ends of the dam, a sand plug of ordinary dredged material is placed at the river end of the core. The sand plug also affords a stable base upon which the spillway is built. The steel sheet pile core wall through the center of the dam insures against seepage through the foundation and, projecting 20 ft. into the dam, makes a bond between foundation and dam. Through the sand plug sections of the core, this wall of piling will be extended by welding on short sections of piling to make an impervious diaphragm where the normal core is lacking. This diaphragm extends beyond the sand plug and into the adjoining core.

Placing the material

Material on the beach is graded by the action of flowing water from coarsest nearest the toes to finest at the edge of the core. The material encountered in the borrow pits has proper characteristics for the dam. In general, it contains a limited amount of pea gravel, 75 to 90% sand, and the remainder is about divided between silt and clay.

Dredge pipes are brought to the edge of the gravel toes and one or more



Land booster plant at the toe of the fill. These units have one 28-in. pump operated by a 2,500 h.p. motor.

wyes placed in the line with a valve on each leg of the wye. Each dredge must have two or more discharge lines available so one may be advanced while discharging through the other. The dredge having the discharge line nearest the river in each portion of the dam must be prepared to pump material into the sand core plug each time the spillway is raised and has a special line for this purpose in the vicinity of the spillway. As this material must be placed in limited amounts, carefully spread over a considerable area, it is discharged through two 21-in. bracket lines.

The pipe lines on the fill are placed on blocking and the discharge falls on a table of planking supported on a light trestle. From the tables the discharge is diverted as desired, by planks placed against the leg extensions. A table is built 4 to 5 ft. above the fill and carries the discharge until the beach material has reached the level of its planking, when the discharge must be turned into another pipe line while the table is dismantled and pipe extended to a new one. Sheer boards are used to protect levees from wash and to divert the flow along the beach to keep the core pool in the proper shape.

Program for 1935 and 1936

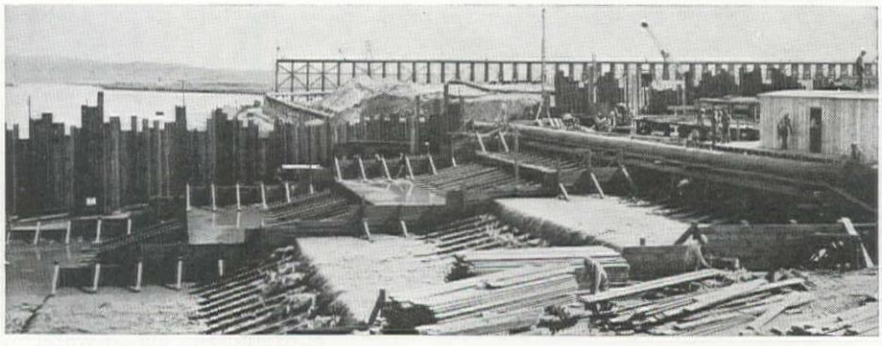
These methods of placing fill will continue through 1935-36 and part of 1937, when completion of the diversion tunnels will permit the flow of the river to be turned from the channel. At the time the diversion is made, a coffer dam will be placed across the channel, and the railway trestle along the upstream toe will be extended across the river. Then, the dredging plant will be floated from the upstream to the downstream borrow pit area. Pipe lines will be taken up and relaid to these new dredging locations, and land boosters will be ferried from above to below the dam.

Gravel toes will then be completed across the river and the spillways, already described, will be removed. Necessary stripping will be done in the foundation of the river section and the filling of the river section will be started. After the closure section has reached the elevation of the two river-side sections, the entire dam will be raised as a unit.

The upstream gravel toe is to be faced with a 6-ft. layer of field stone ranging in size from 20 lb. to 1 ton. This stone is delivered in 30-yd. Western air dump cars in 70-car trains and dumped directly from the trestle. The base of the downstream gravel toe through the river section will consist of a layer of this same field stone placed to El. 2,050 except through the main river channel where a deeper opening is left for the river flow. This stone will be dumped from the downstream trestle and spread by bulldozers. The function of this rock fill is to check the river flow through the dam and prevent erosion of the fill placed on the river banks.

The railroad trestles across the ends of the elevated loop will be buried by the fill by the end of 1935 and will be replaced by a railroad connection from the reservoir spillway. This rail connection routes cars over the Missouri River bridge along the downstream toe, then six miles around the hill on the right bank. Coming down from this hill, a connection will be made with the upstream trestle. Spurs will extend to each berm on the upstream slope of the dam. From these spur tracks a

Timber spillway passing the discharge from the core pool over the sand plug. These are built in pairs and one is raised while the other is in use. The sheet pile cutoff is immediately behind the second spillway.



Calendar of Preparatory Work Prior to 1935 Dredging Season

Oct. 14, 1933—Project authorized under Public Works program as Project No. 30 in charge of the Corps of Engineers, U. S. Army. Acquisition of necessary property and clearing operations at the site started at once.

Nov. 21, 1933—Major T. B. Larkin, Corps of Engineers, arrived to take charge of work.

December 1933—Construction of a 13-mi. railroad from Wiota to the site started. This work was completed in April, 1934.

Jan. 15, 1934—Work on the first dredge hull was started.

Jan. 27, 1934—Building of a new highway from Glasgow to the site started by the state of Montana. This highway was completed in August 1934.

March 1934—Construction of a town to house 4,600 workers begun under a group of contracts. Work was completed October 1934.

April 18, 1934—Contract awarded for the driving of the diversion tunnels and work started May 20.

May 1934—Work on the 288-mi. power line from Great Falls, Mont., was started and the line was connected for service about 130 days later.

June 12, 1934—First dredge hull launched.

June 1934—Stripping operations on the dam site started.

July 1934—Sheet-pile core wall started.

October 1934—The 31,615-ft. trestle and bridge for railroad and vehicle service across the Missouri River at the site was opened for traffic.

October 4, 1934—Delivery of gravel for the toe fills was begun, 1,674,000 cu. yd. placed up to July 15, 1935.

October 13, 1934—Dredging operations commenced.

April 1, 1935—Borrow pit area and dam site ready for season's work.

April 10, 1935—Spring break-up of ice in the river at the site.

blanket layer of gravel 2 ft. thick and a layer of heavy rip rap 3 ft. thick will be placed on the upstream slope.

Performance to date

The first dredge started placing fill in the dam on April 21, 1935, and the fourth unit on April 25. The material placed by these four dredges follows:

Prior to May, 1935	1,370,320 cu.yd.
May, 1935	3,135,980 cu.yd.
June, 1935	3,321,600 cu.yd.
Total to July 1, 1935	7,827,900 cu.yd.

The dredges will place between 22,000,000 and 24,000,000 cu.yd. in the dam this year depending on the length of the operating season available. Dredging operations at the Fort Peck dam are unique in (1) the long lines through which material is pumped, 8,000 to 14,000 ft., (2) the arrangement of the pumps, five 28-in. centrifugal pumps in tandem, and (3) the power and working capacity of the equipment. Each pump will deliver 60 lb. per sq. in. pressure or a total of 300 lb. pressure for the system, but due to the friction loss, the pressures at any point in the line seldom exceed 150 lb. All heavy piping is tested for a 400-lb. pressure. A complete pumping unit has a capacity of 12,500 h.p. and must pump to a height of 240 ft.

Pumped material moves through the pipe line with a velocity of from 21 to 23 ft. per second and carries solids at a rate varying from 15 to 20%. The pumps deliver 90 cu.ft. of water and dredged material per second, or approximately 1,780 cu.yd. of fill per hour. Dredging units have averaged as high as 2,500 cu.yd. per hour during a day's work, which is usually 21 hours. The maximum daily record of 51,540 cu.yd. was made by the Dredge Jefferson.

Although setups of the dredging plant must vary widely and rapidly with dredge movements in the borrow pit and operations on the fill, the following may be called a typical setup for the 1935 dredging season.

Total length of pipe line	12,500 ft.
Floating line, 28-in. flanged pipe with ball joints	2,000 ft.
Land line, 28-in. flanged pipe (landing barge to floating booster)	2,000 ft.
Land line (floating booster to land booster) 28-in. flanged pipe	4,500 ft.
Fill pipe line, 28-in. ball and cone pipe	3,500 ft.
Lift	55 ft.

Organization

The Fort Peck dam is being constructed under the supervision of Col. R. C. Moore, Corps of Engineers, Division Engineer, Missouri River Division at Kansas City, Missouri. The field execution of all work comes under Major T. B. Larkin, Corps of Engineers, District Engineer, at Fort Peck, Montana. Major C. H. Kittrell, Corps of Engineers, is in charge of operations. Captain D. A. D. Ogden, Corps of Engineers, is in charge of dam construction.

Paving Snoqualmie Pass . . . A Major Washington Project

Program of 56 miles of concrete paving on important highway route over the Cascades in Washington nears completion as 8.37-mile contract is finished.

By T. P. DOYLE

District Construction Engineer
Washington Department of Highways

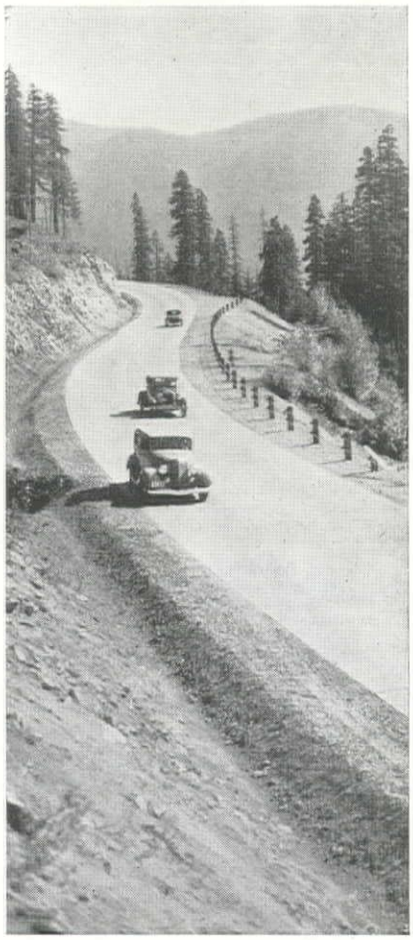
SINCE 1933, when the first contract for paving through Snoqualmie Pass in Washington was awarded, all of this 56-mi. length of difficult highway, except an 8.3-mi. section between the Kachess River and Nelson on the east side in Kittitas County, has been completed. This work has provided a continuous Portland cement concrete surface for State road no. 2, known as the Sunset Highway, from Seattle to Teanaway junction, a distance of 101 mi. Near Seattle the road consists of two 20-ft. lanes of concrete separated by a narrow parkway; as traffic decreases towards the east, the roadway is reduced to a single 20-ft. paving which extends over the mountains to Teanaway.

Snoqualmie Pass, at El. 3,004, is one of three routes connecting eastern and western Washington and is the only road through the Cascade Mountains that is kept open throughout the year, due to the extremely heavy snowfall and the higher elevations of the passes on the other routes. Being the main route over the Cascades, this road carries extremely heavy traffic with a large volume of truck movement. As a result, one requirement in paving was to keep the route open for travel at all times during construction.

Before paving with concrete the surface of the old road was oiled macadam and maintenance was extremely high.

The most recently completed section of this project extends 8.37 mi. between Little Creek and Teanaway junction on State road no. 2 in Kittitas County and was opened to traffic for its full length late in June. The uncompleted 8.3-mi. section on the west of this latest paving was called for bids on July 23 and construction will be started in time to complete the work before the coming winter season, according to plans.

The new section of paving begins about 5.4 mi. west of the city of Cle Elum and extends east to Teanaway, the junction of State roads no. 2 and 3 east of Cle Elum. This section does not include the part through the city, which has an existing 20-ft. concrete pavement. Alignment and grades follow the previous existing route throughout the project. The maximum curvature is 6 deg. and the maximum grade 6.44%.



New pavement on Snoqualmie Pass (El. 3,004) to improve this important section of the heavily travelled, year-round route through the Cascades, east of Seattle.

Due to the character of the subgrade and wide range of climatic conditions, it has been necessary, prior to paving, to reinforce and strengthen the roadway foundation with gravel ballast, laid to an average depth of 8 in. over the full width of the roadway. No earth filler is permitted in this ballast. This manner of construction is also very essential to insure proper drainage of the subgrade, preventing damage to the pavement as a result of freezing and heaving.

The concrete pavement was designed for heavy duty traffic and is of 10-7-10-in. cross-section upon a 30-ft. roadway. Steel reinforcement of the pavement was confined to special sections where extraordinary fatigue of the slab might be expected. The entire section had an existing bituminous surface and the specifications of the contract provided that this material, to an approximate depth of 2 in. be removed prior to paving and stockpiled in convenient places on the project. After the pavement was

Three compartment trucks supplied batched aggregate to the mixer, with sacked cement added in the hopper. Mixer water was pumped from nearby streams or irrigation ditches.

constructed, this bituminous surfacing was spread 2 in. thick on the roadway shoulders and thoroughly compacted. This salvaged material not only provides a durable wearing course, but serves as a seal to prevent surface water from entering the subgrade.

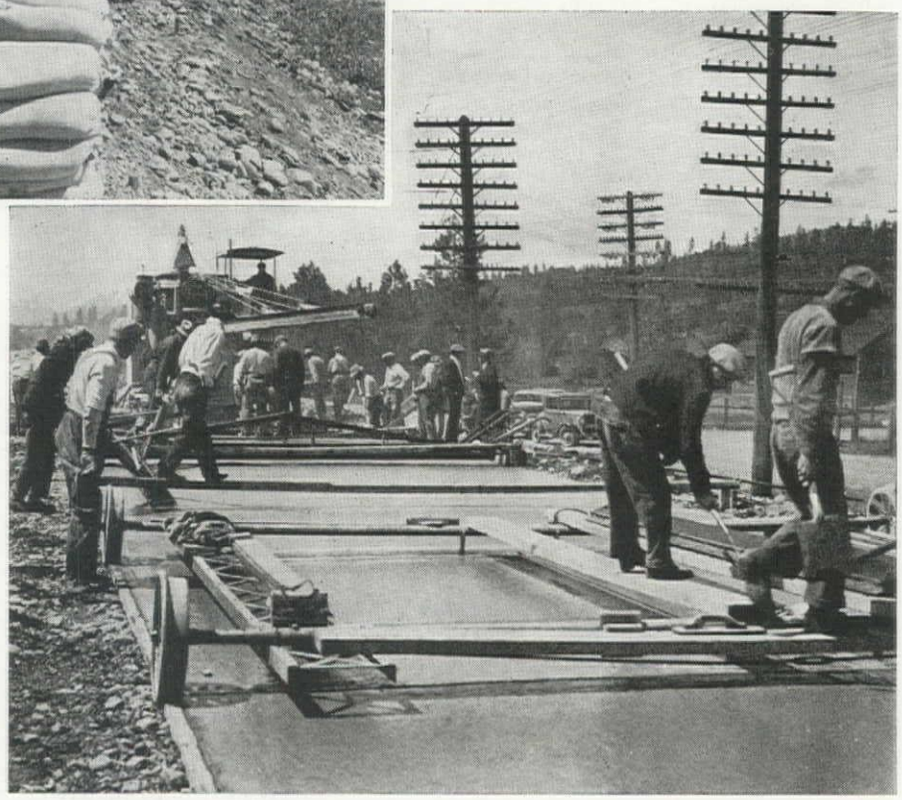
Sand and gravel for the concrete aggregate was developed locally from a deposit on the Cle Elum River about 2½ mi. from the project. The method of production of this material was rather unique. It was sluiced into the gravel plant through an 8-in. pipe and hose line. The plant was located at the bottom of the 250-ft. gravel bank along the river and the material was delivered to the plant by gravity. Water for sluicing was delivered from the river by a 6-in. two-stage Byron-Jackson pump. Electric power for plant operation, including 25 h.p. required for screen and 200 h.p. for the pump, was transmitted from an existing power line ¼ mi. distant.

The aggregate was trucked from the gravel plant and stockpiled at two convenient sites where batching plants were erected. A ¾-yd. gas shovel equipped with a clamshell bucket was used for loading the sand and gravel from the stockpiles into the batching bunkers, which consisted of three 40-cu. yd. bins and Butler scales and batch boxes. Three-compartment White trucks were used to transport the batched material to the crawler-mounted 7-sk. Multi-Foote concrete paver which operated on the subgrade ahead of the concrete placement. Cement was added by hand from sacks piled on the shoulders of the road. Water for mixing and curing the concrete was pumped from the Yakima and Cle Elum Rivers and from nearby irrigation ditches.

Manually operated screeds without vibrators were used in placing the concrete. The concrete surface was finished, using the delayed-finish method which is employed extensively on Washington highways, and affords a very smooth surface with exceptional riding qualities. The pavement was cured by a thin earth covering saturated with water. After the pavement was cured, a longitudinal center stripe, 4 in. wide was added with yellow traffic line paint.

As the work on this project is on a heavily travelled route, considerable attention was given to the matter of handling traffic. The old road, adjacent to the project, affords a suitable detour for much of the work. On one section, however, there were no available detours and the specifications provided that the roadway was to be paved one-half at a time. The state maintained and controlled traffic on the detours in use, as well as on the project whenever one-way traffic was necessary.

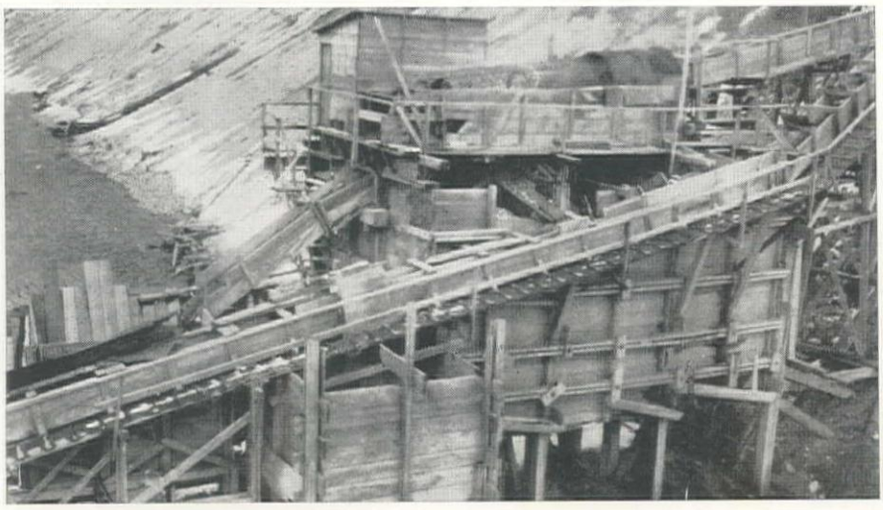
To further expedite the opening of the one-way pavement to traffic on these sections, as well as on the sections where detours were inadequate, high early strength cement was combined with the standard cement in such proportions that the pavement on any one section was opened to traffic three days after the last pavement on the section was laid. This was accomplished by adding pre-determined amounts of high early strength cement, to the standard product, increasing the quantity each day, until the last day's run was all the high early strength type.



Manually operated screeds, without vibrators, were used for finishing followed by curing with an earth covering saturated with water.

In preparing the subgrade a ¾-yd. Koehring gas shovel, 12-ft. Russell grader, Haiss path digging loader, 15-ton Buffalo roller, and 15 and 50 hp. Caterpillar tractors were used. This work was done during the fall of 1934 preceeding the necessary winter shutdown of the construction work, and consisted of light grading along the entire route.

Albertson & Cornell Bros., contractors for this $229,565 job, were represented by: H. S. Woodworth, superintendent; R. C. Kautz, assistant superintendent and engineer; R. Kendall, grading foreman; F. M. Miles, gravel plant superintendent; and J. A. Woodworth and M. Serenich, concrete superintendents.



Built at the foot of a high gravel bank of the Cle Elum River, the aggregate plant was fed raw material by sluicing operations from the flume at the right.

The Washington State Highway Department staff includes: E. C. Simpson, district engineer at Yakima (now at Vancouver); T. P. Doyle, district construction engineer at Yakima; and J. G. Hollinworth, resident engineer. Jas. A. Davis is state construction engineer at Olympia and Lacey V. Murrow is director of highways. On the projects from North Bend to the summit of Snoqualmie Pass on the east slope of the Cascades, George Shearer, district engineer at Seattle, is in charge.

Mr. Doyle has been with the Washington Highway Department for the past 16 years with the exception of about one and a half years when he served as construction engineer for a bond paving project in Kittitas County, Washington. During this time he has served in the construction department of the highway department. Previously, Doyle was employed for two years by Federal Mining & Smelting Co. at Wallace, Idaho, following his graduation from the University of Idaho in 1914 with a B.S. degree in Civil Engineering. Editor.

Island Park Dam in Idaho Will Be Earth and Rock

Bids opened at Ashton, Idaho, Aug. 5, showed Max J. Kuney, Spokane, low at $478,000. The next two bids were: Morrison-Knudsen Co., $483,000, and S. J. Groves and Sons, Minneapolis, $525,000.

INVESTIGATIONS have been in progress several years to find reservoir sites, to relieve acute water shortages suffered by irrigators on lands in the Upper Snake River Basin in Idaho. On Aug. 5 bids were scheduled to be opened for construction of Island Park Dam, an earth and rock-fill embankment with maximum height of 81 ft. and a volume of 558,000 cu. yd. to provide 114,000 ac.-ft. of storage. This reservoir will greatly relieve the shortages, but other dam sites are being investigated with the view of further supplementing the water supply.

The Island Park dam site, on Henrys Fork of the Snake River, is about 30 mi. by road southwest from the west gateway of Yellowstone National Park, and 5 mi. northwest of Island Park, the nearest shipping point on a branch of the Union Pacific R.R. Henrys Fork and the South Fork of the Snake River, which rises in the southern part of Yellowstone Park, join about 20 mi. north of Idaho Falls to form the main body of the Snake River.

The total average flow at the dam site during the flood-water storing seasons from 1918 to 1933 has been estimated at 230,000 ac. ft., with a minimum of 131,000 and a maximum of 296,000 ac. ft. Owners of the lands requiring a supplemental storage water supply have formed the North Fork Water Users Protective Association. The areas are located in Fremont, Madison and Teton counties, Idaho, embracing the towns of Ashton, St. Anthony and Rexburg. Local crops are sugar beets, potatoes, alfalfa seed, and seed peas.

The dam site has been formed by stream erosion cutting through a rhyolite ridge. This rock, a rhyolite tuff, is generally exposed in the 200-ft. width of stream bed and on the right abutment which rises on a 1¼:1 slope. It is also exposed halfway up the left abutment followed by a gentle slope covered by a mantle of soil sand and gravel. A 200-ft. drill hole in the river bed was entirely in rhyolite tuff. Drill holes in the left abutments and ridge encountered basalt and rhyolite at depths from 10 to 50 ft.

The main dam across the river channel will be an embankment of clay, sand and gravel, protected by a heavy rock fill on the downstream slope and by a 3-ft. layer of rock riprap on the upper 54 ft. of the reservoir slope. A dike, in reality a continuation of the dam along the low rim of the reservoir and constructed of the same materials, will have 2 ft. of riprap on the upstream slope but no rock will be placed on its downstream slope. The combined crest length of the dam and dike will be 9,600 ft., the latter having an average height of 10 ft. as compared to the 81-ft. maximum height of the dam.

The spillway, to be constructed through the west abutment, will consist of a concrete-lined inlet structure, with a U-shaped uncontrolled crest, 250 ft. long, and a 600-ft. length of concrete-lined tunnel discharging into the river downstream from the dam. The initial 100 ft. of this tunnel will be an inclined transition from the intake structure and the remainder, or horizontal leg, will have a 13-ft. diameter circular section. Discharge will be 5,000 sec.-ft. with a 3-ft. head on the crest.

A 12-ft. diameter concrete-lined outlet tunnel, about 300 ft. long, will discharge into the spillway tunnel at the base of the inclined shaft. Outlet flow will be controlled by two tandem sets of 5-ft. by 6-ft. high-pressure hydraulically-operated slide gates installed in a tunnel plug. With gates open under full reservoir head the flow will be 3,200 sec.-ft.

Harold L. Ickes, Secretary of the Interior and Federal Public Works Administrator, delegated the design and construction of the project to the U. S. Bureau of Reclamation, Elwood Mead, Commissioner. The work is being supervised by R. F. Walter, chief engineer, with headquarters at Denver. H. A. Parker, construction engineer for this work, has headquarters at Ashton, Idaho.

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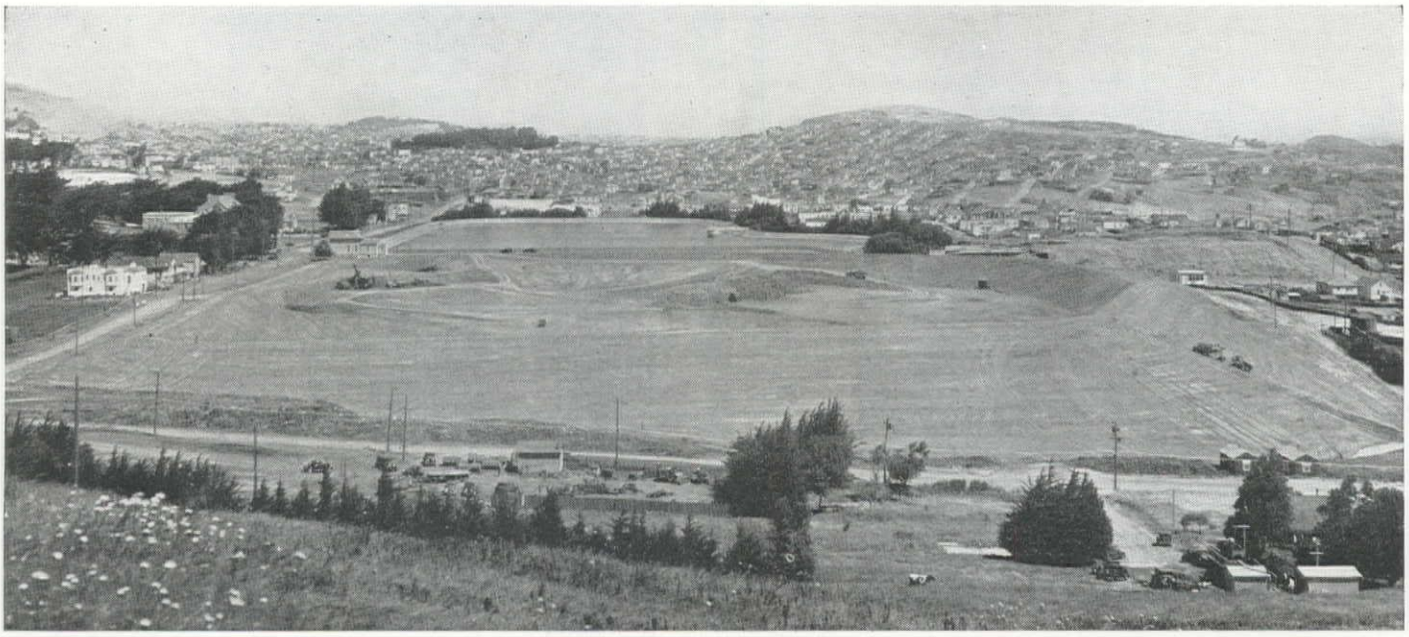
Regional Planning Commission Discussed for San Francisco

Initial steps were taken on July 26 to form a regional planning commission for the 10-county area around San Francisco Bay, at a meeting held in San Mateo, which was attended by representatives from several of these counties. The immediate problems to be considered are rapid transit and highway development in the metropolitan area and the initial program outlined at the meeting would involve organization on the basis of the four counties primarily involved (San Francisco, Alameda, Marin, and San Mateo), with subsequent expansion to take in the adjacent area. The discussion included the need for the planning of recreational areas and the development of a master plan for the region.



Major Improvements for the San Francisco Water System

Program of $12,000,000 well advanced — Work involves many types of construction operations

WORK is about one-half completed on the $12,000,000 program which will provide much needed improvements in the distribution facilities of the San Francisco municipal water supply system. This work is being financed through a PWA loan and grant, authorized by the bond election of Nov. 7, 1933, which approved the issue by a vote of 105,279 to 42,878. The five major items in the program are: (1) Construction of the second bay crossing pipe line about 20 mi. long across the lower end of San Francisco Bay (supplementing the existing line), (2) construction of 15 mi. of 60-in. pipe line from the Crystal Springs Reservoir to the University Mound distribution reservoir in the city, (3) building of the University Mound distribution reservoir to provide a 7-day supply for the downtown district of the city, (4) construction of the new Sunset Reservoir and connecting lines to increase the distribution capacity in the western part of the city and (5) extensive improvement in the distribution mains of the system.

Review of the situation

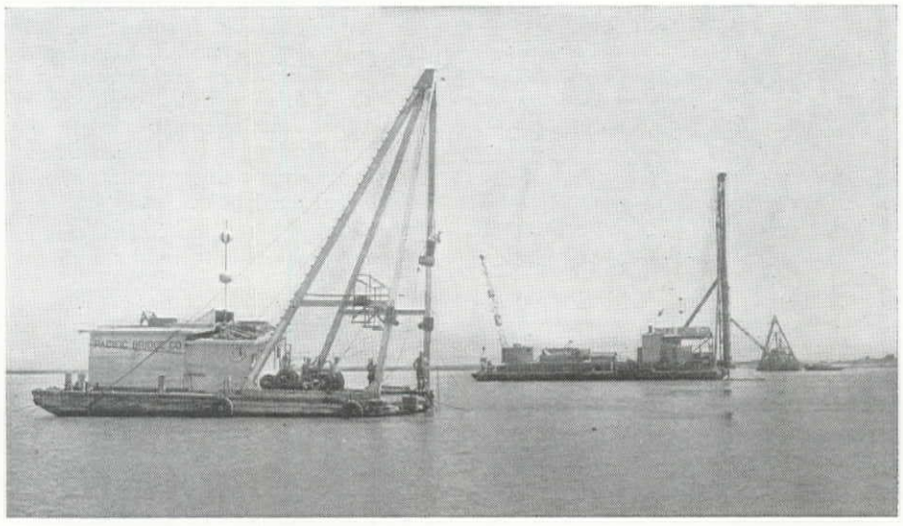
For years prior to the purchase of the Spring Valley Water Co. by the city in March, 1930, the probability of the ultimate transfer to municipal ownership had been a distinct deterrent in the initiating of improvements in the system of the private company. Further, the same reason was instrumental in keeping the city from demanding these betterments because of the resulting increase in purchase price.

As a result, the system, when taken over by the municipality, was not only deficient in facilities designed to take care of future needs, but also was distinctly below normal in local storage and distributional mains from the standpoint of a modern water supply plant. Recognizing this situation, the city set up a program for improvements and replacements to be carried out during a period of several years. During the first year (1931), before the effects of the depression became serious, funds totaling about $500,000 were made available for this purpose and used. The following year the depression produced a very serious effect on municipal and departmental financing and the program was practically halted. Plans for carrying out these improvements were revised when the PWA program was instituted in 1933.

Based on the usual 70% loan and 30% direct grant provision of the PWA plan, the city decided to take up this program of improvements by a bond issue which would take care of 70% of a $12,000,000 program. The election was successful and the bond issue was approved and the work was financed by the PWA.

Bids for the first unit of the work were called in June, 1934, and additional features have been placed under contract progressively during the past year. The progress on this program

Preparatory operations along the line of the Bay Crossing, showing the floating equipment of the Pacific Bridge Co. dredging trench and driving supporting piles.



Excavating the University Mound reservoir site and placing the embankment fill for this 90 m. g. storage which will provide additional pressure and a reserve supply for the business section. Top of p. 236.

and the general features involved are described in the following.

Bay Crossing Pipe Line

Prior to the building of the pipe line now under construction across the lower end of San Francisco Bay, water has been delivered from the Calaveras and Hetch-Hetchy systems through the first bay crossing pipe line, consisting of a 60-in. riveted steel pipe with a 42-in. cast iron submarine section. The capacity of this line is 45 m.g.d. and the new pipe line will raise the capacity of the bay crossing to 114 m.g.d. This second line was essential in securing the added capacity necessary to bring the Hetch-Hetchy supply into the local reservoirs.

Laying 62-in. Lock Joint type of concrete pipe on the Bay Crossing project with a Link Belt crane.

The line consists of the following: (1) about 14¼ mi. of 66-in. welded steel pipe of ⅜ and 7-16-in. plate, of which 3½ mi. is laid on pile trestle bents crossing the salt marshes adjacent to San Francisco Bay; (2) about ¾-mi. of 76-in. welded steel pipe of ½-in. plate on the existing steel truss bridge crossing the shallow water on the westerly side of the bay; (3) two parallel 54-in. submarine lines, each about ½-mi. long, composed of ¾-in. steel plate encased with 6-in. of concrete, crossing the easterly side of the bay; and, (4) about 5 mi. of 62-in. steel cylinder reinforced concrete pipe where soil conditions are adverse.

Looking west toward San Francisco Bay from the Irvington portal of the Coast Range tunnel on the Hetch Hetchy system, showing work of the American Concrete and Steel Pipe Co.

The Western Pipe and Steel Co., contractor for the welded steel sections, has completed about 86% of its contract. The American Concrete and Steel Pipe Co., contractor for the concrete pipe, has completed about 98% of this work. Pile trestle bents, constructed by Barrett & Hilp, are 100% complete. The Pacific Bridge Co., contractor for the submarine sections of the line, has this contract about 17% complete.

