WCN-07-1936

WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED
WESTERN HIGHWAYS BUILDER

PUBLISHED MONTHLY
VOLUME XI, No. 7

JULY, 1936

25 CENTS A COPY
$2.00 PER YEAR

IN THIS ISSUE

Cutting through the Marin County hills to make a wide, modern highway approach to the Golden Gate Bridge. The contract, held by Macco Construction Company, involves about 1,750,000 cu. yd. of excavation.

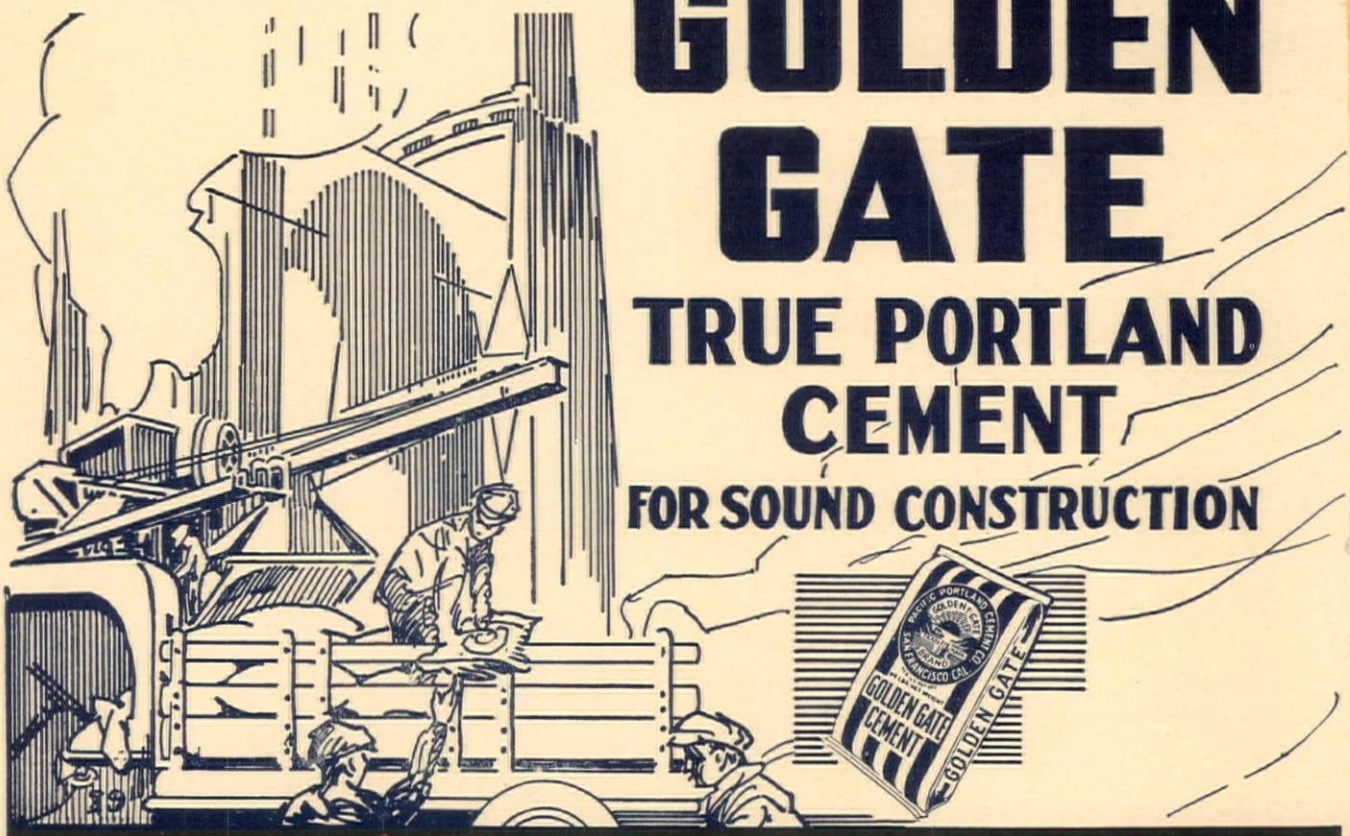
PROGRESS

Change, in the Building Industry as elsewhere, brings with it the demand for new products.

Pacific Portland Cement Company, ever alert to changing needs, has kept abreast. **24 HOUR** Cement that hardens overnight, **TAN PLASTIC** that seals out dampness and now **SEA-WATER** Cement that resists salt water—all typify this progress.

And yet, in producing these products there has been no compromise with **CERTAINTY,** the very essence of sound construction. For each one bears the name of **GOLDEN GATE,** guarantying **TRUE PORTLAND CEMENT**—with all that the name implies to assure unquestioned performance.

Whatever the modern need, you'll find a cement that fits the purpose under the old reliable name of **"GOLDEN GATE".** Ask your Building Materials Dealer.



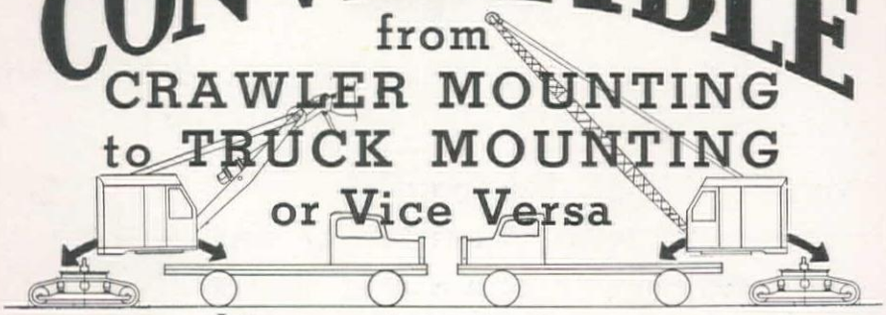
PACIFIC PORTLAND CEMENT COMPANY
SAN FRANCISCO

When writing to PACIFIC PORTLAND CEMENT COMPANY, *please mention Western Construction News*

TWO *NEW* NORTHWESTS

CONVERTIBLE

from
CRAWLER MOUNTING
to TRUCK MOUNTING
or Vice Versa



MODEL 15
3/8 YARD CAPACITY

MODEL 18
1/2 YARD CAPACITY

Designed for high speed portability and output!

IN no other machine of 3/8 or 1/2 yd. capacity are the advantages of the design and construction of larger machines so fully incorporated as on the Northwest Models 15 and 18.

- Simplicity of design.
- Cast steel rotating base — cast steel crawler base.
- High speed gears enclosed and running in oil.
- The Northwest "feather-touch" clutch control.
- Ball or roller bearings on all high speed shafts.
- Cone type swinging clutches.
- Split, demountable drum laggings.
- The patented Northwest cushion clutch.
- Northwest hook rollers adjustable for wear.
- Enclosed worm gear boom hoist running in oil.

Don't buy a shovel, crane or dragline without getting full details. Northwests are built in a range of 15 sizes from 3/8 yd. capacity up.

NORTHWEST ENGINEERING CO.: 255 Tenth St., San Francisco; 3707 Santa Fe Ave., Los Angeles. REPRESENTATIVES: Pacific Hoist & Derrick Co., 3200 Block, 4th Ave. So., Seattle; Arnold Machinery Co., Inc., 149 W. 2nd St. S., Salt Lake City; Baizer Machinery Co., 1636 South East 6th Ave., Portland, Ore.; Neil B. McGinnis Co., 1401 S. Central Ave., Phoenix, Ariz.

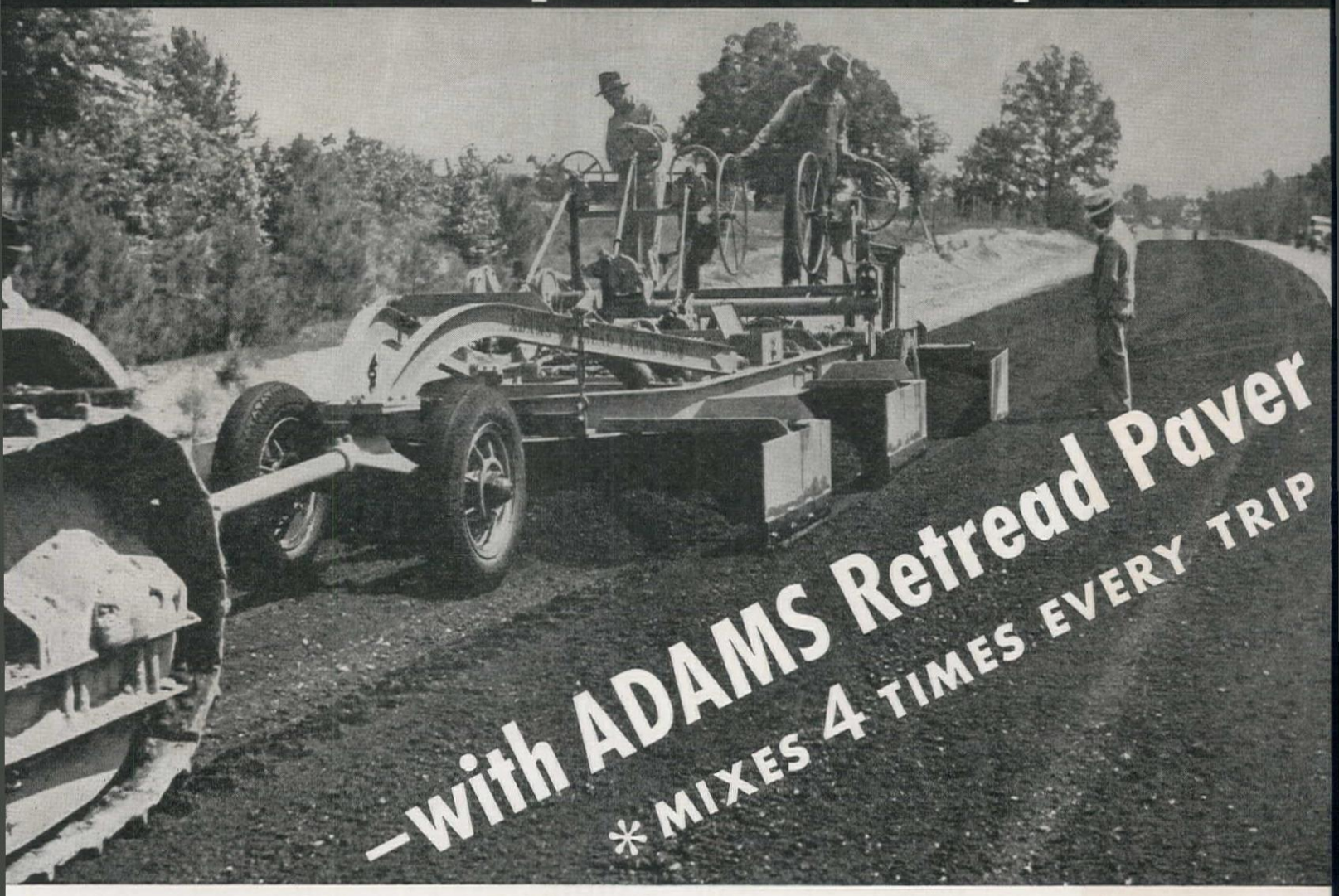
NORTHWEST ENGINEERING COMPANY
1736 Steger Building, 28 E. Jackson Boulevard, Chicago, Illinois, U.S.A.

Gentlemen: Please, without obligation on my part, furnish me with complete information on the models checked.

Model 15—3/8 yd. capacity ☐ Model 18—1/2 yd. capacity ☐
Shovel ☐ Crane ☐ Dragline ☐

Name.....
Address.....
Town.....
State.....

Better, Cheaper Black-Top Roads



● Two things, among others, are very definitely necessary to make a good bituminous "road mix" job—first, a thorough mix and second, a smooth, uniform finish to give the proper riding qualities.

Any blade machine will eventually get the material mixed, but Adams Retread Paver will do it quicker and cheaper because it mixes the material *four times in one trip.* Where quick-setting bitumen is used the quick mixing of Adams Retread Paver is a decided advantage because it accomplishes the mix while the bitumen is in its most liquid state.

As for finishing—in one round trip it lays the material out to proper width, depth and crown, smooth as a floor and ready for rolling. Edges are straight and clean-cut, requiring no hand work.

Adams Retread Paver takes the place of four motor graders and does the job better and cheaper. Works equally well with stone, slag or gravel—with tar, asphalt or road oil. Also a money-saver for mixing on gravel road stabilization work. Pulled by a tractor of 60 or more drawbar H. P. Ask your local Adams representative or write for complete descriptive catalog to

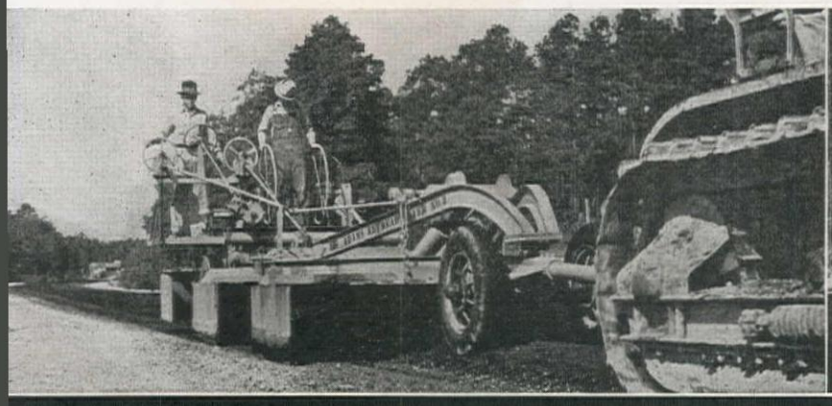
ROAD ADAMS MACHINERY

J. D. ADAMS COMPANY SAN FRANCISCO LOS ANGELES BILLINGS

Western Distributors: HOWARD-COOPER CORP., Portland, Seattle, Spokane, Twin Falls; LUND MACHINERY CO., Salt Lake City; NEIL B. McGINNIS CO., Phoenix, Ariz.; McKELVY MACHINERY CO., Denver; McCHESNEY-RAND EQUIPMENT CO., Santa Fe, N. M.

Mixing 3 inches of graded aggregate and cut-back asphalt. Four sets of mixing blades mix the material four times each trip.

Laying out the mixed material to proper width, depth and cross section. Note the straight clean-cut edges being laid to a string line.



Ten Years Ago

Items from the eighth month's issue of "Western Construction News," July, 1926.

Wilbur F. McClure, state engineer of California from 1912 to 1926, died. Under his administration the first comprehensive inventory of the state's water resources was made and a report prepared which was the predecessor of the present state water development program being started by the Bureau of Reclamation. Paul Bailey was named to succeed Mr. McClure.

●

Plans and specifications for the Coolidge dam in Arizona had been about completed by the U. S. Indian Service under the direction of Major C. R. Olberg, and the bid call was expected.

●

The typhoid epidemic of Santa Ana in 1924 was reviewed by R. F. Goudey and conclusions drawn on the general problem of contamination in water supplies.

●

Design and operating performance of the Lodi, Calif., activated sludge sewage disposal plant were reviewed in detail by Clyde F. Smith.

●

Design and construction of the Seventh Street Viaduct in Los Angeles were described by H. H. Winter, assistant engineer of bridges and structures.

●

Portland was making definite plans for starting the Bull Run dam project and announced that plans would be ready for bidding in the fall.

●

Grier & Mead were starting work on the 18,000-foot Claremont tunnel for the East Bay Municipal Utility District.

●

An editorial in *Western Construction News* stated: "The appalling succession of grade-crossing accidents, with attendant loss of life, during the past month again focuses public attention on this rapidly growing hazard of modern life." Attention is still focused and the hazard is worse.

●

Contract was awarded for a $198,000 steel highway bridge over the Pend d'Oreille River in Bonner County, Idaho, to Sam Boudrye of Lewiston, Idaho.

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

Contents for July, 1936

ABC

WESTERN CONSTRUCTION PUBLICATIONS, Inc.

Office of Publication: 114 Sansome Street, San Francisco, California.

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Northwest Office: 2937 N.E. 64th Ave., Portland, Ore., G. E. Bjork, Mgr.
Chicago Office: 6100 N. Winthrop Ave., Stephen H. Babcock, Manager.
New York Office: 509 Fifth Avenue . . . . . Ralph H. Flynn, Manager

Please address correspondence to the executive offices, 114 Sansome Street, San Francisco

Entered as Second Class Matter at the Post Office at San Francisco, California, under the Act of March 3, 1879.

The manufacturer of this side-mounted bullgrader specializes in equipment for a special job. International supplies the power that makes it work—a Diesel TracTracTor.

International Industrial Tractors and Power Units are first-line equipment on all kinds of projects. Here is a grader powered by International Diesel.

Bank on International Industrial Power to Handle the Tough Jobs

International Harvester's long experience as a manufacturer of tractors and power units is the most reliable guide to follow when you need industrial power.

To get the real lowdown on International Industrial Tractors and Power Units, trust the men who have put this equipment through its paces. Then you will have a good idea of what International Power can do on your jobs. No matter how tough the work, if it's in International's power range you can expect the utmost in results. And, good as International performance is, it becomes all the better when the cost sheets are figured and you find out about economy.

The International line includes TracTracTors, wheel tractors, and power units, with gasoline and Diesel engines. The power units range in size from 12 to over 100 h. p., and there are light-duty engines from 1½ to 5 h. p. Keep this fact in mind also—no matter where your jobs are, International factory-standard service is close by to keep this equipment on the job. For detailed information, call on the nearby Company-owned branch or authorized industrial dealer.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
606 So. Michigan Avenue Chicago, Illinois

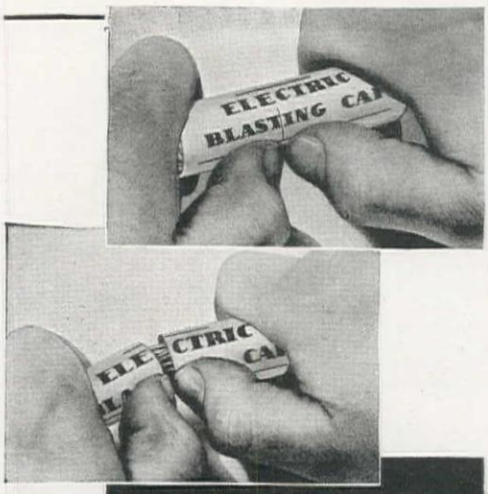
INTERNATIONAL HARVESTER

International Industrial Tractors and Power Units are distributed by J. D. Adams Co., Los Angeles and San Francisco; O. S. Stapley Co., Phoenix; Ronstadt Hardware & Machinery Co., Tucson; H. W. Moore Equipment Co., Denver; Howard-Cooper Corp., Portland, Seattle, Spokane; The Lang Co., Salt Lake City; Motor Equipment Co., Albuquerque; Udell Machinery Co., Boise.