Crystal Springs Reservoir

One of the most important improvements was the constructing of a larger delivery line from the Crystal Springs Reservoir, terminal of the Hetch-Hetchy system, to the distribution system. Up to the present time one 44-in. line has carried the supply for about 40% of the city. This condition, combined with the deficiency in distribution reservoir capacity has made a second line from the Crystal Springs Reservoir one of the most urgent features of this program. This work will consist of laying about 15 mi. of 60-in. welded steel pipe line, or equivalent, to deliver water into the new University Mound reservoir. The capacity of the line will be normally 56 m.g.d. It will cost about $2,500,000 and involves the driving of three short tunnels, totaling about 4,000 ft. in length which are already under construction. The contract for the first section of this line will be let soon.

The Crystal Springs pipe line will be divided into two portions for the purposes of construction. The first section to be constructed will be about 10 mi. long and will extend from an existing 54-in. pipe at Millbrae, San Mateo Co., to the University Mound Reservoir in San Francisco. About 4,000 ft. of this line will be tunnels and some 2,000 ft. will be in trench, about 25% being located in paved roads and in the streets of San Bruno and South San Francisco. The second section of the line will be about 5 mi. long and will extend from the Crystal Springs Reservoir to Burlingame, the connecting gap from Burlingame to Millbrae being an existing 54-in. line. The second section of the line will be practically all in trench, about 33% will be in paved streets through Hillsborough.

Barrett & Hilp, contractors for the three tunnels on this line, have driven about 875 ft. to date. No work has been done on the lining, which will consist of a 60-in. welded steel pipe backfilled with about 6-in. of concrete. The contract price for the tunnels was $211,105.

University Mound Reservoir

To provide a storage capacity of about 90 m.g. to serve the downtown area of San Francisco, the new University Mound Reservoir is being built, as part of the program, at a cost of about $1,000,000. It supplements the original University Mound Reservoir at about the same site which has a capacity of 60 m.g. These two reservoirs will provide a 7-day supply for the main business district.

The reservoir covers six city blocks, an area about 840x860 ft. which was excavated out of the hillside and enclosed on two sides by a rolled earth fill. The material from the excavation was used in making the fill. About 420,000 cu. yd. of material was excavated and 170,000 cu. yd. used in making the embankment. This work was carried out by Granfield, Farrar and Carlin Co. of San Francisco at a contract price of $97,025. One of the im-

Typical trenching operations for the cast iron mains which were added to improve the grid system and supplement the existing distribution lines. About 80 mi. of 6 and 8-in. mains have been laid in the present program.

portant features of the embankment construction was the particular care exercised in moisture control to insure maximum compaction. As a result of the careful field and laboratory control, the rolled earth fill has an average weight of 140 lb. per cu. ft. and officials believe that settlement will be negligible.

The second stage in the construction of this reservoir will be the placing of a 5-in. reinforced concrete lining on the bottom and sides and a reinforced concrete roof and outlet tower. This work will involve about 22,000 cu. yd. of concrete and 1,500 tons of steel. Bids for this work will be called soon.

Sunset Reservoir

The Sunset District in the western part of the city has been deficient in not having an adequate distribution reservoir for storage and maintaining of pressures. The present plans call for the construction of a 100 m.g. reservoir, with necessary feeder lines in this district at an estimated cost of about $1,500,000. Plans on this section of the work have not been prepared in detail, but some interesting features will be involved including the foundation problems in dune sand, which contains no binder and is not well graded.

Test borings are being made to determine whether or not suitable material for a rolled embankment may be found on some adjacent city property. The concrete lining and roof structure for the reservoir will be similar to that provided for the University Mound Reservoir. Contract for the excavation and embankment will be let in the near future and after the embankment has been allowed to settle the lining and roof will be built. The supply pipe line for the reservoir, consisting of 8,900 ft. of 54-in. steel pipe, has been completed at a cost of about $155,000.

Extension to pipe line system

One of the major features of the improvement program was the construction of additional feeder mains and a large number of smaller sized laterals to improve the grid system. In many cases these small laterals, which have a minimum size of six inches, replace old pipes 2-in. diameter.

One of the important large sized mains, already completed, extends from the University Mound Reservoir down to the business section. The first section of this line, consisting of 48-in. pipe, was completed about five years ago. The balance, consisting of 44, 36, and 30-in. pipe has just been completed. This line provides additional capacity and pressures in the downtown district. Laying of the welded steel line did not involve any unusual departures from standard practice, but was complicated by construction work on some of the busiest streets in the city; the crossing of Market St. being accomplished by tunneling.

There are also several other main lines ranging in size from 44 to 20-in. which will be constructed to connect up important sections of the system. These lines will practically all be of welded steel construction, with a spun coal tar enamel lining on the inside. The outside of these pipes will be protected with coal tar enamal and a felt wrapping.

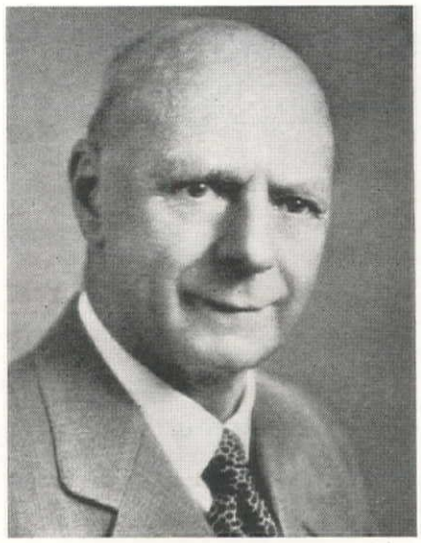
About 80 mi. of cast iron mains 6 to 8 in. in diameter will be laid as part of this program. This work is being carried out in small units of about $30,000 each to permit small contracting organizations to bid. In addition to the 6 and 8-in. mains there will be laid about 20 miles of 12 and 16-in. cast iron pipe, carried out in contracts of about $60,000. The construction procedure is quite standard and does not require any detailed description. To date about 50% of the work on the cast iron mains has been completed.

Organization

Edward G. Cahill is manager of utilities for the San Francisco Public Utilities Commission under whose general direction these improvements are being carried out. N. A. Eckart is general manager and chief engineer of the water department and has general supervision of the program. T. W. Esp is engineer of water production, George W. Pracy is superintendent of city distribution, I. E. Flaa is hydraulic engineer, and O. G. Goldman is assistant superintendent of city distribution. Construction of the Bay Crossing unit is being carried out under the direction of the Hetch-Hetchy Division; L. T. McAfee is chief engineer and L. W. Stocker is the engineer in charge of design.

Handling a 60-ft. length of 44-in. pipe on one of the new connections in the distribution system. This pipe was reclaimed from the emergency connection to the East Bay District system laid several years ago.

Two Prominent Western Engineers Die



D. C. Henny

DAVID CHRISTIAN HENNY, nationally known hydraulic engineer and consultant on many major irrigation and navigation projects built or now under construction in the west, died at his home in Portland, July 15, at the age of 74. His rather sudden death followed an extended inspection tour of western projects and the death of his wife only six weeks before. Mr. Henny led an extremely active professional life since he came to this country from Holland in 1884, three years after graduating from Delft Holland Polytechnic Institute of Civil Engineering. He was born at Arnhem, Holland, Nov. 15, 1860. Prior to his coming to this country he spent three years in drainage, railroad, and bridge work.

His first position in the United States was with the Chicago & Northwestern Railroad. From 1885 to 1887 he served on waterworks construction for the cities of Menominee, Wis., Sterling, Ill., and Oberlin, Ohio. The following years he spent in Colorado on railroad construction work followed by a year's construction work on the Hudson River tunnel. The period between 1888 and 1892, Mr. Henny worked on waterworks construction at Watertown, S. D., New Decatur, Ala., Marion, Ohio, and Provo, Utah.

In 1892 he moved west and for the following ten years was manager and consulting engineer for the Excelsior Wooden Pipe Co. in San Francisco. From 1902 to 1905, Mr. Henny was general manager for the Redwood Manufacturing Co. and during this time he began his long association with the U. S. Reclamation Service. He was supervising engineer for the Pacific Coast Division of the Reclamation Service on the Okanogan, Sunnyside, and Tieton projects in Washington and the Umatilla, Klamath, and Newland projects in Oregon.

The year 1909 he served as consulting engineer for the U. S. Bureau of Reclamation, and from that date until his death he has continued in a similar capacity for the Bureau, while carrying on private practice in irrigation, power, waterworks, flood control, and valuation work. Outstanding projects on which he has acted as a consultant include: Owyhee dam, Bonneville dam, Deadwood dam, Gibson dam, Fort Peck dam, Grand Coulee dam, and Boulder dam. He was also a consultant for the Los Angeles County Flood Control District.

During Mr. Henny's long career he gave much time to professional societies, having been a director and vice-president of American Society of Civil Engineers and served on the following investigation committees: arch dams, high dams, irrigation hydraulics, and mass concrete (American Concrete Institute). He was appointed to the advisory committee of the Reconstruction Finance Corporation in 1932 and was also chairman of the Oregon State Planning Board. Mr. Henny was especially active in studying the problem of power disposal from the Bonneville project, in an effort to attract new industries to the Northwest.

He was twice elected president of the Technical Society of the Pacific Coast, Oregon Society of Engineers and Oregon Technical Council. He was also a member of the Professional Engineers of Oregon and of the Royal Institute of Engineers of Holland.

William Mulholland

WILLIAM MULHOLLAND, builder of the Owens River aqueduct and outstanding water supply engineer of the west, died at his home in Los Angeles, July 22, at the age of 79. In addition to building the aqueduct from the Owens River, which provided Los Angeles with the water supply essential for the city's present growth, Mr. Mulholland visioned, and laid the ground work for the Colorado River Aqueduct now being carried forward by the Metropolitan Water District. He served as chief engineer and general manager of the Bureau of Water Works for the City of Los Angeles from 1886 to the time of his retirement a few years ago.

Mr. Mulholland was born in Belfast, Ireland, Sept. 11, 1855 and was educated in the Christian Brothers School in Dublin. After spending four years at sea as a sailor before the mast, he landed in San Francisco at the age of 19 and shortly after visited Southern California and accepted a job boring a well at Los Angeles. This marked the beginning of his work in the field of water development. He soon entered the employ of the City Water Co., a concern which served water to the town of Los Angeles. His first official title was that of zanjero—the Spanish term for ditch tender—and he combined his work for the company with long hours at reading books in the field of civil engineer and hydraulics. Mr. Mulholland rose through the ranks of this organization until in 1866 he was made general superintendent.

In 1902, the city of Los Angeles took over the property of the City Water Co. and in that year Mr. Mulholland became chief engineer of the municipal system. Almost immediately the need for a larger supply of water to take care of the growth of the city became apparent and he turned his energy to a survey of possible sources of supply. With a team of mules and an old buckboard he made a field trip over 500 miles of deserts and mountains along the route of the present Owens River Aqueduct. As a result of this survey, later checked by more detailed studies, bond issues were voted: $1,500,000 in 1905 and $23,000,000 in 1907. Work on the aqueduct was started in 1908 and completed in 1913. The physical features of this 230-mile aqueduct, its many siphons, which were of unusual size for that time, the hardships of construction work in the desert, and the critical problems involved in financing, are well known to engineers in the west. As a result of constructing this aqueduct the city of Los Angeles was assured a water supply for a future population of 1,000,000.

About a decade after the completion of the Owens River Aqueduct, Mr. Mulholland appreciated the approaching need for a far greater water supply for Los Angeles and the surrounding area. He again took up the search for water supply possibilities and concluded that the Colorado River must be the source of the ultimate water supply for the Los Angeles area. In 1923 he began a systematic survey to determine the

most practical route for aqueduct from the Colorado River to Los Angeles. The data resulting from the studies made by the water department of the city, under the direction of Mr. Mulholland, were turned over to the Metropolitan Water District for its use after this organization was formed.

In the spring of 1928 occurred the break of the St. Francis Dam, an event which proved his true qualities as a man. Following this disaster, Mr. Mulholland publicly accepted all of the blame for the disaster, personally, and took on his own shoulders the public reaction which a smaller man might easily have shifted to others. Undoubtedly this act demonstrated the sterling quality of Mr. Mulholland as the building of the Owens River aqueduct demonstrated his abilities as an engineer.

In December, 1928, he resigned his position after about 50 years of continuous service and was succeeded by H. A. Van Norman, the present chief engineer and general manager of the Department of Water, Los Angeles. Mr. Mulholland was retained in a consulting capacity following his resignation.

In 1914 the University of California conferred upon him the honorary degree of Doctor of Law. He was a member of American Society of Civil Engineers and numerous other engineering organizations.

San Francisco Engineers Visit Bridge Cable Spinning Operations

ABOUT 400 members and guests of the San Francisco section of the American Society of Civil Engineers visited the cable spinning work on the San Francisco-Oakland Bay Bridge as an excursion held July 27. The section was the guest of Columbia Steel Co., contractor for the entire bridge superstructure, including cables, and made special arrangements to permit the engineers to view these operations.

Following a luncheon at the Engineers' Club, attended by more than 300, brief talks were given describing the manufacture of the wire being used for these cables and the process of cable spinning. The party then visited the plant of the Columbia Steel Co. where the wire, which arrives from the east in 3,500-ft. coils, is spliced and wound on reels holding about 60 mi. of continuous wire. After viewing these operations, the party went to the San Francisco anchorage and there was taken out on to the first section of catwalks in small groups accompanied by guides. The interest in the bridge work and particularly the cable spinning operations, which are new to the west, is indicated by the attendance at this excursion.

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Personally Speaking . . . . .

A. H. Ayers, who has been chief engineer for Six Companies Inc., on their Boulder Dam operations since the beginning of the project in 1931, has been transferred to Oakland, Calif. as chief engineer and secretary for the executive committee of that organization.

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Major James A. Dorst, Corps of Engineers, U.S.A. has been assigned to the position of district engineer at San Francisco and will report at his new position about September 20. Major Dorst succeeds the present district engineer, Lieut. Col. H. A. Finch.

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Louis F. Vaile of Vacaville has been appointed supervising engineer for six CCC camps in northern California. The camps over which Mr. Vaile will have supervision are located, at the present time, in Vacaville, Lompoc, Arroyo Grande, Sebastopol, and two in Santa Cruz County.

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T. J. B. Shanley, Butte, Mont., has been made chairman of a regional Works Progress Advisory Board to supervise federal work in the eleven western states. Members of the board which will be composed of either three or five, will be appointed later.

A. E. McKennett, senior engineer, on the Bonneville project, succeeds Mr. Grimm as head engineer in the second district of the North Pacific division. Until a few months ago, when he was made assistant chief engineer for the Bonneville section, Mr. McKennett was in charge of highway and railroad work on this project. Col. T. M. Robins is division engineer and Maj. Charles F. Williams is district engineer.

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Claude I. Grimm, chief civilian engineer of the Bonneville project since work started in 1932 has been made head engineer for the North Pacific Division, U. S. Engineers, effective August 1. Prior to his work on the Bonneville project, Mr. Grimm had been head engineer in the division engineer's office at San Francisco. His new work will include a study of irrigation, storage, and flood control on the Willamette valley recently authorized with a $200,000 appropriation by the federal government.

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John C. Gist is superintendent for T. E. Connolly and Hanrahan Co. on the foundation work for the dam being built on the Mad River for the Eureka water supply project.

Western Highway Funds Allocated

THE ALLOCATION of highway and grade separation funds to the western states from the Emergency Relief Appropriation Act of 1935 is as follows :

State	Highways	Grade Separation
Arizona	$ 2,569,841	$ 1,256,099
California	7,747,928	7,486,362
Colorado	3,395,263	2,631,567
Idaho	2,222,747	1,674,479
Montana	3,676,416	2,722,327
Nevada	2,243,074	887,260
New Mexico ..	2,871,397	1,725,286
Oregon	3,038,642	2,334,204
Utah	2,067,154	1,230,763
Washington ..	3,026,161	3,095,041
Wyoming	2,219,155	1,360,841
Total.....	$35,078,000	$26,404,000

In addition to this amount a total of $17,988,000 will be spent in this region on highways from the unappropriated balance as provided in the Hayden-Cartwright Act of 1933.

Of the funds apportioned to any state under the act, not less than 25% must be applied to secondary or feed-

er roads of the first classification, roads outside of municipalities, and metropolitan areas not included in the state highway system or federal-aid system. Not less than 25% of the funds must be applied to projects within municipalities or metropolitan areas located on the federal-aid highway system or extensions thereof, or on secondary or feeder roads of the third classification. The remaining percentage of a state's apportionment may be applied to projects on the federal-aid system or to secondary projects of the second classification located on the state highway system, but not included in the federal-aid highway system.

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Difficult Pilot Bore Completed On Section of Valverde Tunnel

Crews of the Dravo Contracting Co. have holed through a pilot drift between Shaft No. 2 and No. 3 on the Valverde tunnel of the Colorado River Aqueduct. This work represents one of the most difficult accomplishments on the aqueduct, with the tunnel encountering water bearing sand which necessitated the use of 16x16 in. timbers set "skin tight".

This tunnel is located south of Riverside and is the last underground section on the west end of the aqueduct. The two headings, totaling about 2 mi. in length, came together with an error of only ¼ in. in grade and ¾ in. in alignment. The difficulty encountered with the heavy, water bearing sand is indicated by the fact that the use of shields under pneumatic pressure, was seriously considered at one time. The operations of the Dravo Co. on this work have been under the direction of Fred Youmans, superintendent.

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Employment Record on PWA Work at Pocatello, Idaho

A record of continuous employment relief has been maintained at Pocatello, by PWA projects, according to J. Vernon Otter, acting state director, for Idaho. The first actual construction operations began on a water works project in Alameda, a suburb of Pocatello in June, 1934. This work consisted of building a new distribution system and a steel tank, costing about $34,000, and provided 8,300 man-hours of employment. On June 26, 1934 work was started on a reservoir costing $110,000, and two weeks later extensive repairs were undertaken on the distribution system. To date, more than 154,000 man-hours have been provided by these PWA projects in Pocatello.

On July 10, 1935, a further allotment of $43,000 was made to the city for the construction of a trunk sewer which will extend the record of PWA employment for an additional period.

DISTRIBUTOR and Manufacturer NEWS

Air Reduction Sales Company Opens Portland Store

The Portland branch of Air Reduction Sales Company announced the opening on July 15 of a new and enlarged store at 13 Northwest Fourth avenue. This move from their long established location at Third and Glisan streets is designed to better serve the trade and provide larger quarters for a complete line of welding and cutting supplies, both acetylene and electric, in the Northwest. This firm handles oxygen, acetylene, nitrogen and hydrogen welding and cutting apparatus and supplies, Wilson electric welding machines and welding rods, the Airco National carbide for flare lights and lanterns. The main office in Portland is located at 2949 Northwest Front Avenue.

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Gardner-Denver Branch Moves to Seattle

The Northwest branch office of the Gardner-Denver Co. has removed its offices from 333 S. W. Pine St., Portland to 1028 Sixth Ave. South, in Seattle, and will be in charge of Carl R. Grimm. The new headquarters are located in the offices of the Feenaughty Machinery Co., who are to handle Gardner-Denver products in their various branches located in Portland, Seattle, Spokane and Boise.

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Wood Appointed Reo Director For Western States

With the appointment of Wilmer Wood, formerly Los Angeles sales manager, as new sales director for the western states, the Reo Motor Car Co. distributes its supervision to three centers. Wood will handle fourteen western states and the Hawaiian Islands. Reo has been supplying trucks to the construction industry for many years, and through this new arrangement will strengthen their service to this region.

Wilmer Wood

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Western Steel Moves to Larger Plant

Western Steel & Equipment Corporation of Portland, Oregon, recently leased the 18-ac. property site and buildings of Pacific Car & Foundry Company of Seattle at 734 N. E. 55 Avenue and have moved its sales offices and warehouse from the former location on Southwest First Avenue. The new facilities include two warehouses totalling 41,000 sq. ft. of area in addition to a completely equipped machine shop for overhauling all types of construction and logging equipment. A railroad spur connects with the Union Pacific main line which borders the property.

Z. A. Toye

Western Steel & Equipment Corporation will act as exclusive agents for Pacific Car & Foundry for Oregon for its line of railroad equipment, forgings and structural steel. The following lines of construction equipment complete their distribution. Lima Locomotive Works (shovel and crane division); E. H. Edwards Co., wire rope; Magor Car Corporation, dump cars; American Locomotive Company; Hewitt Rubber Company, hose; and Ingersoll-Rand Company, air compressors and air tools.

Western Steel & Equipment Corporation was organized in 1930. Z. A. Toye is president; Earl Olson, vice-president; and F. G. Lamy, secretary-treasurer. Toye is well known in the construction industry of the northwest having been in the equipment business in Seattle prior to his coming to Portland 15 years ago. He headed his own company, Pacific Equipment Corporation previous to the formation of the present firm.

Albert Lehman

Albert Lehman, Blaw-Knox Chief Dies

After a prolonged illness, Albert Carl Lehman, Chairman of the Board and founder of the original unit of the Blaw-Knox Company, died July 24th at 7:35 a.m. at his residence in Pittsburgh. He was in his fifty-seventh year.

Although he has not been active in business because of ill health for the past nine months, Mr. Lehman was prominent in the steel industry as the head of the Blaw-Knox Company, which he was largely instrumental in building from a small manufacturing unit to a leading independent fabricator of steel specialties. His tireless and aggressive efforts in behalf of the company he organized in 1906 as the Blaw Collapsible Steel Centering Company are a matter of common knowledge in the industry. He served the company first as Vice-President, and later as President, continuing in this capacity until recently when he was lected as Chairman of the Board; this office being created by the Board as a mark of appreciation for his efforts in the Company's behalf.

Mr. Lehman was a Trustee and a member of the Finance Committee of Carnegie Institute and a Trustee of Carnegie Institute of Technology. He was a member of the American Civic Association, and a member of the Engineers' Society of Western Pennsylvania.

Albert Carl Lehman was born in Pittsburgh, October 14th, 1878; educated in the Pittsburgh Public Schools and in the Stone School at Boston, entering Harvard in 1897. He was graduated in 1901 with the degree of Bachelor of Arts. Five years later he organized the original company which has grown into the Blaw-Know organization.

While Lehman was never directly associated with the construction industry in this region, his influence and never tiring efforts greatly affected every construction company. The industry has lost a real leader, and the Blaw-Knox Company stands as a monument to an individual who has contributed so much to the developments which benefit all.

NEW Materials and EQUIPMENT

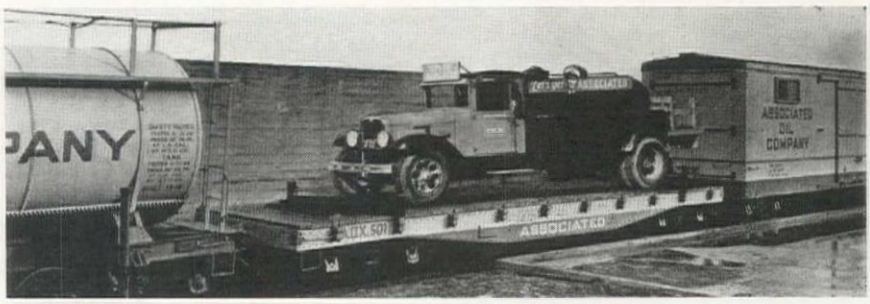
Portable Gasoline Distributing Station

Trucking gasoline and other petroleum products over long distances to large projects goes into the past with develment by Associated Oil Company of a train of four special railroad cars constituting a complete portable distributing plant which can be run to the scene of a construction project.

The new plant, the first of its kind developed, ordinarily comprises two 12,000 gallon tank cars; a flat car on which is carried a tank truck, pumping plant, rails and ties and a portable loading rack; and a specially fitted boxcar used as a combination warehouse and office. However, any number of tank cars may be used if additional commodities are required by the job.

The Portable Distributing Plant is a new idea for the servicing of remotely located projects. It was designed by George W. Hastings, operating manager, and B. G. Brown, superintendent of construction and maintenance for Associated.

When a large project such as the laying of railroad tracks, the building of a new road or the erection of a dam is to be serviced with Associated products, and the location is a considerable distance from a company plant, the new Portable Distributing Plant is brought in. A temporary spur track is laid using the ties and rails carried as part of the equipment, the tank truck is unloaded and the loading rack set up, and delivery service to all parts of the project are immediately inaugurated.



Speeder Tractor Shovel

The Speeder Tractor Shovel has all the mobility of a "Caterpillar" tractor. It travels at speeds upwards to nearly 5 miles an hour under its own power and will negotiate grades and ditches and soft ground. Fast in operation; Speeder patented crowd for shovel operation; anti-friction bearings; simple, extra heavy construction; easy one man operation. The shovel boom length is 14 feet and the dipper stick 11 feet; crane and dragline booms are 22 feet long.

The tractor is the "Caterpillar" Diesel 40 manufactured by the Caterpillar Tractor Company, Peoria, Illinois. The shovel mechanism is manufactured and mounted on the tractor in the speeder factory at Cedar Rapids.

● You may have a problem such as this, with a combination of conditions challenging the ingenuity of the engineer. Here, in an isolated spot, far from sources of supply, was a crossing calling for wide, clear waterway, considerable height, greater than usual loading. The requirements were low first cost, simplicity of erection, and assured low maintenance. ● Add to these expectations the possibility of salvage, when the "service life" of the bridge is ended, and you have the reasons why California Redwood was used.

CALIFORNIA REDWOOD ASSOCIATION 405 Montgomery St. San Francisco

NATURALLY DURABLE CALIFORNIA REDWOOD

When writing to CALIFORNIA REDWOOD ASSOCIATION, *please mention Western Construction News.*

Giant Clam-Shell Bucket

The Wellman Engineering Company, Cleveland, Ohio, has recently designed and built an entirely new type heavy-duty, Williams Clam-Shell Dredging Bucket which is illustrated. This bucket, which is of 3½ cubic yards capacity, weighs over 20,000 pounds. It is constructed of welded alloy-steel, normalized for grain structure; heat-treated shafting; alloy-steel rivets and manganese steel teeth. It was designed to handle heavy rock in the removal of breakwaters. Illustration shows it removing an 18-ton piece of concrete (almost twice the weight of the bucket itself) from 15 feet of water.

The welded design utilizing alloy-steel made possible increased strength with a minimum weight and produced a bucket-structure with more ductility and impact values than are present with the use of steel castings.

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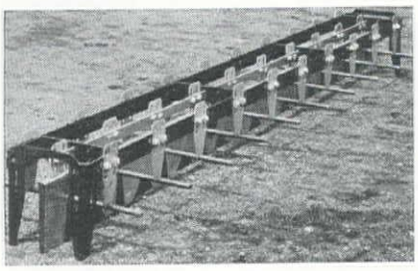

Expansion Joint Spotter Assures Perfect Alignment

A combination dowel, tie-bar and expansion joint spotter has been developed by the Flexible Road Joint Machine Co., Warren, Ohio. The frame holds the dowel bars in parallel alignment and keeps the expansion joint vertical while materials are being set. By the movement of a series of cams the frame can be released and then carried to another joint. By keeping the dowel bars parallel the frame reduces the cracking of the concrete behind the dowel bars. The joint spotter is of light weight and can easily be handled by workmen.

UNIT BID SUMMARY . . . .

Note: These Unit Bids Are Extracted from Our Daily Construction News Service

Dam Construction

Casper, Wyoming— Govt.—Seminoe Dam and Power Plant

Winston Bros., 1470 Northwestern Bank Bldg., Minneapolis, Minn., $2,194,007, low to Bureau of Reclamation, Casper, Wyo., for const. the Seminoe Dam and Power Plant, to be located about 33 mi. northeast of Rawlins, Wyo., on North Platte River, Casper, Wyo., Alcova Project, under Spec. 630. Dam is to be massive concrete arch type, 260 ft. high, 540 ft. crest length, 89 ft. thick at base and 15 ft. thick at top. Bids from:

(1) Winston Bros., Minneapolis.....$2,194,007
(2) J. C. Maguire Co., Butte..... 2,638,073
(3) W. E. Callahan Const. Co.....$2,665,285
(4) General Const. & J. F. Shea..... 3,056,363

	(1)	(2)	(3)	(4)
L. S. diversion and care of river	$65,000	$16,145	$50,000	$175,000
130,000 cu. yd. excav. strip, sand and grav. deposits	.12	.175	.12	.21
9,000 cu. yd. excav. strip canyon walls	3.00	6.00	6.20	1.70
1,100 cu. yd. com. excav. (spillw. inlet and outlet)	.80	1.22	.66	1.30
27,000 cu. yd. rock exc. (spillw. inlet and outlet)	1.50	4.00	1.65	2.60
22,000 cu. yd. exc. (spillw. tunn. and float-well shaft)	8.00	20.00	12.40	9.00
95,000 cu. yd. com. excav. (dam founda. and power house)	.75	1.50	1.40	1.20
100,000 cu. yd. rock excav. (dam founda. and power house)	2.40	2.50	2.73	3.60
50,000 cu. yd. com. excav. (tailrace)	.75	1.00	1.00	.50
25,000 cu. yd. rock excav. (tailrace)	2.00	2.00	2.83	2.10
9,300 cu. yd. com. excav. (roads)	.80	1.00	.50	.65
11,400 cu. yd. rock excav. (roads)	1.80	3.00	1.50	4.50
260 cu. yd. gravel surfacing on roads	2.50	2.00	3.30	5.25
5,600 cu. yd. backfill	.75	.50	1.10	1.80
1,000 cu. yd. riprap	2.00	.50	1.65	2.60
300 cu. yd. rubble masonry	10.00	10.50	9.00	7.30
4,600 lin. ft. drill grout holes up to 25 ft.	1.50	1.00	3.05	4.00
1,400 lin. ft. drill grout holes up to 50 ft.	2.00	1.00	3.15	4.85
4,500 lin. ft. drill grout holes up to 100 ft.	2.75	1.50	3.25	5.65
14,000 lin. ft. drill grout holes over 100 ft.	3.50	2.00	3.35	6.50
28,000 cu. ft. pressure grouting (foundations)	1.00	1.00	1.25	2.00
1,600 cu. ft. pressure grout (contr. jts. and cool system)	2.00	1.00	1.40	5.00
200 lin. ft. drill drain holes up to 25 ft.	4.00	1.00	2.90	7.25
2,300 lin. ft. drill drain holes up to 50 ft.	4.50	1.00	3.00	6.50
180 lin. ft. const. 4" sewer pipe dr. (emb. por. conc.)	.70	1.00	.55	1.60
80 lin. ft. const. 6" sewer pipe dr. (emb. por. conc.)	.80	1.00	1.10	2.50
200 lin. ft. const. 6" sewer pipe dr. (emb. in grav.)	.50	1.00	.55	4.00
150 lin. ft. const. 12" sewer pipe dr. (emb. in grav.)	.70	1.00	1.10	4.80
7,000 lin. ft. mfg. and place porous conc. drain tile	.50	.32	.75	.85
90 cu. yd. porous concrete	7.50	8.80	8.80	17.00
100 lin. ft. const. weep holes except in tunnel	1.00	1.00	.90	1.75
300 lin. ft. drill weep holes in tunnel	1.00	1.00	.90	4.00
800 lin. ft. drill holes for anchor and grout bars	1.00	1.00	.90	4.00
163,000 cu. yd. concrete in dam	4.70	3.33	5.42	5.85
260 cu. yd. concrete in curbs and parapets	17.00	11.80	16.25	18.00
4,200 cu. yd. concrete in trashrack structures	12.00	12.70	16.00	18.00
4,200 cu. yd. concrete in spillway gate struc. below elev. 6403	12.00	30.00	20.00	15.00
320 cu. yd. concr. in spillway gate struc. above elev. 6403	30.00	15.50	25.00	50.00
4,600 cu. yd. conc. (spillw. tunn. and float-well shaft)	13.00	20.00	13.00	20.00
60 cu. yd. conc. spillw. gate counterweight)	12.00	14.00	11.00	20.00
12,400 cu. yd. conc. (power plant bel. generat. floor)	11.50	20.00	10.00	16.00
1,300 cu. yd. conc. (power plant abv. generat. floor)	21.00	20.80	25.00	45.00
340 cu. yd. conc. (paving)	7.00	11.30	10.00	7.50
2,550,000 lb. plac. reinforcem. bars and fabric	.017	.025	.025	.02
7,500 sq. yd. spec. finish of concrete surf.	.60	.40	.55	.50
7,000 lin. ft. inst. met. seal strips (contr. jts.)	.30	.20	.45	.50
45,000 lb. inst. contrac. joint grout pipe	.12	.075	.11	.17
160,000 lb. inst. met. tubing, etc. (concr. cool. sys.)	.10	.055	.09	.16
L. S. Furn., install and operate concr. cooling plant	$25,000	$29,552	$26,000	$14,000
800 lin. ft. install metal sealing strips in contraction joints	.30	.40	.45	1.50
3,800 lin. ft. install metal sealing strips in contraction joints	.30	.20	.45	.65
400 sq. ft. install expansion joint filler	.40	.25	.65	1.00
800 lin. ft. install 4" split sewer pipe drains in contr. joints	.40	.40	.65	1.60
350,000 lb. install spillway gates, gate frames counterweight guides	.02	.035	.033	.025
100,000 lb. inst. spillw. gate hoists and mechanism	.03	.085	.044	.035
970,000 lb. inst. trashrack metal work	.01	.035	.027	.02
140,000 lb. inst. penstock bulkhead gate, etc.	.025	.05	.028	.045
412,000 lb. inst. paradox gates and mechanisms	.017	.035	.022	.035
339,000 lb. inst. power penstocks and outlet pipes	.025	.035	.022	.035
116,000 lb. inst. needle valves and mechanisms	.017	.05	.022	.05
178,000 lb. inst. traveling and gantry cranes	.025	.07	.022	.035
29,000 lb. inst. track rails	.025	.035	.022	.05
11,000 lb. erect struc. steel in powerhouse	.02	.035	.022	.03
192,000 lb. inst. metal tubing, pipe fittings, etc.	.10	.07	.055	.05
8,400 sq. ft. inst. asph. saturated felt roofing	.15	.10	.22	.20
100 sq. yd. const. hollow walls of metal lath	2.00	2.50	2.20	2.00
130 sq. yd. const. suspended ceilings	2.00	2.00	3.30	2.50
400 sq. yd. painting concrete walls	.50	.50	.55	.25
150 cu. yd. light weight conc. in floors	8.00	5.50	18.00	20.00
2,840 sq. yd. place bonded concr. floor finish	1.50	2.00	1.10	1.00
500 sq. ft. install membrane waterproofing	.25	.20	.17	.25
16,000 lb. install metal stairways	.07	.05	.05	.10
36,600 lb. install metal floor plates and gratings	.03	.04	.05	.635
3,500 lb. install sump pumps and accessories	.04	.115	.11	.06
660 sq. ft. install metal accordion doors	.60	.50	.45	1.00
460 sq. ft. install metal swinging doors	.70	.50	.45	1.00
2,100 sq. ft. install metal sash windows	.50	.25	.45	.75
4,000 lb. install metal sash window operators	.07	.10	.13	.10
150 sq. ft. install metal partitions	.80	1.00	.44	1.50
67,000 lb. install misc. metal work	.10	.05	.14	.07
200 sq. ft. install wooden doors	.50	.50	.35	.50
900 lb. install plumbing fixtures, etc.	.10	.20	.28	.30
12,700 lin. ft. install electrical metal conduit not larger than 1¼"	.15	.20	.22	.20
11,400 lin. ft. install electrical metal conduit over 1¼"	.20	.25	.28	.30
1,600 lin. ft. install elec. fiber conduit	.15	.15	.28	.30
3,000 lb. install ground wires and rods	.15	.20	.11	.20
10,000 lin. ft. install elec. cable for resistance thermometers, etc.	.10	.15	.11	.20
30,000 cwt. transporting freight of all kinds for Govt.	.30	.44	1.10	.40

Partners with Winston Bros. were: Utah Construction Co., Ogden; Bechtel Co., San Francisco; Morrison-Knudsen Co., Boise, and Henry J. Kaiser Co., Oakland.

Illustrations at left and center show equipment operated by W. E. Callahan Construction Company and Gunther & Shirley, who have contracts for Sections 1 to 6, inclusive, of the All-American Canal. At right is a bucket operated by Boyce and Igo, a sub-contractor on Section 3. "HERCULES" (Red-Strand) Wire Rope is on the job.

There Is Action On the All-American Canal

Big jobs, hard jobs, and "HERCULES" (Red-Strand) Wire Rope are well known combinations in the construction industry, for contractors have found that the remarkable dependability of this wire rope helps to keep their costs on a lower and more uniform basis.

There are reasons why this is so, and we would be glad to give full particulars to every one interested in reducing and stabilizing their wire rope expense.

And the qualities that make "HERCULES" (Red-Strand) Wire Rope a money saver on the big jobs enable it to work with like economy on the smaller jobs. It is not only able to handle a large tonnage for each dollar of its cost, but its long life makes renewals less frequent.

We invite your inquiries. Feel free to consult us regarding any wire rope problem that may be bothering you.

Made Only by A. LESCHEN & SONS ROPE CO. **Established 1857**

5909 Kennerly Avenue, St Louis, Mo.

Pacific Coast Office and Warehouse: 520 Fourth St., San Francisco
Portland Warehouse: P. O. Box 175. Telephone ATwater 7425

Western Distributors

Billings	Connelly Machinery Company
Boise	Olson Manufacturing Company
Glasgow	Wm. H. Ziegler Co., Inc.
Idaho Falls	Westmont Tractor & Eqpt. Co.
Los Angeles	Garlinghouse Brothers
Missoula	Westmont Tractor & Eqpt. Co.
Phoenix	Pratt-Gilbert Hardware Co.
Salt Lake City	Z. C. M. I.
Seattle	H. J. Armstrong Company
Spokane	Nott-Atwater Company

New Type Scraper

The Continental Wagon Scraper is a combination scoop-up and carry scraper; a hauling dump wagon and a distributing unit. All operations are performed with only one handling of the material. The material hauled can be deposited in any desired manner. In addition to windrowing and stock-piling, this unit will dump backward, truck fashion. All dirt is dumped to the rear of the machine, making it valuable for backfilling against bridges, abutments or dumping entirely over a fill. It will scoop its own load; or it can be used in a fleet of dump wagons or motor trucks under an elevating grader, power shovel or drag line. They can be pulled into loading position, or backed into position up steep banks and through soft soils.

The Wagon Scraper is carried on two low-pressure pneumatic-tired wheels, which are mounted on high grade roller bearings. All operations of the Wagon Scraper are controlled hydraulically by one lever convenient to the operator. The Continental Wagon Scraper is manufactured by the Continental Roll & Steel Foundry Company, general offices in East Chicago, Indiana.

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Riddell Announces The Warco Road Hog Power Grader

The W. A. Riddell Company, Bucyrus, Ohio, is now marketing what they term "the grader of tomorrow." It embodies many new features of design. It is made in two sizes, constructed so that all standard makes of tractors may be used. A two speed variable control power lift gives faster movement to the blade, cross shift, circle turning and scarifier at normal r.p.m. of the motor, or at low throttle, the action is as fast as that of the conventional types when power lever is on high speed, the manufacturers state. The circle size has been increased to 61-½" with adjustable take-up to eliminate all chatter. Externally, the Road Hog presents a strikingly modern appearance, including a roomy turret top cab with adjustable upholstered seat.

Casper, Wyoming—Govt—Earth & Rockfill Alcova Dam

W. E. Callahan Const. Co., Kirby Bldg., Dallas, Texas, and Gunther & Shirley, 206 S. Spring St., Los Angeles, $1,482,651, low to Bureau of Reclamation, Casper, Wyo., for const. the Alcova Dam, to be located on the North Platte River about 30 mi. southeast of Casper, Wyo. Dam is to be earth and rockfill type, about 235 ft. high, crest length 900 ft., and crest width of 40 ft., under Spec. No. 590. Bids from:

(1) W. E. Callahan and Gunther & Shirley.....$1,482,651
(2) Martin Wunderlich Co.....$1,523,083
(3) Winston Bros., Minneapolis..... 1,555,711
(4) S. J. Groves & Sons, Minneapolis 1,633,493
(5) J. A. Terteling & Sons, Boise..... 1,717,898
(6) Geo. Pollock, Sacramento..... 1,821,391
(7) Peterson, Maguire & Lawler..... 1,977,854
(8) John Marsch, Inc., Chicago..... 2,988,991

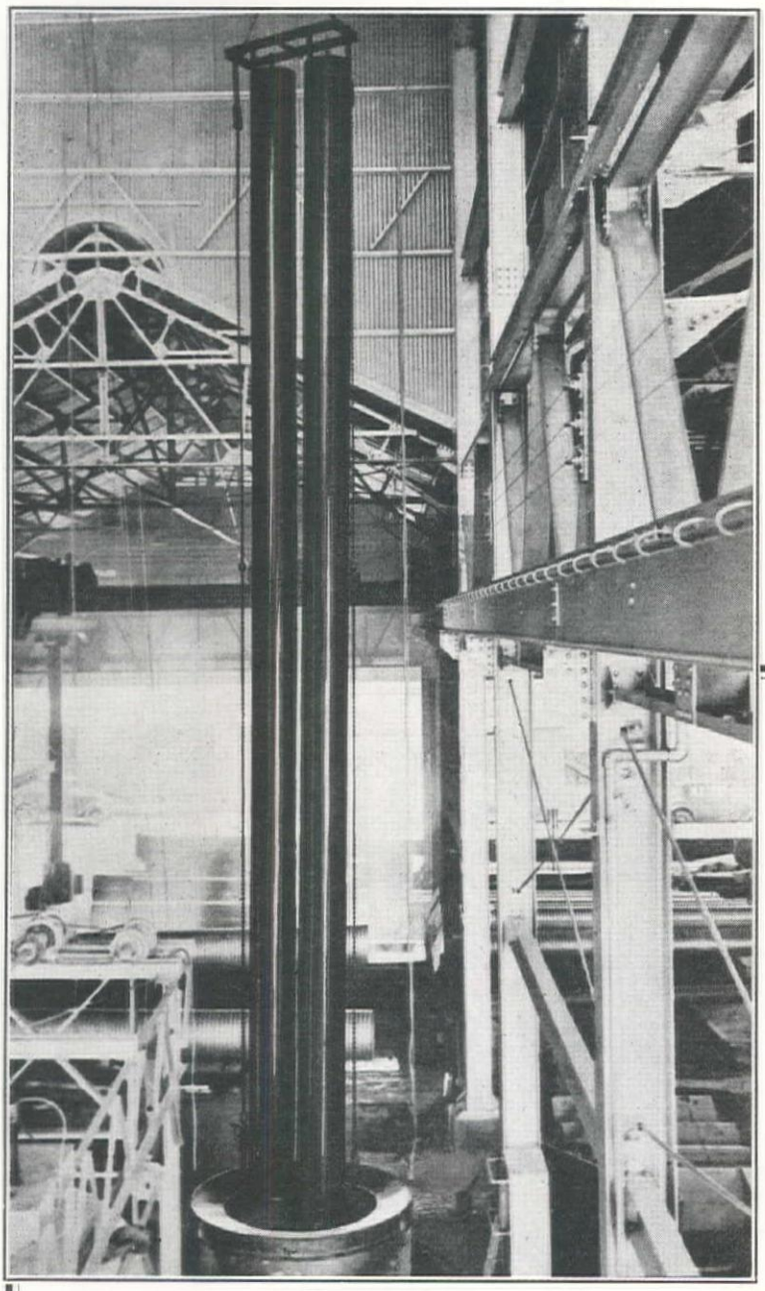
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.S. diversion and care of river.....	$28,000	$20,000	$55,000	$45,000	$20,000	$25,000	$4,000	$805,000
5,000 cy. exc. sand and grav. dep.	.30	.16	.20	.27	.50	.10	.30	.35
52,500 cy. exc. strip bor. pits.....	.25	.16	.20	.27	.30	.10	.30	.68
127,000 cy. com. exc. strip embank..	.25	.60	.50	1.10	.70	1.20	1.50	.75
200 cy. rock exc. strip embankm.	7.00	5.00	5.00	3.00	10.00	5.00	15.00	25.00
200 cy. com. exc. emb. toe drains	2.00	3.00	1.50	2.00	2.00	.80	5.00	2.50
350 cy. rock exc. emb. toe drains	3.50	4.00	3.00	4.00	5.00	5.00	15.00	20.00
500 cy. rock exc. (open trench)..	10.00	8.00	5.00	5.00	20.00	8.00	15.00	20.00
250 cy. rock exc. (open cut)....	5.00	4.00	5.00	5.00	20.00	5.00	15.00	20.00
1,720 cy. exc. (dr. tunn. & shaft)	9.00	20.00	16.00	15.00	30.00	15.00	15.00	40.00
45 cy. rock exc. (trrack str.)..	10.00	10.00	6.00	5.00	20.00	3.00	7.65	20.00
17,500 cy. com. exc. (spillway).....	.27	.30	.40	.40	.75	.50	1.50	1.50
281,000 cy. rock exc. (spillway)....	.81	1.00	.85	1.00	.75	.85	1.50	1.50
40 cy. exc. (outlet works).....	4.00	3.00	6.00	2.00	10.00	5.00	7.40	5.00
1,103,700 cy. com. exc. (bor. pits)....	.26	.30	.28	.24	.28	.26	.275	.20
63,000 cy. rock exc. (bor. pits)....	.70	1.10	.80	.75	.75	.70	.50	1.50
1,500 cy. backfill	.70	1.00	1.00	.50	.50	1.50	.50	1.50
20 cy. grav. fill under floors...	2.00	2.00	3.00	2.00	2.00	3.00	.50	2.50
1,500 cy. riprap (spillw. outlet)..	1.50	1.50	2.00	1.00	1.50	3.00	1.50	2.50
935,300 cy. earthfill embank.....	.80	.08	.07	.10	.08	.10	.09	.15
127,000 cy. sand, grav. & cobble fill	.07	.25	.14	.20	.20	.12	.25	.25
388,000 cy. rockfill (downstr. embm.)	.10	.20	.17	.20	.15	.30	.55	.25
61,000 cy. riprap (upstream emb.)	.45	.30	.40	.50	.25	.50	.50	2.50
275 cy. grav. fill (trashrack str.)	2.50	2.00	3.00	2.50	10.00	3.00	.50	2.50
1,000 ft. drill A gr. holes to 50 ft.	2.60	.90	1.40	1.50	4.00	2.00	2.00	4.00
2,800 ft. drill A gr. holes to 100'	2.60	1.20	1.60	1.75	5.00	2.50	2.00	4.00
3,200 ft. drill A gr. holes to 150'..	2.60	1.30	1.80	2.00	6.00	3.00	2.00	4.00
3,700 ft. drill B gr. holes to 25'...	2.00	.80	1.00	.90	1.00	1.50	2.00	2.00
2,800 ft. drill B gr. holes to 50'...	2.00	.90	1.15	1.00	1.50	3.00	2.00	2.25
34,000 ft. drill B gr. holes to 100'..	2.00	1.10	1.25	1.25	3.00	3.00	2.00	2.50
2,000 ft. drill B gr. holes to 150'..	2.00	1.20	2.00	1.50	3.50	4.00	2.00	3.00
1,600 ft. drill B gr. holes to 250'..	2.00	1.50	2.50	1.75	4.50	5.00	2.00	3.00
10,000 ft. holes for founda. grtng	2.00	2.00	2.00	3.50	2.00	5.00	2.00	1.25
16,000 lb. inst. grout pipe & fitngs	.20	.08	.10	.15	.10	.10	.15	.10
150,000 cu. ft. pressure grouting ...	.55	.40	.65	.75	.80	1.00	1.00	1.50
2,800 ft. drill drainage holes.....	2.50	1.00	2.00	.90	4.00	2.50	1.50	2.00
100 ft. weep holes.....	.90	.50	1.00	2.00	1.00	.50	.60	3.00
3,700 ft. drill holes for bars.....	1.00	.50	.75	1.35	1.00	.50	.60	1.00
1,300 ft. 15" clay pipe drains....	.50	1.50	1.00	1.35	1.50	1.00	1.00	1.00
400 ft. 12" clay pipe drains....	.40	1.00	1.00	1.00	1.50	1.00	1.00	1.00
200 ft. 8" clay pipe drains.....	.30	1.50	1.00	1.00	1.00	.80	1.00	1.00
1,250 ft. 6" clay pipe drains.....	.30	1.25	.80	.90	1.00	.80	1.00	1.00
3,000 ft. 4" clay pipe drains.....	.30	1.00	.80	.85	1.00	.80	1.00	1.00
50 cu. yd. porous concrete.....	7.00	10.00	10.00	4.00	12.00	10.00	10.00	5.00
1,460 cy. concrete (cutoff walls)..	15.00	12.00	13.50	7.75	18.00	20.00	15.00	20.00
320 cy. concrete (cutoff wall)...	8.00	7.00	9.00	9.00	12.00	20.00	15.00	12.00
275 cy. concrete (drain. gallery)	11.00	11.00	12.50	15.00	12.00	20.00	15.00	15.00
730 cy. conc. (dr. tun. & shafts)	16.00	12.00	15.00	15.50	14.00	20.00	15.00	18.00
920 cy. conc. (gate chamb. etc.)	16.00	20.00	12.00	11.00	14.00	20.00	10.00	18.00
300 cy. conc. (trashrack struc.).	20.00	15.00	17.50	20.00	50.00	20.00	10.00	28.00
330 cy. con. (outl. wks opr. hse)	20.00	14.00	26.50	24.00	25.00	15.00	15.00	35.00
500 cy. conc. (parapet, etc.)....	16.00	16.00	18.00	9.50	10.00	15.00	10.00	15.00
8,860 cy. conc. (spillw. lining)...	8.00	8.00	9.00	6.00	10.00	9.00	9.00	7.00
10,970 cy. concr. (spillway).....	16.00	11.00	13.75	12.75	12.00	12.00	9.50	11.00
300 cy. conc. super struct.).....	20.00	30.00	26.00	20.00	25.00	15.00	10.00	25.00
6,000 sq. yd. fin. conc. surfaces...	.60	.40	.70	.75	.50	.50	.25	.45
2,200,000 lb. plac. reinf. bars.....	.02	.013	.017	.015	.015	.0125	.01	.0125
82 sq. yd. inst. conc. floor, etc.	1.00	2.00	1.50	1.00	1.00	1.00	1.00	1.50
130 sq. ft. inst. corkbd cont. jts.	.30	1.00	.30	.25	.50	.30	.50	.10
544 sq. ft. install roofing.....	.20	.40	.50	.25	.50	.25	.50	.30
504,000 lb. inst. spillway gates, etc.	.02	.013	.0225	.0125	.03	.025	.01	.02
225,000 lb. inst. spilw. gate hoists..	.03	.016	.03	.015	.04	.05	.01	.02
165,000 lb. inst. trashrack metalwk..	.02	.015	.02	.05	.15	.02	.01	.08
346,000 lb. inst. HP hydr. oper. gates	.04	.015	.025	.0125	.03	.025	.01	.02
5,300 lb. inst. HP gate con. appr.	.15	.10	.10	.08	.15	.05	.01	.05
368,400 lb. inst. needle valves.....	.04	.015	.025	.0125	.03	.02	.01	.02
55,000 lb. inst. cranes, hoists, etc...	.04	.02	.025	.01	.05	.06	.01	.02
33,500 lb. inst. met. stairways, etc.	.04	.02	.06	.06	.05	.05	.01	.05
32,600 lb. inst. met. tub & std. pipe	.10	.03	.10	.20	.05	.04	.01	.10
7,000 lb. inst. met. air piping....	.10	.08	.10	.25	.05	.10	.01	.10
1,400 ft. inst. met. water stops...	.40	.30	.30	.50	.20	.25	.10	.25
405 sq. ft. inst. metal doors.....	.40	.30	.80	.50	1.00	.55	.10	.22
504 sq. ft. inst. met. sash windw.	.50	.50	.50	.20	1.00	.20	.10	.22
35,000 lb. inst. miscell. met. work..	.15	.10	.08	.08	.06	.05	.01	.10
2,000 ft. inst. 1½" met. conduit..	.20	.08	.20	.25	.30	.20	.10	.25
1,500 ft. inst. same over 1½" dia.	.30	.10	.25	.30	.30	.30	.10	.30
3,000 ft. inst. elec. fiber conduit..	.25	.08	.25	.20	.30	.10	.10	.25
L.S. inst. elec. conductors.....	$600	$300	$1000	$1500	$2000	$2000	$1000	$200

Yuma, Ariz.—Govt—Concrete Aggregates—All American Canal

Triangle Rock & Gravel Co. and Chas. Holmes, Highland Ave., San Bernardino, $149,900, low to Bureau of Reclamation, Yuma, Arizona, for preparation of concrete aggregate at Station 90 of the All American Canal, Boulder Canyon Project, Arizona-Calif.-Nevada, under Spec. 663. Bids on:

(1) 60,000 cu. yd. stripping grav. deposit
(2) 98,000 cu. yd. prepare stockp. sand
(3) 55,000 cu. yd. prepare stockp. gravel
(4) 56,000 cu. yd. prep. stockp. grav. ½-1"
(5) 32,000 cu. yd. prep. stockp. grav. 1 to 1½"
(6) 19,000 cu. yd. prep. stockp. grav. 1½ to 3"

	(1)	(2)	(3)	(4)	(5)	(6)	Totals
Triangle Rock & Gravel Co. and Chas. Holmes....	.18	.535	.535	.535	.535	.535	$149,900
Acme Gravel Company, San Antonio, Texas.....	.06	.64	.64	.64	.64	.64	170,000
V. R. Dennis Const. Co., San Diego.....	.05	.50	.78	.78	.78	.78	178,360
Pacific Rock & Grav. Co., H. G. Fenton Matls....	.01	.65	.65	.70	.85	.84	182,410
Imperial Rock Corporation, Los Angeles.....	.16	.62	.69	.73	.73	.71	186,040
Becker County Sand & Gravel Co., Crosby, Minn.	.15	.70	.70	.70	.70	.70	191,000
Griffith Co., Los Angeles.....	.18	.71	.71	.71	.71	.71	195,400
W. E. Callahan Const. Co., Los Angeles.....	.05	.70	.79	.79	.79	.79	199,580
Ray Schwietzer, Los Angeles.....	.20	.79	.79	.79	.79	.79	217,400
Consolidated Rock Products Co., L. A.....	.20	.65	.75	.75	1.50	.75	221,200
White & Miller, Tucson, Arizona.....	.10	.84	.84	.84	.84	.84	224,400
Boyce-Igo, Yuma, Arizona.....	.20	.87	.87	.87	.87	.87	238,200
Peninsula Paving Co., San Francisco.....	.10	.90	.90	.90	.90	.90	240,000
M. E. Gillioz, Monett, Missouri.....	.50	.90	.80	.70	1.10	.85	252,750
Morrison-Knudsen Co., Los Angeles.....	.25	.94	.94	.96	.96	.96	261,540



The illustration shows two 40-foot lengths of Calco SPI-WELD Pipe being lifted from their full-length asphaltic bath.

VERTICAL DIPPING

...as important as PRE-HEATING to the user of SPI-WELD PIPE.....

BEFORE dipping, Calco, Spi-Weld Pipe is preheated to remove the moisture always present at atmospheric temperatures Then it is *vertically* dipped to insure an even, tightly-adherent coating. SPI-WELD, you'll find, is made to be the pipe of *practical efficiency*.

Write or phone for complete information or a representative's call!

CALIFORNIA CORRUGATED CULVERT CO
West Berkeley Los Angeles

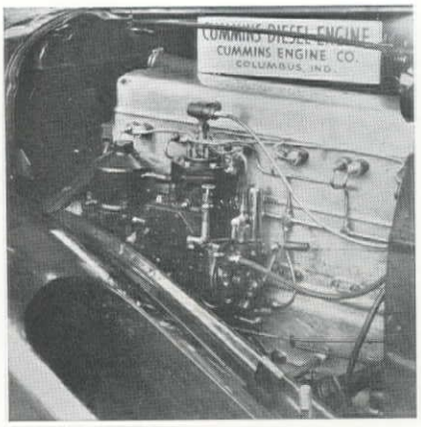
HARDESTY MANUFACTURING CO.
DENVER, COLO.
Salt Lake City, Utah Pueblo, Colo.
Missoula, Mont. Boise, Ida.
Sidney, Montana

WESTERN METAL MFG. CO.
Box 1585 Phoenix, Arizona

PURE IRON CULVERT & MFG. CO.
2321 S. E. Gladstone St., Portland

WASHINGTON CORRUGATED CULVERT CO.
Formerly the
SPOKANE CULVERT & TANK CO.
Seattle Incorporated 1910 Spokane
H. H. HAZELWOOD, Representative
P. O. Box 777, Olympia, Wash.

WESTERN METAL MFG. CO.
HOUSTON
El Paso San Antonio Dallas



New Diesel Engine Proven Practical for Wide Use

C L. Cummins, President of Cummins Engine Company, of Columbus, Indiana, arrived in Columbus in his Diesel-powered Auburn Convertible Phaeton, which is the first standard American passenger car to be equipped with a standard production model Diesel engine. The engine in this car is 6 cylinders and rated at 85 horsepower at 2,200 r.p.m.

For the 966 miles from New York to Columbus, Indiana, the Cummins-powered Auburn averaged 38.6 miles per gallon, which verifies Mr. Cummins' estimate that a transcontinental trip could be made for less than $8.00 fuel cost.

The weight of the car, as it was originally equipped with a gasoline engine, was 4,100 lbs., and the weight of the Diesel being only 80 lbs. more than the gasoline engine. The speed of the car is around 85 miles per hour maximum, and in a good many cases speeds of 75 miles an hour for considerable stretches were easily negotiated.

The significance of this development is far reaching, because it thoroughly demonstrates the flexibility, acceleration, light weight, freedom from smoke, and dependability of this new high speed light weight engine. It has a distinct bearing on the light truck and general industrial fields. This power unit will be in regular production for other than automotive service during the next two to three months. It is felt by those who have studied the design of the engine that the success of it is due to the Cummins Fuel Injection System which consists of a low pressure pump, a distributor, and the injectors in the cylinder head. This has made possible uniform metering of fuel oil to each cylinder, which in turn results in smooth operation.

●

Combination Electric Tool

A new idea in the construction of portable electric tools is embodied in the new Wodack "Do-All" combination electric hammer and drill. The hammer mechanism is so constructed that there are only two working parts, both of which are made of specially treated steels to give long life. The motor is of the universal type with forced draft ventilation, and the tool may be operated from any light socket. By simply open-

(*Continued*)

River and Harbor Work

Seattle, Wn.—Govt—Grays Harbor Jetty

Contract awarded to Columbia Const. Co., Lewis Bldg., Portland, $358,610, by U. S. Engr. Office, Seattle, for placing 80,000 tons stone for rebuilding part of south jetty, const. of an unloading wharf, trackage connect. wharf with base of jetty, tramway on enrockment of old jetty and furn. and install. 2 derricks, 1 track scales, a scalehouse and garage for 1st unit of Grays Harbor jetty project. Bids received from:

(1) Columbia Const. Co. $358,610
(2) L. Romano Engrg. Corp. 371,036
Engineer's estimate 393,000
(3) Winston Bros. and Kern & Kibbe... $377,153
(4) Puget Sound Bridge & Dredg. Co... 407,126

	(1)	(2)	(3)	(4)
36,000 lin. ft. Douglas Fir piling	.60	.50	.40	.70
69,000 lin. ft. Hemlock piling	.38	.45	.32	.45
3,000 lin. ft. Douglas Fir piling cut-off	.30	.15	.20	.30
5,000 lin. ft. Hemlock piling cut-off	.19	.15	.15	.18
12,200 ea. railroad ties	1.20	2.25	1.10	.80
1,096 M ft. BM lumber	45.00	40.00	40.50	55.00
41,500 lb. drift bolts	.05	.0975	.039	.045
43,000 lb. machine bolts w/washers	.06	.11	.054	.06
49,600 lb. boat and wire spikes	.05	.1135	.052	.06
31,400 lb. railroad spikes	.05	.097	.038	.05
460 S tons 70 lb. rail, w/fittings	30.00	40.00	34.00	36.00
6 ea. turnouts complete	200.00	300.00	283.00	300.00
16,600 lin. ft. ⅝" wire cable	.06	.25	.027	.075
580 ea. steel straps on jetty tramway	1.00	1.25	.69	1.10
1,000 lb. miscellaneous steel	.25	.15	.07	.10
550 ea. metal pile shoes	1.50	1.00	1.09	3.00
5,140 ea. anti-rail creepers	.35	.50	.33	.36
22,000 cu. yd. embankment	.30	1.00	.30	.20
80,000 S tons rock in jetty	2.28	2.10	2.87	2.79
2 ea. derricks installed on wharf	$10,000	$3,000	$3,500	$4,500
1 ea. track scales	$7,000	$7,000	$8,800	$8,400
1 ea. scale house	600.00	500.00	$1,000	$1,000
1 ea. garage for track speeder	225.00	200.00	200.00	200.00

Tunnel Construction

Los Angeles, Calif.—San Rafael Nos. 1 and 2 Tunnels

Contract awarded to L. E. Dixon Co., Bent Bros., and Johnson, Inc., 609 S. Grand Ave., L. A., $503,145 Sch. No. 1 and $658,459 Sch. No. 2 by Metropolitan Water Dist., L. A. for const. San Rafael Nos. 1 and 2 tunnels and east portion of Monrovia Tunnel, Spec. No. 107. Bids from:

	Sch. No. 1	Sch. No. 2
(1) L. E. Dixon, Bent Bros. and Johnson, Inc., L. A.	$503,145	$658,459
(2) J. F. Shea, Mecca, Calif.	596,574	660,251
(3) S. S. Magoffin, Adrian, Ore.	599,960	745,670

	Sch. No. 1	Sch. No. 2
(4) West Const. Co.	$622,910	$730,469
(5) Morrison Knudsen Co.	643,545	747,244
(6) Winston Bros., L. A.	685,885	852,529
(7) Broderick & Gordon	775,705	856,009

SCHED. No. 1—San Rafael Nos. 1 and 2 tunnels, length 9,738 ft., diam. 10 ft. lining rein. conc.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
5,000 cu. yd. excavation	$1.50	$ .92	$1.60	$1.75	$1.00	$ .75	$2.00
55,000 cu. yd. excav. in tunnel	5.35	6.70	7.00	7.07	6.85	6.90	8.30
100 cu. yd. exc. for tunn. enlarg.	10.00	10.35	11.00	10.00	10.00	15.00	10.00
300 tons erecting stl. support	20.00	40.00	45.00	55.00	45.00	70.00	55.00
390 M. ft. BM furn. and pl. perm. timb.	35.00	57.50	50.00	50.00	80.00	95.00	50.00
100 cu. yd. gunite coating of rock	20.00	20.00	20.00	25.00	20.00	12.00	25.00
6,500 lin. ft. drilling grout holes	.40	.60	.50	.60	.85	.50	.60
1,300 connections for grouting	1.00	2.30	2.25	2.25	2.00	3.15	2.25
475 cu. yd. mixing and placing grout	25.00	18.00	25.00	25.00	20.00	20.00	25.00
1,450,000 lb. pl. reinf. steel	.01	.01	.011	.015	.01	.016	.015
25,000 cu. yd. concr. in tunnel	5.85	6.15	5.39	5.75	7.15	7.85	5.75
3,600 ton mi. hauling steel	.20	.09	.10	.10	.20	.40	.10
25,000 ton mi. hauling cement	.06	.08	.07	.05	.10	.17	.05

SCHED. No. 2—Monrovia No. 4 tunnel. East portion, length 5,240 ft., dia. 10 ft., lining reinf. concrete; west portion, length 2,856 ft., dia. 9 ft. 9 in., lining of steel cylinder with concrete backing and inner lining of gunite.