International Harvester branches at San Francisco, Los Angeles, Portland, Seattle, Spokane, and Salt Lake City.

ELECTRIC BLASTING CAPS

reach the high point of safety and convenience in the ATLAS ACCORDION FOLD

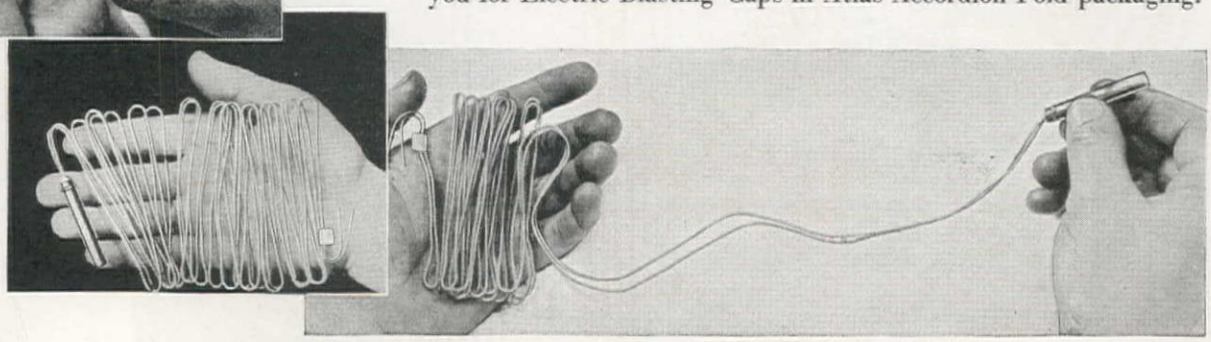


Handy to carry! Easy to open! Easy to prime! The pictures tell the story of Atlas Accordion Fold packaging . . . the use of which is rapidly becoming standard practise.

The utmost safety is provided by folding the wires accordion-wise to cushion the cap at ends and sides and protect the detonator from external shock.

Wires extend naturally into position . . . avoiding tendency to kink or snarl. It is simple to straighten out the cap end for priming without disturbing the rest of the accordion fold.

The Atlas Accordion Fold means greater safety and convenience for every man who uses electric firing. Yet there's no extra charge to you for Electric Blasting Caps in Atlas Accordion Fold packaging.



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.
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Kansas City, Mo.	St. Louis, Mo.
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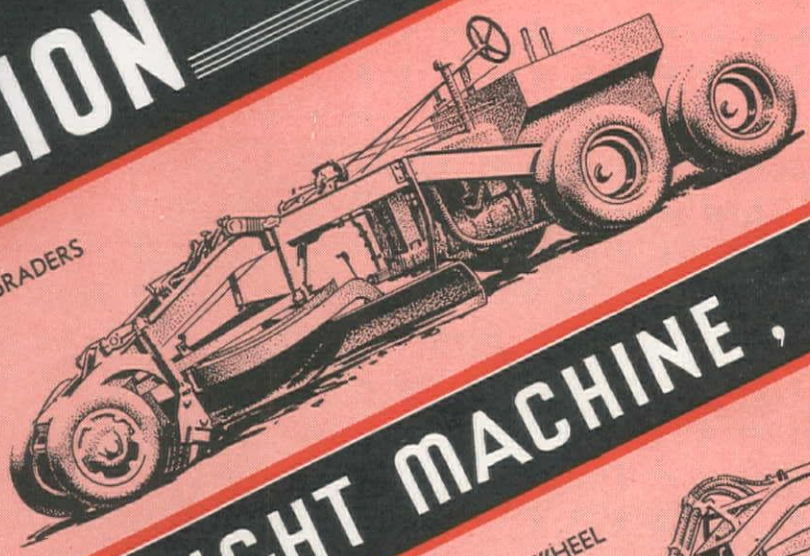
Memphis, Tenn.	Wilkes-Barre, Pa.
New Orleans, La.	Wilmington, Del.

ATLAS EXPLOSIVES

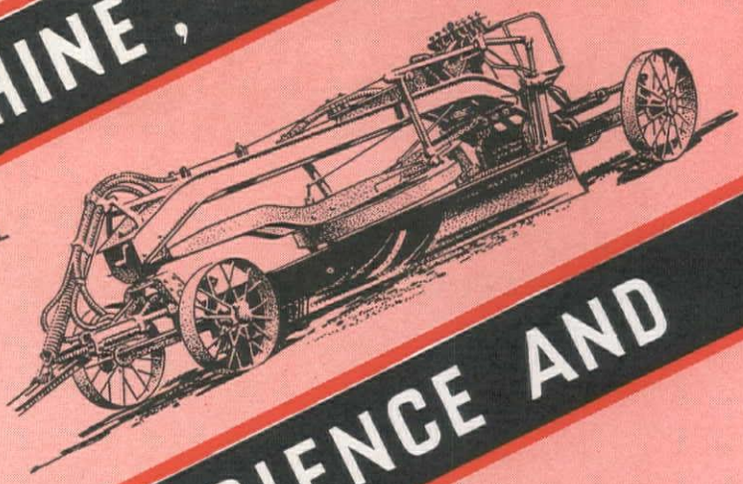
CHEMICALS ATLAS EXPLOSIVES

GALION

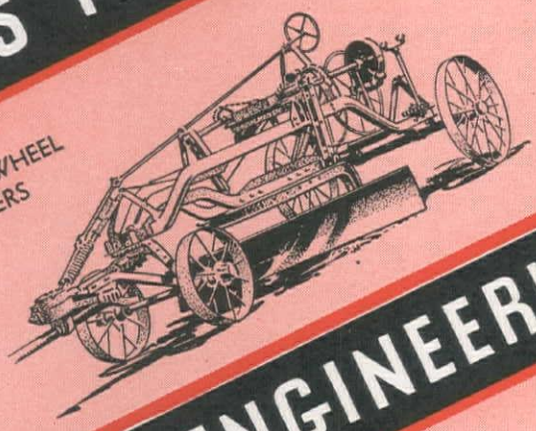


MOTOR GRADERS

HAS THE RIGHT MACHINE, BACKED BY

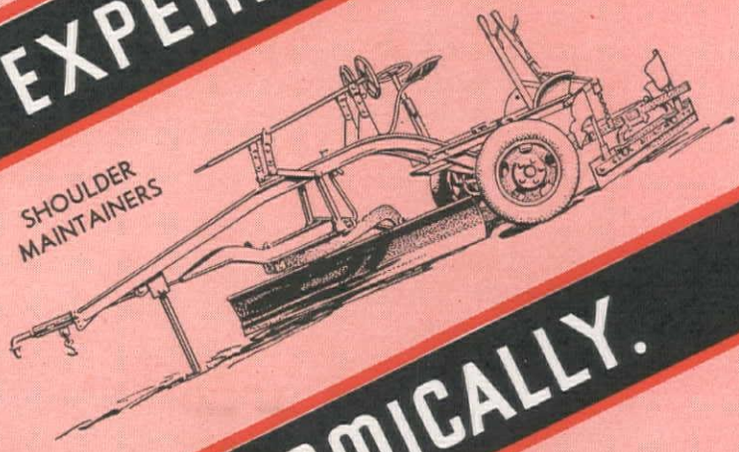


LEANING WHEEL GRADERS

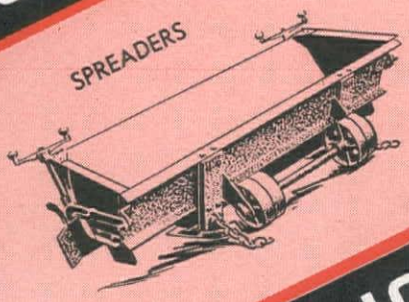


STRAIGHT WHEEL GRADERS

SOUND ENGINEERING EXPERIENCE AND

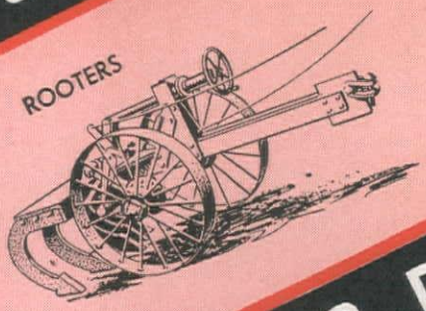


SHOULDER MAINTAINERS

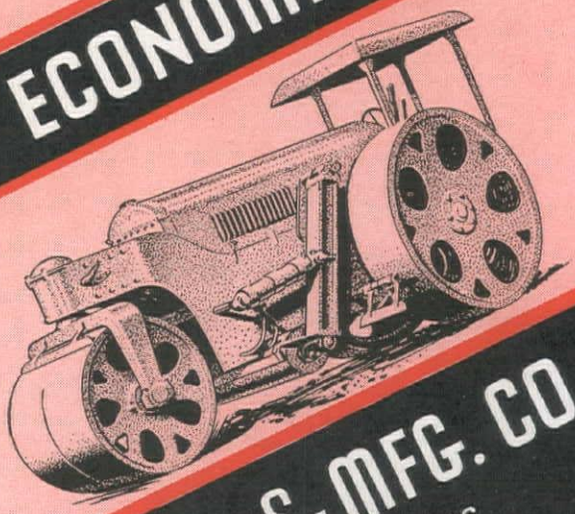


SPREADERS

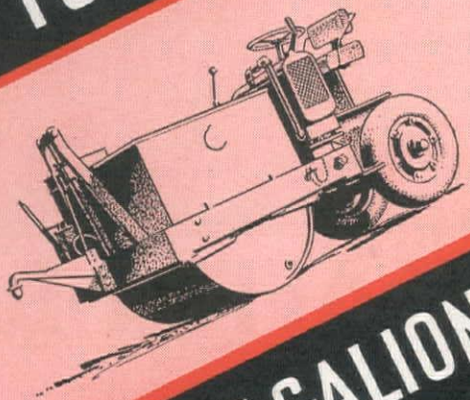
DESIGN, TO DO YOUR JOB ECONOMICALLY.



ROOTERS



ROAD ROLLERS



PORTABLE ROLLERS

THE GALION IRON WORKS & MFG. CO.

DISTRIBUTORS IN PRINCIPAL CITIES

GALION, OHIO

The Cleveland DR·6 *leads them all*

In Adaptability **to all sorts of drilling positions and conditions. Any angle—any direction. Wheels swivel.**

In Convenience of Operation. **Easily and quickly changed from one position to another —Throttle and blowing controls conveniently located, and always in the same place. Continuous air feed — easy to change steels.**

In Drilling Speed. **800 to 1,000 feet of holes per day per machine commonly reported.**

In Blowing Power. **Blows with that sudden "Blast" that cleans out all the dirt.**

In Portability. **Readily towed behind a light truck or automobile. Standard road gauge, but can be set to 16″ narrower for close places.**

In Economy. **Requires less air. Repairs less than any other make of drilling rig.**

In Originality. **First to use pneumatic tires. First to use the frame as an air receiver. First to use long air feed. First to be able to drill at any angle.**

Bulletin 111 tells the story. If you have rock to remove, write us your problem. We can help.

Western Branches

2001 Santa Fe Ave., Los Angeles
1417 Texas St., El Paso
41 East Broadway, Butte
501 Dooly Bldg., Salt Lake City

Western Distributors

Smith Booth Usher Company, Los Angeles
Edward R. Bacon Company, San Francisco
Howard Cooper Corporation, Portland, Seattle, Spokane, Twin Falls
Wortham Machinery Co., Cheyenne, Wyo.
H. W. Moore Equipment Co., Denver, Colo.
Arizona Tractor & Equipment Co., Phoenix, Ariz.
Caird Engineering Works Co., Helena, Mont.
Connelly Machinery Co., Billings, Mont.

THE CLEVELAND ROCK DRILL COMPANY

3734 East 78th Street Cleveland, Ohio, U. S. A.

Cable Address: "ROCKDRILL"

LEADERS IN DRILLING EQUIPMENT

CATER

REG. U. S. PAT. OFF.

FIRST IN SERVICE AS WELL AS FIRST IN SALES

PILLAR

"Caterpillar" Tractor sales are greater than the combined sales of all other track-type tractor manufacturers. The experience of the tens of thousands of owners proves "Caterpillar" Service is also first.

HERE'S WHY "CATERPILLAR" SERVICE IS FIRST

1 Distributors employ only factory-trained service men subject to instant call—kept up to date by traveling factory service experts.

2 Distributors are located within four hours of 95% of all "Caterpillar" owners in the United States.

3 Distributors' shops are equipped with high-speed tool equipment designed and built by "Caterpillar" for quality work at low cost.

4 Distributors carry complete stocks of low-priced genuine "Caterpillar" parts for the oldest as well as the newest models.

5 Distributors ship 90% of all parts orders within 24 hours.

This complete service is designed to keep every "Caterpillar" Tractor working—that's why every SHOW-DOWN shows "Caterpillar" first.

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


GARGOYLE
INDUSTRIAL LUBRICANTS
Now sold on the Pacific Coast by
GENERAL PETROLEUM CORPORATION
Exclusively
SEND FOR THE G. P. MAN
The services of a Socony-Vacuum trained engineer are available at all times in helping solve lubrication problems.
(OVER)

36 of the 50 leading paper manufacturers.

50% of America's mills.

81% of the leading machinery builders.

76% of the foremost industrial companies.

81% of the leading automobile and truck manufacturers.

69% of the leading automotive accessory manufacturers.

74% of the leading tire and rubber manufacturers.

66% of the leading iron and steel fabricators.

62% of the leading iron mines, smelters and rolling mills.

OVER **50%** of the steam turbines.

OVER **50%** of the reciprocating steam engines.

100 leading railroads.

77% of the World's largest manufacturers.

65% of the World's Diesel-driven ships.

The largest company in each of the 26 *leading American Industries.*

1st

GARGOYLE

INDUSTRIAL LUBRICANTS ARE *First* CHOICE OF AMERICAN INDUSTRY

Sold Exclusively on the Pacific Coast By

GENERAL PETROLEUM CORPORATION

"Street shoes" are available and are easily attached to protect against damage from crawler treads. The Bantam Weight can travel on hard surfaced roads, soft roads, over bridges; most anywhere.

HERE'S an excavator made for maintenance jobs. Five minutes will see it on a trailer and off to travel safely over secondary roads and small bridges. The Bantam Weight's built like a streamlined train—high tensile alloy steels give it greater strength with far lower weight. All welded construction has simplified design, reduced inertia-losses, provided a digging cycle that's 'most as fast as a man can swing a scoop shovel. For a hundred highway jobs, the Bantam Weight's an ideal tool . . . so fast in getting to a job that it shrinks a county by miles . . . so fast in getting through a job that it means higher production per day's work. And at a price that's easy to fit into budgets. Send for information today.

HARNISCHFEGER CORPORATION

4490 W. NATIONAL AVE. *Established 1884* MILWAUKEE, WIS.

Warehouses and Service Stations: HARNISCHFEGER CORPORATION, 82 Beale St., San Francisco; R. M. Taylor WESTERN LOGGERS MACHINERY CO., 302 S. W. Fourth Avenue, Portland, Oregon

SEATTLE DALLAS LOS ANGELES SAN FRANCISCO

P&H BANTAM WEIGHT

FIRST TO THE JOB — AND FIRST THRU

ONE OF THE 22 P&H PACEMAKERS FOR 1936

When writing to HARNISCHFEGER CORPORATION, *please mention Western Construction News*

HAULS 600 TONS DAILY

Truck being loaded at mine of Industrial Coal and Iron Co. in Southern Ohio

COAL MINE TRUCK CARRIES 31-TON LOADS . . . NEVER TOUCHES PAVEMENT—TIRES TAKE IT

Six hundred tons of coal hauled is just a day's work for one of these big trucks. Five such semi-trailer units are constantly on the go. They're loaded in a hurry by big, powerful electric shovels. Then, after leaving the stripping operation, they drive through mud and water—over stones. They never see a paved road. And the gross load is over 31 tons. What a job for tires!

Tires Triple Protected

Yet Triple Protected Silvertowns take the trucks through with never a letdown. Not one sidewall break is chalked up against them in over a year!

It's that kind of service that leads truckers to choose Triple Protected Silvertowns for their toughest hauling jobs. And if they stand up under the brutal, grinding service of a strip mine, they'll save money on your trucks, too.

Here's the secret of Goodrich performance. Every Silvertown is built with a new invention in the sidewall. This development—Triple Protection—provides a 3-way safeguard against sidewall breaks—the cause of 80% of premature failures! When you get this protection, you've gone a long way toward getting tire costs down to bed rock. Don't take chances. Insist on Triple Protection when you buy. It costs you *nothing extra.*

HOW TRIPLE PROTECTION WORKS

1 PLYFLEX—a *new*, tough, sturdy rubber material with greater resistance to stretch. A layer of Plyflex in the sidewall prevents ply separation—distributes stresses—checks local weakness.

2 PLY-LOCK—the new Goodrich way of *locking* the plies about the bead. Anchoring them in place. Positive protection against the short plies tearing loose above the bead.

3 100% FULL-FLOATING CORD—Each cord is surrounded by rubber. With ordinary cross-woven fabric, when the cords touch each other, they rub—get hot—break. In Silvertowns, there are no cross cords. No friction.

Goodrich *Triple Protected* Silvertowns

SPECIFY THESE NEW SILVERTOWN TIRES FOR TRUCKS AND BUSES

CONTROL means

Water power ... *out of control* ... can be one of the most destructive forces known to man. Homes, property, human life—all are swept away with fiendish abandon. But *under control* ... water power brings the cheery comfort of heat and light to millions. CONTROL MAKES THE DIFFERENCE.

(*Right*) Control makes a difference in tractors, too. Note the absolute freedom of slippage, as shown by tracks in the sand—the result of BALANCE. This Model "K-O" and bulldozer keep fine, shifting sand from blowing back into California's All-American Canal.