2,000 cu. yd. excav. in approach	$1.00	$1.55	$2.00	$2.00	$1.50	$1.85	$2.00
45,000 cu. yd. excavation in tunnel	7.50	7.72	8.50	9.85	8.00	9.85	10.25
100 cu. yd. excav. for tunnel enlargm.	10.00	10.35	10.00	14.00	10.00	15.00	11.00
275 tons erecting steel support	20.00	40.00	57.00	50.00	45.00	70.00	40.00
375 M. ft. BM furn. and pl. perm. timbers	35.00	57.50	50.00	60.00	80.00	95.00	60.00
100 cu. yd. gunite coating of rock	20.00	20.00	25.00	20.00	20.00	12.00	30.00
5,000 lin. ft. drilling grout holes	.40	.60	.60	.50	.85	.50	1.00
1,000 connections for grouting	1.00	2.30	2.25	2.25	2.00	3.15	2.50
400 cu. yd. mixing and placing grout	25.00	18.00	25.00	25.00	20.00	20.00	25.00
504 lin. ft. furn. and install ¼" stl. cyl.	27.00	27.82	22.50	23.30	29.50	29.00	33.50
539 lin. ft. same 5/16" pl. stl. cyl.	29.00	29.40	24.75	24.70	31.50	30.00	35.30
539 lin. ft. same ⅜"	32.00	33.08	27.25	27.70	35.50	34.00	39.70
555 lin. ft. same 7/16"	35.00	35.44	30.00	29.70	38.50	36.00	42.65
539 lin. ft. same ½"	37.50	38.43	33.00	32.20	42.50	39.00	46.00
185 lin. ft. same 9/16"	42.00	43.70	36.50	36.60	48.00	44.00	52.60
1,800,000 lbs. pl. reinforcement steel	.01	.01	.015	.015	.01	.016	.015
14,120 cu. yd. concr. in tunnel	6.50	6.32	7.50	5.50	8.00	8.05	8.40
6,875 cu. yd. concr. behind cylinders	6.50	6.32	6.75	5.00	8.50	7.70	8.20
2,861 lin. ft. gunite lining, stl. cyl.	12.00	4.60	10.00	8.00	10.00	12.50	6.00
3,100 ton mi. hauling steel	.20	.09	.20	.10	.25	.55	.05
17,000 ton mi. hauling cement	.06	.08	.10	.07	.10	.19	.05

Salt Lake City, Utah—Govt—Ephraim & Spring City Tunnels

Morrison-Knudsen Co., 319 Broadway, Boise, Idaho, $162,434. SCHED. 1; Case Const. Co., Inc., 905 Westminster Ave., Alhambra, $172,487. SCHED. 2; and Case Const. Co., Alhambra, $334,176 (only bil SCHED. 3, low bids to Bureau of Reclamation, Salt Lake City, Utah, for constructing the Ephraim Tunnel and Spring City Tunnel, Ephraim and Spring City Divisions, Sanpete Project, Utah, under Spec. 602. Bids received from:

SCHED. 1—EPHRAIM TUNNEL:

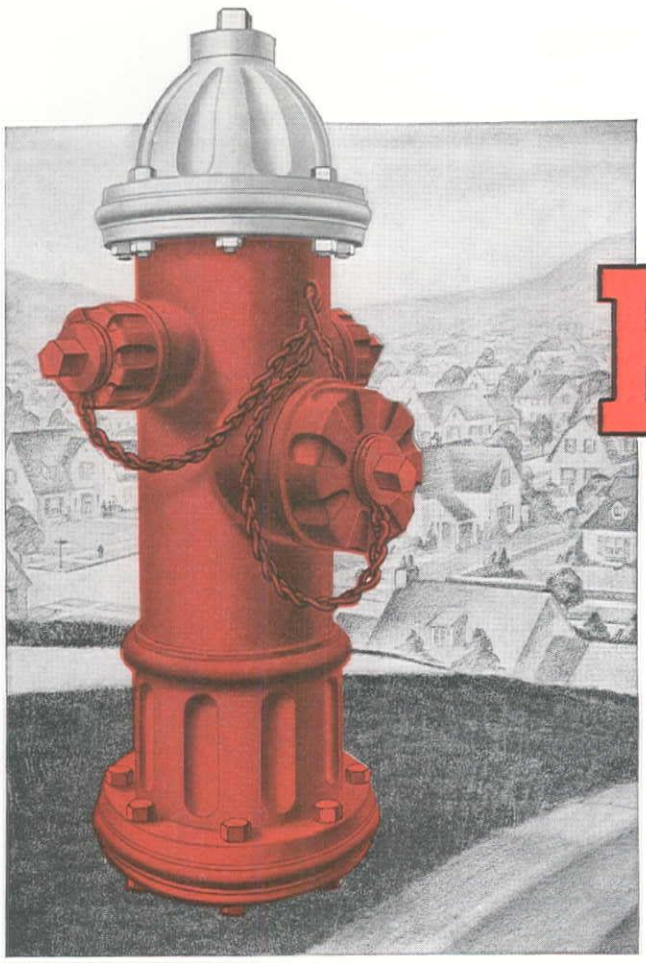
(1) Morrison-Knudsen Co., Inc. $162,434
(2) W. W. Clyde & Co., Springville..... 166,400
(3) Case Const. Co., Alhambra..... 168,334
(4) S. S. Magoffin Co., Inc..... 174,755
(5) Siems-Spokane Co., Spokane..... 204,661

	(1)	(2)	(3)	(4)	(5)
100 cu. yd. excav. open cut Class 1	2.50	2.00	1.50	1.00	1.25
200 cu. yd. excav. open cut Class 2	2.50	2.00	1.50	1.00	2.00
1,500 cu. yd. excav. open cut Class 3	2.50	2.00	2.50	1.25	2.00
9,440 cu. yd. tunnel excav. all classes	14.85	15.50	15.60	16.00	19.40
10 M. ft. BM furn and erect perm. timb. in tunnel	150.00	80.00	95.00	150.00	130.00
340 cu. yd. concrete in tunnel lining	32.50	27.00	30.00	36.00	30.00
5,200 cu. ft. gunite tunnel coating	1.00	1.25	1.10	1.50	1.25

SCHED. 2—SPRING CITY TUNNEL. Bids from:

(1) Case Const. Co., Alhambra..... $172,487
(2) Morrison-Knudsen Co., Inc. 218,482
(3) Siems-Spokane Co., Spokane..... $227,432

(Continued on next page)



BUILT

to give more years of better service

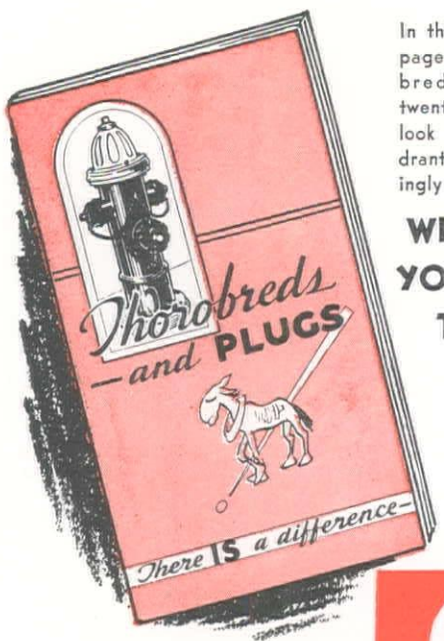
GOOD news travels fast. Wherever Columbian Fire Hydrants have been installed the word has gone out that they are built to work right under all conditions—always.

Examine the Columbian and you will see why it has won the admiration of those who use, maintain, or purchase hydrants. Start at the operating end. The dry top construction with the perpetual self-oiling feature is a long step ahead. There is no possibility of freezing in the bonnet or freezing of the operating nut—no jambing of the threads due to faulty oiling—no corrosion of the stem threads because they are constantly protected by an oil film—no drying out of the packing because it is constantly moistened by oil.

Now go down to the business end. The simple, finely built drain valves assure complete drainage and eliminate all possibility of freezing in the barrel. The main valve of special chrome-tanned leather has twice the life of ordinary valves. A bronze bushing in the shoe provides bronze to bronze threads for the seat ring and makes removal easy. A special copper gasket prevents leaking at the seat ring threads. Since the Columbian is a compression type hydrant, water is shut off *only when repairing main valve!*

And last, but not least, note the Columbian Safety Flange and Coupling at the ground line. It not only cuts the cost of breakage by trucks and automobiles from about $50.00 to $5.00. It also provides an inexpensive way of lengthening hydrants when grades are changed—an ideal way of swiveling nozzles or changing from hose to steamer nozzles at lowest cost and without digging. This will be your final reason for installing Columbians.

Columbian has found the answer to your fire hydrant troubles.



In this pocket-size 64-page booklet, "Thorobreds—and Plugs," twenty-seven points to look for in fire hydrants are interestingly presented.

WRITE FOR YOUR COPY TODAY

COLUMBIAN IRON WORKS
Chattanooga, Tennessee
Division of MUELLER CO.
Decatur, Illinois

COLUMBIAN

FIRE HYDRANTS

ing the chuck and loosening a cap screw, the hammer member may be removed and the tool used as an electric drill, with a capacity of ⅜" in metal. It may also be used as a portable grinder and buffer. When used as a hammer with star drills the tool drills holes in concrete and masonry up to 1⅜" diameter, and by using special tools it does chipping, chiseling, cutting and vibrating. This combination tool will be found useful by contractors, maintenance departments and installers of equipment using expansion bolts and similar concrete fastenings. It is manufactured by Wodack Electric Tool Corporation, 4627 W. Huron St., Chicago, Ill.

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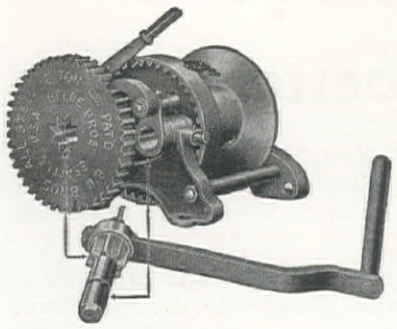

New Two-Ton Beebe Hoist Announced

A new two-ton capacity lightweight hand hoist has been announced by Beebe Bros., 2724 Sixth Avenue south, Seattle. This hoist is a small reproduction of the five-ton general utility hoist and includes the patented instant gear change and positive internal brake. The entire unit weighs only 63 lb. and has a 4-in. cable drum 6 in. wide with a capacity of 300 ft. of ¼-in. cable or 75 ft. of ½-in wire rope. The internal gear main drive minimizes friction and eliminates any exposed drum gears to foul lines. The hoist has two speeds, with a 4:1 cranking ratio for light loads.

●

Surface Material Spreader

A new machine for the spreading of all kinds of surfacing material is announced as the Buckeye Surface Material Spreader. On a job where ½" mesh stone was spread at the rate of ten pounds per square yard in a strip 9 feet wide, a variation of only 500 pounds in a mile, less than 1% variation from absolute accuracy, was noted, the manufacturers state.

A spirally grooved feed roll is driven through a reversing transmission, from the shaft supporting the wheels on which the spreader rides. Each revolution of the feed roll deposits an exact amount of material, and since the forward movement of the spreader controls the speed of the feed roll, variations in the speed with which the spreading is done does not affect the accuracy of the spreading. The volume of material being spread is

(*Continued*)

600 cu. yd. excav. open cut, Class 1	1.50	2.00	1.50
200 cu. yd. excav. open cut, Class 2	1.50	2.00	1.50
500 cu. yd. excav. open cut, Class 3	2.50	2.00	2.00
7,000 cu. yd. excav. in tunnel, all classes	17.20	19.50	23.00
50 M. ft. BM furn. and erect perm. timber in tunnel	100.00	150.00	130.00
50 lin. ft. lay 6" drain pipe with cem. joints	1.00	1.00	1.30
1,875 cu. yd. concrete in tunnel lining	23.00	37.50	30.00
14 cu. yd. concr. (portal struc. and transitions)	37.50	37.50	35.00
1,300 lb. place reinforcement bars	.05	.05	.05
500 cu. ft. gunite tunnel coating	1.50	1.50	1.50
20 cu. yd. backfill about structures	1.00	1.00	2.00
10 cu. yd. puddle or tamp backf. about struc.	1.50	1.00	1.00
25 sq. yd. dry rock paving	3.50	6.00	2.50

SCHED. 3—EPHRAIM AND SPRING CITY TUNNELS. Bid from:

(1) Case Construction Co., Alhambra, Calif. (only bid) $334,176

EPHRAIM TUNNEL	(1)		
100 cu. yd. excav., Cl. 1	1.50	7,000 cu. yd. excav. tunnel	17.20
200 cu. yd. excav., Cl. 2	1.50	50 M. ft. BM furn. and erect timber	100.00
1,500 cu. yd. excav., Cl. 3	2.50	50 ft. lay 6" drain pipe	1.00
9,440 cu. yd. excav., tunnel	15.60	1,875 cu. yd. concrete tun.	20.00
10 M. ft. BM fur. and erect timber	95.00	14 cu. yd. concrete	37.50
340 cu. yd. concrete tun. lining	27.00	1,300 lb. place reinf. bars	.05
5,200 cu. ft. gunite coating	1.10	500 cu. ft. gunite coating	1.50
SPRING CITY TUNNEL		20 cu. yd. backfill	1.00
600 cu. yd. excav., Cl. 1	1.50	10 cu. yd. puddle or tamp backfill	1.50
200 cu. yd. excav., Cl. 2	1.50	25 sq. yd. dry rock paving	3.50

Denver, Colo.—City—Tunnels & Siphon—S. Boulder Div. Conduit

Utah, Bechtel, Morrison, Kaiser Co., Almont, Colo., $447,337, low to Board of Water Commissioners, Denver, Colo., for tunnels Nos. 3, 4 and 5, transitions at the tunnel portals and bench flume, a concrete flume and siphon, and foundations for siphon No. 2 and 3 of the South Boulder Diversion Conduit. Work is located on South Boulder Creek approx. 2 miles above Eldorado Springs in BOULDER COUNTY, Colo. Bids from:

(1) Utah, Bechtel, Morrison, Kaiser $447,337
(2) S. S. Magoffin, Adrian, Oregon 459,580
(3) Peter Serrie, Denver $493,397
(4) Engineer's estimate 453,399

	(1)	(2)	(3)	(4)
577 cu. yd. com. exc. for grading Siphon lines 2 and 3	1.00	1.50	2.00	1.00
198 cu. yd. rock exc. for grading Siphon lines 2 and 3	2.25	3.00	2.60	2.00
1,361 cu. yd. dry and wet com. exc. (Founda. siphons and flumes)	2.75	2.50	3.00	1.50
1,258 cu. yd. rock exc. dry and wet (Founda. siphons and flumes)	5.00	4.00	3.90	3.50
2,952 cu. yd. com. exc. in trench for Siphon No. 3	2.00	1.70	2.40	.40
984 cu. yd. rock exc. in trench for Siphon No. 3	3.50	2.50	4.50	2.00
29,534 cu. yd. excav. for tunnels Nos. 3, 4 and 5	9.50	10.00	10.00	10.00
171 M ft. BM timbering for tunnels Nos. 3, 4 and 5	$100	80.00	90.00	90.00
314 cu. yd. concrete in founda. for siphons 2 and 3	12.00	15.00	20.20	15.50
810 cu. yd. concrete in transitions and flumes	20.00	20.00	22.60	20.00
3,478 cu. yd. concrete in tunnel linings Nos. 1 and 2	12.00	14.00	17.65	15.50
858 cu. yd. concrete in tunnel linings Nos. 3 and 4	15.00	14.00	19.95	15.50
100 cu. yd. cement gunite in tunnels Nos. 3, 4 and 5	15.00	25.00	25.00	30.00
1,250 lin. ft. steel pipes for grouting	.60	.60	1.00	1.00
150 cu. yd. grout in tunnels Nos. 3, 4 and 5	25.00	27.00	20.00	35.00
104,500 lb. reinforcing steel	.05	.05	.06	.055
425 lin. ft. copper seal or expansion joints	.75	1.00	1.50	1.00
L. S. Water tight doors, manh., etc. (transit, flume and Tun. 3)	$1000	$1200	$1485	$920
1,132 lin. ft. precast concrete pipe	36.50	32.00	36.00	23.00
L. S. Gate valv., CIP, vitr. pipe, etc. (Siphon No. 3)	$575	$1000	$1050	$700
100 cu. yd. riprap for Siph. 2 and 3 and Flume No. 1	2.50	2.00	4.00	5.00

Irrigation and Reclamation

Ogden, Utah—Govt—Earthwork—Ogden-Brigham Canals

J. A. Terteling & Son, 2223 Fairview Ave., Boise, $156,091. SCH. 1, and Utah Const. Co. and Morrison-Knudsen Co., Box 726, Ogden, Utah, $197,429 SCH. 2 (as stated our issue of July 8), low to Bureau of Reclamation, Ogden, for const. earthwork, canal lining and struc. Sta. 0 to Sta. 587, Ogden-Brigham Canal, Ogden River Proj., Utah, under Spec. No. 623. Bids received from:

	SCH. 1	SCH. 2	Combined Total
(1) J. A. Terteling & Son, Boise, Idaho	$156,091	$204,354	$360,446
(2) Utah Const. Co. and Morrison-Knudsen Co.	170,049	197,429	367,479
(3) Gunther & Shirley, Los Angeles*	197,293	174,641	371,934
(4) Siems-Spokane Co., Spokane, Wn.	166,718	218,668	385,386

*Will accept both schedules or none.

SCHEDULE 1—(Sta. 0-00 to Sta. 127-10)

	(1)	(2)	(3)	(4)
38,600 cu. yd. excav. for canal, Class 1	.35	.40	.45	.35
6,900 cu. yd. excav. for canal, Class 2	.60	.50	.60	.60
22,700 cu. yd. excav. for canal, Class 3	1.25	1.50	3.70	1.50
2,000 cu. yd. remove loose rock above canal	.50	1.00	1.50	.50
500 sta. cu. yd. overhall	.20	.05	.03	.10
1,700 cu. yd. excav. for struc., Class 1	1.00	1.00	1.20	2.00
400 cu. yd. excav. for struc., Class 2	1.50	1.50	2.40	2.00
1,400 cu. yd. excav. for struc., Class 3	2.00	2.50	8.00	2.00
1,650 cu. yd. excav. for dr. chann. and dikes, Class 1	.50	.32	1.20	1.25
50 cu. yd. excav. for dr. chann. and dikes, Class 2	.75	.60	2.40	2.00
50 cu. yd. excav. for dr. chann. and dikes, Class 3	1.00	2.00	8.00	2.50
2,500 cu. yd. compacting embankments	.75	.60	.30	.50
3,400 sq. yd. prep. founda. conc. lin. and comb. sec. rock exc.	.70	.60	.40	1.00
12,800 sq. yd. trim canal sec. in earth conc. lin. and comb. sec.	.25	.50	.15	.35
22,300 cu. yd. trim canal sec. in earth conc. lin. and comb. sec.	.25	.50	.15	.35
22,300 cu. yd. backfill about struc.	.40	.50	.20	.35
1,760 cu. yd. concrete in structures	21.00	25.00	18.10	25.00
540 cu. yd. concrete in comb. sections	27.50	20.25	17.75	27.00
1,100 cu. yd. concrete in canal lining	18.50	15.00	8.00	13.50
278,000 lb. place reinforcement bars	.03	.03	.02	.03
50 cu. yd. rubble masonry	15.00	12.00	12.00	15.00
185 cu. yd. dry rock walls	5.00	6.00	4.00	3.00
55 sq. yd. dry rock paving	2.00	2.50	3.00	2.00
115 cu. yd. riprap	3.00	3.00	2.50	4.00
58 lin. ft. 12" concrete pipe	.75	1.00	.75	.75
20 lin. ft. 15" concrete pipe	1.00	1.00	.75	.75
16 lin. ft. 18" concrete pipe	1.00	1.25	.75	1.00
88 lin. ft. 24" concrete pipe	1.50	1.50	1.50	1.50
176 lin. ft. 30" concrete pipe	1.50	1.75	1.50	2.50
308 lin. ft. 36" concrete pipe	2.00	2.00	2.00	4.00
50 lin. ft. 6" sewer pipe with cemented joints	.50	1.00	.25	.50
50 lin. ft. 8" sewer pipe with cemented joints	.50	1.00	.25	.50
1,000 lb. install gates and gate hoists	.05	.10	.05	.10
3,150 lb. install blowoff valves and connections	.05	.10	.05	.08

(Continued on next page)

LE TOURNEAU

Equipment . . . Rips San Marcos rocky soil

Whips its steep grades . . .

On Granfield, Farrar & Carlin' job at San Marcos, on the California coast highway, cuts and fills are deep.... 100 to 150 feet....grades steep....up to 35%....the materials hard soil and rock....but it was for just such conditions that LeTourneau equipment was built.

At San Marcos, LeTourneau Rooters break the rock and soil, eliminate the need for powder. LeTourneau Carryall Scrapers move that rock and soil at the rate of 75 yards an hour on a 2800-foot round trip haul, including 250 feet of 30% upgrades on the return. Such performances as this, typical of what LeTourneau equipment does on job after job, cut costs, up profits.

Ask our Engineers what Le Tourneau equipment can do for you.

R. G. LeTOURNEAU, INC.

Stockton, California Peoria, Illinois

Cable Address: *"Bobletorno"*

Moving 900,000 yards of excavation, 1,225,000 station yards of overhaul at San Marcos.

ANNOUNCING . . .

A TWO-WHEELED DERRICK for use with TRACTORS

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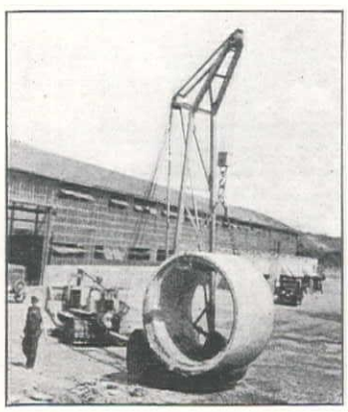


Designed for use wherever heavy lifts have to be made quickly and surely. Built in three boom lengths—20, 30 and 40 feet. Capacities vary from a lift of 5 tons with 20-foot boom and 20 h.p. tractor to a lift of 12 tons with a 75 h.p. tractor.

Operated and controlled by a LeTourneau Two-Drum Power Control Unit.

Easily connected and disconnected—no sub-frame to detach—simply remove draw bar pin.

MANUFACTURERS OF:

Angledozers, Bulldozers, Buggies, Carryall Scrapers, Derricks, Rooters, Sheep's Foot Rollers, Power Control Units, Trailers

A 20-TON SEMI-TRAILER FOR HAULING HEAVY EQUIPMENT

Made to haul 20 tons, plus capacity of truck to which it is attached.

Width overall 96 inches. Length overall 144 inches. Bed dimensions 96″ x 144″. Weight 7,920 pounds. Sturdily built and mounted on sixteen 8¼ x 20 pneumatic tires.

Double oscillating beams keep the trailer bed level and force each tire to carry its full share of the load regardless of road inequalities.

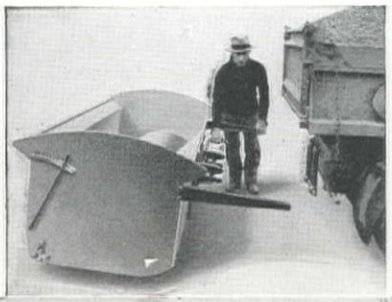
Easy rolling and easy to spot.

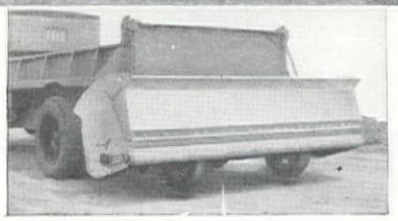
R. G. LeTOURNEAU, INC.

Stockton, California Peoria, Illinois

Cable Address: *"Bobletorno"*

LE TOURNEAU





controlled by an adjustable shutter bar.

The spreader rides on two wide faced wheels, so placed so that the load is evenly balanced. The machine is coupled to any truck by means of a simple coupling device, and may be unhooked from one empty truck and attached to the next loaded truck in a moment.

The machine is adaptable to a wide variety of jobs, such as the spreading of sand on icy roadways, calcium chloride for traffic bound roads, etc. The Buckeye Traction Ditcher Company, Findlay, Ohio, manufactures the machine.

•

Le Tourneau Announces Heavy Duty Trailer

A 20-Ton Semi-Trailer designed principally for transporting heavy equipment, such as compressorss, tractors and tractor equipment, or general construction tools, is announced by R. G. LeTourneau, Incorporated, Peoria, Illinois, and Stockton, California.

This trailer is mounted on sixteen 8¼x20 pneumatic tires. Double oscillating walking beams keep the bed level and force each tire to carry its portion of the load regardless of road inequalities. As a result, extremely rough ground, such as is so often encountered on construction jobs, may be covered without danger of upsetting the load.

Big tires and heavy duty Timken Bearings make for a very light draft. On good roads and moderate grades, a 1½-ton truck will easily handle the LeTourneau semi-trailer loaded with a 75 h.p. tractor, weighing approximately 33,000 pounds. Built to handle like a 2-wheel trailer, it is easily maneuvered and spotted.

SCHEDULE 2—(Sta. 169-40 to 586-98)				
78,500 cu. yd. excav. for canal, Class 1	.25	.27	.45	.31
2,700 cu. yd. excav. for canal, Class 2	.40	.40	.60	.75
7,900 cu. yd. excav. for canal, Class 3	1.25	1.40	2.00	1.70
5,000 sta. cu. yd. overhaul	.10	.05	.03	.10
3,000 cu. yd. excav. for struc., Class 1	.50	.75	1.20	2.00
60 cu. yd. excav for struc., Class 2	.50	2.00	2.40	2.50
20 cu. yd. excav. for struc., Class 3	1.25	3.50	6.50	3.00
1,600 cu. yd. excav. drain. chann. and dikes, Class 1	.30	.30	1.20	1.00
350 cu. yd. excav. drain. chann. and dikes, Class 2	.50	.40	2.40	1.50
100 cu. yd. excav. drain. chann. and dikes, Class 3	1.00	1.40	6.50	2.50
250 cu. yd. compacting embankment	.60	.50	.30	.50
3,660 sq. yd. prep. founda. conc. lin. and comb. sec. rock exc.	.70	.60	.40	1.00
64,750 sq. yd. trim canal sec. in earth conc. lin. and comb. sec.	.25	.30	.20	.30
9,050 cu. yd. backfill about struc.	.25	.35	.25	.35
4,150 cu. yd. puddle or tamp backfill about struc.	.40	.50	1.00	.35
1,260 cu. yd. concrete in structures	20.00	22.50	18.20	24.50
260 cu. yd. concrete in comb. sections	22.00	20.00	17.75	27.00
5,550 cu. yd. concrete in canal lining	16.00	13.50	8.00	14.00
359,000 lb. placing reinforcement bars	.03	.025	.02	.03
620 cu. yd. dry rock walls	5.00	6.00	4.00	4.00
260 sq. yd. dry rock paving	2.50	2.50	3.00	2.50
385 cu. yd. riprap	3.00	3.00	2.50	4.00
480 lin. ft. 12" concrete pipe	.75	1.00	.75	.70
40 lin. ft. 15" concrete pipe	1.00	1.00	.75	.70
80 lin. ft. 18" concrete pipe	1.00	1.25	.75	.90
20 lin. ft. 21" concrete pipe	1.25	1.25	1.00	1.00
44 lin. ft. 24" concrete pipe	1.50	1.50	1.50	1.20
132 lin. ft. 30" concrete pipe	1.50	1.75	1.50	2.25
528 lin. ft. 36" concrete pipe	2.00	2.00	2.00	4.00
300 lin. ft. 12" corr. metal pipe	.50	.40	1.00	.50
180 lin. ft. 18" corr. metal pipe	.75	.50	1.00	.60
69 M.ft. BM erect timber in structures	25.00	40.00	45.00	50.00
16 lin. ft. erect No. 48 metal flumes	10.00	2.00	2.00	1.25
356 lin. ft. erect No. 144 metal flumes	10.00	3.00	5.00	1.60
600 lin. ft. 4" underdrain	1.50	.40	.35	.20
200 lin. ft. 6" underdrain	1.50	.40	.35	.20
100 lin. ft. 8" underdrain	1.50	.45	.35	.25
475 lin. ft. 6" drain pipe with cemented joints	.50	.60	.25	.50
30 lin. ft. 8" drain pipe with cemented joints	.50	.60	.25	.50
33,200 lb. struc. steel in substruc. for metal flumes	.05	.05	.04	.03
8,100 lb. install gates and gate hoists	.05	.10	.05	.10
3,500 lb. install blowoff valves and connections	.05	.10	.05	.10

Street and Road Work

Los Angeles, Calif.—State—Grade, Pave & Bridge—Ventura & Los Angeles Counties

Contract awarded to Oswald Bros., 366 E. 58th St., L. A., $219,606, by Calif. Div. of Highways, State Bldg., Los Angeles, for 5.6 mi. grading and concrete paving and widening two bridges between Little Sycamore Canyon and Encinal Canyon, VENTURA and LOS ANGELES COUNTIES. Bids from:

(1)	Oswald Bros., Los Angeles	$219,606	
(2)	Hanrahan-Wilcox Co., S. F.	226,667	
(3)	Sharp & Fellows, Los Angeles	240,832	
(4)	Basich Bros., Torrance	246,087	
(5)	Sander Pearson, Santa Monica	$255,193	
(6)	C. O. Sparks, Los Angeles	260,109	
(7)	Griffith Co., Los Angeles	273,193	
(8)	J. E. Haddock, Pasadena	275,337	

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
299 sta. clearing and grubbing	$5.00	$1.50	$6.00	$11.00	$6.00	$5.00	$25.00	$10.00
5,200 M gals. water	1.75	1.00	.90	.50	1.50	1.50	1.00	1.50
258,500 cu. yd. roadway excav.	.21	.208	.275	.27	.276	.29	.35	.25
6,080 cu. yd. struct. excav.	.60	.70	.90	.80	1.50	1.50	.90	1.50
1,700 cu. yd. ditch and channel exc.	.60	.60	.275	.60	1.00	.50	.70	1.00
835,000 sta. yd. overhaul	.005	.003	.003	.005	.004	.007	.01	.005
1,290 cu. yd. remove concrete	3.00	1.50	2.00	2.50	5.10	2.60	2.50	3.00
9,150 cu. yd. sand	.60	.40	.38	.50	.70	1.00	.70	.75
55,000 sq. yd. blend subgrade	.025	.03	.02	.07	.04	.05	.035	.04
50,500 sq. yd. prepare subgrade	.10	.07	.10	.10	.12	.10	.15	.12
299 sta. finish roadway	2.50	6.00	5.00	13.50	5.50	5.00	13.00	10.00
2,200 sq. yd. asph. paint binder	.02	.03	.03	.03	.015	.04	.04	.02
700 tons min. aggr. plant mix	3.00	4.50	3.40	3.10	2.70	4.00	3.00	4.00
40 tons liq. asph. MC 5	15.00	15.00	18.00	14.00	16.90	20.00	15.00	18.00
65 tons same, SC 2, prime coat	8.00	9.50	8.50	6.14	8.85	$20	$10	9.40
680 tons same, SC 2, shoulders	8.00	9.50	8.50	7.14	8.85	$10	$10	9.40
54,000 sq. yd. prep. mix & shape shldrs	.04	.04	.05	.05	.046	.05	.06	.10
70 tons liquid asph. 90-95	$16	$19	$17½	15.50	18.05	$20	$18	19.50
800 tons screenings	2.00	2.50	2.60	2.50	2.20	3.00	3.00	3.00
9,400 sq. yd. prepare and shp. gut.	.05	.05	.09	.05	.07	.20	.06	.12
10,100 cu. yd. "A" conc. pavement	7.25	8.50	7.95	10.83	7.85	7.00	7.74	9.00
139,000 lb. reinf. steel	.045	.055	.04	.05	.05	.05	.042	.055
13,650 ea. pavement dowels	.09	.12	.10	.12	.105	.15	.11	.12
1,075 cu. yd. "A" conc.	$18	$19	$19½	16.00	19.55	$18	14.00	22.00
13.5 cu. yd. "F" conc.	$50	$55	$65	$50	65.50	$70	40.00	60.00
435 lb. misc. iron and steel	.13	.12	.10	.12	.20	.10	.10	.20
650 lb. bronze exp. plates	.25	.30	.30	.30	.28	.30	.30	.50
338 ft. timber railing	.90	.60	1.50	.75	1.60	.50	1.20	2.00
1 lot miscell. work	$300	$500	$800	$500	$368	$1500	$500	$500
830 lin. ft. 18" std. reinf. pipe	2.50	2.10	2.10	3.31	2.35	2.30	2.00	2.70
600 lin. ft. 24" same	3.00	2.80	2.75	3.95	3.19	3.10	2.60	3.35
180 lin. ft. 30" same	4.50	4.30	4.15	5.40	4.65	4.50	4.00	4.70
410 lin. ft. 24" extr. reinf. same	3.50	3.40	3.30	4.56	3.83	3.50	3.20	4.10
380 lin. ft. 30" same	5.00	4.80	4.50	5.95	5.49	5.00	4.30	5.50
90 lin. ft. 36" same	7.00	6.60	6.80	7.65	7.00	6.75	6.00	7.00
1,920 lin. ft. 8" corr. met. pipe	1.00	.90	.95	.95	.82	1.00	1.10	1.00
50 lin. ft. 18" same	2.00	1.70	2.00	1.67	1.70	1.60	2.00	1.50
100 lin. ft. 24" same	2.75	2.70	3.00	2.43	2.60	2.40	3.00	2.50
60 each spillw. assemblies	$12	$13	$15	12.68	11.90	12.00	12.00	15.00
90 ea. culvert markers	2.50	2.00	2.50	1.25	1.40	3.50	2.50	3.00
1.2 mi. new fence	$600	$420	$450	$600	$460	$550	$500	$600
12 each drive gates	$15	$20	$12½	$14	$14	$25	9.00	15.00
10.5 mi. move and reset fence	$300	$190	$350	$550	$245	$500	$250	$400
80 monuments	2.50	2.50	3.00	2.00	1.75	3.00	3.00	3.00

Ogden, Utah—Govt—Grading & Surfacing—Custer County

Award recommended to Myers & Goulter, 3227 1st, South, Seattle, Wn., $154,626, by Bureau of Public Roads, Ogden, Utah, for 3.614 mi. const. or improv. the Ketchum-Clayton Highway, in Challis National Forest, Idaho, CUSTER COUNTY, Utah (proj. No. 26-). Bids from:

(1)	Myers & Goulter, Seattle	$154,626	(7)	P. L. Crooks & Co., Portland	$174,153
(2)	Morrison Knudsen Co., Boise	154,677	(8)	Elliott & Co., Inc., Seattle	177,729
(3)	Triangle Const. Co., Boise	155,544	(9)	Floyd S. Whiting, Kaysville	189,177
(4)	Utah Const. Co., Ogden	163,642	(10)	Sam Orino, Bonneville	192,187
(5)	J. Crick & J. H. Hansen, Jr.	163,984	(11)	Gibbons & Reed, S.L.C.	197,612
(6)	Clifton & Applegate, Spokane	164,543	(12)	Engineer's estimate	156,663

(Continued on next page)

Galion Portable Patch Roller

A new general utility roller having portability as its outstanding feature, has been announced by the Galion Iron Works & Manufacturing Co., Galion, O. It can be quickly attached to a truck and the toll raised from the ground by means of a hydraulic lift. This feature enables transportation to the job at truck speed.