Controlled Ignition

ELIMINATES THESE COSTLY PROFIT ROBBERS:

- **High Tension Rings**
- **Special High Pressure Bearings**
- **Heat Reservoirs In Combustion Chamber**
- **Special Lubricating Oil**

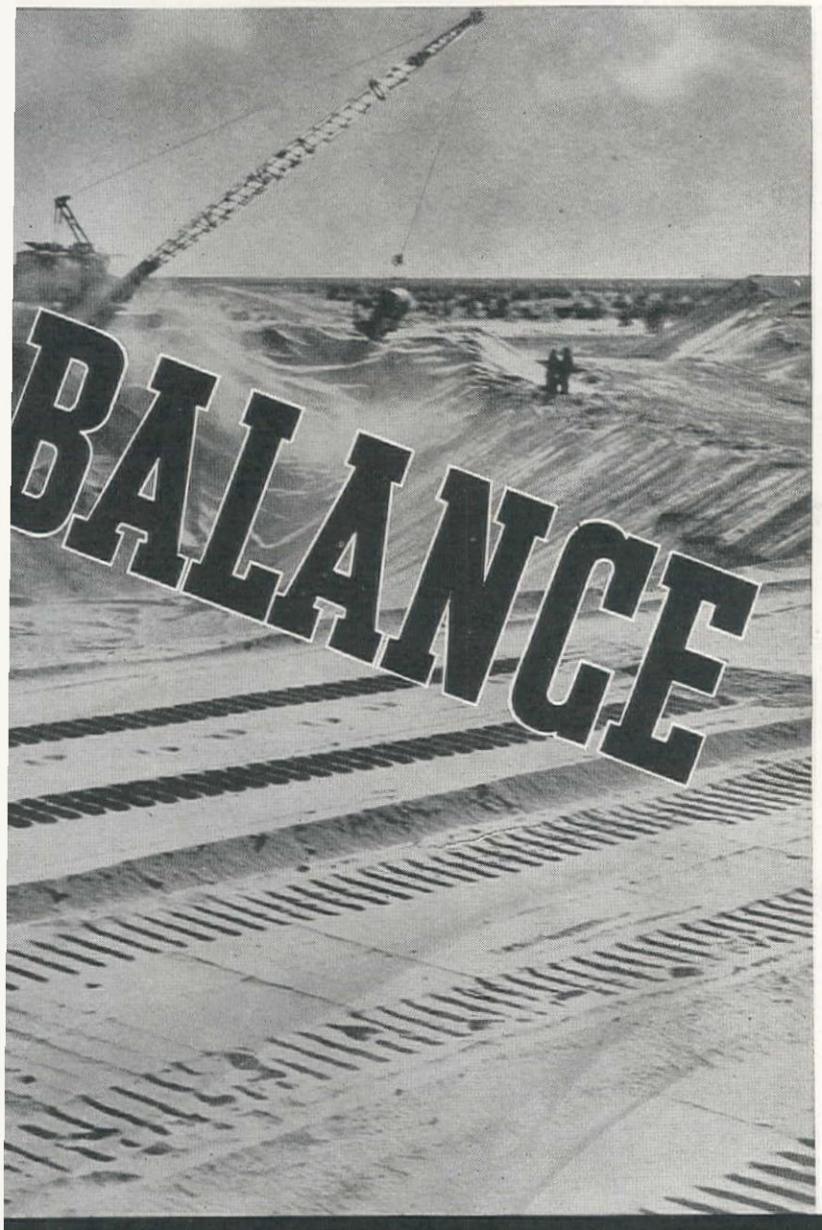
ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

Controlled Ignition PERMITS PROPER BALANCE BETWEEN POWER AND WEIGHT

ALLIS-CHALMERS Oil Tractors are "trained down" to fighting weight. Light-footed . . . responsive . . . quick-acting—a pleasure to operate, a revelation in performance. The exclusive *Controlled Ignition* principle does away with the extra dead weight which cuts down speed, wastes power, and slows up production. Such familiar penalties of high compression ignition as heavy, unbalanced parts, special heavy construction and auxiliary starting devices are no longer necessary. Once again Allis-Chalmers leads the way—this time to give you maximum economy on Diesel fuel oil, combined with simplicity, smoothness, better balance, greater flexibility, easier servicing, instant starting, lower first cost. Branch house and dealer service everywhere. Ask the A-C dealer.

• • •



CONTROLLED IGNITION OIL ENGINES—INCLUDING FUEL PUMPS AND INJECTORS—ARE OF ALLIS-CHALMERS OWN DESIGN

CONTROLLED *Instant* STARTING

Easy starting, regardless of weather. Crank or self-starter. No auxiliary starting motor.

CONTROLLED INJECTION OF FUEL

Diesel fuel oil is sprayed (not squirted) into the combustion chamber at 60° before top dead center. Fuel pump of A-C design . . . measures charge of fuel accurately, regardless of load or throttle setting. Simplest, easiest to service fuel pump built. Controlled pressure in fuel lines — no hammer-like blows from pressure changes.

CONTROLLED AIR-FUEL RATIO

Specially designed injection system maintains proper ratio for efficient combustion at ALL engine speeds. No excess of air at idle speeds to lower exhaust temperatures at the expense of power.

CONTROLLED IGNITION

Controlled spark ignition at exactly the proper point for complete, efficient combustion. No chance of power-wasting pre-ignition. High compression pressures with the resulting destructive forces are eliminated. No need of special rings, or heavy, unbalanced parts. No split-hair tolerances.

Again ALLIS-CHALMERS LEADS THE WAY

Controlled Ignition OIL TRACTORS

One of three new Cummins diesel-powered Osgood cranes just delivered to the United States Engineers for use on the Upper Ballona Creek job of their seventeen million flood control program in Los Angeles County.

Acceleration *without Vibration*
Lighter *in Weight*
Flexibility *and Cold Starting*
Backed *by Good Service*

CUMMINS ENGINE COMPANY, 706 WILSON STREET, COLUMBUS, INDIANA

CUMMINS-DIESELS

INDUSTRIAL • AUTOMOTIVE • MARINE

When writing to CUMMINS ENGINE COMPANY, *please mention Western Construction News*

JAEGER BITUMINOUS PAVER

On Top with both Engineers and Road Builders

NO WEIGHT, NO TRACTION on the NEWLY LAID MATERIAL

Because it lays smoother roads and bigger tonnages, to the satisfaction of every state and contractor who has used it, many of the below users have already bought their second Jaeger Paver:

Albertson & Cornell Co., Tacoma, Wash.
Arcole Asphalt Co., Evanston, Ill. *(Repeat)*
Big Rock Stone & Material Co., Little Rock, Ark.
Canadian Rock Products, Ltd., Montreal, Que.
Carter-Halls-Aldinger Co., Ltd., Winnipeg, Man. *(Repeat)*
J. C. Compton Co., Portland, Ore.
Cooke Asphalt Paving Co., Detroit, Mich.
Cumberland Contracting Co., Cumberland, Md.
Detroit Asphalt Paving Co., Detroit, Mich.
Dufferin Paving & Construction Co., Ltd., Toronto, Ont. *(Repeat)*
Essex County Highway Dept., Westport, N. Y.
Sam E. Finley, Atlanta, Ga. *(Repeat)*
James Gallagher Co., Chicago, Ill.
Thomas Gallo, Newark, N. J.
Globe Construction Co., Inc., Kalamazoo, Mich.
Lane Construction Corp., New Haven, Conn. *(Repeat)*
Louis Longhie, Torrington, Conn.
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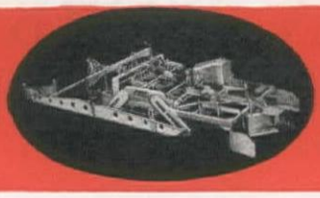

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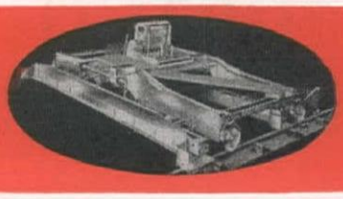

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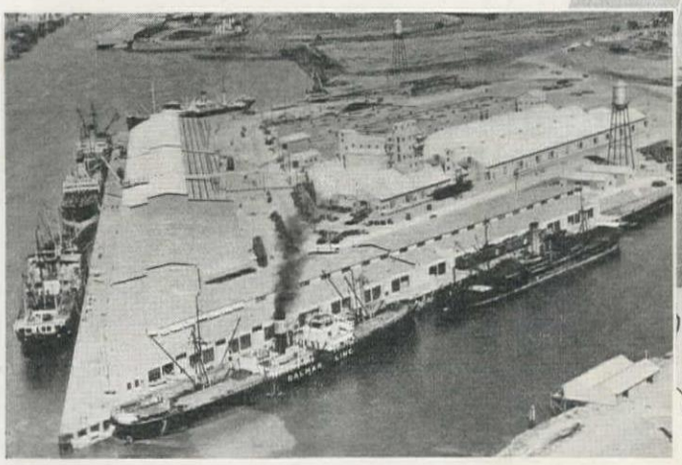
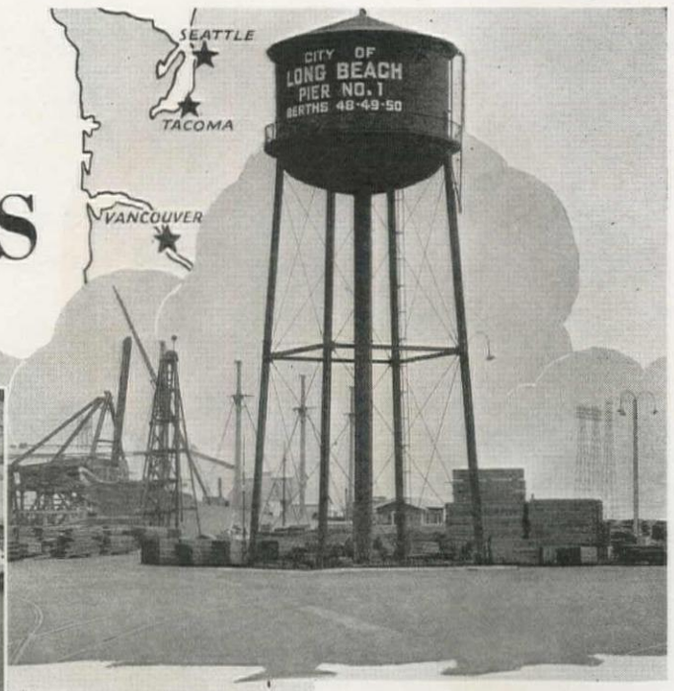
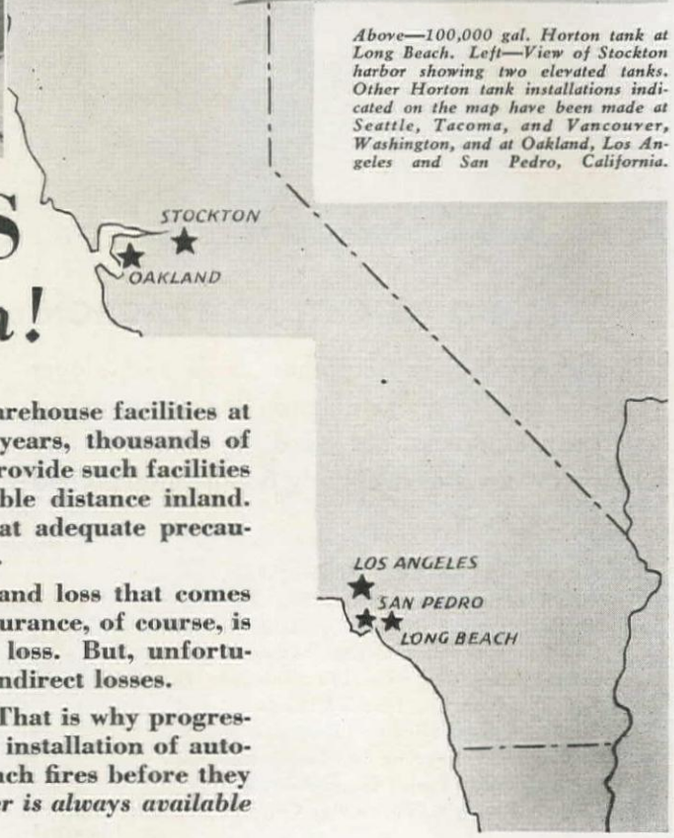




Above—100,000 gal. Horton tank at Long Beach. Left—View of Stockton harbor showing two elevated tanks. Other Horton tank installations indicated on the map have been made at Seattle, Tacoma, and Vancouver, Washington, and at Oakland, Los Angeles and San Pedro, California.



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THE advantages of having harbor, dock and warehouse facilities at a seaboard city are well known. In recent years, thousands of dollars have been invested on the West Coast to provide such facilities even for cities on navigable waters a considerable distance inland. Under such circumstances, it is only natural that adequate precautions should be taken to guard against fire losses.

No one can accurately evaluate the damage and loss that comes when shipping is attracted to other channels. Insurance, of course, is a desirable form of protection against material loss. But, unfortunately, insurance cannot always compensate for indirect losses.

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Birmingham	1500 North Fiftieth Street	Tulsa	Thompson Bldg.	Philadelphia	1700 Walnut Street Bldg.
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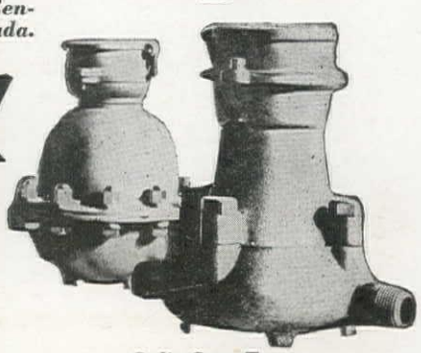

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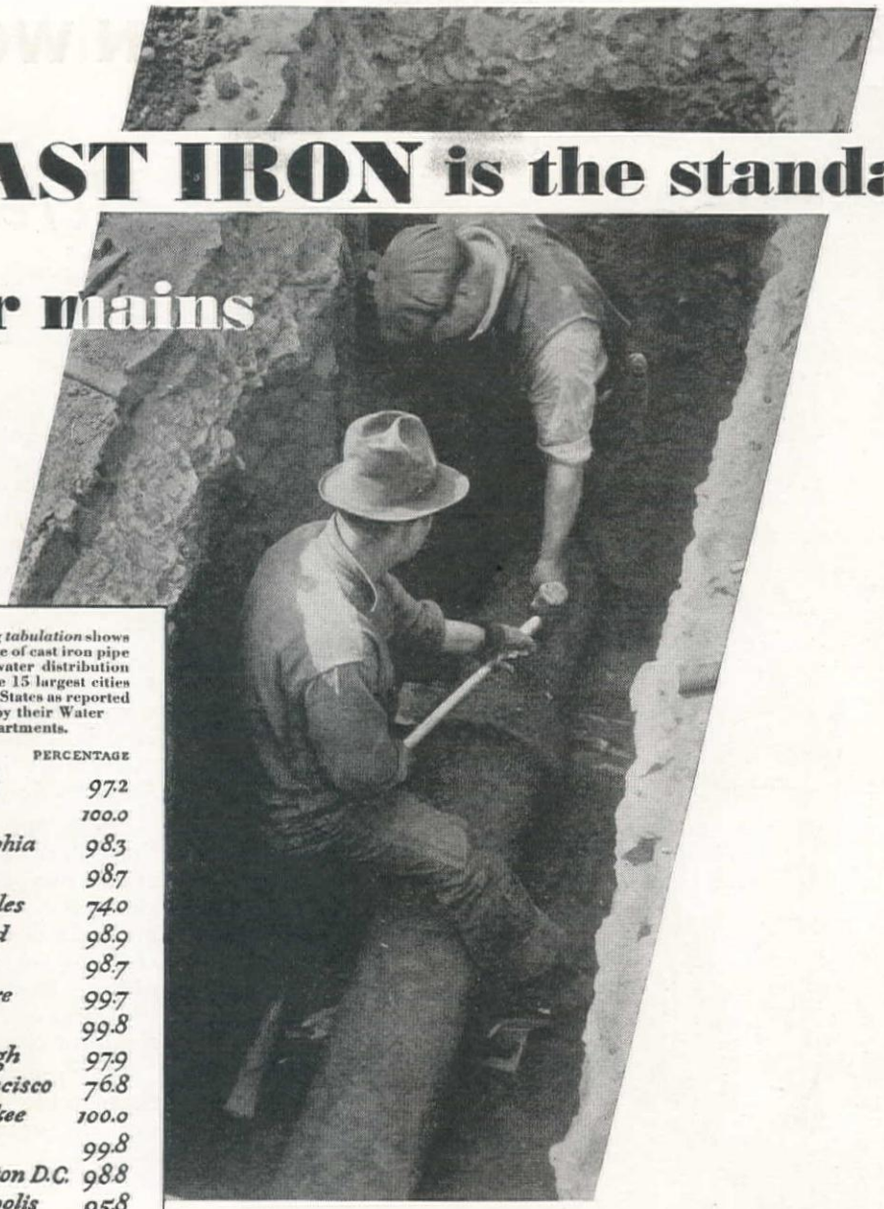

The following tabulation shows the percentage of cast iron pipe used in the water distribution systems of the 15 largest cities in the United States as reported in 1935 by their Water Departments.

CITY	PERCENTAGE
New York	97.2
Chicago	100.0
Philadelphia	98.3
Detroit	98.7
Los Angeles	74.0
Cleveland	98.9
St. Louis	98.7
Baltimore	99.7
Boston	99.8
Pittsburgh	97.9
San Francisco	76.8
Milwaukee	100.0
Buffalo	99.8
Washington D.C.	98.8
Minneapolis	95.8

When New York City engineers uncovered this 105-year-old cast iron water main to cut in a new valve, their comment was "that pipe looks good enough to last another hundred years."

IT serves longest—costs less per service year—costs little to maintain. Those are the reasons why cast iron pipe is the standard material used almost exclusively for the water distribution mains of our 15 largest cities. In these cities the average age of the oldest cast iron pipe in service is 86 years. Cast iron pipe has by far the longest life of any material practicable for water mains—a fact known by all water works engineers, and through our advertising, by the public whom they serve.

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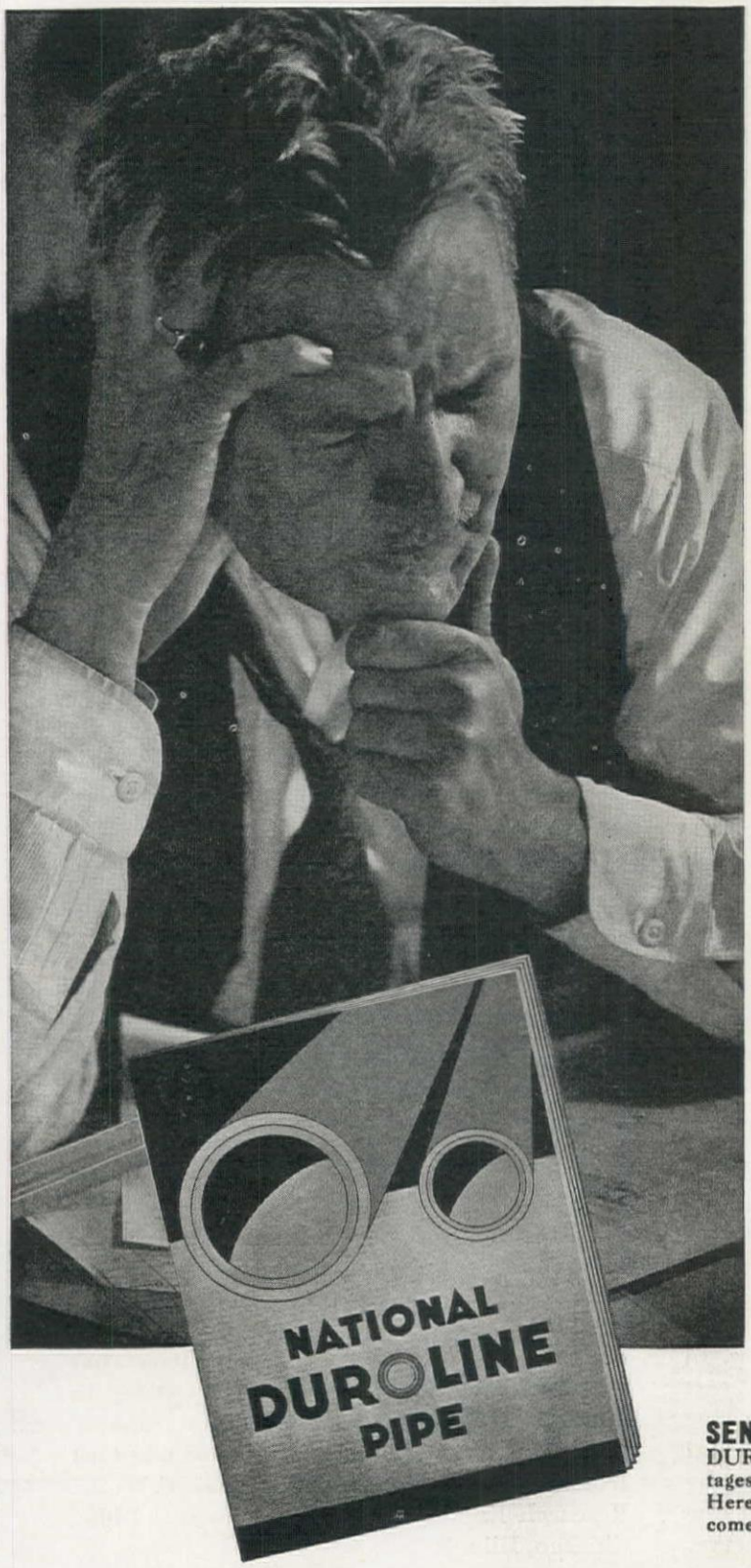

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WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER

July, 1936 Vol. II, No. 7

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

Highway Maintenance Becomes a Major Problem in the Mountain States

DURING the past few years the Intermountain states have carried out extensive programs of highway improvements, based primarily on the public demand for dustless, surfaced roads at the earliest possible moment. These state programs, in many cases, have been advanced much faster than the best judgment of the engineers dictated, but were the result of popular demand that funds be spread out thinner and thinner, to gain mileage, rather than used to consolidate the betterment on sections where the initial stage of improvement had been made. Foundation and subgrades, of necessity, have had inadequate treatment, drainage provisions have been held to a minimum in this demand for mileage, and the surfacing has been primarily of a road-oil mat type using the metal available at the project. The fact that thousands of miles of this type of highway have given excellent service for a number of years is good evidence of what modern highway engineering is able to do, and the ability of this type of construction to fulfill its purpose. However, this very service has tended to hide from the public the knowledge of the problem facing the states, and aggravated the insistent demand for further mileage.

Today, these states are faced with the rapidly mounting maintenance problem. One phase of this problem is the necessity for the diversion of available funds from construction to maintenance, with the corresponding decrease in the amount of matching-funds for meeting Federal aid, and the other is the new emphasis which will be placed on the study of highway maintenance engineering in the West. Highway engineers in the Intermountain states will be forced to attack the maintenance problem as they have not done in the past. Costs and methods will take on a new significance. With this in mind, we are presenting in this issue an article reviewing highway maintenance programming, methods and costs from the Wyoming Highway Department. It contains data and information of value to all those concerned with this subject. With the coöperation of other western states this subject may be further discussed in these pages, as the logical place where this distinctly regional highway problem can be reviewed for the benefit of the entire highway industry west of the Rocky Mountains.

•

West *vs.* East in the Field of Water Works Engineering

"YOU western water works engineers have problems which we eastern engineers can hardly imagine," was the manner in which President Frank Barbour expressed the attitude of eastern delegates to the American Water Works Convention at Los Angeles, after listening to a group of papers which reviewed such western water projects as the construction of the Hetch Hetchy and Los Angeles aqueducts.

This constitutes an excellent indication of the regional characteristics of water supply engineering in the eleven western states. In the East the securing of an adequate quantity of water is not usually a serious problem, with the exception of a few metropolitan areas where population concentration necessitates long distance conveyance. For the most part their problems consist of pumping and purification. In the West the pumping problems are the same, only more so, because of greater variation in elevation, refractory characteristics of quality are equally severe, and, in addition, the source of supply may be located a hundred miles or more from the point of use. Thus, the western water works engineer has all the problems of his brother in the East, with the possible exception of gross sewage pollution, and must also face the entire range of engineering construction problems from great storage dams, tunnels and all other features of long aqueduct building. In fact western water supplies problems are often considered rather well solved and the battle practically won when the project gets the supply to the point where the eastern engineer is called upon to start his job.

SLOGAN: An Irrigated Acre Is Better than a Scorched Section

RECURRENCE of a serious Mid-West drought this summer will tend to emphasize the importance of western irrigation in the general scheme of national agricultural development. The result will increase the desirability of agricultural land where there is assurance that a whim of Nature will not ruin the efforts of an entire year. The irrigation farmer must face the gamble with the law of supply and demand and other kindred economic factors of uncertainty but, at least, he can usually produce what he starts out to grow. Irrigated land now available for new farmers, admittedly, is not as cheap as it was in years past, but its use constitutes a challenge to industry and scientific agriculture as compared to the "sow and pray" policy of the drought areas. Two years ago when the farmers from the Dakotas to the Texas Panhandle were being burned out of the dry-farming belt by the drought of 1934, there was a definite migration of farming population toward the irrigated areas of the West. One tangible evidence of this movement was the marked increase in inquiries and interest for land on the projects of the Bureau of Reclamation. Another season such as is being predicted for 1936 will greatly accelerate this movement. These potential irrigationists will constitute an important factor in the growth of the West, not alone in creating the immediate need for more irrigated land but in the secondary demand for further industrial and commercial expansion in the Western Empire.

And where does the construction industry of the West fit into the picture? From a very narrow approach to the subject there is the need for extending existing irrigation projects and starting new ones with the necessity for more storage dams, tunnels, conduits and canals. From the broader point of view, more permanent population means healthy regional growth, which will be reflected in the increasing need for highways, municipal facilities and industrial developments. These growth factors are evidence that the West cannot escape an accelerating expansion which will be based on civil engineering and construction activity.

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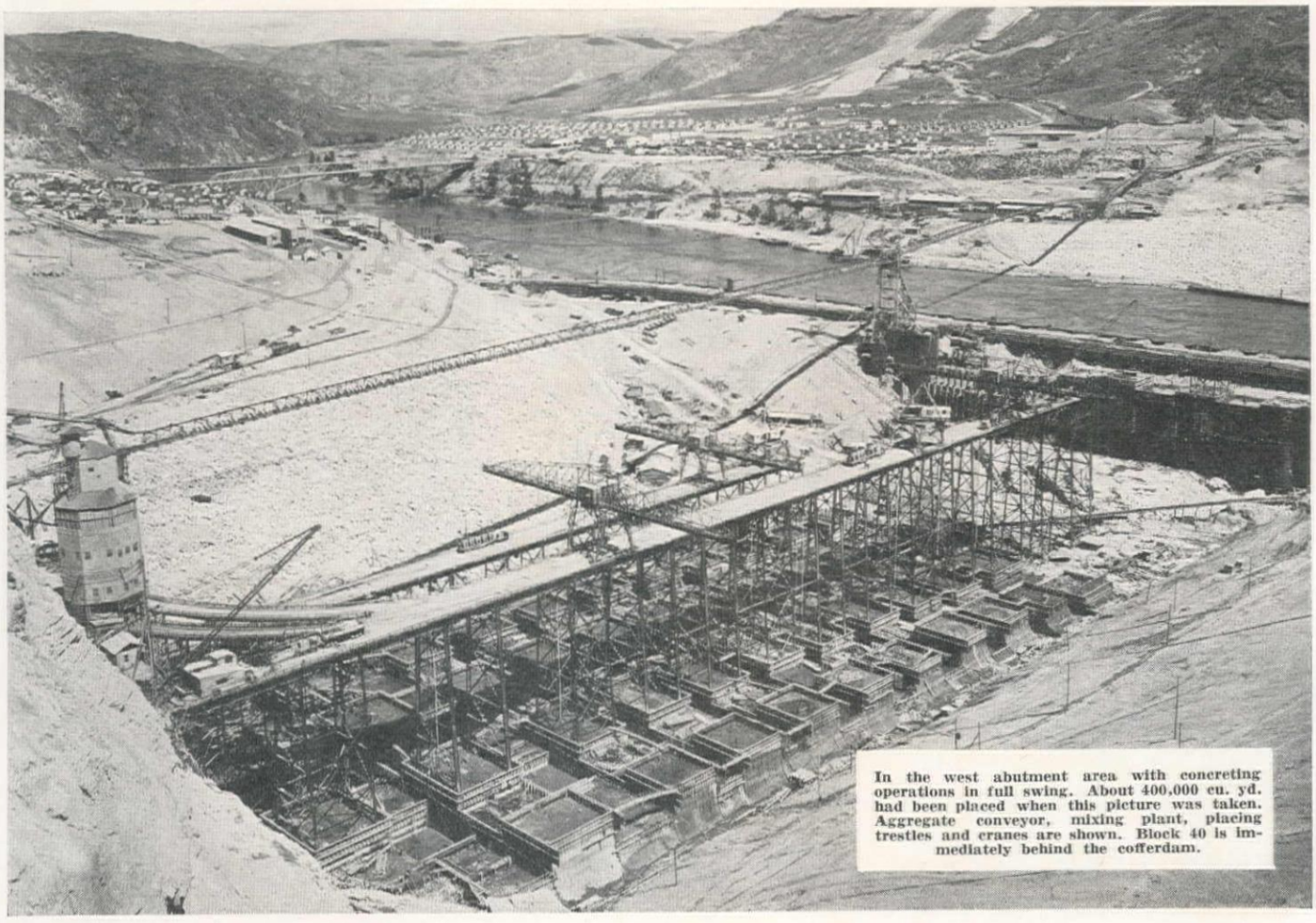
WESTERN CONSTRUCTION NEWS
JULY, 1936



In the west abutment area with concreting operations in full swing. About 400,000 cu. yd. had been placed when this picture was taken. Aggregate conveyor, mixing plant, placing trestles and cranes are shown. Block 40 is immediately behind the cofferdam.

Details of Concreting Procedure At Grand Coulee Dam

Data on foundation grouting, step-by-step review of concrete placing methods, form design, cooling system and contraction joint grouting — Original and present contracts reviewed

CONCRETE placing at Grand Coulee dam has settled down to a well regulated, highly systematized procedure resembling the operations in a straight-line production manufacturing plant. The "5-ft. lift per block" is the unit of production and, with the second concrete plant in operation, the rate of placing will reach the astonishing figure of 1 cu. yd. of concrete every 6 sec. Previous articles in *Western Construction News* have reviewed the preparation of aggregate and the operation of the concrete plant (see list of articles); the following review goes into details of foundation grouting, form work, placing procedure, cooling system, and other factors of particular interest to engineers and construction men.

Present operations involve placing about 4,500,000 cu. yd. of concrete for this structure being built by the Bureau of Reclamation on the Columbia River in eastern Washington. The contract was awarded June, 1934, to the Mason-Walsh-Atkinson-Kier Co., and a review of the work to be done under the original contract, and the subsequent revision in plans appears at the close of this article.

Foundation preparation

Following the excavation of river overburden and the exposing of bedrock, the first construction operation consists of foundation grouting. The foundation and abutment rock is a fine-grained, dense granite of excellent quality, with a bearing capacity of about 18,000 lb. per sq. in. The rock is somewhat seamy, a characteristic of the granite, and has a minor fault at the foot of the east abutment. Average bedrock of the foundation is at about El. 870. Exploration diamond drill holes totaling 7 mi. in length have been drilled into the rock, and cores from these holes indicate the rock is of first quality. In some instances, holes have been drilled through the granite for 40 ft. without striking a seam. Depth of rock underlying the dam has not been determined, but some holes have been drilled to El. 600, and indicate a continuation of the same uniform quality of rock.

As exposed, the bedrock is slightly irregular with small grooves and channels cut by water. Some areas of the exposed rock are considerably weath-

ered, especially on the east side of the river, but the greater part of the foundation shows only slight surface deterioration. From 5 to 20 ft. of the weathered rock is removed in preparing the foundation for concrete. Excavation for the west abutment and foundation out to tier 40 has involved removal of 300,000 cu. yd. of rock. Foundation rock under the upstream portion of the dam is being sealed with preliminary low-pressure grouting, followed by final high pressure grouting. Four series of holes will be used, as shown in the accompanying drawing. Type "D" holes (60-ft. vertical), not shown on the drawing, will be used as auxiliary holes in areas needing additional grouting. The sequence of the grouting operations is as follows:

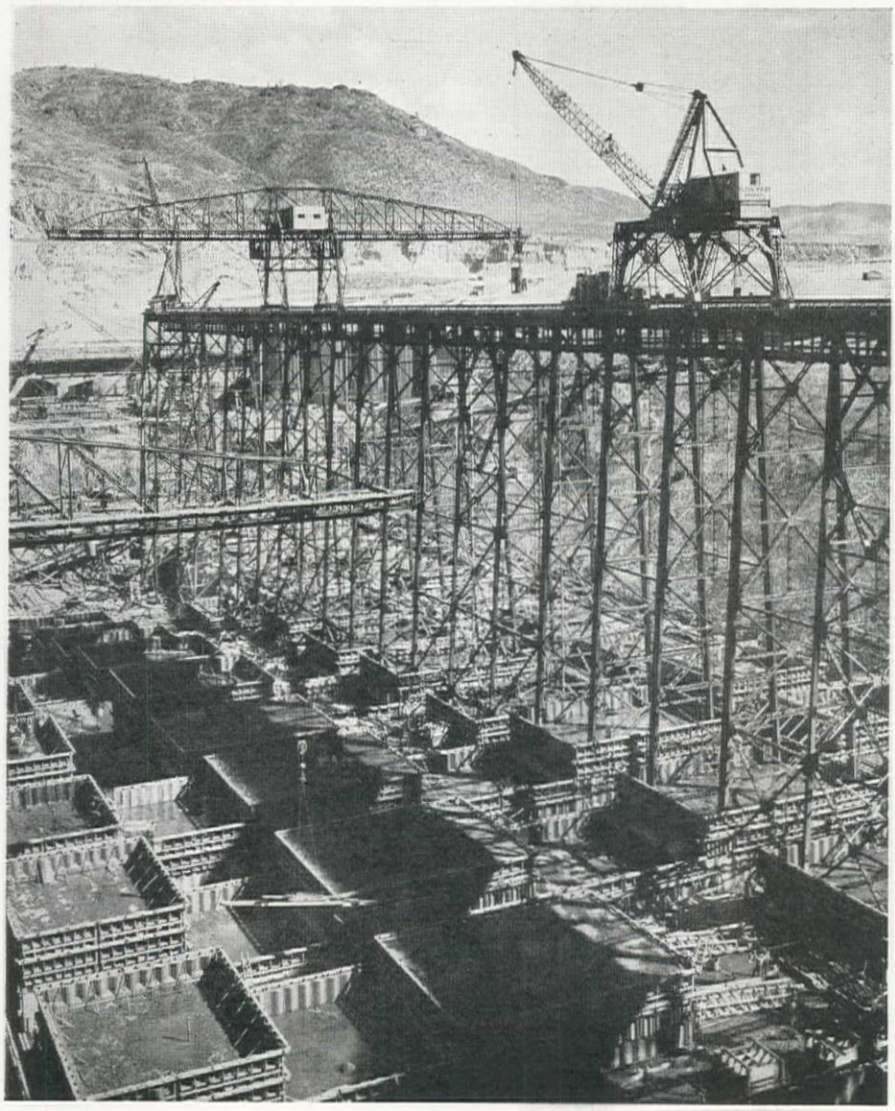
1—Drill "B" holes and grout under low pressure prior to placing foundation concrete.
2—Drill "D" holes and grout under low pressure where "B" holes are not adequate.
3—Drill "C" holes and grout under intermediate pressure prior to diversion of river over foundation.
4—Drill "A" holes from gallery and grout under high pressure prior to completion of the dam. "A" holes are 150 ft. deep at 20-ft. centers. Deeper intermediate holes to be drilled and grouted later at such spacing and depth as determined by the quantity of grout acceptance.
5—Drill drainage holes from gallery.

Low pressure grouting is being done with pressures up to 250 lb. per sq. in. and high pressure grouting is to be done with pressures up to 600 lb. per sq. in. High pressure grouting will be done after most of the concrete has been placed, to take advantage of the weight of the dam in resisting the uplift.

To date, about 400 "B" holes have been drilled and grouted. The average hole takes about 100 sacks of cement, in the form of grout. Some holes refuse grout, and a few have taken over 1,500 sacks of cement. In some cases, successive grouting is necessary. Various consistencies of grout, ranging from ½ part water to 1 part cement up to 5 parts water to 1 part cement are used, depending on the manner in which the rock receives the grout. Grout is pumped from a central plant by air operated duplex pumps. About 80 "D" holes, with an average depth of 60 ft., have been drilled and grouted on the west side. An average "D" hole requires about 185 sacks of cement.

In addition to the grout holes, a number of 36-in. diameter clay holes will be drilled in the foundation. Eight were put down in the west enclosure, varying in depth from 30 to 67 ft. In addition to permitting direct inspection and tests of the foundation rock, the original plans called for installation of strain meters in these holes, but the idea was abandoned in the west enclosure, because the holes were not properly located for this purpose. After inspection, the holes were filled with concrete. Strain meters will probably be installed in the holes on the east side.

Hammerhead crane and whirley on the high (upstream) trestle used to handle 4-yd. buckets of concrete from trains to forms. Hammerheads are used mostly for placing because of a fast load line, and the whirleys for form handling and cleanup with the special advantage of quick access to any point in reach. The steel trestle will be embedded in the dam.



Concrete procedure

The dam is being built in tiers of blocks, each block being built up in 5-ft. lifts. Tiers are at right angles to the axis of the dam, and are 50 ft. wide, except in the portion of the dam containing the penstocks, where they alternate at 25 and 40-ft. widths. Blocks in the tiers are 50 ft. long, except those at the upstream and downstream faces. In adjacent tiers, blocks are offset 25 ft. Tiers are numbered consecutively, and blocks in the tiers are designated alphabetically, starting with "A" in the upstream block.

The manner in which each lift is prepared and poured is comparable to the routine procedure of assembling an automobile in an assembly plant. The 5-ft. lift is the unit of production, and the cycle of its preparation and completion involve a number of routine operations, each carried out by a crew of men working under a foreman, who is responsible for the completion of one operation. The various operations are done in sequence, and when a crew has completed its work in one form, it moves on to the next one. This organization creates efficiency and speed. Listed below, in their usual sequence, are the major operations that go into the preparation for and the placing of a 5-ft. lift of concrete.