The power consists of a highly efficient 4-cylinder motor equipped with air cleaner, magneto with impulse starter, governor and fan. Fuel consumption for normal operating conditions is approximately ½ gallon per hour. The steering axle is so mounted as to provide a wide range of oscillation on the center pin, which permits the operator to roll close to curbs with one wheel rolling on top of the curb. Heavy duty 32-in. by 6-in. tires are used on the wheels. The weight of the compression roll is 5,000 lb., which can be increased to 7,300 lb. by adding water to the roll. Rolling width is 42 in.; speed in low 1.5 m.p.h., and 5 m.p.h. in high.

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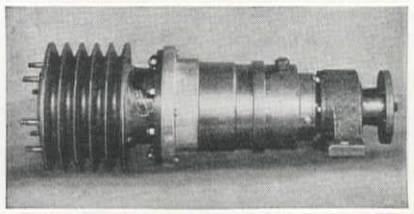

Davey Power Take-Off

In most maintenance work, self-contained units which can be moved quickly to the job and away again on their own power, and that can be stripped of excess weight are invaluable. One such development, by Davey Compressor Company, Inc., Kent, Ohio, greatly increases the usefulness of the motor truck.

This device is the Davey Power Take-off, an invention of Mr. Paul H. Davey. It was first employed in driving an air compressor mounted on truck chassis, by means of the truck motor itself. It is equally adaptable for operating other kinds of truck-mounted machinery, such as pumps, portable generating plants for lighting systems, arc welders, etc.

The Power Take-off operates from the truck drive shaft by a clutch and is controlled from the driver's cab. A pull of the lever engages the clutch, applying the full power of the truck motor to operation of compressor or other equipment, through a sheave and V-belts.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
260,000 cy. uncl. exc..	.35	.34	.38	.40	.43	.395	.44	.45	.50	.50	.49	.35
1,230 cy. exc. struc.	5.00	2.65	3.00	4.00	1.50	3.00	4.00	1.50	3.00	2.00	6.50	2.70
680,000 sta. yd. overh.	.01	.0175	.005	.015	.005	.01	.01	.01	.01	.01.	02	.02
9,900 cy. mi. overh.	.20	.20	.20	.25	.15	.30	.20	.20	.20	.20	.20	.20
3.614 mi. fin. rdway	$500	$400	$500	$300	$300	$300	$300	$300	$200	$500	$200	$300
0.7 MF BM untr. timb.	$100	$100	$100	$200	$90	$200	$100	$100	$100	$75	$100	$75
363 cy. "A" concr.	$25	$30	$24	$24	$26	$26½	$28	$25	$30	$25	$30	$28
100 cy. "B" concr.	$25	$26	$26	$24	$22	$25	$28	$25	$30	$25	$28	$26
187 cy. "D" concr.	$25	$30	$30	$24	$28	$27½	$28	$25	$30	$28	$31	$28
78 cy. "S" concr.	$25	$22	$30	$24	$18	$27½	$28	$30	$30	$28	$32	$28
67,000 lb. reinf. steel	.06	.06	.065	.06	.053	.07	.06	.06	.06	.07	.07	.06
70 cy. cem. rub. masonry ...	$15	$14	$18	$12½	$20	$15	$15	$15	$20	$15	$10	$15
100 ft. 12" C.M.P.	1.60	1.50	1.25	1.50	1.25	1.50	1.50	2.00	1.50	1.50	1.25	1.50
1,130 ft. 18" C.M.P.	2.25	2.00	1.70	1.90	2.00	2.00	2.00	2.50	2.50	2.25	.90	1.75
230 ft. 24" C.M.P.	3.50	3.00	2.80	2.90	3.00	3.25	2.50	3.50	3.00	3.50	3.00	3.30
50 ft. 36" C.M.P.	8.00	6.00	6.00	5.25	6.00	6.00	5.00	5.00	6.00	7.00	5.50	5.00
200 cy. hndl riprap	5.00	4.00	5.00	3.50	4.00	3.00	5.00	4.00	4.00	3.00	4.00	2.00
140 Sta. rd.cut slps	$12	$12	8.00	7.50	$12	8.00	$10	$10	7.00	$10	7.00	7.00
7,100 ft. fur. ditch.	.02	.06	.10	.05	.03	.10	.10	.10	.10	.05	.05	.05
100 ft. ½ rd. 12" C.M.P.	$1	1.00	1.00	1.25	2.00	1.75	1.00	3.00	2.00	1.50	1.00	1.00
L.S. 260' steel bridge superstr. ..		$15,400		$13,000		$15,950		$18,000		$18,000		$15,400
	$16,720		$15,000		$14,661		$13,000		$12,000		$13,000	

San Francisco, Calif.—Govt—Grading, Etc.—San Diego County

Award recommended to J. E. Haddock Co., Ltd., 357 N. Chester Ave., Pasadena, $203,683, by Bureau of Public Roads, S. F., for 10.985 mi. grad. and plac. subgr. reinforcem. on Sec. C and D, Rt. 73, the Laguna Natl. Forest Highway, Cleveland Natl. Forest, SAN DIEGO COUNTY, Calif. Bids

(1) J. E. Haddock Co., Ltd.....$203,683
(2) Isbell Const. Co., Reno, Nev..... 229,183
(3) Daley Corp., San Diego..... 271,449
(4) Young & Sons Co., Ltd., Berkeley..$284,894
(5) Engineer's estimate 198,259

	(1)	(2)	(3)	(4)	(5)
57 acres clearing	150.00	150.00	200.00	160.00	150.00
347,500 cu. yd. unclass. excavation	.41	.50	.60	.64	.40
2,300 cu. yd. struc. excav.	1.50	1.50	1.70	1.25	1.50
1,141,500 sta. yd. overhaul	.01	.005	.01	.01	.0075
59,200 cu. yd. mi. overhaul	.15	.15	.12	.15	.15
36 lin. ft. 8" corr. metal pipe	.90	1.20	1.55	1.00	1.10
72 lin. ft. 12" corr. metal pipe	1.25	1.50	1.65	1.25	1.40
2,004 lin. ft. 18" corr. metal pipe	1.75	1.80	1.70	1.75	1.95
1,664 lin. ft. 24" corr. metal pipe	2.75	2.60	2.60	2.75	2.90
364 lin. ft. 30" corr. metal pipe	3.45	3.50	3.30	3.50	3.50
192 lin. ft. 36" corr. metal pipe	4.30	5.25	5.10	4.75	5.30
34 lin. ft. 42" corr. metal pipe	6.20	6.00	5.90	5.50	6.20
214 lin. ft. 48" corr. metal pipe	7.70	7.50	7.15	9.10	7.20
2 ea. type "A" spillway inlets	17.50	17.00	15.00	15.00	15.00
316 cu. yd. "A" concrete	27.00	27.00	27.50	30.00	27.00
15 cu. yd. "B" concrete	27.00	27.00	27.50	30.00	25.00
18,100 lb. reinforcing steel	.06	.06	.08	.07	.065
28 ea. steel grates	20.00	15.00	22.00	25.00	20.00
190 lin. ft. 6" porous tile underdrain	.50	1.00	.70	.70	.60
214 lin. ft. wood guardrail	.50	1.00	1.50	1.25	1.00
12,000 lin. ft. Type 1 protection ditch	.15	.15	.14	.10	.15
12,500 lin. ft. fence	.12	.10	.10	.12	.12
5 ea. fence gates	20.00	20.00	25.00	20.00	20.00
96 ea. culvert markers	2.50	3.00	3.00	2.50	2.00
86 ea. right-of-way monuments	3.00	3.50	3.00	3.00	3.00
L.S. selective work (clearing)	300.00	300.00	300.00	300.00	300.00
L.S. extra work fill slope eros. control	$1,750	$1,750	$1,750	$1,750	$1,750

Ogden, Utah—Govt—Surfacing—Kootenai County

Award recommended to Utah Const. Co., Ogden, Utah, $155,773, by Bureau of Public Roads, Ogden, Utah, for 5.856 mi. surf. the North Pacific Highway, Proj. NR 7-C5, in Coeur d'Alene Natl. Forest, KOOTENAI COUNTY, IDAHO. Bids from:

(1) Utah Const. Co., Ogden.....$155,773
(2) James Crick, Spokane, Wn..... 160,489
(3) J. L. McLaughlin, Great Falls..... 164,871
(4) Triangle Const. Co., Spokane..... 165,529
(5) Max J. Kuney Co., Spokane..... 166,231
(6) Barnard-Curtiss Co., Minneapolis... 169,153
(7) Nolan Bros., Inc., Minneapolis..... 170,617
(8) Goodfellow Bros., Wenatchee..... 174,866
(9) Siems-Spokane Co., Spokane..... 175,810
(10) Elliott & Co., Inc., Seattle.....$175,900
(11) McNutt Bros., Eugene, Ore..... 179,521
(12) Colonial Const. Co., Spokane..... 184,940
(13) Morrison-Knudsen Co., Boise..... 192,870
(14) The Lawler Corp., Butte, Mont..... 193,267
(15) P. L. Crooks & Co., Portland..... 207,961
(16) L. Romano Engrg. Co., Seattle..... 212,729
(17) Myers & Goulter, Seattle, Wn..... 218,580
(18) Engineer's estimate 170,203

Bids received on:

(A) 27 acres clearing
(B) 27 acres grubbing
(C) 194,000 cu. yd. excavation
(D) 193,000 cu. yd. borrow excav.
(E) 500 cu. yd. struc. excav.
(F) 578,000 sta. yd. overhaul
(G) 3,970 cu. yd. mi. overhaul
(H) 10,300 tons cr. run bottom course
(I) 10,300 tons cr. run top course
(J) 850 tons suppl. cr. st. or cr. grav.
(K) 67 cu. yd. "A" concrete
(L) 63 cu. yd. "B" concrete
(M) 7,000 lb. reinforcing steel
(N) 1,070 lin. ft. 18" corr. metal pipe
(O) 220 lin. ft. 24" corr. metal pipe
(P) 262 lin. ft. 36" corr. metal pipe
(Q) 478 lin. ft. 48" corr. metal pipe
(R) 25,000 tons gravel
(S) 1,000 M gallons water
(T) 1 only water plant
(U) 150 hours roller operation
(V) 400 100 ft. sta. round cut slopes
(W) 7,000 lin. ft. furrow ditch
(X) 100 lin. ft. ½ rd. 12" corr. metal pipe
(Y) L. S. maintain detours

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
A	$150	$ 50	$100	$ 90	$ 60	$100	$150	$100	$ 70	$125	$100	$125	$125	$150	$100	$ 50	$100	$ 80
B	$ 75	$ 50	$ 75	$100	$ 60	$100	$100	$ 75	$100	$150	$100	$100	$125	$150	$ 80	$ 50	$100	$ 80
C	.32	.37	.34	.35	.35	.38	.38	.42	.41	.40	.40	.39	.39	.45	.50	.35	.44	.42
D	.185	.16	.20	.20	.15	.175	.17	.17	.21	.18	.20	.23	.26	.19	.25	.35	.25	.15
E	1.50	2.00	1.25	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.50	1.50	1.50	1.50	1.00	1.00	1.50	1.50
F	.015	.005	.0075	.01	.005	.01	.015	.005	.0075	.01	.01	.01	.015	.015	.01	.02	.01	.015
G	.40	.264	.25	.20	.25	.20	.33	.25	.30	.20	.20	.20	.20	.20	.15	15.	.20	.25
H	.58	.90	.85	.93	1.10	.80	1.03	1.15	.85	1.00	.80	1.10	.90	1.04	.80	1.20	1.10	.80
I	.58	.90	.85	.93	1.30	.80	1.03	1.15	.85	1.00	.80	1.10	.90	1.04	.80	1.20	1.10	.80
J	.45	.90	.85	.93	1.10	.80	1.03	1.15	.85	1.00	.80	1.10	.80	1.04	.80	1.20	1.10	.80
K	$25	$25	$25	$25	$25	$30	$35	$27	$27	$25	$30	$25	$30	$25	$25	$30	$30	$27
L	$25	$25	$26	$25	$25	$25	$30	$25	$27	$30	$30	$24	$28	$25	$25	$30	$25	$26
M	.07	.10	.07	.06	.10	.08	.10	.07	.07	.06	.07	.07	.10	.08	.06	.08	.06	.07
N	1.90	2.00	1.85	1.50	2.00	1.75	1.50	1.33	1.50	2.00	1.60	1.75	1.75	1.50	2.00	1.50	2.00	1.75
O	2.75	3.00	2.75	2.20	4.00	2.75	2.50	2.10	2.25	2.50	2.40	2.50	2.70	2.50	3.00	2.50	3.00	3.00
P	5.00	5.00	7.00	4.20	5.00	4.75	3.50	4.20	4.50	4.50	4.75	4.50	5.00	4.35	5.00	4.00	6.00	5.00
Q	6.75	7.00	10.00	6.00	8.00	6.50	6.50	5.70	6.25	6.50	7.35	6.00	7.00	7.00	7.00	7.00	8.00	7.00
R	.38	.50	.45	.40	.70	.50	.33	.42	.40	.35	.50	.35	.50	.48	.60	.80	1.10	.40
S	1.50	1.50	2.00	1.50	2.00	2.00	1.00	2.50	2.00	2.00	2.50	2.50	1.35	1.75	2.00	1.00	1.00	2.00
T	$150	$500	$100	$200	$100	$200	$100	$100	$150	$350	$100	$300	$150	$250	$500	$25	$500	$200
U	7.00	5.00	2.50	3.00	3.00	4.00	3.00	5.00	3.50	3.00	3.00	5.00	4.00	2.50	6.00	5.00	8.00	2.50
V	$10	7.00	8.00	8.00	6.00	10.00	7.00	4.00	6.00	8.00	10.00	10.00	8.00	6.00	7.50	5.00	12.00	7.00
W	.03	.04	.05	.10	.05	.05	.05	.10	.05	.10	.20	.05	.05	.05	.03	.05	.05	.04
X	2.50	1.50	1.25	1.00	2.00	1.50	1.00	.67	2.00	2.00	1.00	1.00	1.00	1.00	.80	.50	1.00	1.00
Y	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

CONSTRUCTION

Note: For additional information regarding projects in this summary refer to Daily Construction News Service, date appearing at end of each item.

Large Western Projects . . . . .

WORK CONTEMPLATED

Water improvements for San Diego, to be financed. Est. cost $1,060,000.

Diversion dam and supply canal for Owl Irrigation Dist., Thermopolis, Wyo. Est. cost $443,646.

Dam and other improvements for Nevada Irrigation Dist. Est. cost $1,330,000.

Dam and spillways, etc., for Salt River Water Users Association, Phoenix. Est. cost $6,000,000.

BIDS RECEIVED

Gunite lining 4,890,000 sq. ft. canal for Roosevelt Irrigation Dist., Buckeye, Ariz., Vinson & Pringle, Phoenix, $462,685, low.

2,000 ft. L. A.-Long Beach breakwater for U. S. Engr. Office, L. A., Rohl-Connolly Co., L. A., $827,750, low.

CALL FOR BIDS

202,020 tons reinforcing steel for Metropolitan Water Dist., L. A., bids to Aug. 19.

BIDS RECEIVED

Administration bldg. and toll plaza for S. F.-Oakland Bay Bridge, Clinton Const. Co., S. F., $360,857, low.

11.613 mi. bitum. tr. cr. gravel base course on Tioga Road for Bureau of Public Roads, S. F., Peninsula Paving Co., S. F., $166,528. Award recommended.

Concrete arch Seminoe Dam and Power Plant for Bureau of Reclamation, Casper, Wyo., Winston Bros., Minneapolis, $2,194,007, low.

Lock operating equipment for Bonneville Dam for U. S. Engr. Office, Portland, Pacific Coast Steel Corp., S. F., $398,298, low.

Desilting basins and mechanical apparatus for Imperial Dam for Bureau of Rec., Denver, Dorr Co., Inc., N. Y., $564,800, low.

Ephraim and Spring City tunnels for Bureau of Reclamation, Salt Lake City, Case Const. Co., Alhambra, $334,176, low.

Gates, stop logs, gantry cranes, etc., Bonneville Project, for U. S. Engr. Office, Portland, Star Iron & Steel Co., Tacoma, $95,261, Sched. No. 1; Pacific Car & Foundry Co., Seattle, $137,514, Sched. No. 2; and Columbia Steel Co., Portland, $1,109,447, Sched. No. 3, low bids.

Earthwork on Ogden-Brigham Canal for Bureau of Reclamation, Ogden, J. A. Terteling & Son, Boise, $360,446, low.

Tunnels at S. Boulder Diversion Conduit for Bd. of Water Comm., Denver, Utah, Bechtel, Morrison, Kaiser Co., Almont, $447,337, low.

Earth and rockfill Alcova Dam for Bureau of Reclamation, Casper, Wyo., W. E. Callahan Const. Co. and Gunther & Shirley, L. A., $1,482,651, low.

White Point Joint outfall sewer No. 1, near Harbor City, for L. A. County Sanitation Dist., to Shofner & Gordon, L. A., $629,967 for Sched. No. 1 and $976,314 for Sched. No. 2; and to United Concrete Pipe Corp., L. A., $503,145 Sched. 1 and $658,459 Sched. 2.

Submerged pipeline, White Point outfall sewer, for L. A. County Sanitation Dist., to Merritt, Chapman & Scott Corp., San Pedro, $528,059.

Dredging channel in Willapa River for U. S. Engr. Office, Seattle, to Puget Sound Bridge & Dredging Co., Seattle, $196,492.

Grays Harbor Jetty for U. S. Engr. Office, Seattle, to Columbia Const. Co., Portland, $358,610.

Monrovia No. 4 and San Rafael Nos. 1 and 2 tunnels for Metropolitan Water Dist., L. A., to L. E. Dixon Co., Bent Bros., and Johnson, Inc., L. A., $503,145 Sched.0 1 and $658,459 Sched. 2.

Sutter By-Pass drainage pumping plants (3) for U. S. Engr. Office, Sacramento, to F. W. Snook Co., S. F., $212,175.

Dams, canals and tunnels for Verde Irrigation and Power Dist., Phoenix, to Harry T. Johnson Co., L. A., $23,000,000.

8.1 mi. concrete paving on State Road No. 9 for Washington Highway Dept., to Goetz & Brennan, Seattle, $293,534.

Street and Road Work . . . . .

CALL FOR BIDS

PHOENIX, ARIZ.—Bids to 10 a.m., Aug. 22, by Bureau of Public Roads, Phoenix, for 25.303 mi. placing a bitum. tr. surf. on Secs. A, B1 and B2 of Rt. 1, and all of Rt. 2 of the Petrified Forest Natl. Monument, APACHE and NAVAJO COUNTIES, Arizona. Work involves in the main: 42,800 tons bitum. tr. crush. gravel OR 35,300 tons Laykold asph. concr. (ALT.), 3,000 tons screenings for seal coat. 8-1

SAN FRANCISVO, CALIF.—Bids to 2 p.m., Aug. 15, by Bureau of Public Roads, San Francisco, for 1.823 mi. grading Sec. B of Rt. 20, the Almanor Natl. Forest Highway, Plumas Natl. Forest, PLUMAS COUNTY, Calif. Work involves 110,000 cu. yd. unclass. excav. 7-26

SAN FRANCISCO, CALIF.—Bids to 2 p.m., Aug. 20, by Bureau of Public Roads, San Francisco, for 9.603 mi. placing subgrade reinforcement on portions of Sections F and G of Rt. 21, the Deer Creek Meadows Natl. Forest Highway, Lassen National Forest, BUTTE and TEHAMA COUNTIES, Calif. Work involves: 3,000 cu. yd. excav., 12,000 cu. yd. subgrade reinf., 500 cu. yd. cr. rock or grav. backfill. 7-30

CALLS FOR BIDS

SAN FRANCISCO, CALIF.—Bids to 2 p.m., August 27th, by Bureau of Public Roads, San Francisco, for 4.103 miles grading Sections A and B of Route 61, the Angeles Crest National Forest Highway, Angeles National Forest, LOS ANGELES COUNTY, Calif. Work involves: 644,000 cu. yd. excavation. 8-2

BOISE, IDAHO—Bids to 2 p.m., Aug. 16th, by Comm. of Public Works, Boise, Ida., for: (1) CASSIA CO. (NRH&M 70-CD (1935)—3.174 mi. const. roadbed drainage struc. and cr. gravel surfacing on the Old Oregon Trail Highway from Burley west, involving in the main: 39,800 cu. yd. excav., 17,500 tons cr. grav. surfacing. (2) BENEWAH CO. (FAP 143-ABCD)—17.870 mi. const. pl. mix. bitum. mat. and cr. rock shoulders on Heyburn Park Highway betw. Plummer and

NEWS SUMMARY

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St. Maries, involv.: 58,600 tons cr. rock surfacing, 8,850 cu. yd. binder for surfacing, 1,335 tons MC-3 liq. asph. (bit. mat), 32,300 tons bituminous mat, plant mix. (1) ADAMS CO. (Reconst. Proj. 454)—12.671 mi. pl. mix bitum. mat. and cr. gravel shoulders on the North and South Highway betw. Mesa and Fruitvale, involving: 11,000 tons cr. gravel surfacing, 832 tons heating and applying MC-4 liq. asph. (bitum. mat.), 19,800 tons bitum. mat. (pl. mix). (2) VALLEY CO. (FAP 130-AH)—12.505 mi. const. pit run subbase and shoulders and cr. grav. surf. on the Payette Highway betw. Donnelly and McCall, involving: 56,300 cu. yd. pit run grav. subbase, 22,700 tons cr. grav. surf. 8-3

SEATTLE, WN.—Bids to 10 a.m., Aug. 26, by King County Commissioners, Seattle, Wn., for paving the Renton-Three Tree Point Secondary Road Proj. No. 83, P.W.A. Docket No. 5799, Unit No. 2, for a distance of 1.03 miles. Work involves 4,600 cu. yd. excav., 12,000 sq. yd. cement concr. pavement, and incidental items. 7-27

VANCOUVER, WN.—Bids to 10 a.m., Aug. 17th, as follows, by County Clerk, Vancouver, Wn., for: (1) 1.25 mi. clearing, grading, draining and surfacing from Manor Road to Pleasant Valley. (2) 0.37 mi. approaches and replace two bridges on Veneisborg Road. (3) Improvement to Orchards-Camas Road near Proebstel. 8-3

BIDS RECEIVED

JUNEAU, ALASKA—Wright & Stock, Lowman Bldg., Seattle, Wn., who bid $18,847, low to Bureau of Public Roads, Juneau, Alaska, for 5.6 mi. clearing and grubbing on the Seward Highway, Snow River-Lawing Section of the Chugach Natl. Forest. 7-10

PHOENIX, ARIZ.—Arizona Sand & Rock Co., Box 1522, Phoenix, Ariz., $7,080 low to Bur. of Pub. Roads, Phoenix, for 15.448 mi. placing seal coat on Secs. B and C of Rt. 4, the Ashfork-Flagstaff-Angell Natl. Forest Hi'way, Kaibab Natl. Forest, COCONINO COUNTY, Ariz. 7-18

PHOENIX, ARIZ.—Lee Moor Contr. Co., Bassett Tower, El Paso, Tex., $25,830 low to Bur. of Pub. Roads, Phoenix, for 31.969 mi. plac. seal coat on Sec. H, Rt. 1, all of Rt. 10, Grand Canyon Natl. Park, and on Secs. A, B, C, D and E of Cameron-Desert View Approach to Grand Canyon Natl. Park, COCONINO COUNTY, Ariz. 7-18

PHOENIX, ARIZ.—Skousen Brothers, Albuquerque, N. M., $47,240, low to Bur. of Pub. Roads, Phoenix, Ariz., for 8.125 miles grading Sec. "B" and placing selected material subgrade reinforcement on Secs. A and B of Rt. 30, the Globe-Showlow Natl. Forest Highway, Sitgreaves Natl. Forest, NAVAJO COUNTY, Arizona. 7-30

EUREKA, CALIF.—Helwig Const. Co., 115 S. Main St., Sebastopol, $12,405, low to Dist. Engr., Calif. Div. of Highways, Eureka, for 67.5 mi. liq. asph. treatm. on Rt. 56, betw. Gualalla and 8 mi. N. of Fort Bragg in MENDOCINO COUNTY, Calif. 7-29

LOS ANGELES, CALIF.—Geo. Herz & Co., 311 Platt Bldg., San Bernardino, $74,578 ALT B, low to Div. of Highw., L. A., for 1.9 mi. grade and concr. pav. betw. Alabama St. and State St. in Redlands, SAN BERNARDINO COUNTY, Calif. 7-25

LOS ANGELES, CALF.—Square Oil Co., Inc., 916 Adobe St., L. A., $21,644, low to Calif. Div. of Highw., L. A., for 50.1 mi. apply seal coat betw. Valle Vista and Rt. 187, in RIVERSIDE COUNTY, Calif. 8-1

LOS ANGELES, CALIF.—B. G. Carroll, 4396 Maryland St., San Diego, $29,877 low to Calif. Div. of Highways, L. A., for 1 mi. grad. and road mix surf. treatm. applied and const. reinf. concr. abutments for an undergr. R.R. crossing betw. Santa Ana River and "M" Street in Colton, SAN BERNARDINO COUNTY, Calif. 8-1

LOS ANGELES, CALIF.—Griffith Co., L. A. Railway Bldg., L. A., $90,420 low to Calif. Div. of Highways, State Bldg., L. A., for 1.3 mi. grad. and asph. concr. pav. and const. reinf. concr. bridge on steel piles on "I" St. betw. E. City Limits of Colton and W. City Limits of Colton, in SAN BERNARDINO COUNTY, Calif. 8-1

SACRAMENTO, CALIF.—Earl W. Heple, 494 Delmas Ave., San Jose, $103,850, low to Calif. Div. of Highways, Sacramento, for const. an undergrade crossing under the tracks of the S.P. Railroad 1½ mi. S. of Agnew, consisting of 2 concr. abutments with wing walls and approx. 0.29 mi. roadway graded and paved with concrete, in SANTA CLARA COUNTY, Calif. 7-24

SACRAMENTO, CALIF.—Griffith Co., L. A. Railway Bldg., L. A., $96,769 ALT. "A" and $94,994 ALT. "B", low to Calif. Div. of Highways, Sacramento, for 1.0 mi. grad. and asph. concr. or concr. paving and const. reinf. concr. underpass abutments betw. 1 mi. S. of Delano and Delano, in KERN COUNTY, Calif. 7-24

SACRAMENTO, CALIF.—Union Paving Co., Call Bldg., San Francisco, $97,437, low to Calif. Div. of Highways, Sacramento, for 3.6 mi. grad. and surf. with crusher run base and applying bitum. surf. tr. betw. Edgemar and Thornton in SAN MATEO COUNTY, Calif. 7-31

SAN BERNARDINO, CALIF.—E. L. Yeager, P. O. Box 470, San Bernardino, $10,320 low to Distr. Engr. Calif. Div. of Highways, San Bernardino, for 18.6 mi. seal coat to be applied betw. Adelanto and Rt. 58, in SAN BERNARDINO COUNTY, Calif. 7-29

FT. BAYARD, N. M.—Lee Moor Contracting Co., El Paso, Texas, $17,951, low to U. S. Veterans Administration Facility, Arlington Bldg., Wash., D. C., for resurfacing roads at U. S. Veterans Facility, Ft. Bayard, New Mexico. 8-2

VANCOUVER, WN.—Bids received as follows by County Comm., Vancouver, Wn., for: (Klineline, Barn & Johnson, Vancouver, Wn., $12,814, low for 1.5 mi. asph. concr. paving on Sara-Ridgefield road, Sec. Rd. Proj. 46. (2) Klineline, Barn & Johnson, Vancouver, Wn., $15,003, low for 1.5 mi. asph. concr. pav. on Brush Prairie-Hockinson Road, Sec. Rd. Proj. 47. (3) Klineline, Barn & Johnson, $6,280, low for 0.92 mi. regrade, widen and resurf. with cr. stone on Camas-Oak Pk. road, Sec. Rd. Proj. 45. (4) Klineline, Barn & Johnson, $7,085, low for 1.29 mi. grade, drain and resurf. with cr. stone on Munich Road, Sec. Rd. Proj. 54. 8-2

CONTRACTS AWARDED

PHOENIX, ARIZ.—To E. W. Everly, 900 N. 1st St., Albuquerque, N. M., $48,562 by Bur. of Pub. Roads, 414 Title & Trust Bldg., Phoenix, for 3.906 mi. grad. and placing select. material subgr. reinforcem. on Sec. C of Rt. 3, the Flagstaff-Clints Well Natl. Forest Highway, Coconino Natl. Forest, COCONINO COUNTY, Arizona. 7-31

PHOENIX, ARIZ.—Award recommended to Skousen Bros., Albuquerque, N. M., $43,600 by Bur. of Pub. Roads, Phoenix, Ariz., for 3.090 mi. grad. and const. bridge on Sec. J, Rt. 7, the Oak Creek Natl. Forest Highway, Coconino Natl. Forest, YAVAPAI COUNTY, Arizona. 7-25

CHULA VISTA, CALIF.—Award recommended to V. R. Dennis, P. O. Box "F", Sta. "A", San Diego, $237,914, for emuls. asph. pavem. and shoulder treatment, (2) $224,789 for emuls. asph. pavem. and fuel oil shoulder treatment, (3) $169,164 for asph. concr. pavem. and emuls. asph. shoulder treatment; and (4) $156,039 for asph. concr. pavem. and fuel oil shoulder treatment, to City of Chula Vista, for paving 21 mi. of streets in the City of Chula Vista. 7-16

LOS ANGELES, CALIF.—To Southwest Paving Co., 712 Lankershim Bldg., L. A., $19,770 (on 7" asph. conc.) to Board of Pub. Works, City Hall, L. A., for improving San Fernando Road west betw. Aviation Drive and Goodwin Avenue. 7-16

LOS ANGELES, CALIF.—To Osborn Co., 1570 San Pasqual Street, Pasadena, $22,075, to County Board of Supervisors, L. A., for improving Santa Anita Road from Longden Ave. to Huntington Park in San Marino and San Gabriel, a distance of 0.71 mi. 7-27

LOS ANGELES, CALIF.—To C. W. Wood, Box 49, Stockton, $42,020, by Calif. Div. of Highways, L. A., for 33.5 mi. liq. asph. treatm. betw. 6 mi. N. of Blythe and Vidal, RIVERSIDE and SAN BERNARDINO COUNTIES, Calif. 7-27

LOS ANGELES, CALIF.—To Oswald Bros., 366 E. 58th St., L. A., $55,064 ALT. "A", by Calif. Div. of Highways, L. A., for 2.1 mi. grad. and asph. concr. paving on Cerritos Ave. betw. Los Angeles St. and Artesia Ave., LOS ANGELES COUNTY, Calif. 7-27

LOS ANGELES, CALIF.—To Oswald Bros., 366 E. 58th St., L. A., $219,606, by Calif. Div. of Highways, L. A., for 5.6 mi. grading and concr. paving and widening two bridges betw. Little Sycamore Canyon and Encinal Canyon, VENTURA and LOS ANGELES COS., Calif. 7-27

LOS ANGELES, CALIF.—To Basich Bros., 20550 Normandie Ave., Torrance, $27,892, by Calif. Div. of Highways, L. A., for 13.7 mi. roadmix surf. tr. to be applied to existing roadbed shoulders and 24.9 mi. bitum. seal coat tr. shoulders betw. Lancaster and Mojave, LOS ANGELES and KERN COUNTIES, Calif. 7-27

SACRAMENTO, CALIF.—To Union Paving Co., Call Bldg., San Francisco, $95,324, by Calif. Div. of Highways, Sacramento, for 4.5 mi. grading and road mix surf. betw. .8 of a mi. N. of Newman and .2 mi. S. of Crows Landing, in STANISLAUS COUNTY, Calif. 7-10

SACRAMENTO, CALIF.—To Union Paving Co., Call Bldg., San Francisco, $59,869, to Calif. Div. of Highways, Sacramento, for 1.2 mi. widen and concr. and asph. concr. paving in Santa Rosa betw. College Ave. and South City Limits in SONOMA COUNTY, Calif. 7-10

SACRAMENTO, CALIF.—To C. F. Fredrickson & Sons, Lower Lake, Calif., $22,632 to Calif. Div. of Highways, Sacramento, for 59.4 mi. liq. asph. treatm. betw. Rt. 29 and Almanor Dam and betw. S. end of Govt. Sec. and Rt. 21 on Plumas 83, B, C and D, and betw. Keddie and Quincy and betw. Blairsden and Delleker, and betw. Quincy and Meadows Valley-Plumas 21 C and F, in PLUMAS CO., Calif. 7-11

SACRAMENTO, CALIF.—To Dunn & Baker, Klamath Falls, Oregon, $148,542, to Calif. Div. of Highways, Sacramento, for 8.2 mi. grading betw. Cougar and 4 mi. N.E. of Grass Lake Station, SISKIYOU COUNTY, Calif. 7-19