1—Bedrock is drilled and blasted.
2—Blasted rock is hauled out and disposed of either as rip rap or as waste. Shovels, draglines and skips are used to load the rock into trucks.
3—Foundation rock is government inspected.
4—Low-pressure grouting is completed.
5—Remaining fragments of loose rock are barred out, and the rock is given general cleaning.
6—Government engineers establish block layout points.
7—Carpenters build first forms in the field to fit bedrock.
8—Heavy metal grout stop is fastened and welded together on the side of form approximately 1 ft. above bedrock. Vertical grout stop is installed.
9—Grout pipe and fittings are installed in the form.
10—Any additional items (required in some bedrock forms) such as risers

from high pressure grout holes and drainage holes are installed.

11—Rock is sand blasted, washed and given final cleanup for concrete. Waste is loaded into skips and placed in dump cars on trestles by whirleys.

12—All items of government issue are invoiced in the form.

13—Form is given final inspection and accepted for concrete.

14—A ¾-in. layer of grout is swept over bedrock. Grout consists of 1 part cement, 2.7 parts of sand, and .6 part of water.

15—Concrete is placed in the form in a 4-yd. bucket, either by a hammerhead crane or a whirley. Placing of the concrete is directed by the government inspector. The foreman of the eight-man placing crew spots the bucket. One man dumps the bucket. Four men, two to a machine, operate two large electric vibrators, and level down the mass of the batch of concrete. One man operates a small vibrator and compacts the concrete in places not easily accessable to the large vibrators. The remaining three men, including the man who dumped the bucket, shovel loose aggregate into the path of the vibrators. Concrete is placed in layers of about 1 ft.

16—Pour is completed and concrete leveled off roughly to the top of the form. Form for small sump is placed in center of pour. Form anchors and cooling pipe tie wires are inserted in concrete.

17—Concrete is allowed to set about 12 hr. A layer of about ¾-in. is cut off of top of concrete with high pressure air and water blast.

18—After 24 hr., construction of the next form on top is begun. Prefabricated forms are used for pours off of bedrock.

The operations in a form several lifts off of bedrock are as follows:

1—Bottom form is stripped and placed on top of pour. After concrete in top form has set 24 hr., stripping is done by small portable gasoline crane. Crane is lifted from one block to another by a whirley.

2—Carpenters set form. Any additional structures such as gallery and shaft forms are erected. All forms for internal structures are prefabricated.

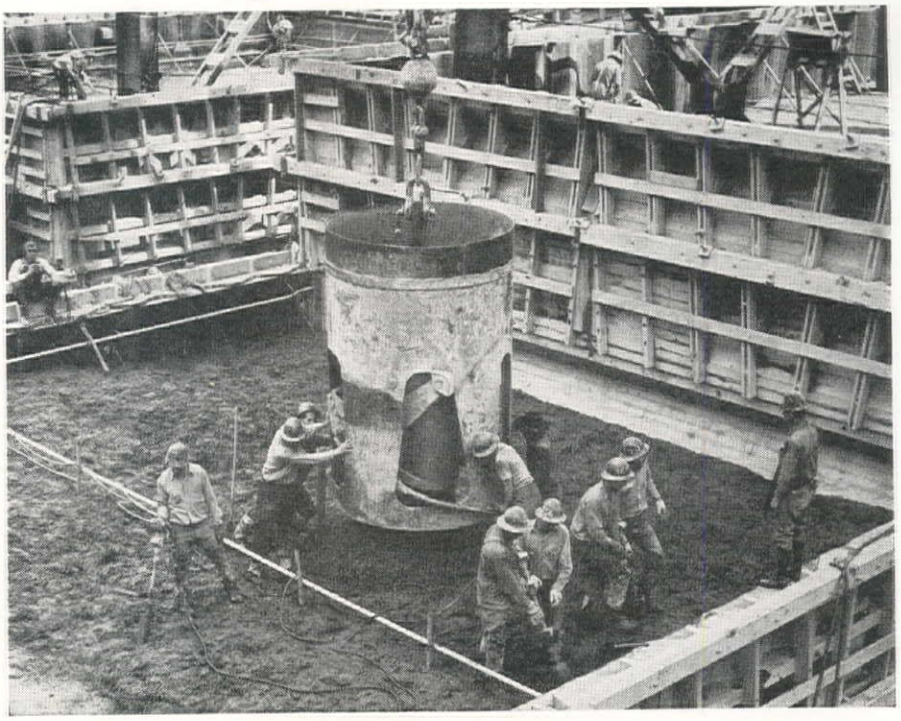
3—Vertical grout stop is installed.

4—Cooling system within the form is installed.

5—Grouting system within the form is installed. Grout stop, cooling and grouting materials are kept in portable bins which can be placed in convenient locations by a whirley.

6—Any additional items such as reinforcing, electrical mechanism, conduit, thermometers, etc., are installed.

7—Operations 12 to 19, as described in the preparations of a bedrock form, are repeated.



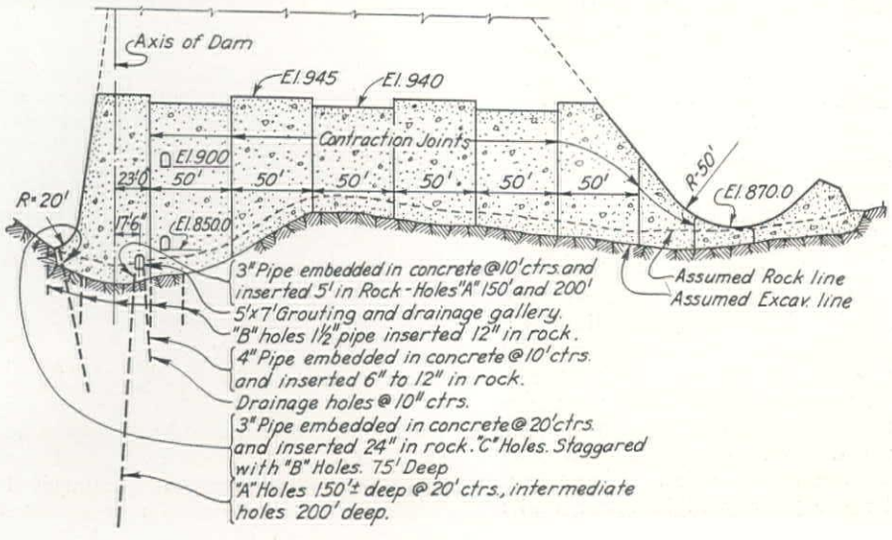
Dumping a 4-yd. bucket. An eight-man crew and three vibrators handle the concrete. The man at the extreme left, sitting on the form, is directing the crane operator by telephone. Note the type of form as shown on the adjacent block.

Note: 72 hr. must elapse from the time a pour is completed until the next pour can be made.

The following table indicates the number of men who were working on each operation connected directly with the placement of concrete for a 24-hr. period in which 6,880 cu. yd. of concrete were placed:

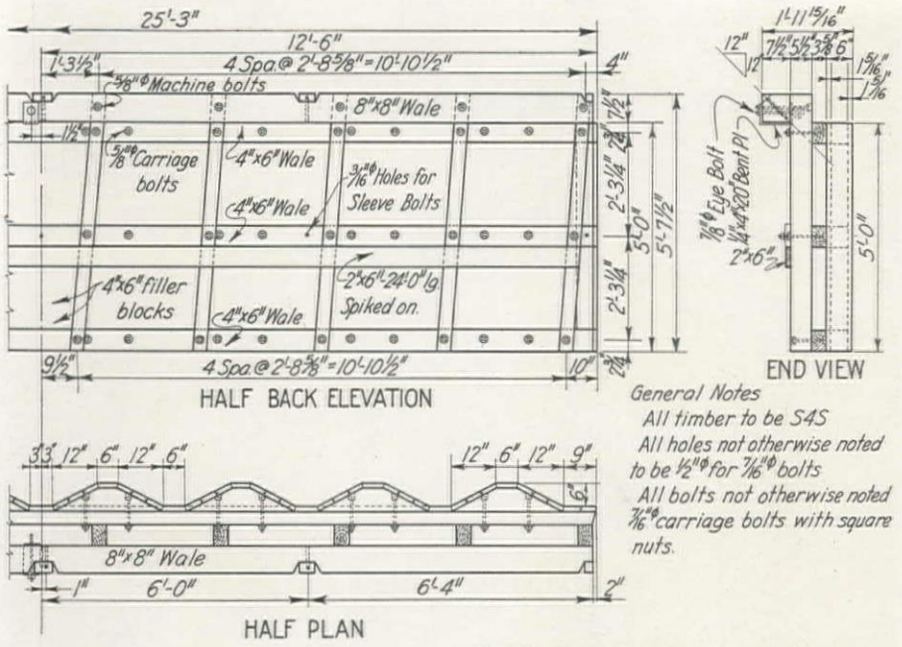
Type of Work	No. of Foremen	No. of Men
Rock cleanup	4	36
Carpenters	15	249
Cleanup	27	199
Placing	14	111
Stripping	4	86
Cutting	3	39
Installing cooling pipe	3	32
Installing grout pipe	3	63
Welding	3	27
Steel	2	22
Pumping	3	46
Trestles	4	124
Plant operation	3	21
Rigging	3	18
Finishing	1	12
Electricians	3	18
Mechanics	3	24
Saw filing	1	6
Total	99	1133

Section through the spillway with details of the foundation grouting program. The sequence of this grouting work is reviewed on page 210 and the relation of the top of the concrete as indicated to the final structure is outlined on page 214.



Forms

Forms used are the two course type, similar to those used at Norris dam. In using double course forms, two complete sets of panels are used on each block. The lower set of panels remain on the completed 5-ft. lift until the panels for the next lift have been set and the lift poured. The bottom course is then stripped and re-set on the completed pour. In setting this type of form, the top of the lower course provides support for the bottom of the top course. Tie rods, attached to hooks in the concrete, hold the top of the high course in place. Advantages of this type of forming are: (1) they usually



Details of form design showing the type of construction used on the panels forming the transverse faces of the blocks. Lumber is prefabricated at the mill and assembled in the contractor's shop at the site. Walers are of Select Structural Douglas Fir and the frame is of No. 1 Common Douglas Fir.

require less time to set; (2) they are adaptable to straight type dam construction; (3) no bolts or projections from the concrete are necessary for bottom support; (4) they are suitable for power stripping. The main disadvantage is that it requires twice as many form-units as single course forms do. This is offset, however, by the fact that both sets of panels will probably be completely worn out by the time the top of the blocks are reached.

Longitudinal and transverse panels are used in the block construction. The longitudinal panels form the horizontal keys and the transverse forms make the vertical keys. Lumber for the standard panels, gallery, and shaft forms is pre-fabricated at the mill and assembled in the contractor's form yard as needed. Draft tube forms, and any special forms are built from stock. Forms for bedrock pours and the upstream fillet are built in the field as required.

The following grades of lumber are used:

Walers—
Select structural Douglas Fir

Frame—
No. 1 common Douglas Fir

Lagging for face forms—
C grade 5/4-in. stock

Lagging for interior forms—
Select merchantable 5/4-in. stock

(All lagging is end matched and tongue and grooved.)

Stripping

A form jack, resembling a huge claw hammer, is used for stripping. The handle is hooked to the load line of a crane. One end rests on the back of the top form and the other end is placed in front of the top waler on the form to be stripped. This end is attached to an eye bolt in the waler. As the jack is pulled up, the form is pried loose. Rollers on the ends of the jack protect the wood. When the form swings free, it is held by the connection to the eye bolt.

Two problems have been encountered in using forms of this type and construction. The forms are not faced, and the concrete sets in the small cracks between the boards, causing excess wear on the forms in stripping. A metal facing on the forms would alleviate this condition. In building up the blocks, a 25-ft. vertical differential is specified between the highest and lowest block. Use of a single course panel would give an additional 10-ft. of working elevation, which would be helpful in scheduling pours. Consideration is being given to using single panels on some of the blocks.

Pouring schedule

The job of maintaining a pouring schedule that will derive the utmost efficiency from each piece of machinery and each man is a difficult one. A model of the block layout is used to aid in solving this problem. One man, known as the pouring-schedule engineer, keeps in direct contact with all pouring operations. As soon as a pour is completed, he adds another lift to the corresponding block on the model. He also notes the time that the pour was completed, and the time when the block will again be released for concreting.

From the model, and his frequent visits to the forms, he makes out a list of blocks whose curing time limit is up, that can be made ready for concreting. He then submits the list to the job superintendent, and together they work out the probable daily placing schedule for each rig. The blocks in which pours are to be made are listed in the order the pours will be made, and an approximate time that each pour will be made.

Usually 6 hr. are allowed for pouring a form under a trestle or otherwise not easily accessable, and 4 hr. are allowed for pouring easy forms. The list of blocks and anticipated time schedule for each pour is then handed down to the foremen of the various operations, and each foreman is responsible for the completion of his particular operation before the time for pouring arrives.

Working with this organization is an "OK" man, whose duty is to keep in touch with operations in the forms, and as soon as one operation is completed, contact the government inspector and get an "OK" on the operation. His importance is to see that no time is lost in getting inspection of the various parts as they are finished. If any particular operation is lagging, it is also his job to find out why, and get action.

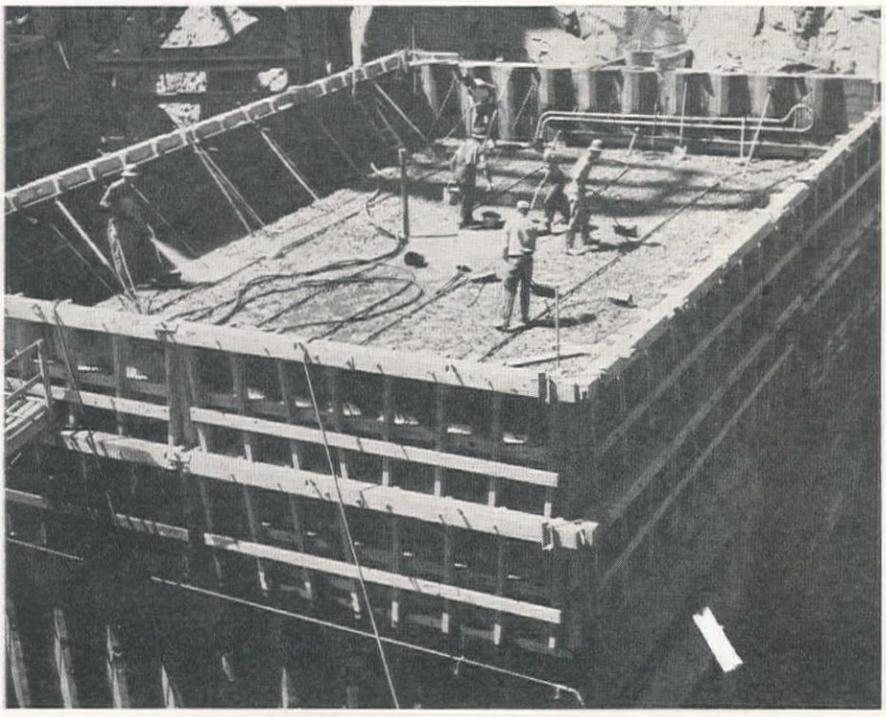
The block pouring schedule as it is made out and attempted to maintain, cannot, however, be final. Sometimes a pour will be completed ahead of time, or it may be delayed. Final inspection may hold up placing. In such cases, the schedule is altered to best fit existing conditions. The schedule is made out with the idea of localizing as many pours as possible, so that when one pour is completed, the men and equipment can move quickly to the next block.

The performance of the mixing plant has been most efficient and the trestles for placing have been entirely satisfactory. Based on a 3-min. mixing time, the plant has a theoretical 24-hr. capacity of 7,680 cu. yd. On several days when the mixing time was cut down slightly, the plant has produced within a few yards of its rated capacity. Both hammerhead cranes and whirleys have been found to have definite advantages for certain types of work. The hammerheads are more suitable for placing, due to a fast load line. Whirleys are used for cleanup work, and as auxiliaries in placing. The chief merit of the whirley is that it has quick access to any point within the reach of the boom.

An identical layout for concreting operation will be set up on the east side of the river. The east mixing plant is complete, and several bents on the high trestle have been erected. Concreting on the east side will begin as soon as the east pit is pumped out behind the cofferdam. When both mixing plants are into full operation, there will be 1 cu. yd. of concrete going into the dam every 6 sec.

Cooling system

The concrete will be cooled by pumping river water through the cooling pipe system installed in each 5-ft. lift. For this purpose, longitudinal galleries are constructed at 50-ft. elevations along the axis of the dam. Transverse galleries lead out from these, and are connected at intervals by vertical shafts.



Giving a block the final cleanup before starting the placing of another 5-ft. lift. Note the two-course forms and the grout pipes and cooling water pipes in position. After the new pour has set for 12 hr. a layer of about ¾ in. is cut off the surface by air and water blast.

Cooling pipes 1-in. in diameter embedded in the concrete at 5-ft. 9-in. intervals horizontally and 5-ft. vertically, make complete circuits through several blocks and terminate at the vertical shafts. The cooling pipes will be connected into the pumping system and cold water will be circulated until the concrete has been cooled to the required temperature. Thermometers installed in the concrete will indicate the progress of cooling. None of the concrete now in place has been cooled. In the completed dam, there will be over 2,000-mi. of 1-in. cooling pipe.

Contraction joint grouting

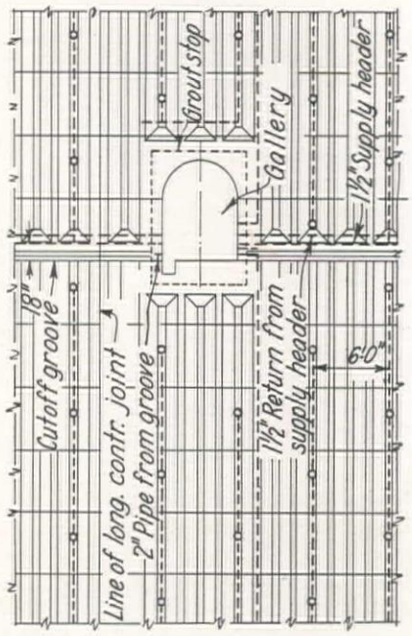
After the concrete has been properly cooled, contraction joints will be grouted. Transverse joints will be grouted from the longitudinal galleries already described. Horizontal 2-in. headers with 1½-in. returns lead out from the galleries; ½-in. vertical risers spaced at 6-ft. intervals carry the grout up through the joints. Grout outlets spaced at 10 ft. and staggered in alternate risers distribute the grout into the joints. A grout groove at the top of each 50-ft. lift catches the grout as it rises up through the joint. When the groove is filled, pressure will be increased and maintained until the grout has set. Metal grout stops 1 ft. inside the faces of the dam, and a vertical grout stop between blocks in each tier, confine the grout in the transverse joint. Grouting of longitudinal joints will be done in a similar manner from the transverse galleries. There will be more than 8 mi. of galleries in the completed dam.