SACRAMENTO, CALIF.—Awards as follow by Calif. Div. of Highways, Sacramento: (1) NAPA COUNTY—To Jack Casson, 319 Warren St., Hayward, $17,915 for 1.1 mi. grad. and cr. run base surf. and plant mix surf. at various locations betw. Carneros and Napa. Refer to issue of July 17 for units. (2) FRESNO COUNTY—To Clyde W. Wood, P. O. Box 49, Stockton, $12,930, for 34.9 mi. tr. with roadmix surf. betw. Visalia and Orange Ave. and betw. Visalia and Woodlake, in TULARE and FRESNO COUNTIES, Calif. (3) KINGS and TULARE COUNTIES—To Stewart & Nuss, Inc., 410 Thorne Ave., Fresno, $13,397, for 20.3 mi. seal coat tr. betw. 1 mi. E. of Corcoran and Tulare and betw. Lindsay and 4.3 mi. W., Calif. 7-27

SACRAMENTO, CALIF.—Contracts awarded as follows by Calif. Div. of Highways, Sacramento, for: (1) MADERA COUNTY—To A. Teichert & Son, Inc., 1846 37th St., Sacramento, $105,708 for 7.8 mi. surf. (plant mix) on cr. run base betw. Coarse Gold and Oakhurst. Refer to issue of July 24 for units. (2) MODOC and SISKIYOU COUNTIES—To Biasotti, Willard & Biasotti, 40 W. Clay St., Stockton, $144,103 (only bid) for 5.5 mi. grading betw. 2½ mi. S.E. of Tule Lake and Oregon State Line. Refer to issue of July 24 for units. (3) ALAMEDA COUNTY—To Peninsula Paving Co., 9 Main St., S. F., $103,826 on ALT. "A" for 0.9 mi. grading and asph. concr. paving 38th St. and Moss Ave. betw. Market St. and Broadway in Oakland. 7-31

SAN BERNARDINO, CALIF.—To Paulsen & March, 8275 Compton Ave., L. A., $12,024 by Dist. Engr., Calif. Div. of Highways, San Bernardino, for 7.2 mi. treatment with liq. asph. betw. Summit Station and West Fork of Mojave River on the Cajon-Lake Arrowhead Highway, in SAN BERNARDINO COUNTY, Calif. 7-27

SAN FRANCISCO, CALIF.—Award recommended to Young & Son Co., Ltd., 599 Colusa Ave., Berkeley, $70,320, by Bur. of Pub. Roads, S. F., for 2.200 mi. grad. Sec. "B" of Rt. 81, the Mammoth Lakes Natl. Forest Highway, Inyo Natl. Forest, MONO COUNTY, Calif. 7-31

SAN FRANCISCO, Calif.—Award recommended to Morrison-Knudsen Co., 1121 Title & Guaranty Bldg., L. A., $147,390, by Bur. of Pub. Roads, S. F., for 6.823 mi. grad. Sec. "A", Rt. 81, the Mammoth Lakes Natl. Forest Highway, Inyo Natl. Forest, MONO COUNTY, Calif. 7-31

SAN FRANCISCO, CALIF.—To Chas. L. Harney, Call Bldg., S. F., $35,284 to Public Utilities Commission, S. F., for repaving street or sidewalk openings where pavement has been removed for fiscal year ending June 30, 1936. 7-10

SAN FRANCISCO, CALIF.—To Claude C. Wood, 669 Bedford Road, Stockton, $48,664, to Bur. of Pub. Roads, S. F., for 0.718 mi. grading and placing subgrade reinf. on a portion of Sec. D and bitum. treatment (light surf. application) on portion of Sec. D, and 3.180 mi. on a portion of Sec. E, Rt. 77, the Mt. Shasta-Mt. Lassen Natl. Forest Highway, Shasta Natl. Forest, SISKIYOU and SHASTA COUNTIES, Calif. 7-16

SAN FRANCISCO, CALIF.—To W. W. Clyde & Co., Springville, Utah, $48,824, by Bur. of Pub. Roads,S. F., for 18.381 mi. bitum. surf. tr. (pl. mix) on Secs. A and B, Rt. 12, Midland Trail (Current Cr.) Natl. Forest Highway, Nevada Natl. Forest, and on Sec. C of FLHP No. 1 (part of Midland Trail), Ely-Tonopah Highway, WHITE PINE and NYE COUNTIES, Nevada. 7-18

SAN FRANCISCO, CALIF.—Award recommended to J. E. Haddock Co., Ltd., 357 N. Chester Ave., Pasadena, $203,683, by Bur. of Pub. Roads, S. F., for 10.985 mi. grad. and plac. subgr. reinforc. on Secs. C and D, Rt. 73, the Laguna Natl. Forest Highway, Cleveland Natl. Forest, SAN DIEGO COUNTY, Calif. 7-20

SAN FRANCISCO, CALIF.—To Central States Contr. Co., Ltd., 344 High St., Oakland, $24,506, by Bur. of Pub. Roads, S. F., for 3.661 mi. plac. bitum. tr. surf. (road mix) on Sec. A, Rt. 11, Mt. Charleston Natl. Forest Highway, Dixie Natl. Forest, CLARK COUNTY, Nevada. 7-31

SAN FRANCISCO, CALIF.—To J. G. Chigris, 2316 31st Ave., S. F., $49,771, to Bur. of Pub. Roads, S. F., for 4.839 mi. grading Sec. "G" of Rt. 77, the Mt. Shasta-Mt. Lassen Natl. Forest Highway, Shasta and Lassen Natl. Forests, SHASTA COUNTY, Calif. 7-23

SAN FRANCISCO, CALIF.—Award recommended to Peninsula Paving Co., 9 Main St., S. F., $166,528, on ALTERNATIVE "B", by Bur. of Pub. Roads, 461 Market St., S. F., for 11.613 mi. placing a bitum. tr. cr. gravel base course on Sec. C1 of Rt. 4, Tioga Road, Yosemite Natl. Park, TUOLUMNE COUNTY, Calif. 7-29

SAN LUIS OBISPO, CALIF.—To L. A. Brisco, Arroyo Grande, Calif., $11,672, to Dist. Engr., Calif. Div. of Highways, San Luis Obispo, for 34.2 mi. liq. asph. tr. betw. 1.75 mi. and 9.35 mi. E. of Cambria; betw. mile 3.95 and mile 11.70; betw. Rt. 56 and 4.70 mi. E.; and betw. 5.15 mi. E. of San Margarita and 1 mi. E. of Pozo, in SAN LUIS OBISPO COUNTY, Calif. 7-31

DENVER, COLO.—Award recommended to Western Paving & Constr. Co., Denver, Colo., $78,002, by Bur. of Pub. Roads, Denver, for 13.579 mi. const. or improving the Mount Evans Forest Highway Route, located in Pike Natl. Forest, CLEAR CREEK COUNTY, Colorado, Proj. 54-A2 to E2. 7-19

DENVER, COLO.—Award recommended to Larson Const. Co., Denver, $31,850, by Bur. of Pub. Roads, Denver, for 11.67 mi. surf. Proj. 33-E1, F1, G1 of the Loveland Fremont Pass Forest Highway Route, located in Cochetopa Natl. Forest, LAKE COUNTY, Colo. 7-22

DENVER, COLO.—To Leach Bros., 1508 Lincoln St., Denver, $81,566, by Bur. of Pub. Roads, Denver, for 4.061 mi. earthgr. and dr. highw. on Proj. 9-H of the Dayton-Kane Forest Highway Route. 7-27

DENVER, COLO.—To Cook & Ransome, Ottawa, Kan., $15,400, by Bur. of Pub. Roads, Denver, for 20.705 mi. const. or impr. Rabbit Ears Pass Forest Highw. in Routt Natl. Forest, Colo., ROUTT, JACKSON & GRAND CO. 8-3

BOISE, IDAHO—To Western Const. Co., Pocatello, Idaho, $17,574 on ALT. 2 by Commissioner of Public Works, Boise, Idaho, for crushing and stockpiling gravel or rock for cover coat material at 4 sites in BOUNDARY, BONNER, BENEWAH and KOOTENAI COUNTIES, Ida. 7-15

MISSOULA, MONT.—T. JP. C. Maguire Const. Co., Butte, Mont., $52,966, to Bur. of Pub. Roads, Missoula, Mont., for constr. the Butte Boulder and Pipestone Pass Highways, bitum. road mix project FHEC 26-A2 and NR-24-A2, located in Deer Lodge Natl. Forest, JEFFERSON COUNTY, Montana. 7-26

BOISE, IDAHO—To Wm. Hoops, Twin Falls, Idaho, $87,570 (RESILIFLEX) by Commissioner of Public Works, Boise, daho, for 5.073 mi. grading and surf. with cr. grav. and const. a 130 ft. concr. bridge and 160 ft. concr. overhead structure on the Old Oregon Trail Highway betw. Hansen and Murtaugh, in TWIN FALLS COUNTY, Proj. NRH 23-C. 7-15

BOISE, IDAHO—Awards as follow by Comm. of Public Works, Boise, Idaho, for: (1) BENEWAH and LATAH CO. (FAP 151-AB)—To G. D. Lyon & Co. and J. C. Compton, McMinnville, Ore., $196,463 for 20.634 mi. const. pl. mix bitum. mat and cr. rock shld. on Palouse Highway betw. Potlatch and Tensed. (2) ADA, ADAMS, CANYON and ELMORE COUNTIES—To Quinn-Robbins Co., Inc., Boise, $19,624 for furn. cover coat matl. and cr. rock surf. in stockpiles in above counties. 7-29

BOISE, IDAHO—Awards as follow by Commissioner of Public Works, Boise, Idaho, for: (1) CASSIA CO. (FAP 131-DE)—To Olof Nelson, Logan, Utah, $124,756 for 26.264 mi. pl. mix bitum. mat and cr. grav. shoulders on Raft River Highway betw. Declo and Malta. (2) JEROME CO. (FAP 125-D, FL. 1-B and St. Aid Proj. 28-A)—To Olof Nelson, Logan, Utah, $96,937 for 7.547 mi. pl. mix bitum. matl and cr. grav. shoulders on Sawtooth Park Highway from Newman's Corner to Jerome Airport and 7.354 mi. on Sawtooth Park Highway, Jerome Branch, betw. Newman's Corner and Jerome. (3) KOOTENAI CO. (FAP 101-FHI)—To Olof Nelson, Logan, Utah, $177,438 for 16.480 mi. const. a plant mix bitum. mat and cr. rock shoulders on the Palouse Highway betw. Coeur d'Alene and Mud Bay School. 7-29

CARSON CITY, NEVADA—Awards as follow by Nev. State Highw. Comm., Carson City, Nev., for: (1) MINERAL and ESMERALDA CO.—To U. B. Lee, 1059 Carpenter St., San Leandro, $68,469 for 34.62 mi. grav. surf. betw. Calif.-Nev. State Line and Coaldale, Rts. 10 and 15, Sec. A. (2) HUMBOLDT CO.—To Geo. French, Jr., P. O. Box 107, Stockton, $21,086 for 12.33 mi. asph. roadmix surf. on State Highway system betw. Winnemucca and Toll House, Rt. 8, Secs. A1 and A2. (3) MINERAL CO.—To J. A. Casson, 319 Warren St., Hayward, $15,111 for 8.84 mi. asph. roadmix surf. betw. 3.3 mi. W. of Luning and 12.8 mi. E. of Hawthorne, Rt. 3, Sec. B2 and C1. 7-24

CARSON CITY, NEVADA—To Geo. French, Jr., Box 107, Stockton, $58-134 to Nevada State Highway Comm., Carson City, Nev., for 0.58 mi. grading and surf. in City of Ely, Rt. 2, Sec. D1, in WHITE PINE COUNTY, Nevada. 7-31

CARSON CITY, NEV.—To Peninsula Paving Co., 9 Main St., S. F., $135,-262 to Nevada State Highway Comm., Carson City, Nev., for 11.37 mi. grad. and surf. betw. Elko and 11.4 mi. N., Rt. 11, Sec. B1 (NRS 134-1935), in ELKO COUNTY Nevada. 7-31

PORTLAND, ORE.—To Theo. Arenz, 10509 N.E. Sandy Blvd., Portland, Ore., $83,417 to Bur. of Pub. Roads, Portland, for 15.237 mi. constr. or impr. the Willamette Highway subgrade reinforcement project FHEC 21-E3, F3, G1, Natl. Forest Road Project, LANE Co., Ore. 7-15

PORTLAND, ORE.—Award recommended to Cowan & Hubback, 317 Highland Drive, Seattle, Wn., $38,933 (METAL PIPE), by Bur. of Pub. Roads, Portland, for 1.3462 mi. grading the St. Helens Highway Reconst. Project NR 15-A5, located in Columbia National Forest, COWLITZ COUNTY, Washington. 7-25

PORTLAND, ORE.—To Lidral Const. Co., 1006 Securities Bldg., Seattle, Wn., $18,481 to Bureau of Public Roads, Portland, Ore., for grading and constructing bridges on the Baker River Reconst. Proj. NR-25-A4, B3, located in Mt. Baker Natl. Forest, WHATCOM CO., Wn. 7-26

PORTLAND, ORE.—Award recommended to E. L. Gates, McCredie Springs, Ore. (MET. PIPE), $95,861, by Bur. of Pub. Roads, Portland,: for 3.2729 mi. grading the N. Santiam Forest Road project, located in the Willamette Natl. Forest, LINN COUNTY, Ore. (24-F2) 8-2

PORTLAND, ORE.—Award recommended to J. L. McLaughlin, Great Falls, Mont., $141,529, by Bureau of Public Roads, Portland, Ore., for 11.5698 mi. const. or improv. the Red Lodge-Cooke City Approach Road, Sec. "D" (portion) surf. and bitum. base treatment and bitum. road mix, Natl. Park project, located adjacent to Yellowstone Natl. Park, in PARK and PARK CO., States of Wyoming and Montana. 8-3

PORTLAND, ORE.—Award recommended to Myers & Goulter, 3227 1st, South, Seattle, Wn., $99,027, to Bureau of Public Roads, Portland, Ore., for 1.581 miles grading Stevens Pass Highway, located in Wenatchee National Forest, Wn. 8-2

OGDEN, UTAH—To Nolan Bros., Inc., 18 N. 2nd St., Minneapolis, Minn., $107,008 by Bureau of Public Roads, Ogden, Utah, for 12.197 mi. bitum. surf. on North Pacific Highway, Proj. FHEC 7-A4, B3, C4, and D4 in Coeur d'Alene Natl. Forest, in KOOTENAI CO., Utah. 7-15

OGDEN, UTAH—To J. W. Whitink, Springville, Utah, $92,704, by Bureau of Public Roads, Ogden, Utah, for 4.631 mi. grading and surfacing the Sevier-Summit, Nat'l Forest Road project, 19-B3, C2, D2, located in the Dixie National Forest, KANE COUNTY, Utah. 7-26

OGDEN, UTAH—Award recommended to Utah Const. Co., Ogden, Utah, $155,773, to Bureau of Public Roads, Ogden, Utah, for 5.856 mi. surf. the North Pacific Highway, Proj. NR 7-C5, located in the Coeur d'Alene National Forest, KOOTENAI COUNTY, Idaho. 7-23

OGDEN, UTAH—To Gibbons & Reed, 165 E. 4th, South, Seattle, Wn., $63,656 by Bur. of Pub. Roads, Ogden, Utah, for const. or improving the Leadore-Montana Line National Forest Road project, located in Salmon Natl. Forest, Idaho. 7-26

SALT LAKE CITY, UTAH—Awards as follow by Utah State Road Commission, Salt Lake City, for: (1) UTAH COUNTY (NRM 50-A-B)—To Strong & Grant, Springville, Utah, $85,801 for 1.930 mi. const. concr. and bitum. concr. or natural rock asphalt road in Payson City. (2) CACHE COUNTY (FAP 127-E)—To Olof Nelson, Logan, Utah, $73,811 for 4.774 mi. const. concr. and bitum. conc. OR natural rock asph. road betw. Logan and Smithfield. (3) EMERY CO. (FAP 75-B and E)—To J. M. Sumison, Springville, Utah, $36,389 for 5.528 mi. const. an oil mix surf. road betw. Woodside and Green River. 7-31

SALT LAKE CITY, UTAH—To Preece & Corbett, Provo, Utah, $32,935 by Utah State Road Comm., Salt Lake City, for 2.916 mi. grav. surf. road betw. Sunset and Hooper (Proj. NRS 160-A, 1935), in DAVIS COUNTY, Utah. 7-8

SALT LAKE CITY, UTAH—To J. M. Sumison, Springville, Utah, $71,566 by State Road Comm., Salt Lake City, for 20.728 mi. oil mix surf. betw. Levan and Gunnison on State Road No. 28, in SANPETE and JUAB COS., Utah, FAP 140-B-C (1936) and FLHP 16-B (1935). 7-22

SALT LAKE CITY, UTAH—Awards as follow by State Road Comm., Salt Lake City, for: (1) SALT LAKE CO.—To Gibbons & Reed, 165 E. 4th, S., S. L. C., $133,663 for 3.600 mi. concr. and bitum. pav. road betw. Sandy and Draper Cross Roads, FAP 119-G. (2) GARFIELD and PIUTE CO.—To W. W. Clyde & Co., Springville, $175,837 for 16.914 mi. pl. mix bit. surf. road U. S. 89 betw. Hatch and Sevier Summit and betw. Junction and Garfield County Line, FP 19-B-C-D. (3) RICH CO.—To W. W. Clyde & Co., Springville, $103,982 for 10.643 mi. oil mix surf. road betw, Saleratus Cr. and Wyoming Line, FAP 85-B and 46. 7-24

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) KITTITAS CO. (FAP 114 C and 114 F)—To Goetz & Brennan, 914 Seaboard Bldg., Seattle, Wn., $248,407 for 8.3 mi. conc. paving on St. Road No. 2, Kachess River to Nelson, Wn. (2) GRAYS HARBOR CO.—To Goetz & Brennan, Seattle, $293,534 for 8.1 mi. conc. pav. on St. Road No. 9, Montesano to Aberdeen, Wn. (3) COWLITZ CO. (NRH 32)—To Sheble Const. Co., Securities Bldg., Seattle, $110,570 for grad. and const. 240 ft. steel span on St. Road No. 1, Toutle River Bridge. 7-26

OLYMPIA, WN.—To Norris Bros., Burlington, Wn., $198,628 by Director of Highways, Olympia, Wn., for 4.7 mi. concr. paving on State Road No. 2, Sec. 1, Summit (Snoqualmie Pass) to Upper Crossing South Fork Snoqualmie River, FAP 142-E in KING COUNTY, and Sec. 2, Hyak-Paving Gap, FAP 114-B, KITTITAS COUNTY, Wn. 8-1

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) PACIFIC and WAHKIAKUM CO.—To Homer G. Johnson, Imperial Hotel, Portland, Ore., $124,941 for 14.2 mi. miner. aggreg. on St. Road No. 12, Palex River to Johnson's Landing, Sec. 1, Pacific County; 17.9 mi. surf. and production of miner. aggreg., Johnson's Landing to Grays River, Sec. 2 in Pacific and Wahkiakum Counties; and 6.6 mi. produce miner. aggreg. on Sec. 3, Bear River to Illwaco, in Pacific County, Wn. (2) WHITMAN CO. (PWP 1358)—To Norris Bros., Burlington, $9,838 for 0.16 mi. concr. paving on St. College of Wn. Campus, Sec. 2, in front of Mines Bldg., College Hall and Wilson Hall, at Pullman, Whitman County. 7-26

SEATTLE, WN.—Awards as follow by Board of Public Works, Seattle, Wn., for: (1) To Northwest Const. Co., 3950 6th, N.W., Seattle, Wn., $27,996 for paving Woodlawn Ave. from Maple Leaf Place to East 75th St.; and on 1st Ave. N.E. from East 75th St. to East 85th St., under Ord. No. 63906. (2) To Northwest Const. Co., Seattle, Wn., $16,940 for paving 24th Ave. N.W. from West 65th St. to West 73rd St., under Ord. No. 63805. 7-8

CHEYENNE, WYOMING—Awards as follow by State Highway Comm., Cheyenne, for: (1) GOSHEN and NIOBRARA CO. (FAP 150 F and R)—To Driscoll Const. Co., Pueblo, Colo., $117,915 for 24.305 mi. oil tr. by road mix method on Lingle-Lusk and Lusk-Newcastle roads. (2) FREMONT CO. (FAP 162-A and 162-CR)—To Northwest Engrg. Co., Rapid City, $134,614 for 23.708 mi. oil tr. by road mix method on Lander-Muddy Gap road. (3) PLATTE CO. (FAP 204 AR)—To Northwest Engrg. Co., Rapid City, $25,936 for 4.641 mi. oil tr. by road mix method on Bosler-Wheatland road. 7-20

CHEYENNE, WYOMING—Awards as follow by State Highway Comm., Cheyenne, Wyo., for: (1) CONVERSE CO. (FAP 209-A-R)—To W. A. Norris, Inc., Cheyenne, $65,723 for 15.844 mi. oil tr. by road mix method on Douglas-Gillette Road. (2) BIG HORN CO. (FAP 211-AR)—To Taggart Const. Co., Cody, Wyo., $38,779 for 10.315 mi. oil tr. by road mix method on Lovell-Kane road. (3) HOT SPRINGS CO. (FAP 213-AR)—To Peter Kiewitt & Sons, Omaha, $32,149 for 7.706 mi. oil tr. by road mix method on the Thermopolis-Meeteetse road. (4) WESTON CO. (FAP 214-A)—To Peter Kiewitt & Sons, Omaha, $36,818 for 7.920 mi. oil tr. by road mix method on Newcastle-Custer Road. (5) CARBON CO. (NRH 164 and FLHP 8)—To Woodward Const. Co., Rock Springs, $24,600 for 10.627 mi. oil tr. by road mix method on Casper-Rawlins Road. (6) CAMPBELL CO. (FAP 66-B-R)—To Inland Const. Co., Cheyenne, $63,435 for 8.777 mi. oil tr. by road mix method on Gillette-Arvada road. 7-20

CHEYENNE, WYOMING—Awards as follow by State Highway Comm., Cheyenne, Wyo., for: (1) ALBANY CO. (NRS 29-B)—To J. M. Keahey, Laramie, Wyo., $39,388 for 5.167 mi. grad., dr., base course surf. and const. 2 tr. timb. bridges and 1 reinf. conc. culvert on Laramie-Woods Landing Road. (2) LARAMIE CO. (NRH 73-A, NRM 73 BR and NRM 46-B, comb.)—To A. H. Read, Cheyenne, Wyo., $24,763 for .845 mi. const. sidewalk on Cheyenne-South and Cheyenne-Laramie road. (3) FREMONT CO. (NRH 52-A, Unit 2)—To J. M. Keahey, Laramie, Wyo., $15,835 for 2.7 mi. grad. and base course surf. on Shoshoni-Riverton road. 7-19

CHEYENNE, WYOMING—Awards as follow by the State Highway Comm., Cheyenne, Wyo.: (1) BIG HORN and PARK CO. (FLHP 7-R)—To Peter Kiewit Sons, Omaha, Nebraska, $66,511 for 24.573 mi. oil tr. by road mix method on the Cody-Greybull road. (2) SWEETWATER and SUBLETTE CO. (FLHP 6 A and B)—To Northwestern Engrg. Co., Rapid City, Iowa, $111,837 for 30.461 mi. oil tr. by road mix TER CO.—To Woodward Const. Co., Rock Springs, Wyo., $8,365 for TER CO.—To Woodward Const Co., Rock Springs, Wyo., $8,360 for 50.407 mi. seal coating Baggs Creston road, involving 85,800 gal. seal coat RC-1. 8-1

Bridges and Culverts . . . . . .

WORK CONTEMPLATED

HOLLISTER, CALIF.—Plans and specifications are being completed by County Surveyor, and call for bids will be issued shortly to be opened two weeks later, by County Clerk, Hollister, Calif., for constructing 3 bridges—one across Dos Picachos Creek near the Dooling Ranch; 1 across the Dos Picachos Creek near Jarvis Place and 1 over Los Viboras Creek on the Comstock Road, all in Supervisors District No. 1. 8-2

CONTRACTS AWARDED

SAN FRANCISCO, CALIF.—To Clinton Const. Co., 923 Folsom St., S. F., $360,857 to S. F.-Oakland Bay Bridge, Room 811, 500 Sansome St., S. F., for constr. of Administration Bldg. and Toll Plaza for the S. F.-Oakland Bay Bridge under Contract No. 10. (See Unit Bid Summary.) 7-31

CARSON CITY, NEVADA—To Dodge Const. Co., Inc., Fallan, Nevada, $15,585 to State Highway Comm. of Nevada, Carson City, Nev., for constr. a reinf. concr. bridge and 0.19 mi. approaches in Eastgate on Rt. 2, Sec. E1, in CHURCHILL CO., Nev. 7-31

PORTLAND, ORE.—To Averill & Philpott, Rt. 10, Portland, Ore., $23,778 to Bur. of Pub. Roads, Portland, Ore., for constr. a continuous steel beam bridge over Elk Creek and grading approaches, Tiller Trail project, in Umpqua Natl. Forest, DOUGLAS COUNTY, Ore. 7-29

Water Supply Systems . . . . .

WORK CONTEMPLATED

BREA, CALIF.—Plans are being prepared and application will be made to PWA for a loan and grant of $12,000 for const. of a roof on water reservoir north of the City. 7-20

FRESNO, CALIF.—The P.W.A. has made a grant of $13,090 to the City of Fresno, Calif., for constructing a well, pumping station, and distribution system with service conn. for municipal water system. 7-22

SAN DIEGO, CALIF.—Recommendations have been made as follows by Fred Pyle, hydraulic engineer, to the City Council, San Diego, for construction of a $1,060,000 water program: Strengthening of Hodges Dam, $180,000; El Capitan Pipe Line, $430,000; strengthening of San Dieguite Dam, $40,000; El Capitan Reservoir Road, $60,000; development of Murray Reservoir (including 2.5 mi. pipeline, filter plants, water towers, etc.), $350,000. 7-16

SANTA PAULA, CALIF.—Plans are being prepared by Santa Paula Water Works, VENTURA COUNTY, for const. of a regulating and equalizing reservoir, and for replacement of 2,520 ft. of distribution pipe. 7-6

SEAL BEACH, CALIF.—The City Council, City Hall, Seal Beach, has engaged Victor Hayes, Long Beach, as consulting engineer to prepare plans and specifications for construction of a city water system. Est. cost of the above project is $45,000. An application for Federal Funds will be made shortly. 7-31

TACOMA, WN.—Plans and specifications have been completed and call for bids will be issued within two weeks by Board of Contracts and Awards, Tacoma, Wn., for constructing new water mains for City. Est. cost of work is $467,000. 7-31

SAN FRANCISCO, CALIF.—W. C. Akard, 225 Cervantes Blvd., S. F., $11,647, low to Dept. of Public Works, S. F., for installation of Sec. "B" of Embarcadero Exten. to the Auxiliary Water Supply System. 7-17

SAN FRANCISCO, CALIF.—Pacific State Construction Co., 708 Call Bldg., S. F., $55,840, low to Dept. of Pub. Works, S. F., for const. of the Hayes Valley Extension to the Auxiliary Water Supply System. 7-24

OMAK, WN.—Bids received as follows by City Clerk, Omak, Wn.: (1) J. M. DeBlasio, Yakima, Wn., $18,561 low for furnishing and laying 2,970 ft. 10" and 4,930 ft. 6" and 3,520 ft. 4" pipe water main; including hydrants, valves, fittings, service changes and hauling earth and stone. (2) C. F. Schaeffer, Omak, $3,205 low for furn. and installing a vertical pumping unit having a capacity of 800 gal. per min.; 167 ft. total head, complete with all connec. and fittings; furn. and installing one chlorinator with 12 lb. cap. in 24 hours; and erection of one frame pump house and approx. 3.3 cu. yd. concr. struc. 7-16

CONTRACTS AWARDED

PHOENIX, ARIZ.—To O. F. Fisher, Phoenix, $50,852 to City Comm., Phoenix, for construction of an underground water system in the Municipal Park, located N.W. of 7th Avenue and Encanto Blvd. Contract for furnishing irrigation pipe for this project has been awarded to Arizona Concrete Co. at $11,367. 7-6

LOS ANGELES, CALIF.—To Fred W. Weber, 8442 California Ave., South Gate, $12,500 to Board of Public Works, L. A., for furn. and installing pumping plants, pumps and piping and sludge piping system for the Terminal Island Sewage Treatment Plant, P.W.A. Proj. 5633, Unit No. 3B. 7-20

SAN FRANCISCO, CALIF.—To C. C. Moore & Co., Engineers, 450 Mission St., S. F., $9,267 to State Architect, Sacramento, for furnishing and installing water softeners, Boiler Plant Bldg., Camarillo State Hospital, Camarillo, Calif. 7-8

SACRAMENTO, CALIF.—To Frederick W. Snook Co., 596 Clay St., S. F., $212.175 by U. S. Engineer Office, Sacramento, for furn. and installing 3 drainage pumping plants along the easterly levee of the Sutter By-Pass in Sutter County. 7-24

SAN BRUNO, CALIF.—To Cement Gun Construction Company, 9 Main St., S. F., $6,000 by City Clerk, San Bruno, for guniting new city reservoir. 7-27

SAN FRANCISCO, CALIF.—Awards as follow by Dept. of Pub. Works, City Hall, S. F., for: (1) To M. J. Lynch, Barneveld and Oakdale Sts., S. F., $43,694 for install. of Sec. "B" of the Park-Presidio Extension to the Auxiliary Water Supply System, under Spec. No. 18,845. (2) To Pacific States Const. Co., Call Bldg., S. F., $33,307 for const. the Sunset Extension to the Auxiliary Water Supply System. 7-12

SAN FRANCISCO, CALIF.—To Fay Improvement Co., Phelan Bldg., S. F., $23,441 to Dept. of Public Works, S. F., for installation of Sec. "A" of the Embarcadero Extension to the Auxiliary Water Sup. Sys. 7-25

SAN FRANCISCO, CALIF.—To Steel Pipe & Tank Co. of Calif., 1100 4th St., Berkeley, $50,865 by National Park Service, S. F., for furnishing and laying in a trench furn. by National Park Service, elec. arc-welded, soil-proofed steel pipe, penstock anchorages, and dresser type couplings; also remove and relay present 26" penstock for use in connection with construction of the hydro-electric power plant to be installed at Mammoth, Yellowstone Natl. Park. Above award excludes Item 6 and all ALTERNATIVE items. 8-1

JACKSONVILLE, ORE.—To Consolidated Supply Co., 139 S.W. Stark St., Portland, Ore., who bid $5,493 to the City Clerk, Jacksonville, Ore., for improvements to waterworks system. 7-10

WOODRUFF, UTAH—Award to S. A. Young Const. Co., Richfield, Utah, $6,579 by Town Clerk, Woodruff, Utah, for waterworks imps. 7-15

Sewer Construction .....

WORK CONTEMPLATED

EL MONTE, CALIF.—The bond election on a proposed bond issue for $23,500 to match Federal funds allotted for improving and enlarging the city's sewage disposal plant on the Rio Hondo carried by more than five to one majority. 7-25

MIDWAY CITY, CALIF.—Special election will be called shortly by the Midway City Sanitation District to vote $20,000 in bonds to finance construction of sanitary sewers in district bounded by Hazard St., Sugar St., Newland St., and Huntington Beach Blvd. Total cost of the project is $80,000 and a loan and grant will be asked of the Public Works Administration. 7-31

CALL FOR BIDS

LOS ANGELES, CALIF.—Bids to 10 a.m., Aug. 21st, by Bd. of Public Works, Los Angeles, for constructing sewer complete Centinela Ave. and Venice Blvd. sewer district, not including house connections or resurfacing, involving: 22,319 lin. ft. vitr. pipe; 279,510 sq. ft. "AA" resurfacing. Spec. No. 137. 8-2

BIDS RECEIVED

CAMARILLO, CALIF.—Fred J. Early, Jr., 369 Pine St., San Francisco, who bid $83,900, low to State Architect, Public Works Bldg., Sacramento, for const. a complete seweage disposal plant at Camarillo State Hospital, Camarillo, Calif. 7-30

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To Joe Sutalo, 476 Camulos St., Los Angeles, $18,681, to Board of Public Works, Los Angeles, for constructing sewer in Mt. View Ave. and Venice Blvd. sewer district. 7-27

LOS ANGELES, CALIF.—To Merritt, Chapman & Scott, Box 698, San Pedro, $528,059, to County Sanitation District, Los Angeles, for construction of a submerged pipeline portion of unit No. 1 of joint outfall sewer extending southwesterly from the ocean shore near White Point, west of San Pedro, into the Pacific Ocean. 7-10

LOS ANGELES, CALIF.—Awards as follow by the County Sanitation Dist., Los Angeles, for const. of part of Unit No. 1 of joint outfall sewer extending from dist. joint disposal plant near Harbor City to ocean shore near White Point, San Pedro: SCHEDULE 1—To Shofner & Gordon, 1631 N. Main St., L. A., $629,967. SCHEDULE 2—To Shofner & Gordon, L. A., $976,314. SCHEDULE 3—To United Concrete Pipe Corp., Sta. H, Box 1, L. A., $440,058. 7-9

SAN MATEO, CALF.—Award recommended (subject to P.W.A. approval) to W. J. Tobin, 3701 Balfour Ave., Oakland, $71,630 (after deductions of items 2, 4, 5 and 6) by City Manager, San Mateo, for constructing Unit "B" of sewage pumping plant in connection with the San Mateo Outfall sewer. 7-23

River and Harbor Work .....

WORK CONTEMPLATED

LOS ANGELES, CALIF.—Application has been made to U. S. Engr. Office, L. A., by Victor Flemming, for War Dept. permit, to extend an existing pleasure pier with appurtenant ramp and float 35 ft. channelward of combined pierhead and bulkhead line, betw. U. S. Harbor-line Sta. 108-109 in Newport Bay, Calif. 7-9

LOS ANGELES, CALIF.—Application has been made to U. S. Engineer Office, Los Angeles, by the Harbor Dept., City of San Diego, for War Department permit to dredge about 1,800,000 cu. yd. of material from portions of Seaplane Basin, southerly of the municipal airport, to minus 12 ft. and deposit material in areas adjacent to the airport at San Diego. 7-31

RICHMOND, CALIF.—The Richmond City Council has granted to I. M. Isaacs, Pres., Fish Meals & Oil Co., a permit to build a wharf and plant on land leased from Parr Terminals. Est. cost $30,000. 7-11

SEAL BEACH, CALIF.—City Council, Seal Beach, has engaged Victor Hayes, Long Beach, as consulting engineer to prepare plans and apply to P.W.A. for funds for financing the $62,000 Anaheim Bay Breakwater. 7-31

BIDS RECEIVED

LOS ANGELES, CALIF.—Rohl Connolly Co., 4351 Alhambra Ave., Los Angeles, $827,750, low to U. S. Engr. Office, L. A., for furnishing all labor and materials and performing all work for const. a composite type breakwater approx. 2,000 ft. long in Los Angeles-Long Beach Outer Harbors, Calif. 7-29

OAKLAND, CALIF.—All bids submitted to the U. S. Coast Guard Headquarters, Washington, D. C., for construction of a steel sheet pile bulkhead approximately 1,528 ft. long, anchorages, and bollard piles and accessories at the U. S. Coast Guard Base Eleven, Govt. Island, Oakland, have been rejected. 7-22

SAUSALITO, CALIF.—A. W. Kitchen, 110 Market St., San Francisco, $194,119, UNIT 1, and C. L. Wold Const. Co., Ltd., 4412 Fulton St., S. F., $111,122, UNIT 2, low bids submitted to Golden Gate Yacht Harbor, Ltd., 892 Mills Bldg., S. F., for const. of harbor facilities for the Golden Gate Yacht Harbor at Sausalito, including piers, bulkheads, dolphins, marine railway, foundations, dredging, filling and pavement, buildings, boat storage space, etc. 7-29

PORTLAND, ORE.—F. J. Kernan, Portland, Ore., and Brookfield Co., Astoria, Ore., $395,178, low to U. S. Engineer Office, Portland, Ore., for channel improvement in Columbia River, Oregon and Washington, from Celilo Falls to Wallula. 8-1

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To Merritt, Chapman & Scott, San Pedro, $32,320, by U. S. Engr. Office, L. A., for repairs to breakwater at San Luis Obispo. 7-9

SAN DIEGO, CALIF.—Award recommended to Chas. & F. W. Steffgen, 2015 Bay Front, San Diego, $.37 per cu. yd., to 11th Naval Dist., ft. of Broadway, San Diego, for dredging continuous to runway to final assembly shop, involving approx. 32,000 cu. yd., under Spec. 6037. 7-30

SAN DIEGO, CALIF.—To V. R. Dennis Const. Co., 3911 5th Ave., San Diego, $11,590, by 11th Naval Dist., San Diego, for const. concr. wall (bulkhead) for seaplane runway approx. 450 ft. long, under Spec. 8036. 8-2

PORTLAND, ORE.—To S. S. Montague, 42 S. E. Salmon St., Portland, Oregon, $52,920, to U. S. Engineer Office, Portland, for clearing and grading river bank and constructing approximately 4,340 ft. protective gravel fill and removing and relaying 7,200 sq. ft. stone revetment in Willamette River near Independence, Oregon, under Bid No. 698-36-8. 7-25

PORTLAND, ORE.—To Parker Schram Co., 515 Couch Bldg., Portland, Oregon, $60,980, to U. S. Engineer Office, Portland, Ore., for const. a total of about 5,360 ft. of pile dikes in Columbia River at 6 different sites located one to four miles above Vancouver, Wn., under Invit. for Bids 698-36-2. 7-25

PORTLAND, ORE.—To Tacoma Dredging Co., Inc., 1113½ A Street, Tacoma, Wn., $79,000 to U. S. Engineer Office, Portland, for dredging material from channel in Columbia River, extending from Interstate Highway Bridge at Vancouver, Wn., to the mouth of Willamette River, Oregon. 7-25

PORTLAND, ORE.—To Kern & Kibbe, 42 E. Salmon St., Portland, $80,993, on Sections 1, 2 and 3 by U. S. Engineer Office, Portland, Ore., for bank clearing, bar clearing, grading of river bank, and constructing approximately 22,635 lin. ft. protective gravel fill, all along the Willamette River, Oregon, between Eugene and Harrisburg, under Invitation for Bids No. 698-36-20. 7-31

PORTLAND, ORE.—Awards as follow by the U. S. Engr. Office, Portland, Ore., for furn. erecting and putting in operating condition, intake gates, stop logs, steel gates, gantry cranes, etc., for Bonneville Power Navigation project, Bonneville, Ore., under Spec. 694-35-29: SCHED. No. 2—To Warden Allen Co., Milwaukee, Wisc., $130,280, (ALT B) for furnishing steel intake gates and stop logs for powerhouse. SCHED. No. 3—To Columbia Steel Co., 2345 Northwest Nicolai, Portland, $1,191,000, for furnishing gantry cranes and steel gates for spillway dam. 8-2

PORTLAND, ORE.—To Pacific Coast Steel Corp., 20th and Illinois Sts., San Francisco, $398,298 (ALT. "B") by U. S. Engineer Office, Portland, Ore., for furn. and installing lock operating equipment at Bonneville, Ore., involving Upper and Lower Miter gates with complete operating machinery, four Tainter valves with complete operating machinery, six floating mooring bitts complete and floor plates and grating. 8-2

BELLINGHAM, WN.—To Tacoma Dredging Co., 1113½ "A" Street, Tacoma, Wn., $19,030, by U. S. Engineer Office, Seattle, Wn., for 57,150 cu. yd. dredging in Whatcom Creek waterway in Bellingham Harbor. 8-1

SEATTLE, WN.—To Columbia Const. Co., Lewis Bldg., Portland, $358,610, to U. S. Engineer Office, Seattle, Wn., for placing 80,000 tons stone for rebuilding part of south jetty, const. of an unloading wharf, trackage connect. wharf with base of jetty, tramway on enrockment of old jetty and furn. and installing 2 derricks, 1 track scales, a scalehouse and garage for 1st unit of Grays Harbor jetty project. 7-22

SEATTLE, WN.—To Puget Sound Bridge & Dredging Co., 2929 16th Ave., S. W., Seattle, Wn., $196,492, to U. S. Engineer Office, Seattle, Wn., for dredging a cutoff channel in a bend of the Willapa river just above the Narrows and below Raymond. 7-18

Irrigation and Reclamation

WORK CONTEMPLATED

PHOENIX, ARIZ.—Call for bids will be issued within 60 days by the Bureau of Reclamation for construction of improvements on the Salt River, according to Lin B. Orme, president of the Salt River Water Users Association. Plans call for excavation of a new spillway channel for Stewart Mountain Dam on the Salt River; increasing Mormon Flats and Horse Mesa Dam spillways to capacity of 150,000 second feet; lowering of the spillway gates at Roosevelt Dam; construction of a diversion dam 19 miles above Roosevelt on the Salt River to divert water into the power canal at Roosevelt. This work will be financed by a Federal allocation of $6,000,000 ($4,500,000 to be used for the first year's work). The funds will be repaid by the Water Users Association over a 40-year period. The Dept. of the Interior, U. S. Indian Service, has allocated $844,000 for the construction of the Bartlett Dam on the Verde River, 5 miles above Camp Creek. This structure will have a storage capacity of 200,000 acre feet (40,000 acre feet to be used for irrigation of Indian lands; balance for Salt River Project). 7-26

YUMA, ARIZ.—Bureau of Reclamation will open office to handle Yuma-Gila project and call for bids will be issued shortly for 17 miles of rock excavation for main canal. Work also includes heading at Imperial Dam, power house and lines, 4 booster pump stations and concrete laterals. 7-29

GRASS VALLEY, CALIF.—The Nevada Irrigation District, Grass Valley, Calif., has made application to the Reconstruction Finance Corp., for a loan of $8,000,000 to finance new works and pay outstanding bonds. New construction planned includes: Storage dam and improvements to canal system, $400,000; extension to workings in Placer County, $400,000; enlarge storage area at Weaver Lake, $300,000; miscellaneous improvements, $230,000. 7-26

SALEM, ORE.—An allocation of $1,000,000 of P.W.A. funds has been approved by the President for the construction of the Wickiup Dam in Central Oregon. Work on the above project is expected to start shortly. 7-26

THERMOPOLIS, WYOMING—A grant of $199,636 and a loan of $244,000 has been made by the P.W.A. to the Owl Irrigation District, Thermopolis, Hot Springs County, Wyo., for const. of a low diversion dam on Owl Creek, and a supply canal from Owl Creek to the South Fork of Owl Creek with a capacity of 5,200 acre ft.

CALL FOR BIDS

MISSOULA, MONTANA—Bids to 10 a.m., August 21st, by the Bureau of Reclamation, Missoula, Montana, for construction of earthwork, Main Canal, Frenchtown Project, Montana, under Spec. 706-D. Work is located near Missoula, Mont., and involves in the main: 241,000 cu. yd. all cl. excav. for canal 11,000 sta. cu. yd. overhaul. 7-29

ONTARIO, ORE.—Bids to 10 a.m., August 21st, by the Bureau of Reclamation, Ontario, Oregon, for construction of structures, North Canal laterals N. C. 26.4 to 28.7 Mitchell Butte Division, Owyhee Project.

Oregon-Idaho, under Spec. No. 708-D. Work is located near Dunaway, Oregon, and involves in the main: 1,850 cu. yd. all class. excav. for struc.; 1,800 cu. yd. backfill; 680 cu. yd. concrete in structures; 1,200 sq. yd. dry-rock paving; 38,000 lb. reinforcing bars (place); 1,080 lin.ft. 15" to 42" diam. concr. pipe (lay); 5,800 lb. gates and gate hoists (install). 7-29

BIDS RECEIVED

BUCKEYE, ARIZ.—Vinson & Pringle, 919 E. Madison St., Phoenix, Ariz., $462,685, low to Roosevelt Irrigation District, Buckeye, Ariz., for sloping, reinforcing and backfilling 1" gunite lining on 4,890,000 sq. ft of irrigation canal from Hassayampa River to Phoenix. 7-26

SNOWFLAKE, ARIZ.—Leo Frost & Rogers, Snowflake, Ariz., $73,970, low to Showlow-Silver Creek Water Conservation & Power District, Snowflake, Ariz., for constructing the Lone Pine Dam, near Snowflake, NAVAJO COUNTY, Ariz. 7-24

YUMA, ARIZ.—Triangle Rock & Gravel Co. & Chas. Holmes, Highland Ave., San Bernardino, $149,900, low to Bur. of Reclam., Yuma, Ariz., for preparation of concr. aggregates at Sta. 90 of All-Amer. Canal, Boulder Cany. Proj., Ariz.-Calif.-Nev., under Spec. 633. 7-8

HELENA, MONT.—S. J. Groves & Co., Red Lodge, Mont., $86,742, low to State Water Conserv. Board, Helena, Mont., for const. of a small earthfill dam at the site of the Glacier Lakes Reservoir. This is the second unit of the Carbon County Conservation project. 7-15

ONTARIO, ORE.—Henry L. Horn, Nyssa, Ore., $10,225. SCH. 1, and $11,326. SCH. 2, low to Bur. of Rec. Ontario, for const. struc., North Canal laterals N. C. 25.4 to 25.4-4.8 Mitchell Butte Div., Owyhee Proj., Oregon-Idaho, under Spec. 694-D. 7-15

OGDEN, UTAH—J. A. Terteling & Son, 2223 Fairview Ave., Boise, $156,092. SCH. 1 and Utah Const. Co. & Morrison-Knudsen Co., Box 726, Ogden, $197,430. SCH. 2, low to Bur. of Reclam. Ogden, for const. earthwork, canal lining and struc. Sta. 0 to Sta. 587, Ogden-Brigham Canal, Ogden River Proj., Utah, Spec. 623. 7-8

CASPER, WYOMING—W. E. Callahan Const. Co., Kirby Bldg., Dallas, Texas, and Gunther & Shirley, Los Angeles, $1,482,651, low to Bureau of Reclamation, Casper, Wyo., for constructing the Alcova Dam, to be located on the North Platte River about 30 mi. southeast of Casper, Wyo. Dam to be earth and rockfill type, about 235 ft. high, crest length 900 ft., and crest width of 40 ft., under Spec. No. 590. (See Unit Bid Summary) 7-15

CASPER, WYOMING—Winston Bros., 1470 Northwestern Bank Bldg., Minneapolis, Minn., $2,194,007, low to Bureau of Reclamation, Casper, Wyo., for constructing the Seminoe Dam and Power Plant, to be located about 33 mi. northeast of Rawlins, Wyo., on North Platte River, Casper, Wyo., Alcova project, under Spec. No. 630. Dam is to be massive concrete arch type, 260 ft. high, 540 ft. crest length, 89 feet thick at base and 15 ft. thick at top. (See Unit Bid Summary) 7-22

CONTRACTS AWARDED

PHOENIX, ARIZ.—Contract awarded to Harry T. Johnson Co., 501 Merritt Bldg., Los Angeles, by Verde Irrigation and Power District, Phoenix, for construction of developments in the Paradise and Deer Valleys, north of Phoenix. The following projects are included in the $23,000,000 contract which was awarded to Mr. Johnson on a cost plus basis: Camp Verde Reservoir on Verde River—Capacity 950,000 acre feet; dam to be 800 ft. long and 263 ft. high. Horseshoe reservoir on the Verde River—Capacity 240,000 acre feet. New River Reservoir—Capacity 83,000 acre feet. McDowell-Paradise main canal, distributing canals and 50 pumping plants. Eight power plants at Camp Verde Dam, Horseshoe Dam, lower end of Harris Power Canal, lower end of McDowell Power Canal. The first project to be started is the Camp Verde Dam, est. cost $1,500,000, on October 1. Harry T. Johnson will sublet various portions of the work, such calls for bids to emanate from his Los Angeles office after August. 1 7-26

YUMA, ARIZ.—Sub-contract for 3,472,000 cu. yd. canal excavation in Sched. No. 4, west of the sand hills, on the All-American Canal, has been awarded to W. E. Callahan Const. Co., 206 S. Spring St., L. A., by Mittry Bros., 5531 Downey Road, Los Angeles, under contract to the Bureau of Reclamation, Yuma, Ariz., for constr. of Sched. No. 4. 7-11

FAIRFIELD, MONT.—To Rue Bros., Bismarck, N. D., $78,881, by Bur. of Reclam., Fairfield, Mont., for const. earthw. and struc. for Greenfields Main Canal and Greenfields South Canal enlargement and extension and laterals and lateral extensions and enlargements, Greenfields Division, Sun River Proj., Mont., under Spec. No. 626. 7-30

ONTARIO, ORE.—To J. A. Terteling & Sons, 2223 Fairview Ave., Boise, Ida., $9,740, to Bureau of Reclamation, Ontario, Ore., for earthwork and structures, Kingman Main Drain and Kingman Drain 2.23 Owyhee Project, under Spec. 669-D. 7-9

Flood Control Work . . . . .

WORK CONTEMPLATED

SANTA ANA, CALIF.—The Orange County Board of Supervisors have applied to the Public Works Administration for funds to finance the following flood control projects: Construction of the Santiago Reservoir addition to cost $495,000. Construction of Prado Dam on Santa Ana River (90 ft. high), $7,000,000. Construction of Santa Ana Channel Spreading Ground, $255,000. Construction of San Juan Creek Reservoir, $1,000,500. Construction of Trabuco Reservoir, $650,000. Construction of Fullerton Reservoir, $150,000. Construction of Carbon Creek Canyon Reservoir, $600,500. Construction of Aliso Reservoir, $112,000. Construction of Brea Creek Reservoir, $750,000. 7-31

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To L. E. Dixon Co., 609 South Grand Ave., Los Angeles, $25,756, on SCH. 1 to the County Board of Supervisors, Hall of Records, Los Angeles, for constructing a concrete lined channel on Verdugo Wash from Debris dam to point 1700 ft. southerly. 7-15

LOS ANGELES, CALIF.—To Gogo & Rados, 10024 S. Figueroa St., Los Angeles, $66,899, to County Board of Supervisors, Los Angeles, for constructing a concrete conduit on Verdugo Wash from Kenilworth Ave. to L. A. River. 7-15

LOS ANGELES, CALIF.—To R. A. Wattson, 1026 S. McCadden Place, Los Angeles, $119,861, by County Bd. of Supervisors, L. A., for const. of a concrete conduit in Pickens Canyon Channel from the Debris Basin to Verdugo Wash. 7-15

LOS ANGELES, CALIF.—To Case Const. Co., Inc., 905 Westminster Ave., Alhambra, $44,291, by County Board of Supervisors, Los Angeles, for const. concr. conduit in Pickens Canyon Channel from Debris Basin to Verdugo Wash. 7-15

LOS ANGELES, CALIF.—To Bannister Field Co., Ltd., 4101 Goodwin Ave., L. A., $138,480, by County Board of Supervisors, Los Angeles, for constructing concrete conduit in Halls Canyon Channel from Debris Basin to Verdugo Wash. 7-15

LOS ANGELES, CALIF.—To Geo. Bock, 1120 N. Las Palmas, L. A., $37,401, by Board of Superv., L. A., for const. Hall Beckley Debris Basin, near Montrose. 7-15

LOS ANGELES, CALIF.—To L. E. Dixon Co., 609 S. Grand Ave., L. A., $73,351, by Bd. of Superv. L. A., for concr. conduit on Verdugo Wash from Del Valle Ave. to exist. conduit, 800 ft. about Mountain St. 7-15

Tunnel Construction....

WORK CONTEMPLATED

ALAMEDA, CALIF.—The City of Alameda has made applicaiton to the P.W.A. for a combined loan and grant of $2,500,000, for the construction of a west-end tube under the Oakland Estuary for connection with the S. F.-Oakland Bay Bridge. An appropriation of $1500 has been made for test borings on the proposed site. 7-6

BIDS RECEIVED

LOS ANGELES, CALIF.—Bids received as follows by the Metropolitan Water Dist., 306 W. 3rd St., L. A., for const. concr. lined tunnels or precast concr. pipeline and appurtenant works of the Colorado River Aqueduct distribution system, betw. Sta. 2287-00 and 2951-50, and betw. Sta. 3061-00 and 3117-14 of the Upper Feeder, under Spec. No. 110. Work is located within the County of Los Angeles and principally within the cities of Sierra Madre and Pasadena. Work involves excavation and lining of water supply pressure tunnels with approaches of jointed cast-in place pipe, having interior diam. of 10 ft. and the const. of precast concr. pipelines, having interior dia. 9 ft. 10 in.: SCHED. No. 1 (6050 ft. of tunnel and 400 ft. cast-in-place pipe, together with appurtenances, betw. Upper Feeder Stas. 2287-00 and 2951-50 in Sierra Madre), J. F. Shea Co., Inc., 610 S. Main St., Los Angeles (low), $256,442. SCHED. No. 2 (5504 ft. of tunnel and 100 ft. cast-in-place pipe, betw. Upper Feeder Sta. 3051-00 and 3117-14 in Pasadena. L. E. Dixon, Bent Bros. and Johnson, 609 S. Grand, Los Angeles (low), $204,475. SCHED. No. 3 (1550 ft. tunnel and 4900 ft. precast concr. pipe, betw. Upper Feeder Sta. 2887-00 and 2951-50 in Sierra Madre: Chicago Bridge & Iron Works, 608 S. Hill St., L. A. (low), $288,259. SCHED. No. 4 (5623 ft. precast concr. pipe, betw. Upper Feeder Sta. 3061-00 to 3117-14 principally in Pasadena. Chicago Bridge & Iron Works, 608 S. Hill St., Los Angeles (low), $260,887. 7-30

DENVER, COLO.—Utah, Bechtel, Morrison, Kaiser Co., Almont, Colo., $447,337, low to Board of Water Commissioners, Denver, Colo., for constructing tunnels No. 3, 4 and 5, transitions at the tunnel portals and bench flume, a concrete flume and siphon, and foundations for siphon No. 2 and 3 of the South Boulder Diversion Conduit. Work is located on South Boulder Creek approx. 2 miles above Eldorado Springs in BOULDER COUNTY, Colo. See Unit Bid Summary) 7-9

SALT LAKE CITY, UTAH—Bids received as follows by Bur. of Reclam., S.L.C., for const. of Ephraim and Spring City Tunnels, Ephraim and Spring City Divisions, Sanpete Proj., Utah, Spec. 602: Morrison-Knudsen Co., Sch. 1, $162,434; Sch. 2, $218,402. Case Const. Co., only bid Sch. 3, $334,176. 7-8

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To L. E. Dixon, Bent Bros. & Johnson, Inc., 609 South Grand Ave., Los Angeles, $503,145, on SCH. 1, and $658,459 on SCHED. 2 by Metropolitan Water District, 306 W. 3rd St., Los Angeles, for construction of the San Rafael Nos. 1 and 2 tunnels and east portion of Monrovia Tunnel, under Spec. 107. (See Unit Bid Summary) 7-26

Miscellaneous.....

WORK CONTEMPLATED

DOUGLAS, ARIZ.—Phelps Dodge Corp., Douglas, Ariz., has announced that const. will start immediately on reverbatory furnace and one new heat waste boiler and auxiliaries. The furnace will be 26 by 107 ft.; the boiler will be 2718 HP with 400 lb. pressure. Est. cost $250,000. 7-10

LA MESA, CALIF.—La Mesa Lemon Grove & Spring Valley Irrigation Dist. has asked permission of City Council, City Hall, San Diego, to start construction of a 36" pipeline. The City of San Diego and the Irrigation Dist. have a joint agreement to share cost of construction of a pipeline betw. El Capitan and the El Monte Pumping Plant, 6 miles west of El Capitan Dam. District has asked that its share be allotted and construction start immediately so that the P.W.A. grant may be used. 7-20

BIDS RECEIVED

WESTWOOD, CALIF.—Jack P. Naboe, Westwood, Calif., $.2668 per flume ft., low to T. R. Wills, c/o Red River Lumber Co., Westwood, Calif., for installing lining in Hydro Flume. Flume is 16,800 ft. long, 8 ft. wide, and height of lining is 3 ft. Lumber will be furnished by company and piled on top of flume. 7-8

PORTLAND, ORE.—Lake Washington Shipyards, Houghton, Wn., $177,000, low to U. S. Engineer Office, Portland, Ore., for constructing and delivering afloat at Govt. Moorings, No. 8010, W. St. Helens, Portland, 1 single screw Diesel electric driven survey boat, under Spec. No. 698-36-17.

CONTRACTS AWARDED

PHOENIX, ARIZ.—To Phoenix-Tempe Stone Co., Phoenix, $28,850, to City Commission, Phoenix, for soil preparation and obstruction demolition in the 227-acre municipal park to be developed northwest of Phoenix. 7-6

HANFORD, CALIF.—To Case Construction Co., Inc., 905 Westminster Ave., Alhambra, $62,900, to Peoples Ditch Co., Hanford, for construction of 435 ft. of concrete weir designed to hold water to a height of 15 ft. 7-30

EQUIPMENT and MATERIALS SECTION

This is a directory of products made by manufacturers whose advertisements appear in this issue of *Western Construction News*. If you do not find what you want, write for further information to *Western Construction News*, 114 Sansome Street, San Francisco, California.

On the following pages will be found the "Where to Buy in the West" section; and an alphabetical index of advertisers is on the last page of this issue.

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Asphalt Institute, The
Union Oil Co. of Calif.

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Harnischfeger Corp.
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co.

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Chicago Bridge & Iron Works
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Bits, Rock Drilling
Chicago Pneumatic Tool Co.
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Adams, J. D., Co.
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Page Engineering Co.
Wellman Engineering Co.

Bulldozers
Austin-Western Road Mchy. Co.
LeTourneau, R. G., Inc.

Cableways
American Cable Co., Inc.
Columbia Steel Co.
Leschen, A., & Sons Rope Co.
Roebling's Sons Co., John A.

Carbide Torches
Air Reduction Sales Co.

Castings Steel, and Alloy Steel
Electric Steel Foundry Co.

Cement
Pacific Portland Cement Co.
Portland Cement Association

Cement Pumping Equipment
Fuller Co.

Cement, Tan
Pacific Portland Cement Co.

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Great Western Electro-Chemical Co.

Chlorinators
Wallace & Tiernan Co., Inc.

Chlorine
Great Western Electro-Chem-

Clarifiers, Water
Hardinge-Western Co.
Link-Belt Co.

Compressors, Air
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Worthington Pump & Mchy Co.

Conveyors, Belt
Jeffrey Manufacturing Co.
Link-Belt Co.

Cranes, Diesel, Electric, Gas and Steam
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Koehring Co.
Lima Locomotive Works, Inc.
Link-Belt Co.
McKiernan-Terry Corp.
Northwest Engineering Co.
Thew Shovel Co.

Creosoting Cylinders
Chicago Bridge & Iron Works

Crushers
Austin-Western Road Mchy. Co.

Culverts
California Corrugated Culvert Co.
Austin-Western Road Mchy. Co.
Western Pipe & Steel Co.

Derricks, and Derrick Fittings
Harnischfeger Corp.
McKiernan-Terry Corp.

Drills, Diamond
Chicago Pneumatic Tool Co.

Drills, Rock
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Dynamite
Apache Powder Co.
Atlas Powder Co.
Hercules Powder Co.
Halafax Explosives Co.
Trojan Powder Co.

Elevators, Bucket
Jeffrey Manufacturing Co.
Link-Belt Co.

Engines, Diesel, Gasoline and Steam
Caterpillar Tractor Co.
Ingersoll-Rand Co.

Equipment, Rebuilt
(See Opportunity Section)

Equipment for Rent
(See Opportunity Section)

Equipment, Used
(See Opportunity Section)

Excavators, Ditching and Trench
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Lima Locomotive Works, Inc.
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co.

Excavators, Dragline
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Lima Locomotive Works, Inc.
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co.

Explosives
Apache Powder Co.
Atlas Powder Co.
Halafax Explosives Co.
Hercules Powder Co.
Trojan Powder Co.

Ferric Chloride
Great Western Electro-Chemical Co.

Fire Hydrants
Columbian Iron Works

Flumes, Metal
Western Pipe & Steel Co.

Flumes, Wood Stave
Federal Pipe & Tank Co.

Forms, Concrete
Western Pipe & Steel Co.

Gasoline
Union Oil Co. of Calif.
General Petroleum Corp.

Generators, Electric
General Electric Co.

Generators, Turbine
Pelton Water Wheel Co.

Graders, Road
Adams, J. D., Co.
Austin-Western Road Mchy. Co.
Caterpillar Tractor Co.

Gravel Plant Equipment
Austin-Western Road Mchy. Co.
Link-Belt Co.

Hoists, Diesel, Gas, Electric and Hand Power
Chicago Pneumatic Tool Co.
Harnischfeger Corp.
Ingersoll-Rand Co.
Link-Belt Co.
McKiernan-Terry Corp.
Wellman Engineering Co.

Hoppers, Steel
Link-Belt Co.

Hospital Service
National Hospital Association

Kilns, Rotary
Chicago Bridge & Iron Works

Lighting Plants
General Electric Co.

Liner Plates
Western Pipe & Steel Co.

Loaders, Power, Truck and Wagon
Austin-Western Road Mchy. Co.
Link-Belt Co.

Lubricants, Oils and Greases
General Petroleum Corp.
Union Oil Co. of Calif.

Lumber
Baxter, J. H., & Co.

Lumber, Redwood
California Redwood Assn.

Lumber, Treated
Baxter, J. H., & Co.
Reilly Tar & Chemical Corp.

Medical Service
National Hospital Assn.

Meters
Neptune Meter Co.

Mixers, Concrete
Koehring Co.

Motors, Electric
General Electric Co.
Lincoln Electric Co.

Paints, Protective
General Paint Corp.

Paving Breakers
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Worthington Pump & Mchy. Corp.

Penstocks
Chicago Bridge & IronWorks
Western Pipe & Steel Co.

Pile Drivers
Harnischfeger Corp.
Industrial Brownhoist Corp.
McKiernan-Terry Corp.

Piling, Creosoted
Baxter, J. H., & Co.

Piling, Steel
Columbia Steel Co.
Pacific Coast Steel Corp.

Piling, Wood
Baxter, J. H., & Co.

Pipe, Cast Iron
Pacific States Cast Iron Pipe Co.
U. S. Pipe & Foundry Co.

Pipe, Riveted Steel
Chicago Bridge & IronWorks
Western Pipe & Steel Co.

Pipe, Steel
Columbia Steel Co.
Western Pipe & Steel Co.

Pipe, Welded Steel
California Corrugated Culvert Co.
Chicago Bridge& Iron Works
Columbia Steel Co.
Western Pipe & Steel Co.

Pipe, Wood
Federal Pipe & Tank Co.

Pneumatic Tools
Chicago Pneumatic Tool Co.
Worthington Pump & Mchy. Corp.

Powder
(See Explosives)

Pumps
Pelton Water Wheel Co.
Pomona Pump Co.
Worthington Pump & Mchy. Corp.

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Columbia Steel Co.

Reinforcing, Steel Bar and Fabric, for Concrete
Columbia Steel Co.

Road Oils
General Petroleum Corp.
Union Oil Co. of Calif.

Rollers, Compacting
LeTourneau, R. G., Inc.

Rollers, Road
Austin-Western Road Mchy. Co.

Rope, Wire
American Cable Co., Inc.
Columbia Steel Co.
Leschen, A., & Sons Rope Co.
Roebling's Sons Co., John A.

Scarifiers
Adams, J. D., Co.
Austin-Western Road Mchy. Co.
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Scrapers
Adams, J. D., & Co.
Austin-Western Road Mchy. Co.
LeTourneau, R. G., Inc.

Tanks, Storage
Chicago Bridge &Iron Works
Federal Pipe & Tank Co.

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American Cable Co., Inc.
Columbia Steel Co.
Leschen, A., & Sons, Rope Co.
Roebling's Sons Co., John A.

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St. Louis Power Shovel Co.

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General Electric Co.
Pelton Water Wheel Co.

Valves, Gate
California Corrugated Culvert Co.
Columbian Iron Works
Pacific Pipe Co.
Pelton Water Wheel Co.

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Austin-Western Road Mchy. Co.
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Sewage Disposal Apparatus
Link-Belt Co.
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Sharpeners, Drill
Ingersoll-Rand Co.

Shovels, Power
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Koehring Co.
Lima Locomotive Works, Inc.
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co.

Steel, Hollow Drill
Columbia Steel Co.
Ingersoll-Rand Co.

Steel, Reinforcing
Columbia Steel Co.
Pacific Coast Steel Corp.

Steel, Structural
Western Pipe & Steel Co.

Tanks, Metal
Western Pipe & Steel Co.

Tanks, Wood
Federal Pipe & Tank Co.

Tar
Reilly Tar & Chemical Corp.

Timber, Creosoted
Baxter, J. H., & Co.

Tires, Rubber
Goodrich, B. F., Co.

Tools, Pneumatic
Ingersoll-Rand Co.

Tractors
Caterpillar Tractor Co.

WHERE TO BUY IN THE WEST

A directory of distributors and branch offices of the manufacturers whose advertisements appear in this issue of *Western Construction News*. Because of space limitations only the principal centers of the west are listed. If you do not find what you want, or the firm you want, write for further information to *Western Construction News*, 114 Sansome Street, San Francisco, California. In communicating with distributors or branch offices, please mention *Western Construction News*.

A directory of equipment and materials and an alphabetical index of advertisers will be found on the last pages of this issue.

Arizona

Phoenix

Allison Steel Mfg. Co.
S. 19th Ave.
4-1191
American Cable Co., Inc.

Arizona Tractor & Equipment Co.,
138 South First Ave.
3-1146
Bucyrus-Erie Co.
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Fuller, W. P., & Co.,
117 East Jackson St.
4-2123
Reilly Tar & Chemical Corp.

General Electric Company,
441 West Madison St.
3-6139

General Petroleum Corporation of California
24th & Jackson Sts.
4-3119

Goodrich, B. F., Co.,
2nd St. and Van Buren
3-6168

McGinnis, Neil B., Company,
1401 South Central Ave.
4-1493
Adams, J. D., Co.
Allis-Chalmers Mfg. Co.
Mall Tool Co.
Northwest Engineering Co.

Mine & Smelter Equipment Co.,
110 South 3rd Ave.
3-6418
Link-Belt Co.
Page Engineering Co.

Motor Supply Co.,
315 North Central Ave.
4-1153
Lincoln Electric Co.