Inspection

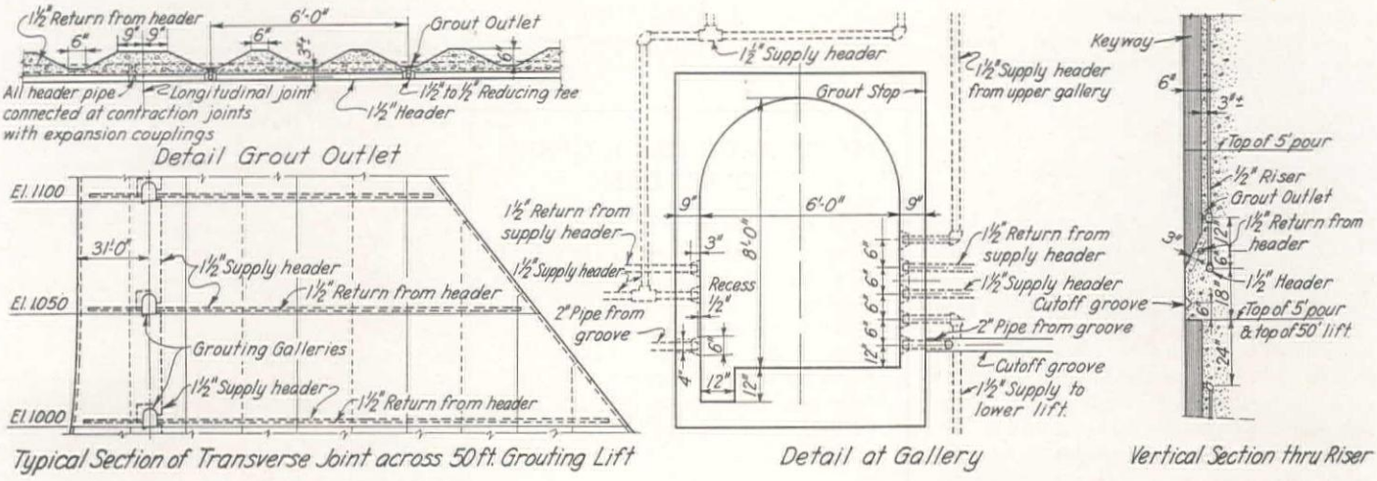
Every operation in connection with concreting must have inspection. Ordinarily each inspector has one operation to inspect, such as grout pipe, cooling pipe, forms, etc. As each operation is completed, the government inspector is called on for acceptance. He passes judgment on the work, and if it is satisfactory, he signs for the operation on a card which lists all of the various work items carried out in a form. When all work in the form has been completed and inspected, and the card has been properly filled out, the concrete inspector is notified, and he gives the form a final inspection. If acceptable, he then orders the grout for the form and the pour can begin. About 200 government engineers, inspectors and field men are working on the dam.

Material

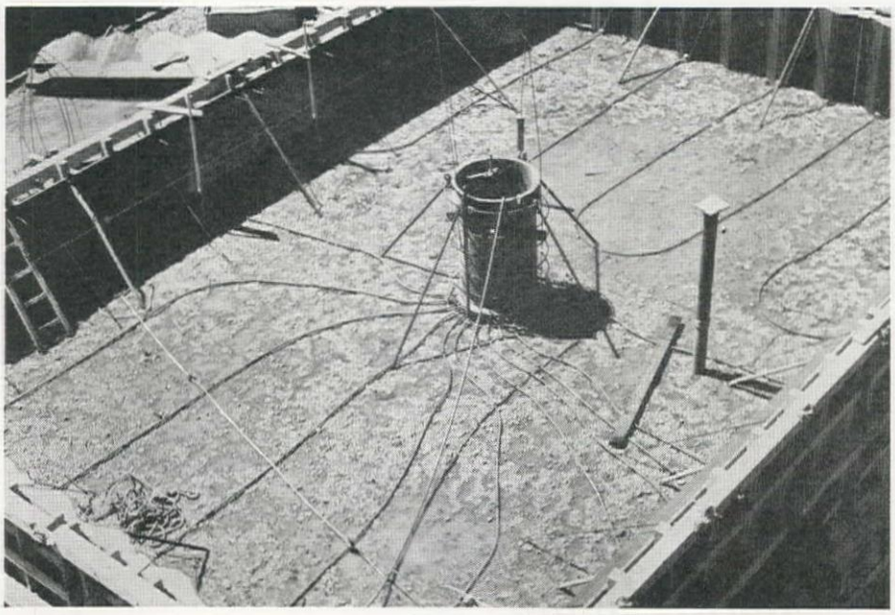
Practically all materials going into the dam, with the exception of the aggregate, are furnished by the government. At the dam site, the Bureau of Reclamation maintains a large, modern warehouse arranged to provide quick access to all items, and expedite the



Pipe Layout



General plan and details of the contraction joint grouting arrangement. The unit of grouting is the 50-ft. lift (lower left) each provided with a separate grouting gallery. The general layout of the piping on each transverse joint is shown at the right. Details of the headers and outlets are shown in the two sections through the joint.



Vertical shaft for cooling water. These shafts connect with the system of longitudinal and transverse galleries. From the shafts the water circulates through the 1-in. pipes shown in position on the top of the concrete. These pipes are spaced at 5 ft. 9 in. intervals horizontally. The cooling water will be pumped directly from the river. Cooling operations have not yet been started.

filling of orders drawn by the contractor. Material purchased by the Government is billed directly from factories to Odair, Wash., the Coulee Dam railhead. From there it is hauled over the government construction railroad to the dam, by the MWAK Co. The government pays the contractor $30.00 per car for delivery to the warehouse and return to Odair.

As the material is received, it is checked and stored in the warehouse. The contractor draws from the warehouse, and is billed for all items issued to him. Government checkers itemize the material after it has been placed in the forms, and once a month, the contractor is credited with the quantities he has placed in the dam. Any material drawn from the warehouse and not accounted for in the forms is charged to the contractor.

Major items of materials

Major items of material going into the dam under the present contract are: 3,516,000 lb. black cooling pipe and fittings of various sizes; 2,885,000 lb. Sherardized and cast iron pipe and fittings for grouting; 10,000,000 lb. control gates and metal conduit; 22,000,000 lb. reinforcing bars. Hundreds of other items of various quantities complete the list of materials that are handled through the government warehouse and go into the construction of the dam.

Purpose of the project

The primary purpose of the Grand Coulee dam project is irrigation, made possible by the dam raising the water about 300 ft., augmented by a 300-ft. pumping lift using power generated at the dam. Supplementing irrigation, the development will generate power to liquidate the cost of the dam and help pay for the cost of the irrigation project. The dam will also be used to regulate the flow of the river. The project will increase by 100% of the prime power of all existing and future power plants on the Columbia River between the dam and the mouth of the Snake River. Prime power of plants below the Snake River will be increased by 50%.

Original and present contract

In June, 1934, the contract was let to the Mason - Walsh - Atkinson - Kier Co., a group of eastern and western contractors, to build a straight gravity type dam, about 3,500-ft. long, containing about 4,000,000 cu. yd. of concrete, with parapet at El. 1,116 and spillway crest at El. 1,085. This structure was then termed the "low dam." The amount of the contract was about $30,000,000, and the total cost of the development was to be about $65,000,000. The plan at that time was to build the "low dam" to completion with the money then available and, in the future, when more funds are appropriated, incorporate the low dam with the high dam as part of its foundation.

In June, 1935, a change order was approved by Secretary of the Interior Ickes, ordering the funds that had been set aside for the low dam to be expended for the construction of the base of a high dam. At that time, the contractor's program had been mainly excavation and the construction of a cofferdam, and the change order fitted in with previous operations without calling for any major changes or loss of work already done.

The contract now in effect calls for the construction of a foundation structure approximately 3,150 ft. long from abutment to abutment, and containing approximately 4,500,000 cu. yd. of concrete.

The west portion, beginning with Tier 8 at the abutment and extending to Tier 31, will be poured up to El. 1,010 in the even tiers and to El. 1,005 in the odd. Work in this zone will also include the construction of a power house base up to El. 949, and nine 24-ft. octagonal openings for future installation of penstocks. From Tier 32 to 63, the spillway section of the dam, even tiers will be built to El. 945 and odd tiers to El. 970, with the exception of Tier 40 at El. 1,005, which will be used in the river diversion program. From Tier 64 to 82 at the abutment, even tiers will be at El. 1,005 and odd ones at El. 1,010. This section of the foundation will also contain a power house base and openings for 9 penstocks. To date, concreting operations have been between the west abutment and Tier 40 inclusive.

When the dam is built to completion, the parapet will be at El. 1,308, and the crest of the 1,650-ft. spillway at El. 1,260. From abutment to abutment, the dam will be approximately 4,300 ft. long, and will be about 450 ft. from bedrock to the top of the parapet, with an extreme height of about 550 ft. It will contain approximately 11,250,000 cu. yd. of concrete, and will be the world's largest dam. Two powerhouses will each have nine 120,000 kw. units, or a total installed capacity of 2,500,000 hp. The completed dam will have a roadway on the parapet, crossing the spillway on trusses supported by 12 piers. Spillway gates will be installed between the piers, with a crest at El. 1,290.

Personnel

U. S. Bureau of Reclamation

F. A. Banks, construction engineer of the project; J. H. Miner, office engineer; A. F. Darland, field engineer; R. F. Walter, chief engineer, Denver office; John C. Page, acting commissioner of reclamation, Washington, D. C.

MWAK Co.

T. J. Walsh, president of MWAK Co.; George H. Atkinson, job manager; C. D. Riddle, chief engineer; M. H. Slocum, general superintendent.

The efficient work of the MWAK Co. at Grand Coulee dam is indicated by the fact that they have completed over half of their contract in less than 40% of the allotted time. At the present rate of progress, they will finish their contract in February, 1938.

MAJOR ARTICLES ON GRAND COULEE DAM

Fresno Airport Improved By $362,000 WPA Project

Runways lengthened, drainage system extended and connected with outfall sewer—Moving 52,000 cu. yd. of earth by hand labor

By JEAN L. VINCENZ

Commissioner of Public Works
Fresno, California

THE Municipal Airport of Fresno, Calif., has the distinction of being located closer to the downtown section of the city than any other airport in the United States. It is less than 1½ mi. from the city hall to the Fresno - Chandler Municipal Airport. Located in the exact center of the state, this airport is considered to have great importance to the Federal Government from the point of view of military maneuvers.

At the present time, the airport is being enlarged and improved under a WPA project at a cost of $362,000. The city, as part of its share, has purchased 30 ac. of adjoining land, which will permit the construction of three runways, when the improvement is completed. The northwest-southeast runway will be 4,000 ft. long, the east-west runway 2,600 ft. long, and north-south runway 2,000 ft. long. All of the runways will be provided with oil mixed surfacing, using the sandy soil on the site.

Drainage of the field was undertaken in a previous SERA project, but was not entirely successful. In the present project, rainfall will be handled by means of catch basins set in large size rock with the overflow from these basins flowing into a combination sanitary and storm sewer. This sewer line consists of 30-in. concrete pipe, extending from near the head of the city's out-fall sewer, and will be 1 mi. long.

One of the main obstacles presented to city officials in this improvement was the entertainment park, owned by the Italian Amusement Park Co. This 10-ac. property was located on the land required for the airport extension and one corner helped to create a very bad bottle-neck. In this amusement park were located a bandstand, dance pavilion, exposition hall, running track, and a midget auto race track, together with several thousand bleacher seats.

Through the effective coöperation of the WPA officials, officers of the Italian Park and officials of the city, the city purchased 10 ac. of land across the road or south from the old park; then also purchased the Italian Park, and moved all of the buildings and equipment to the new location. Even the 6-in. clay surfacing for the midget auto race track was moved and placed on the new track after it had been properly graded and compacted.

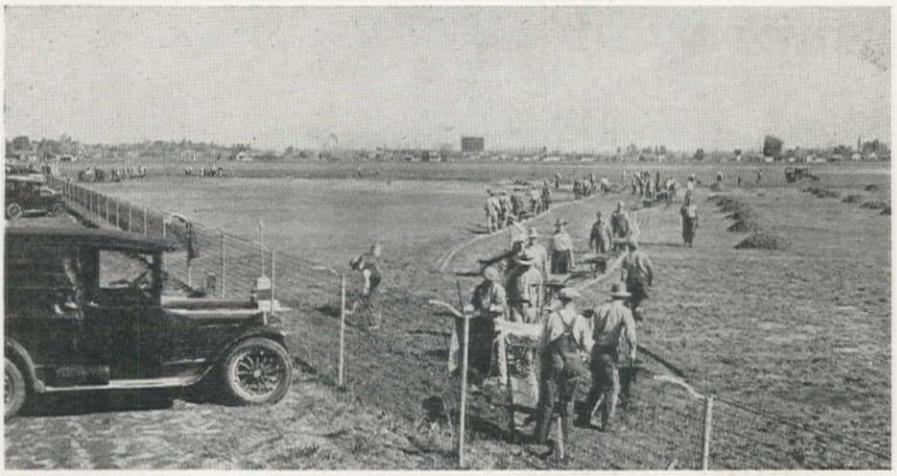
All of the existing buildings and hangars are being moved back and parallel to the fence at the south side of the airport, into the area formerly occupied by the amusement park. This entirely abolishes the bottle-neck, which had previously hindered airport expansion. A new administration building for the airport will be built with floor area of 5,000 sq. ft. This building will be of frame construction with stucco exterior, and will include a general waiting room, superintendent's office, ticket offices, coffee shop, toilet facilities, and a dispatcher's observation tower. The present administration building, with a floor area of about 1,500 sq. ft., will be moved to a location adjoining the new building, and will be provided with an office for the United States Department of Commerce Inspector, and can be used by relief pilots and others for rest and recreational purposes.

A separate toilet building is being constructed which can be used when large crowds are visiting the airport, as often happens at an airport located so close to the city.

Considerable interest in the improvement of the airport was aroused by the Junior Chamber of Commerce. Prizes were offered for the best designs of a new entrance to the airport which will probably consist of two reinforced concrete pylons and ornamental iron gates.

One of the major construction items involves the moving of 52,000 cu. yd. of earth in the grading of the field. When completed, approximately 90 ac. of landing area will be available. In setting grades for the field, natural depressions were taken into account, to lead the water from the runways and into the drainage lines as quickly as possible. A mistake was made when the field was first laid out seven years ago in an endeavor to have the field almost level. Such a flat grade was left that the water could not run off the oiled portion. A taxi strip 100 ft. wide by 1,000 ft. long, together with various concrete pavements, curbs, gut-

Trench digging (above) by WPA labor to install a 30-in. combination sanitary and storm sewer to connect with the outfall sewer of the city. This new connecting line is about 1 mi. long. General grading operations (left) on the site of the old amusement park after the buildings had been removed. The oval marks the location of the midget auto track.



Moving 52,000 cu. yd. of earth by hand in leveling the area. In establishing grades the natural depressions were utilized in facilitating drainage.

ters, and sidewalks, will make a total of 140,000 sq. ft. of concrete paving.

Considerable study was given to the matter of proper lighting of the airport. The Department of Commerce, appreciating the local conditions to be considered, consulted with the operating manager of the United Airlines in making the final decision for the lighting of this airport. While runway lights flush with the runway are not in general use, it was decided that they should be installed on the main runway of the Fresno airport because of the proximity to the city, with its overhead street lights and electroliers; also because of the fog conditions that prevail during six weeks of the winter. In addition, seven green lights will be located at each end of the main runway, at right angles to the runway, as a guide during fog conditions. Two batteries of flood lights will be installed, one near each end of the main runway. These will be on separate switches and can be used as required.

The city fire alarm system has been extended so that three call-boxes will be located on the airport near the administration building and hangars. One of the largest fire engine stations in the city is located less than one mile from the airport.

The people of Fresno believe that when this airport is completed, the municipality will have one of the best and most up-to-date airports, though not the largest, in the United States.

WPA employment

An average of 400 men will be given employment for nine months under this program. On July 1, about one-half of the money has been expended. It is true that, with good equipment and under contract operations, the work could undoubtedly have been done for a smaller amount of money. However, the morale of the men has been excellent, and a rather high degree of efficiency among the workmen has been attained.

The excellent engineering supervision has had much to do with this efficiency. It is further true that a very great many of the men employed are not physically able to do as high grade work, or to give as much work per day as an employee of one of the building trade unions. The average WPA worker in this community is conscientious, and if leadership is right will endeavor to give a good day's work. Further, it is a fair statement that it would have been absolutely impossible to have persuaded the people of this city to vote a bond issue for this improvement work, even though the amount was only a small fraction of the present estimate.

The project has had most effective coöperation from all the various agencies concerned in the improvement program. These officials include: B. M. Doolin and R. L. Campbell of the United States Department of Air Commerce at San Francisco; Earl W. Cummings, district director of the WPA, and staff. Airport superintendent, George T. Johnson, has been in charge of the project assisted by H. M. Crooker, engineer in charge of the construction. W. Frank Rantsma, deputy commissioner of public works of Fresno, has been active in the supervision of the entire project.

Oregon Announces 1937 Highway Program

THE 1937 Oregon federal-aid highway construction program (starting July, 1936) submitted by R. H. Baldock, state highway engineer, was recently approved by the Bureau of Public Roads. The program provides for 40 major construction projects involving 193 mi. of highway and a total cost of $3,611,000 of which $2,044,633 will be federal-aid funds. More than one million dollars will be expended on reconstruction of the Pacific Highway.