Pratt-Gilbert Hardware Co.,
701 South Seventh St.
3-5145
Air Reduction Sales Co.
Apache Powder Co.
Ingersoll-Rand Co.
Koehring Co.
Leschen, A., & Sons Rope Co.

Stapley, O. S., Company,
723 Grand Ave.
4-1116
Austin-Western Road Machinery Co.

Torson Construction Co.,
220 South 7th Ave.
Electric Tamper & Equipment Co.

Union Oil Co. of Calif.,
Grand Ave. at Six Points
3-1181

Western Pipe & Steel Co.,
611 South Dunlap Ave.
3-5602

Tucson

Baum & Adamson,
296 North Stone Ave.
4050
Goodrich, B. F., Co.

Corbett, J. Knox, Lumber & Hdw. Co.,
340 North Sixth Ave.
2140
Austin-Western Road Machinery Co.

Fuller, W. P., & Co.,
219 East Congress St.
2278
Reilly Tar & Chemical Corp.

General Petroleum Corporation of California
503 E. 23rd
710

Ronstadt Hdw. & Mchy. Co.,
92 East Broadway
680
Galion Iron Works & Mfg. Co.

Steinfeld, Albert, & Co.,
119 North Stone Ave.
882
Apache Powder Co.

Threlkeld Commissary, Inc.,
P. O. Box 1881

Union Oil Company,
901 East 16th St.
799

California

Los Angeles

Adams, J. D., Company,
1202 Mateo Street
TRinity 8381
Adams, J. D., Co.

Air Reduction Sales Co.
2423 East 58th St.
JEfferson 6141

American Cable Co., Inc.
841 Petroleum Sec. Bldg.
PRospect 5753

Atlas Powder Co.,
805 Title Guarantee Bldg.
MIchigan 8896

Austin-Western Road Mchy. Co.,
4400 District Boulevard
KImball 4156

Barrett Co.
1136 South Hayworth Ave.
YOrk 1559

Bevis Machinery Co.,
3649 Santa Fe Ave.
KImball 4149
Industrial Brownhoist Corp.

Brown-Bevis Equipment Co.,
4900 Santa Fe Ave.
JEfferson 5221
Electric Tamper & Equipment Co.
Ingersoll-Rand Co.
Page Engineering Co.

California Corrugated Culvert Co.
409 LeRoy St.
CApitol 13181

Chicago Bridge & Iron Wks.
608 South Hill St.
TUcker 1938

Chicago Pneumatic Tool Co.
655 Santa Fe Ave.
MIchigan 2651

Columbian Iron Works
2801 East 12th St.

Collins, Harry C., Machinery Co.,
1919 Santa Fe Ave.
Link-Belt Co.

Crook Company,
2900 Santa Fe Ave.
KImball 5137
American Cable Co., Inc.
Bucyrus-Erie Co.

Electric Steel Foundry Co.,
2205 Santa Fe Ave.
JEfferson 4191

Fuller Company
1041 South Olive St.

Fuller, W. P., & Co.,
135 North Los Angeles St.
TRinity 0711
Reilly Tar & Chemical Corp.

Garlinghouse Bros.,
2416 East 16th St.
JEfferson 5291
Leschen, A., & Sons Rope Co.
Mall Tool Co.
McKiernan-Terry Corp.
Worthington Pump & Machinery Corp.

General Electric Company,
5201 Santa Fe Ave.
LAfayette 0961

General Paint Corp.,
544 Mateo St.
TRinity 4941

General Petroleum Corporation of California
508 Higgins Bldg.
MUtual 2311

Goodrich, B. F., Co.,
1000 East 8th St.
TRinity 1075

Halafax Explosives Co.,
810 South Spring St.
TRinity 8528

Harnischfeger Sales Corp.,
2025 Santa Fe Ave.
MAdison 2444

Harron, Rickard & McCone Co.,
2205 Santa Fe Ave.
JEfferson 4191
Electric Steel Foundry Co.
Harnischfeger Corp.—Welders
Koehring Co.
Wellman Engineering Co.

Hercules Powder Co.
Fidelity Bldg.
MUtual 6397

Ingersoll-Rand Co.,
1460 East Fourth St.
ANgelus 6761

Lincoln Electric Co.
812 Mateo St.

Link-Belt Company,
361 South Anderson St.
ANgelus 6171

Neptune Meter Company,
701 East Third St.
TRinity 2879

Northwest Engineering Co.,
3707 Santa Fe Ave.
JETerson 2196

Pacific Portland Cement Co.,
633 East Gage Ave.

Portland Cement Association
816 West 6th St.
MIchigan 9897

Reilly Tar & Chemical Corp.,
Architects Building
MUtual 0433

Rix Company, Inc., The,
810 Santa Fe Ave.
TRinity 4134
Page Engineering Co.
Thew Shovel Co.

John A. Roebling's Sons Co.
216 South Alameda St.
TRinity 1261

Shepherd Tractor & Equipment Co.,
150 West Jefferson St.
PRospect 0247
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.
John A. Roebling's Sons Co.

Smith Booth Usher Company
2001 Santa Fe Ave.
TRinity 6911
Lima Locomotive Works, Inc. (Shovel and Crane Division)
Page Engineering Co.
Worthington Pump & Machinery Corp.

Standard Steel Works,
5001 Boyle Ave.
LAfayette 1138

Saint Louis Power Shovel Co.
322 West Third St.
MUtual 2885

St. John, A. S., Co., Inc.
126 West Third St.
VAndike 8865
Apache Powder Co.

Stevenson Chemical Co.,
641 Gibbons St.
Gt. Westn. Electro-Chemical Co.

United States Pipe and Foundry Co.
504 Subway Terminal Bldg.
VAndike 5166

Victor Welding Equipment Co.,
2032 Santa Fe Ave.
JEfferson 6246
General Electric Company

Wallace & Tiernan Company,
3923 West Sixth St.
FEderal 6823

Western Pipe & Steel Co.,
5717 Santa Fe Ave.
JEfferson 3131

Worthington Pump & Machinery Corp.
5075 Santa Fe Avenue
JEfferson 6251

Oakland

Air Reduction Sales Co.
Park Ave. & Halleck St.
OLympic 4100

Bates, Sam, Co.,
1925 Dennison St.
ANdover 4327
Chicago Pneumatic Tool Co.
Page Engineering Co.

California Corrugated Culvert Co.
5th & Parker St. (Berkeley)
BErkeley 5420

Fuller, W. P., & Co.,
259 10th St.
GLencourt 0167
Reilly Tar & Chemical Corp.

General Petroleum Corporation of California
Fox Oakland Bldg.
HOlliday 5573

Goodrich, B. F., Co.,
254 23rd St.
GLencourt 1803

Industrial Equipment Co.,
Outer Harbor
GLencourt 5909
Bucyrus-Erie Co.

Link-Belt Co.,
526 Third St.
HIgate 4286

Mall Tool Co.,
2308 Webster St.
TEmplebar 6878

Pacific Electric Motor Co.,
10th and Oak Sts.
GLencourt 1844
General Electric Co.

Robinson Tractor Co.,
1705 East 12th St.
FRuitvale 2485
Caterpillar Tractor Co.

Union Oil Co. of Calif.,
516 18th St.
GLencourt 6440

Sacramento

Air Reduction Sales Co.
501 I St.
Main 852

Fuller, W. P., & Co.,
1013 12th St.
Main 6890
Reilly Tar & Chemical Corp.

General Paint Corp.
11th and R
Capital 2121

General Petroleum Corporation of California
W. Sacramento
Main 720

Goodrich, B. F., Co.,
12th and I Sts.
Main 454

Union Oil Co. of Calif.,
Calif State Life Bldg.
Capitol 2400

Vandercook Gold Company
F & M Building
Sacramento
Main 2085
Worthington Pump & Machinery Corp.

Weaver-Rye Tractor Co., Inc.,
1715 2nd St.
Main 4100
Caterpillar Tractor Co.

Western Pipe & Steel Co.,
c/o Sutter Club
Main 217

Where to Buy in the West

San Diego

Charles N. Bottiger
209 West E
Main 1657
Lincoln Electric Co.

Contractors Equipment & Machinery Co.
1344 National Ave.
Main 8833
John A. Roebling's Sons Co.
Worthington Pump & Machinery Co.

Fuller, W. P., & Co.,
803 7th Ave.
Main 0181
Reilly Tar & Chemical Corp.

General Electric Co.,
206 W. Market St.
Main 4288

General Petroleum Corporation of California
1302 Crosby
Franklin 7667

Goodrich, B. F., Co.,
7th and Market Sts.
Franklin 6258

San Diego Tractor & Equipment Co.,
701 First Ave.
Main 6151
Caterpliilar Tractor Co.

Southern Machinery Co.,
666 State St.
Franklin 6388
Ingersoll-Rand Co.

Union Oil Co. of Calif.,
1521 National Ave.
Franklin 3144

Western Metal Supply Co.
215 7th St.
FRanklin 3111
Air Reduction Sales Co.

San Francisco

Adams, J. D., Co.,
230 Utah St.
UNderhill 5120
Adams, J. D., Co.

Air Reduction Sales Co.
313 6th St.
SUtter 4582

American Cable Co., Inc.
630 Third St.
SUtter 1708

Associated Equipment Co., Ltd.,
355 Fremont St.
KEarny 1181
Thew Shovel Co.

Atlas Powder Co.,
1 Montgomery St.
GArfield 8640

Austin-Western Road Mchy. Co.,
435 Brannan St.
DOuglas 2183

Bacon, Edward R., Co.,
17th and Folsom Sts.
HEmlock 3700
Mall Tool Co.
McKiernan-Terry Corp.
Page Engineering Co.
John A. Roebling's Sons Co.

Bucyrus-Erie Co.,
989 Folsom St.
GArfield 8192

California Redwood Association,
Financial Center Bldg.
EXbrook 7880

Chicago Bridge & Iron Wks.
116 New Montgomery St.
DOuglas 7376

Chicago Pneumatic Tool Co.
175 First St.
KEarny 2014

Columbian Iron Works
1072 Howard St.

Fuller Co.,

Fuller, W. P., & Co.,
301 Mission St.
EXbrook 7151
Reilly Tar & Chemical Corp.

Garfield & Co.,
Hearst Bldg.
SUtter 1036
Industrial Brownhoist Corp.
Link-Belt Co.
Worthington Pump & Machinery Co.

General Electric Co.,
235 Montgomery St.
DOuglas 3740

General Paint Corp.,
2627 Army St.
ATwater 5100

General Petroleum Corporation of California
310 Sansome St.
EXbrook 6411

Goodrich, B. F., Co.,
11th and Howard Sts.
UNderhill 1801

Great Western Electro-Chemical Co.,
9 Main St.
GArfield 8323

Harnischfeger Sales Corp.,
82 Beale St.
DOuglas 2313

Harron, Rickard & McCone Co.,
2070 Bryant St.
ATwater 2202
Electric Steel Foundry Co.
Koehring Co.
Wellman Engineering Co.

Hercules Powder Co.
Standard Oil Bldg.
DOuglas 2330

Ingersoll-Rand Co.,
350 Brannan St.
GArfield 6330

Knapp, J. E., Co.,
593 Market St.
GArfield 4783
Ingersoll-Rand Co.

Kratz & McClelland, Inc.,
522 Bryant St.
SUtter 6807
Electric Tamper & Equipment Co.

Leschen, A., & Sons Rope Co.,
520 Fourth St.
GArfield 8134

Lincoln Electric Co.
894 Folsom St.
GArfield 5507

Link-Belt Co.,
400 Paul Ave.
DElaware 6400

Neptune Meter Co.,
320 Market St.
GArfield 8144

Northwest Eigineering Co.,
255 Tenth St.
HEmlock 5060

Pacific Pipe Co.,
207 Folsom St.
EXbrook 6255

Pacific Portland Cement Co.,
111 Sutter St.
GArfield 4100

Pacific States Cast Iron Pipe Co.,
Rialto Bldg.
KEarny 5075

Portland Cement Association
564 Market St.
SUtter 8159

Robinson Tractor Co.,
1175 Howard St.
MArket 8020
Caterpillar Tractor Co.

John A. Roebling's Sons Co.
646 Folsom St.
GArfield 6490

Thew Shovel Co.,
355 Fremont St.
KEarny 1181

Union Oil Co. of Calif.,
220 Montgomery St.
SUtter 1400

United States Pipe and Foundry Co.
907 Monadnock Bldg.
GArfield 5140

Victor Welding Equipment Co.,
844 Folsom St.
GArfield 5727
General Electric Co.

Wallace & Tiernan Co., Inc.,
171 Second St.
KEarny 5072

Welding Service, Inc.,
954 Howard St.
DOuglas 3292
Harnischfeger Corp.—Welders

Western Machinery Co.,
760 Folsom St.
EXbrook 4167
Ingersoll-Rand Co.

Western Pipe & Steel Co.,
444 Market St.
GArfield 6788

Worthington Pump & Machinery Corp.
543 Howard St.

Young, A. L., Machinery Co.,
26 Fremont St.
SUtter 5736
Lima Locomotive Works, Inc.

Colorado

Denver

American Cable Co., Inc.
2125 Blake St.
TAbor 0197

Atlas Powder Co.,
401 Midland Savings Bldg.
Bostwick, Frederick H.,
Denver Natl. Bank Bldg.
TAbor 5744

Western Pipe & Steel Co.
Cederberg, C. R.
5531 East 14th Ave.
YOrk 0604
Wallace & Tiernan Co., Inc.

Clinton & Held Co.,
1637 Wazee St.
TAbor 3291
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Corson, Ray, Machinery Co.,
1646 Wazee St.
KEystone 6632
Bucyrus-Erie Co.
Page Engineering Co.

Denver Metal & Machinery Co.,
130 Larimer St.
TAbor 6178
Ingersoll-Rand Co.

Denver Oxygen Co.
901 Navajo
TAbor 4725
Air Reduction Sales Co.

Fair, Elton T., Co.,
1646 Wazee St.
TAbor 1685
Adams, J. D., Co.

Fitzgerald, Paul,
U. S. Natl. Bank Bldg.
TAbor 1841
Harnischfeger Corp.—Welders

General Electric Co.,
650 17th St.
KEystone 7171

General Machinery & Supply Co.
635 Walnut St.
KEystone 1500
Worthington Pump & Machinery Co.

Goodrich, B. F., Co.,
14th and Glenarm Sts.
KEystone 0175

Great Northern Tool & Sup. Co.
2125 Blake St.
TAbor 0197
Lincoln Electric Co.

Hendrie & Bolthoff Mfg. & Supply Co.,
1639 17th St.
KEystone 4111
General Electric Co.
John A. Roebling's Sons Co.

Ingersoll-Rand Co.,
1637 Blake St.
KEystone 2245

Leschen, A., & Sons Rope Co.,
1554 Wazee St.
MAin 1366

Liberty Trucks & Parts Co., Inc.,
615 East 18th Ave.
MAin 3241
Austin-Western Road Machinery Co.

Link-Belt Co.,
Boston Bldg.
MAin 0231

Mine & Smelter Supply Co.,
1422 17th St.
KEystone 3111
McKiernan-Terry Corp.
Northwest Engineering Co.

Moore Hardware & Iron Co.,
1529 15th St.
TAbor 2251
Harnischfeger Corp.—Welders

Moore, H. W., Equipment Co.,
Sixth and Acoma Sts.
TAbor 1361
Thew Shovel Co.
Wellman Engineering Co.

Neptune Meter Co.,
1700 15th St.
MAin 3221

Pacific States Cast Iron Pipe Co.,
1921 Blake St.
MAin 0697

Socony-Vacuum Oil Co., Inc.
(Road Oil Sales)
U. S. N. Bank Bldg.
TAbor 2809

Stearns-Roger Mfg. Co.
1720 California
KEystone 3311
Chicago Pneumatic Tool Co.

Steinbarger, Herbert N., Co.,
1711 Market St.
MAin 3460
Lima Locomotive Works, Inc.

Worthington Pump & Machinery Co.
512 18th Street

Idaho

Boise

Bunting Tractor Co.,
926 Front St.
2649
Caterpillar Tractor Co.

Feenaughty Machinery Co.,
9th and Grove Sts.
1333
Thew Shovel Co.

General Electric Co.,
906 East Bannock St.
368

General Paint Corp.,
2218 W. Fairview Ave.
2861-W

Intermountain Equipment Co.
Broadway and Myrtle St.
171
Bucyrus-Erie Co.
General Electric Co.
Ingersoll-Rand Co.
LeTourneau, R. G., Inc.
Page Engineering Co.
John A. Roebling's Sons Co.

Jeter, F. A.,
1116 North 18th St.
2612
Austin-Western Road Machinery Co.

Olson Mfg. Co.,
214 South 5th St.
4277
Leschen, A., & Sons Rope Co.

Stockton-Regan, Inc.,
10th and Grove Sts.
78
Goodrich, B. F., Co.

Montana

Billings

Austin-Western Road Mchy. Co.,
2413 First Ave. N.

Connelly Machinery Co.,
2706 Montana Ave.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Leschen, A., & Sons Rope Co.
LeTourneau, R. G., Inc.

Freeman Auto Service
Goodrich, B. F., Co.

Great Northern Tool & Sup. Co.
Lincoln Electric Co.

Midland Implement Co.,
2300 Montana Ave.
Koehring Co.
Page Engineering Co.
Socony-Vacuum Oil Co., Inc.

Where to Buy in the West

Butte

Atlas Powder Co.,
412 West Broadway
2-4868

Chicago Pneumatic Tool Co.
920 South Arizona St.
2-4285

Daugherty, H. H.,
420 South Idaho St.
3884
Bucyrus-Erie Co.

General Electric Co.,
20 West Granite St.
5479

Hall-Perry Machinery Co.,
812 East Iron St.
6376
American Cable Co., Inc.
Page Engineering Co.
Thew Shovel Co.

Ingersoll-Rand Co.,
420 E. Iron St.
2-3903

Lowney & Williams,
202 South Montana St.
3352
Goodrich, B. F., Co.

Montana Hardware Co.,
823 South Montana St.
2-1295
Ingersoll-Rand Co.
John A. Roebling's Sons Co.
Socony-Vacuum Oil Co., Inc.

Wright, S. P., & Co., Inc.,
48 East Broadway
2-3221
Lima Locomotive Works, Inc.

Great Falls

Connelly Machinery Co.,
315 2nd Street S.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Leschen, A., & Sons Rope Co.
LeTourneau, R. G., Inc.

Northwest Equipment Co., Inc.,
Great Northern Tracks
3982
Koehring Co.
Socony-Vacuum Oil Co., Inc.

Taylor Chevrolet Co.,
802 Central Ave.
8467
Goodrich, B. F., Co.

Missoula

Star Garage
Goodrich, B. F., Co.

Wells, Walker J.
Austin-Western Road Machinery Co.

Westmont Tractor & Equipment Co.,
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Leschen, A., & Sons Rope Co.
LeTourneau, R. G., Inc.
Wellman Engineering Co.
Worthington Pump & Machinery Corp.

Nevada

Reno

Bell, O. C.,
649 John Fremont St.
Reno 4043
Adams, J. D., Co.

Colhier Tractor & Equipment Co.,
502 East Fourth St.
Reno 6107
American Cable Co., Inc.
Caterpillar Tractor Co.
Harnischfeger Corp.
LeTourneau, R. G., Inc.

Flanigan Warehouse Co.,
408 Eureka St.
Reno 3852
Western Pipe & Steel Co.

Hinckley Tire Service, Inc.,
145 West 2nd St.
Reno 6792
Goodrich, B. F., Inc.

Reno Motor Supply Co.
15 West Plaza
Reno 4108
Air Reduction Sales Co.

Smith, James M.

Union Oil Co. of Calif.,
107 East 4th St.
Reno 3661

New Mex.

Albuquerque

Calhoun Independent Oil Co.,
1801 North 4th St.
3516
Goodrich, B. F., Co.

Harrison, R. L., Co., Inc.,
211 North 4th St.
3300
American Cable Co., Inc.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.
McKiernan-Terry Corp.
Wellman Engineering Co.

Magnolia Petroleum Co.
1100 North 1st
450

McChesney-Rand Equipment Co.
Adams, J. D., Co.
Thew Shovel Co.

Santa Fe

Santa Fe Motor Co.
Goodrich, B. F., Co.

Magnolia Petroleum Co.

McChesney-Rand Equipment Co.
Adams, J. D., Co.
Thew Shovel Co.

Oregon

Klamath Falls

General Petroleum Corporation of California
Keno Road 473-W

Locke Motor Co.,
522 South 6th St.
49
Goodrich, B. F., Co.

Lorenz Co.,
Sixth and Broad Sts.
371
Ingersoll-Rand Co.
John A. Roebling's Sons Co.

Miller Tractor & Equipment Co.,
719 Market St.
314
Caterpillar Tractor Co.

Peoples' Warehouse
1425 South Sixth St.
704
Air Reduction Sales Co.

Union Oil Co. of Calif.,
Sixth and Market Sts.
776-W

Portland

Air Reduction Sales Co.
2878 N. W. Sherlock
BRoadway 2501

Atlas Powder Co.,
833 Pacific Bldg.
BEacon 2845

Balzer Machinery Co.,
1636 S.E. Sixth Ave.
EAst 5609
Chicago Pneumatic Tool Co.

Clyde Equipment Co.,
1631 N.W. Thurman St.
BRoadway 5561
Bucyrus-Erie Co.
Electric Tamper & Equipment Co.

Consolidated Supply Co.
139 S. W. Stark
ATwater 6511
Air Reduction Sales Co.

Cramer Machinery Co.,
Lewis Bldg.
ATwater 3852
Koehring Co.

Electric Steel Foundry Co.,
2458 N.W. York St.
BEacon 6344
American Cable Co., Inc.

Feenaughty Machinery Co.,
112 S.E. Belmont St.
EAst 2187
LeTourneau, R. G., Inc.
Page Engineering Co.
Thew Shovel Co.

General Electric Co.,
621 S.W. Alder St.
ATwater 0281

General Paint Corp.,
838 S.W. 2nd Ave.
ATwater 5205

General Petroleum Corporation of California
Woodlark Bldg.
BEacon 7101

Goodrich, B. F., Co.,
Union and Stark Sts.
EAst 4148

Gordon & Finkbeiner Co.,
112 S.W. Pine St.
ATwater 9401
Ingersoll-Rand Co.

Haag, A. C., & Co.,
931 S.E. Sixth Ave.
EAst 2388
Adams, J. D., Co.
Worthington Pump & Machinery Corp.

Harmer Steel Products & Supply Co.
120 S.W. Front
ATwater 2957
John A. Roebling's Sons Co.

Haseltine, J. E., & Co.,
115 S.W. Second Ave.
ATwater 7511
General Electric Co.

Howard-Cooper Corp.,
307 S.E. Hawthorne Ave.
EAst 8188
McKiernan-Terry Corp.

Leschen, A., & Sons Rope Co.,
Foot of S.W. Sheridan St.
ATwater 7425

Lincoln Electric Co.
1631 N.W. Thurman St.
BRoadway 5561

Link-Belt Co.,
1637 N.W. 14th Ave.
ATwater 6481

Loggers & Contractors Machinery Co.,
211 S.E. Madison St.
EAst 4128
Caterpillar Tractor Co.
Wellman Engineering Co.

National Hospital Association,
400 Mohawk Bldg.
ATwater 5291

Neptune Meter Co.,
1519 N.W. Johnson St.
BRoadway 0100

Pacific Portland Cement Co.,
701 Lewis Bldg.
ATwater 6656

Pacific States Cast Iron Pipe Co.,
Spaulding Bldg.
ATwater 5465

John A. Roebling's Sons Co.
14th and Marshall Sts.
BRoadway 6411

Union Oil Co. of Calif.,
Yeon Bldg.
ATwater 9521

Western Loggers Mchy. Co.,
302 S.W. 4th Ave.
ATwater 7491
Harnischfeger Corp.—Welders

Western Steel & Equipment Co.,
734 N.E. 55th Ave.
TAbor 2370
Lima Locomotive Works, Inc.

Woodbury & Company, Inc.
133 S. W. 2nd
ATwater 6644
Chicago Pneumatic Tool Co.

Texas

El Paso

Car Parts Depot, Inc.,
810 Texas St.
Main 9000
Harnischfeger Corp.—Welders
Ingersoll-Rand Co.

Chicago Pneumatic Tool Co.
426 Mills Building
Main 976

General Electric Co.,
109 North Oregon St.
Main 5500

General Engineering & Equipment Co.
Worthington Pump & Machinery Corp.

Goodrich, B. F., Co.
501 Texas St.
Main 262

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OPPORTUNITY SECTION

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OPPORTUNITY SECTION

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Public Roads

Subgrade Reinforcement on Deer Creek Meadows Nat'l For. Hwy.

San Francisco, California, July 30, 1935.

Sealed Bids will be received at the office of the Bureau of Public Roads, 807 Sheldon Building, 461 Market Street, San Francisco, California until 2:00 o'clock p.m. on August 20, 1935, for performing all work for placing subgrade reinforcement on portions of Sections F and G of Route 21, the Deer Creek Meadows National Forest Highway, Lassen National Forest, Butte and Tehama Counties, California. The length of the project is 9.603 miles. The principal items of work are approximately as follows: 1 acre clearing; 3,000 cubic yards unclassified excavation; 12,000 cubic yards subgrade reinforcement; 500 cubic yard miles overhaul; 550 cubic yards structure excavation; 14 lineal feet 36 inch C.M. Pipe; 174 lineal feet 8 inch C.M. Pipe; 1,720 lineal feet 8 inch perforated C.M. Pipe; 500 cubic yards crushed rock or gravel backfill, 119 each culvert markers. The minimum wage paid labor employed on this project shall be in accordance with the classified labor rates attached to the specifications of which the minimum is $1.00 per hour for skilled labor, 68 cents per hour for intermediate labor and 60 cents per hour for unskilled labor. The attention of bidders is especially directed to the provisions covering the **subletting** and **assignment** of the contract; and to the **alternate** bids which must be submitted in case the bidder desires to offer any **foreign** articles, materials or supplies. Where copies of plans and specifications are requested a deposit of $10 will be required to insure their return. If these are not returned within 15 days after opening of bids the deposit will be forfeited to the Government. Checks should be certified and made payable to the Regional Fiscal Agent, U. S. Forest Service. Plans, specifications and proposals may be obtained at the office of the Bureau of Public Roads, 807 Sheldon Building, 461 Market Street, San Francisco, California.

C. H. SWEETSER,
District Engineer.

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Reclamation
(Federal Emergency Administration of Public Works Project)

Portland Cement for Columbia Basin Project

Washington, D. C., July 22, 1935.

Sealed bids (Specifications No. 641) will be received at the office of the Bureau of Reclamation, Denver, Colorado, until 2 p.m., August 20, 1935, and will at that hour be opened, for furnishing and delivering f.o.b. cars at the shipping point or f.o.b. cars at Odair, Washington; approximately 720,000 barrels of modified or standard portland cement and approximately 3,500,000 barrels of modified portland cement or 650,000 tons of modified portland cement clinker for the Grand Coulee Dam and Power Plant, Columbia Basin Project, Washington. No charge for specifications to prospective bona fide bidders; to others, $0.25, not returnable. For particulars, address the Bureau of Reclamation, Denver, Colorado, or Washington, D. C.

ELWOOD MEAD,
Commissioner.

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OPPORTUNITY SECTION

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Reclamation
(Federal Emergency Administration of Public Works Project)

Structural Steel for Boulder Canyon Project

Washington, D.C., July 29, 1935.

Sealed bids (Specifications No. 640) will be received at the office of the Bureau of Reclamation, Denver, Colorado, until 2 p.m., August 29, 1935, and will at that hour be opened, for furnishing and delivering f.o.b. cars at the shipping point or f.o.b. cars at Boulder City, Nevada; structural steel supports, gratings and handrailings for the walkways, stairs and ladders to be installed in the upper Arizona and upper Nevada tunnels at the Boulder Dam, Boulder Canyon Project, Arizona-California-Nevada. The materials will be installed by the Government. No charge for specifications to prospective bona fide bidders; to others $3.50, not returnable. For particulars, address the Bureau of Reclamation, Denver, Colorado, or Washington, D.C.

ELWOOD MEAD,
Commissioner.

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Reclamation
(Federal Emergency Administration of Public Works Project)

Two 115,000 Hp. Turbines and Governors, Boulder Power Plant

Washington, D. C., July 22, 1935.

Sealed bids (Specifications No. 639) will be received at the office of the Bureau of Reclamation, Denver, Colorado, until 2 p.m., September 9, 1935, and will at that hour be opened, for furnishing and delivering f.o.b. cars at the shipping point or f.o.b. cars at Boulder City, Nevada; two vertical-shaft, 115,000 horsepower, 180 r.p.m., hydraulic turbines and two governors with pumping equipment, for regulating the speed of the turbines for installation in the Boulder Power Plant, Boulder Canyon Project, Arizona-California-Nevada. All apparatus will be installed by the Government. No charge for specifications to prospective bona fide bidders; to others, $2.00, not returnable. For particulars, address the Bureau of Reclamation, Denver, Colorado, or Washington, D. C.

ELWOOD MEAD, Commissioner.

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Public Roads

Asphaltic Road Material Petrified Forest National Monument

San Francisco, California, Aug. 7, 1935. Sealed Bids will be received at the office of the Bureau of Public Roads, 807 Sheldon Building, 461 Market Street, San Francisco, California, until 2:00 o'clock p.m. on August 22, 1935, for furnisihng approximately 310 tons liquid asphaltic road material—Type MC 2; 205 tons liquid asphaltic road material, Type R.C. 2; and 1,900 tons liquid asphaltic road material, Type M.C. 5, or as an alternate 1,400 tons asphaltic cement and 760 tons Laykold tempering fluid for use on sections A, B1 and B2 of route 1 and all of route 2, Petrified Forest National Monument, Apache and Navajo Counties, Arizona. Guarantee will be required with each bid in the amount of five (5) percent of the bid. Specifications and proposals may be obtained at the offices of the Bureau of Public Roads, 807 Sheldon Building, 461 Market Street, San Francisco, California, or 414 Title & Trust Building, Phoenix, Arizona.

C. H. SWEETSER, District Engineer.

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Reclamation
(Federal Emergency Administration of Public Works Project)

Two 82,500 Kva. Generators Boulder Power Plant

Washington, D. C., July 22, 1935.

Sealed bids (Specifications No. 638) will be received at the office of the Bureau of Reclamation, Denver, Colorado, until 2 p.m., September 9, 1935, and will at that hour be opened, for furnishing and installing two 82,500 kv.a., 180 r.p.m., vertical-shaft, alternating current generators for the Boulder power plant, Boulder Canyon Project, Arizona-California-Nevada. Drawings shall be mailed by the contractor within sixty (60) calendar days after date of receipt by the contractor of notice to proceed, and the installation of the first generator shall be completed within seven hundred (700) calendar days and the installation of the second generator shall be completed within seven hundred and fifty (750) calendar days from the date of receipt of notice to proceed. No charge for specifications to prospective bona fide bidders; to others, $2.00 not returnable. For particulars, address the Bureau of Reclamation, Denver, Colorado, or Washington, D. C.

ELWOOD MEAD, Commissioner.

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Public Roads

Placing Treated Rock on Secs. of Generals Highway

San Francisco, California, August 6, 1935.

Sealed Bids will be received at the office of the Bureau of Public Roads, 807 Sheldon Bldg., 461 Market Street, San Francisco, California, until 2:00 o'clock p.m. on August 23, 1935, for placing a bituminous treated crushed rock base course on Sections D3 and D4 of Route 1, the Generals Highway, Sequoia National Park, and on Section A, General Grant-Sequoia Park Approach Road, Sequoia National Forest, Tulare County, California. The length of the project is 13.323 miles and the principal items of work are approximately as follows: 8,300 cu. yds. unclassified excavation; 10,000 cu. yd. miles hauling unclassified excavation; 1,400 cu. yds. unclassified excavation for structures; 13.323 miles fine grading subgrade and shoulders; 1,600 M gals. watering; 25,800 tons crushed rock for bottom layer of base course; 21,200 tons crushed rock for top layer of base course; 800 tons supplemental crushed rock; 1,237 tons liquid asphaltic material, Types SC-1-A, MC-4 or MC-5 and RC-1; 5,478 lin. ft. underdrain in place; 1,200 cu. yds. crushed rock or gravel for backfill; 1,220 sq. yds. backfill seal. The minimum wage paid labor employed on this project shall be in accordance with the classified labor rates attached to the specifications of which the minimum is $1.00 per hour for skilled labor, 68 cents per hour for intermediate labor and 60 cents per hour for unskilled labor. The attention of bidders is especially directed to the provisions covering the **subletting** and **assignment** of the contract and to the **alternate** bids which must be submitted in case the bidder desires to offer any **foreign** articles, materials or supplies. Where copies of plans and specifications are requested a deposit of $10 will be required to insure their return. If these are not returned within 15 days after opening of bids the deposit will be forfeited to the Government. Checks should be certified and made payable to the Regional Fiscal Agent, U. S. Forest Service. Plans, specifications and proposals may be obtained at the office of the Bureau of Public Roads, 807 Sheldon Building, 461 Market Street, San Francisco, California.

C. H. SWEETSER, District Engineer.

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