County	*Highway*	*Type of Work*	*Length (miles)*	*Estimated Cost*
Multnomah	Columbia River	Grading-Paving	1.05	$ 80,000
Multnomah	Columbia River	Grading-Paving	.8	15,000
Washington	West Side Pacific	Grading-Paving	1.3	65,000
Washington	West Side Pacific	Grading-Paving	1.1	50,000
Washington	Tualatin Valley	Resurfacing	5.0	120,000
Linn	Santiam	Grading-Surfacing	3.0	104,000
Tillamook	Wilson River	Grading	.6	6,500
Tillamook	Wilson River	Surfacing	12.3	62,000
Tillamook	Wilson River	Bridge	....	16,500
Clatsop	Wolf Creek	Grading-Surfacing	1.0	80,000
Clatsop	Wolf Creek	Bridge	....	152,920
Tillamook	Coast	Bridge	....	50,000
	Willamette	Grading	1.0	100,000
Deschutes	The Dalles-California	Resurfacing	15.0	180,000
Klamath	The Dalles-California	Grading	5.1	83,254
Wheeler	Sherman	Surfacing-Oiling	10.0	75,000
Crook	Ochoco	Grading-Oiling	4.0	75,000
Harney	Central Oregon	Grading-Surfacing	18.0	172,019
Harney	Central Oregon	Surfacing-Oiling	14.0	100,000
Lake	Fremont	Grading-Oiling	14.2	100,000
Baker	Old Oregon Trail	Bridge	....	40,000
Baker	Old Oregon Trail	Paving	10.0	90,000
Baker	Old Oregon Trail	Grading-Tunnel	1.2	118,000
Malheur	Old Oregon Trail	Grading-Oiling	.6	35,000
Umatilla	Old Oregon Trail	Grading-Oiling	7.05	140,000
Umatilla	Old Oregon Trail	Grading-Surfacing	8.8	145,000
Grant	Pendleton-John Day	Oiling	16.0	25,000
Wheeler	John Day	Grading-Oiling	4.2	85,500
Grant	John Day	Grading-Oiling	3.4	50,500
Linn	Pacific	Grading-Paving	7.6	186,000
Linn	Pacific	Bridge	....	25,000
Douglas	Pacific	Grading-Paving	5.6	231,283
Douglas	Pacific	Paving	1.0	36,768
Lane	Pacific	Grading-Paving	2.2	176,300
Lane	Pacific	Paving	2.0	60,000
Lane	Pacific	Paving	2.0	53,700
Jackson	Pacific	Grading	1.6	125,000
Jackson	Pacific	Surfacing	9.9	215,000
	Statewide	Roadside Improvement	....	36,000
	Statewide	Planning-Surveys	....	49,756

Highway Maintenance Costs And Methods in Wyoming

Review of the state highway department system of operations — Cost data presented in detail and analyzed by types of work and surfacing

By JAMES B. TRUE
State Highway Superintendent
Wyoming

DURING the past few years, the State of Wyoming has added hundreds of miles of road mix oil surfacing to its highway system. The increasing public demand for improving surfacing, particularly on the main highways has resulted in Wyoming carrying out a construction program which has provided 2,500 mi. of oiled road in an existing system of 3,500 mi., within a remarkably short period of years. The program for highway maintenance and the general plan of operations of the Wyoming State Highway Department are reviewed in the following article.

Plan of operations

With the exception of a small mileage of gravel road, Wyoming has definitely eliminated the old patrol system of maintenance from its highway system, in favor of the "gang maintenance," with larger crews operating from important highway junctions covering large districts. At the present time, state maintenance crews include about 170 trained men and this force is augmented during the summer as necessary.

The state is divided into six districts with a district highway engineer in charge of all work in his district, including both construction and maintenance. Each district engineer has a maintenance supervisor who carries on the district maintenance program. District engineers, in turn, report to the State Highway Department headquarters at Cheyenne. At present, maintenance is carried on from thirty principal maintenance-gang stations with these crews working about 50 mi. in each direction. If the station is located at a junction point, the crews operate within a 50 mi. radius.

Because of the extremely long distances on the Wyoming Highway System between important junction points, the state has not been able to entirely abandon the patrol system and a few small maintenance units of this type are still required between some of the main stations.

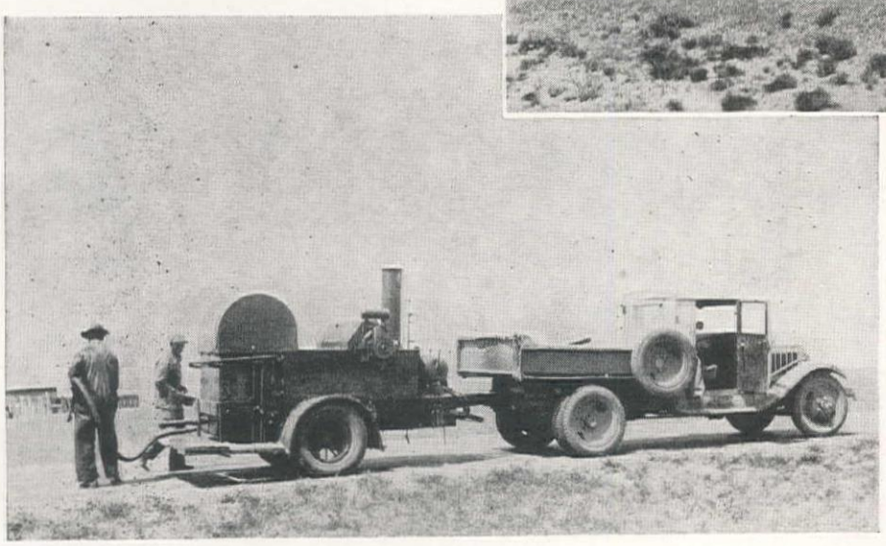
Operations in the districts

Each highway district has its own repair shop to maintain equipment for both minor and major repairs. Although the maintenance equipment used in different districts may vary because of the type of highway and the mileage of surfacing, in general, each district operates the following units of equipment:

- 3 or 4 one-man patrols
- 2 to 4 truck oil tanks (600 to 1,200 gal.)
- 1 to 4 oil distributors (department made, trailer type)
- 1 to 3 rollers (5 to 10 ton, or Texas type)
- 10 to 15 1½ and 2-ton trucks
- Tar kettles
- 6 to 10 ½-ton pick-ups
- 3 to 5 3½ and 4-ton, four-wheel drives
- 3 or 4-blade graders, 8, 10 and 12 ft.
- 12 to 20 snow plows (both blade type and V-plows)
- 2 to 4 mowers (pull type on pneumatic tires)
- 1 ⅜-cu. yd. shovel.

In the maintenance of the standard Wyoming road mix surfacing, the procedure is to carry on the usual patching work on shoulders and to keep the original surfacing of the traveled way in its original condition as nearly as possible. Procedure is fairly standard with crews using light trucks for transporting material and equipment, and tar kettles or distributors, as required by the particular job.

In connection with contracts requiring crushing operations, when prices are considered economical, stock piles of patching materials are placed along the highway in 200 or 300-ton lots for the maintenance gang. The Highway Department owns and operates a crushing and screening plant used for production of material for maintenance and stone chip surfacing. This plant more than paid for itself the first season of its operation in the saving in cost of material produced, as compared to contract prices.



Typical maintenance crew at work on patching. Light trucks are used for transporting materials and equipment. Stock piles for surfacing repairs are prepared by the department's own crusher plant and placed in 200- to 300-ton lots for the maintenance crews.

The present practice is to use cutback oils for patching, rather than road oils formerly used. In many instances patching of oiled surfaces is all that is required. However, in some cases, it is more economical to tear up the entire surface, add more oil or gravel or both, then remix and relay. Rolls in the oil surface are caused by moisture either in the base, subgrade, or the oil mat. When rolls appear, the entire mat is torn up and both the mat and foundation allowed to thoroughly dry out. All unsuitable subgrade material

TABLE I—Highway Maintenance Costs in Wyoming for 1935

County	Supervision 1	Right-of-Way 2	Signs 3	Roadbed 4	Bridges 5	Surface 6	Drainage 7	Snow Storage and Removal 8	Ice and Floods 9	Miscellaneous 10	Grand Total 11
Albany	$1,711	$1,477	$719	$1,898	$1,003	$24,355	$466	$9,141	$5	$124	$40,904
Big Horn	1,646	1,617	603	6,367	347	14,550	1,333	1,050	....	802	28,318
Campbell	1,264	2,455	259	1,206	1,145	8,777	785	5,585	....	101	21,580
Carbon	2,010	2,571	949	2,491	1,259	34,666	1,471	6,935	4	384	52,745
Converse	1,078	1,185	270	1,343	207	4,630	292	2,357	....	43	11,408
Crook	2,473	2,313	167	2,645	838	10,579	508	5,700	25	197	25,449
Fremont	4,119	2,910	898	7,930	1,312	29,232	2,677	3,625	137	580	53,425
Goshen	1,065	2,119	357	2,388	214	6,755	411	931	....	198	14,442
Hot Springs	496	720	350	1,607	133	4,512	148	931	....	109	9,009
Johnson	1,362	2,073	447	1,679	1,209	16,021	1,009	4,018	....	112	27,934
Laramie	1,445	3,082	793	5,192	229	15,611	630	4,137	....	327	31,450
Lincoln	1,946	2,294	645	3,417	944	21,931	2,860	21,027	57	110	55,235
Natrona	3,317	4,037	784	9,578	958	19,633	576	6,254	143	1,018	46,302
Niobrara	1,453	2,622	147	2,256	613	10,993	622	4,490	283	94	23,579
Park	1,175	1,271	374	3,862	212	9,833	523	2,110	....	336	19,700
Platte	1,112	2,651	342	3,900	396	10,799	688	1,737	....	39	21,667
Sheridan	1,650	3,918	411	3,372	1,680	17,822	1,312	6,464	....	1,118	37,751
Sublette	1,128	378	231	250	720	13,808	761	15,277	38	84	32,679
Sweetwater	1,933	2,515	990	2,292	301	25,441	228	7,152	48	564	41,468
Teton	927	235	92	438	1,564	8,071	359	8,366	338	54	20,448
Uinta	935	755	444	703	310	11,167	455	13,052	108	26	27,959
Washakie	800	1,087	409	3,884	344	5,503	865	1,486	4	66	14,452
Weston	2,160	903	181	1,094	470	14,636	583	3,720	....	137	23,888
Total Cost	$37,216	$45,198	$10,872	$69,804	$16,421	$339,335	$19,576	$135,544	$1,196	$6,634	$681,801
per Cent of Total	5.4%	6.6%	1.6%	10.2%	2.4%	49.8%	2.9%	19.9%	0.2%	1.0%	100.0%

EXPLANATION OF HEADINGS

1—Supervision—Salary and expense of maintenance supervisor, engineer and other employees on maintenance work. Transportation, shelter, subsistence, etc., of maintenance supervisor. Cost of necessary engineering work, materials, investigations, and advertising.

2—Right-of-Way—Expense of maintaining the right-of-way, including: Moving, cutting and removal of weeds from shoulders, ditches and other land; removal of wreckage and debris, and repair of fences.

3—Signs—Repair, repainting and renewal of signs and mountings.

4—Roadbed—Repairing and restoring roadbed, extending cuts and fills to standard width, sloping cuts, bank protection, riprap; reshouldering to original cross section, widening cuts, removing slides, and cleaning shoulder or roadbed ditches.

5—Bridges—Maintaining of bridge structures, including maintenance of structural parts, repainting and renewal of wearing surface; also includes cost of maintaining riprap and channel for protection of such structure.

6—Surface—Maintaining of roadbed surface, including: Dragging, blading, scarifying, surfacing materials, oiling and patching.

7—Drainage—Maintaining of culverts and other drainage structures, including cost of construction, installing, replacing, and cleaning.

8—Snow Removal and Storage—Maintaining of facilities for the accumulation of snow, including the repair and renewal of permanent snow fences, and the maintenance of portable snow fences, cost of maintaining trees, shrubs and other means of snow prevention. Cost of snow removal from the roadway.

9—Ice and Floods—Combating of ice and floods in rivers and streams to prevent damage or loss of roadway or structures.

10—Miscellaneous—In addition to general miscellaneous items, this includes the maintaining of guard rails, guard fences, water stations, store shelters, etc.

is removed and replaced with pit run gravel, rock, or other proper material, before the oil mat is relayed. This method has resulted in the elimination of the recurrence of these rolls in every instance.

Due to the climatic conditions in Wyoming, maintenance work is necessarily seasonal, most of the work being performed in the late spring and summer months.

Wherever the character of the topography permits, roadway sections are constructed with wide, shallow ditches and flat side slopes. This makes possible the mowing of weeds on the shoulder of the road and the side slopes and the bottom of the ditches. This type of section has made it possible to avoid the old method of blading weeds which caused distribution of seeds and recurrence of the weeds. The mowing method encourages the growth of native grass and formation of sod, which in turn tends to prevent soil erosion. Widening of the roadway is often a necessary maintenance operation and this requires deepening of the ditches and loss of sod. On low fills, widening is accomplished with the use of blade machines. On high fills, speed shovels and dump trucks are used.

Winter snow removal has grown to be a very important factor in the work of maintenance gangs. This work is performed with the use of blade plows (both speed and heavy duty types), augmented by two rotary snow plow units. Use of snow fence, of both permanent and portable types, properly placed prevents drifts on much of the highway system.

On sections of the highway system where the subgrade and oil mat have been made stable and frequent tearing up, reprocessing and relaying of the mat are no longer required, stone chips are being placed on top of the oiled mat in connection with seal coat operations. Approximately ¼ gal. per sq. yd. of RC —2 is applied as a seal coat over which a layer of stone chips having a maximum size of ½ in. is then distributed with spreaders. Limestone chips are preferable and used when available. Otherwise, suitable local material is crushed and used. In the application of stone chips, careful control is used in the amount of cutback used to prevent its being forced up through the stone chips by traffic during the curing process. Application of stone chips by this method produces a more stable mat with a non-skid surface that reflects rather than absorbs light, thus greatly reducing the hazard of night driving.

Maintenance Funds and Costs

Maintenance funds come entirely from the four-cent state gasoline tax revenues. One-fourth of this net revenue is allocated to the counties for county road purposes. Payment of interest on outstanding highway bonds, amounting to $112,000 annually, is made from the balance and the remaining revenue from the gas tax is then credited to the Highway Fund. Automobile license fees, amounting to $340,000 per year, are also credited to this fund.

Explanation of data in tables

A recapitulation of the annual maintenance costs on Wyoming highways during 1935 is given in the two tables accompanying this article. In a study of these cost figures, there are several points which require explanation. It will be noted that the average cost of maintenance on oil roads is $195 per mi., with corresponding figures of $209 for gravel and $175 for earth. Obviously, the natural conclusion to be drawn is that there is practically no reduction in the maintenance costs as a result of oiling. However, it must be remembered that in general, the oiled roads are those receiving the heavy

traffic, with the travel on the gravel roads relatively light; much of this latter mileage is in the mountains where summer tourist traffic represents the most serious wear. A better comparison would be to take one typical example from the table, which shows a maintenance cost of $43.74 per mi. for oiled road while the adjacent gravel road indicated a maintenance cost of $427.27. This section of gravel road, necessarily, will be oiled during the present season.

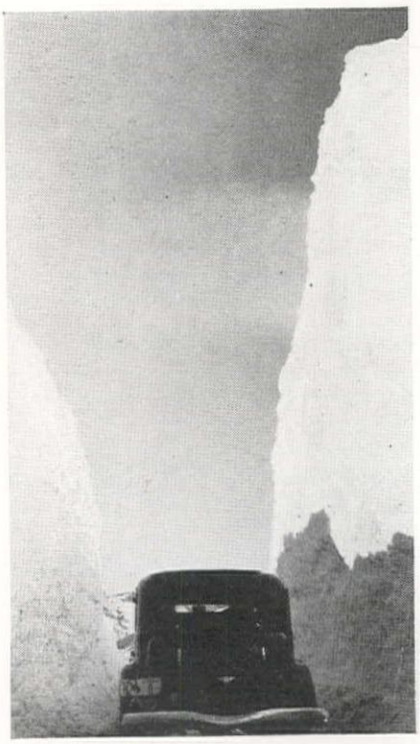
The table also indicates that the average maintenance cost in Uinta County was as high as $370, but it should be observed that $9,683 out of the $27,959 total was spent for snow removal. The regular maintenance costs for highways in this county is no heavier than for other counties when the snow removal cost is deducted. During the past season, the total cost of snow removal in the state has been $119,000, or about 17% of the total spent for maintenance work. This heavy expenditure resulted from the extraordinary heavy snowfall during the past winter, combined with the increasing demand from the public that roads be kept open. During the previous year, only $43.000, or 7% of the total maintenance charges, were spent for snow removal.

With the exception of the marked increase in snow removal charge, the percentages for various items spent on maintenance are about the same for 1935 as for the preceding year. Surface maintenance work, which usually represents about one-half of the total funds, decreased about $30,000 from 1934. Omitting the snow removal items, it will be noted that there has been a decrease from $170 per mi. to $160 per mi. in the cost of maintenance work during the past year. Practically all of this decrease has been in the one item of surface maintenance.

The cost of maintaining individual sections of oiled highways varies from a low figure of $50 per mi. to $473 per mi. In one case, where considerable reconstruction work was done, and this was all charged to maintenance, the cost ran as high as $837 per mi. From the detailed figures indicated in the table, a general conclusion can be drawn that the maintenance of the type of road, as now constructed on present Wyoming standards, does not exceed $150 per mi. This includes all charges, as well as a nominal expenditure for snow removal.

Almost invariably, high maintenance costs have resulted from roads constructed on poor subgrade without sufficient design for drainage and base sections. This condition is aggravated in irrigated areas where the ground is moist during the summer season, and on sections of 20-ft. oiled mat, which carry heavy bus or truck traffic. The sections where these high maintenance costs have developed represent only a small percentage of the total mileage in the state, and these faulty conditions are gradually being corrected.

Wyoming, with small population, vast distances, and limited funds, is confronted with a serious problem in the financing of road construction and maintenance. In order to be able to match Federal Aid, every effort is made to keep maintenance costs as low as is consistent with the primary objective of conserving the capital investment in the highway system. As a result, in recent years, the average cost of maintenance has been reduced from $300 to $230 per mi. per year. This maintenance cost includes: surface repairs, seal coating, structure repairs, snow and weed removal, flood damage repairs and some road widening. The cost of maintenance is not materially affected by the volume of traffic, up to 1,000 cars per day.



Snow removal costs in Wyoming in 1935 were 17% of the total maintenance expenditure, compared to 7% in 1934, as a result of a heavy snow season and public demand for more open roads during the winter.

The success or failure of any enterprise depends largely on the organiza-

TABLE II—Allocation of Expenditures for Highway Maintenance in Wyoming for 1935

County	Division of Expenditure Into:			Expenditure by Type of Road:			Type of Road and Mileage				Average Cost Per Mile			
	Labor	Equip-ment	Ma-terial	Oil	Gravel	Earth	Oil	Gravel	Earth	Total	Oil	Gravel	Earth	Gen-eral
Albany	$16,331	$18,440	$6,132	$24,715	$10,258	$5,929	124	56	14	195	$199	$181	$396	$209
Big Horn	11,194	13,577	3,545	19,423	3,856	5,038	106	20	38	165	182	184	130	170
Campbell	10,241	9,757	1,580	12,951	.....	8,628	67	....	66	133	192	.....	130	161
Carbon	19,921	22,284	10,539	42,482	.....	10,262	177	....	64	242	239	.....	158	217
Converse	4,842	5,618	947	9,077	1,650	680	83	6	19	109	108	237	35	103
Crook	11,273	12,763	1,413	14,479	6,364	4,605	74	26	39	140	193	243	103	181
Fremont	21,418	26,424	5,581	33,139	6,408	13,877	197	24	65	287	168	260	211	185
Goshen	6,785	4,904	2,752	14,442	.....	.....	121	....	....	121	118	.....	.....	118
Hot Springs	4,236	4,069	703	7,467	1,541	.....	36	12	....	48	206	121	.....	184
Johnson	13,024	11,345	3,563	19,947	2,320	5,666	100	22	26	149	198	101	216	187
Laramie	13,965	11,823	5,661	31,450	.....	.....	162	....	....	162	193	.....	.....	193
Lincoln	21,018	32,093	2,123	16,355	35,072	3,807	83	127	14	225	195	275	260	244
Natrona	20,206	19,898	6,198	46,302	.....	.....	204	....	....	204	226	.....	.....	226
Niobrara	11,847	9,561	2,169	23,579	.....	.....	126	....	....	126	186	.....	.....	186
Park	8,346	9,895	1,458	14,489	5,211	.....	95	36	....	132	151	144	.....	149
Platte	10,275	7,687	3,705	18,907	2,760	.....	104	20	....	124	181	135	.....	173
Sheridan	17,052	14,569	6,129	30,053	3,726	3,971	113	30	28	173	263	122	139	218
Sublette	11,199	20,514	965	7,962	20,595	4,121	26	96	26	149	302	213	153	218
Sweetwater	16,010	17,892	7,565	41,468	.....	.....	218	....	....	218	190	.....	.....	190
Teton	8,197	11,790	461	5,695	.....	14,753	38	....	61	100	148	.....	238	204
Uinta	10,007	11,820	6,130	25,307	.....	2,651	78	....	22	101	320	.....	118	275
Washakie	6,723	6,911	818	7,047	1,724	5,680	48	10	22	81	144	166	257	178
Weston	9,467	12,153	2,267	15,568	8,319	.....	78	32	....	111	198	254	.....	214
Total	283,589	315,798	82,413	482,313	109,811	89,676	2,468	524	510	3,504	195	209	175	194
	41.6%	46.3%	12.1%	70.7%	16.1%	13.2%	70.4%	15.0%	14.6%	100.0%				

tion delegated to do the work. The cost of labor turnover and training employees amounts to a considerable sum. A permanent trained and skilled organization is therefore essential. Such an organization of keymen are continuously employed by the Wyoming Highway Department. These men are required to use considerable judgment and initiative in the performance of their duties, especially with heavy equipment and emergency work occasioned by floods and blizzards. The loyalty and pride manifest by these men in the performance of their duties is a real credit to them and to the State of Wyoming.

Organization

The operations of the Wyoming State Highway Department are under the general direction of James B. True, superintendent-engineer. C. C. Warrington is office engineer, C. F. Seifried, engineer of plans, W. H. Fisher, bridge engineer, I. E. Russel, materials engineer, J. E. Lloyd, oil engineer, J. J. Swanson, special engineer in charge of labor relations and employment, and W. E. Davis, chief accountant. A list of district officers is given in the following table.

District	*Engineer*	*Maintenance Sup't.*
Cheyenne	J. G. Smith	R. D. Fuller
Rock Springs	T. Moore	R. C. Ball
Casper	J. R. Phillips	H. Langheldt A. C. Marburger
Basin	R. C. Kay	R. Earhard
Sheridan	R. J. Templeton	W. E. Sutton R. G. Currie
Rawlins	Geo. Corwine	J. O. Heald

Lake Mead 344 ft. Deep

LAKE MEAD, created by Boulder dam and already the largest man-made body of water in the world, has doubled its size in two months. It now contains 7,000,000 ac. ft. of water. Measurements of Lake Mead on June 4 represented an increase of 1,000,000 ac. ft. of water in nine days. Seven million acre-feet of water is 2,287,000,000,000 gal., sufficient to supply all the needs of a city the size of Chicago for 15 years.

The depth of Lake Mead is increasing about 1 ft. per day and has now reached a total of 344 ft. near the dam. The lake was 91 miles long today, extending into the extreme lower portion of Grand Canyon.

Installation of the machinery in the powerhouse at Boulder dam is proceeding rapidly, Ralph Lowry, construction engineer, reports. It is expected that initial tests of the first generators can be started in the late summer with generation to be started about 30 days later. Mr. Lowry said the power installations were 70% complete.

Imperial Dam Piling Contract Withheld

CONTRACT for supplying 1,438,560 lb. of steel sheet piling for Imperial dam, would be withheld from the Jones & Laughlin Steel Co. of Pittsburgh, because that company has been found guilty by the National Labor Relations Board of unfair labor practices, according to an announcement of Secretary Ickes.

Identical bids received

Four companies presented identical bids on March 17 of $40,086.91 for delivery of the steel to the Bureau of Reclamation at the dam site. The steel is required for construction of the dam, which will head the All American Canal on the Colorado River about 15 mi. north of Yuma, Ariz. Contract was scheduled to be awarded to the Jones & Laughlin Steel Co. because its plant was the farthest removed from the dam site, of those who presented qualified bids, when the National Labor Relations Board notified Secretary Ickes of its decision in the case against this company. Negotiations in connection with award of the contract were stopped.

Of the four bids received, that of the Bethlehem Steel Co. was disqualified because of a discrepancy. The Inland Steel Co., of Chicago, which has a plant at Indiana Harbor, Ind., and the Carnegie-Illinois Steel Co., of Denver, which has a plant at South Chicago, Ill., were the other two bidders. Their bids now are being studied pending a decision on future action.

Secretary Ickes' comment

"In the case of deciding between identical bids," Secretary Ickes said, "I shall always prefer that of the bidder which is fair to its workers. I disapprove of the practice of identical bidding, and would reject all such bids except for the fact that to reject them would carry no assurance of getting anything but more identical bids after readvertisement and delay."

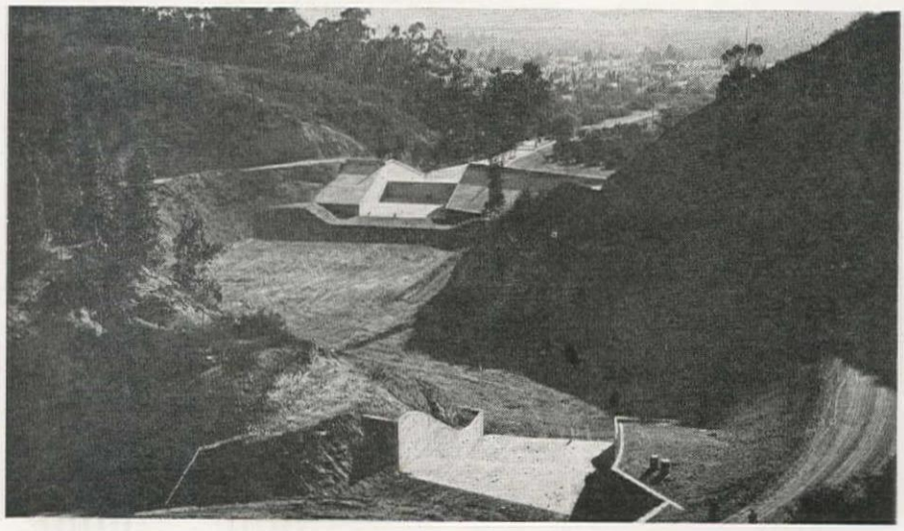
Charges were brought against the Jones & McLaughlin Steel Co. before the National Labor Relations Board in January, 1936, by the labor union on charges of mistreatment by the company of employees at its Aliquippa plant.

Trapping Flood Debris in Excavated Detention Basins

Los Angeles County builds reservoirs at mouths of foothill canyons—Storage of 100,000 cu. yd. per sq. mi. of watershed used in design

By W. E. CHRISTISON
Chief Design Engineer
Los Angeles County Flood Control District

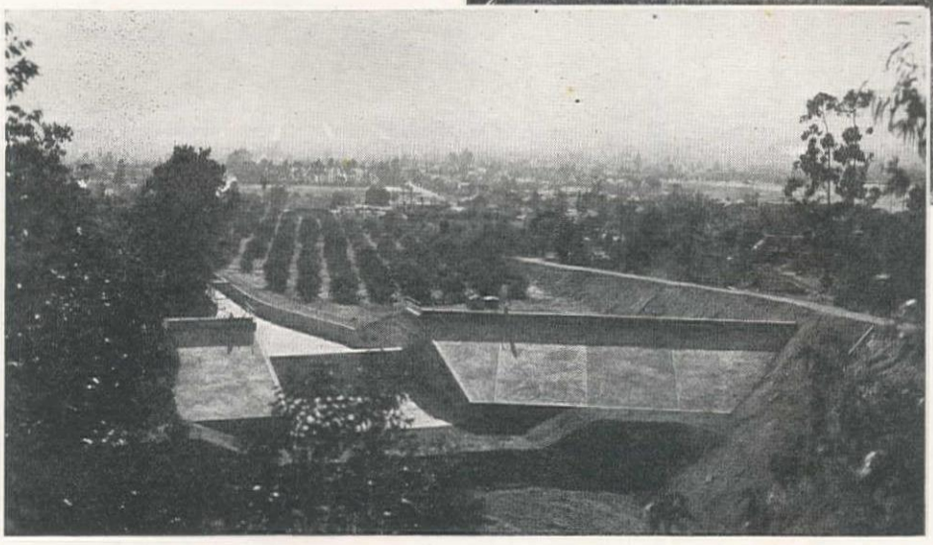
ONE of the most difficult and acute problems confronting the Los Angeles County Flood Control District is that of controlling debris-laden floods flows which originate in the narrow, precipitous canyons of the foothills immediately behind suburban areas. These flash floods, carrying great quantities of debris, debouch upon the foothill debris cones at the outlets of the canyons, causing serious damage to the rapidly expanding residential districts. The acuteness of the



The completed Brand Canyon debris basin looking downstream. The inlet structure appears in the foreground while the dam and spillway are shown in the background. The basin was excavated to rock to provide storage below the natural ground surface and thus reduce the hazard in case the dam should be overtopped.

situation was demonstrated in January, 1934, when a heavy rainfall above the LaCrescenta-Montrose area, on a watershed denuded by fire during November, 1933, caused a debris flow which resulted in deaths of approximately thirty persons and property damage to the extent of about $5,000,000.

After an exhaustive study of this problem, the District embarked upon a program of constructing debris basins for the purpose of trapping debris carried by flood flow from mountain



The completed spillway structure with concrete surfacing and elevated berm. The proximity of the highly populated residential area which appears immediately downstream from the basin indicates clearly the necessity for some protection from debris-laden floods.

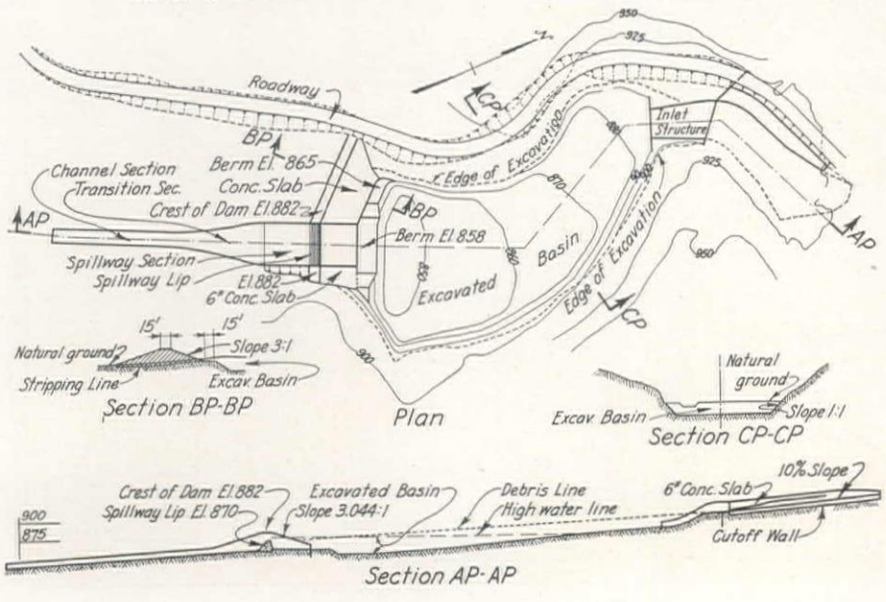
slopes and thus preventing uncontrolled flow of debris-laden waters through the populated area lying below the canyon.

The Brand Canyon debris basin, constructed by the District in 1934-35, is a typical example of the type of structure evolved by the District. A brief description of this basin follows:

The Brand Canyon debris basin is located near the mouth of Brand Canyon in the Verdugo Mountains, approximately 1½ mi. northwest of the City of Glendale, Calif. The watershed of Brand Canyon, 1.03 sq. mi. in area, was denuded of its protective brush covering by a fire which occurred in December 1927. It is estimated that approximately 26,000 cu. yd. of debris was deposited on city streets by the first storm occurring after the fire. Every winter since the fire, considerable debris has been carried by storm runoff from the canyon with attendant danger, inconvenience and expense to the city.

In designing debris basins, it is the policy of the District engineers to provide as near a storage capacity of 100,000 cu. yd. per sq. mi. of drainage

Plan and longitudinal section of the Brand Canyon debris basin.



Compacting the earthfill for the west abutment of the dam for Brand Canyon basin. The spillway crest appears at the left. Construction of the spillway channel appears in the background.

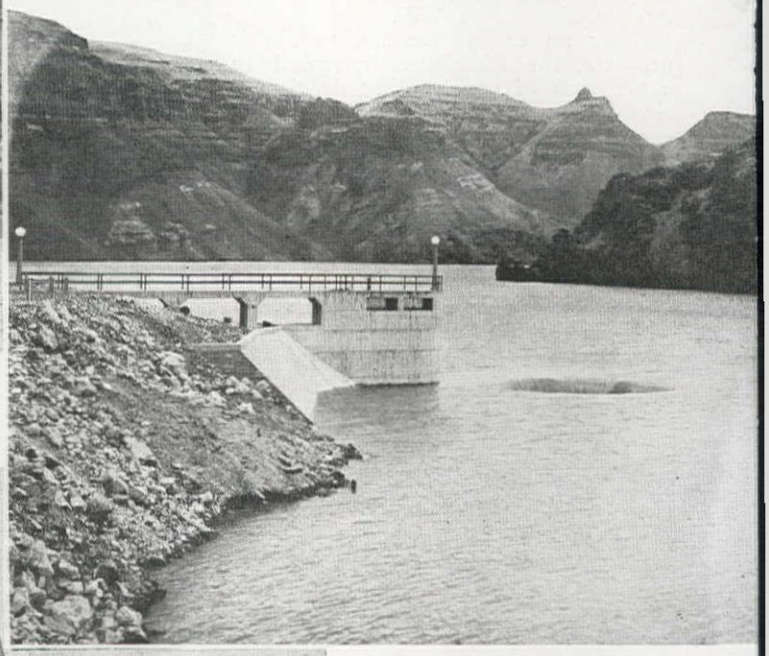
area as the site and funds available for construction will permit. This figure has been determined after careful consideration of available data on debris flows from small drainage areas which have been denuded by fire. The largest debris flow actually measured was at Haines debris basin where, from a burned drainage area of 0.47 sq. mi. 32,000 cu. yd. of debris was measured in the catchment basin, which is equivalent to 67,000 cu. yd. per sq. mi. of drainage area. It is considered best to provide as much of the storage capacity as possible in excavation below ground so as not to store debris above the general ground surface, and thus create a potential hazard in the event of overtopping the dam. On the Brand Canyon basin site, due to shallow depth to bedrock, only 83% of the desired capacity could be secured by excavation below stream bed. This fact necessitated the construction of a dam and placing the spillway lip at the proper elevation to secure the necessary storage.

After consideration of these various factors, the decision to design for a debris storage capacity of 69,500 cu. yd. was reached. The reduction from the basic design figure of 100,000 cu. yd. per sq. mi. of drainage area was considered safe, because only 68% of the area had been burned, several years had elapsed since the fire and considerable protective vegetation had regrown on the watershed.

Details of the inlet and outlet structures, the basin, dam and transition structure below the outlet are shown on the accompanying drawing and photographs.

Contract for the construction of the basin was awarded to J. L. McClain, deceased, on Jan. 30, 1934, and the job was completed Nov. 1, 1935. Engineering and inspection was performed by the Los Angeles County Flood Control District. William H. Fain was resident engineer on the job for the District. C. H. Howell is chief engineer of the District.

Views From Large Western Projects



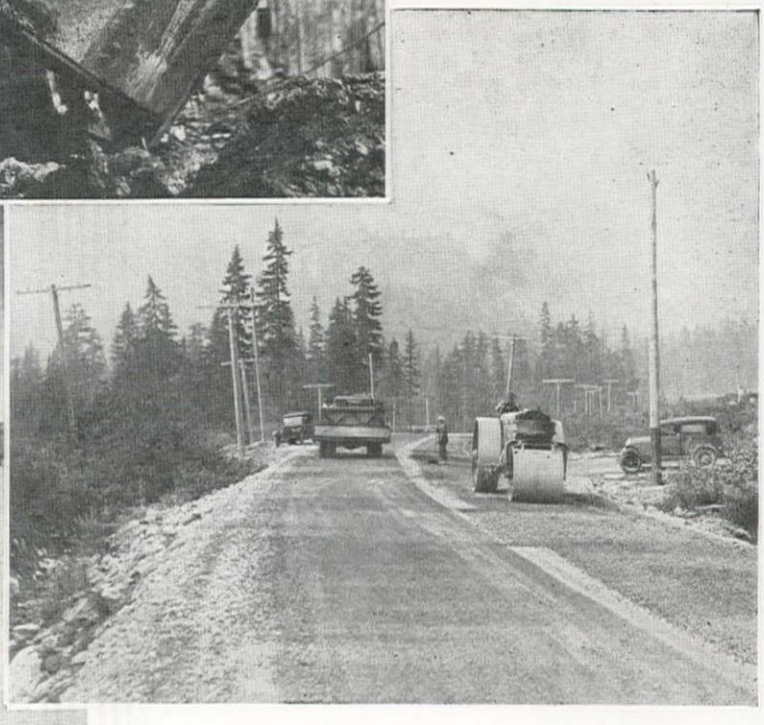
At the Tujunga Canyon quarry *(above)* where rock is being secured for the Los Angeles County flood control projects being carried out under the direction of the U. S. Engineers. Loading is being done with a Bucyrus-Erie Loadmaster mounted on a Caterpillar tractor.

Although concrete placing has the spotlight on the Grand Coulee Dam project, excavation work is still a major activity *(right)* with power shovels moving rock at record rates.

OWYHEE RESERVOIR SPILLS *(above)*—For the first time, the 1,120,000-ac. ft. reservoir behind the Owyhee dam in eastern Oregon has been filled and water discharged down the glory-hole type of spillway. This storage assures a two-year supply of water for the Owyhee project of the Bureau of Reclamation.

On the famous Snoqualmie Pass route *(below)* of the Washington State Highway system over the Cascade Mountains, the state-owned equipment includes an Austin-Western Autocrat roller.

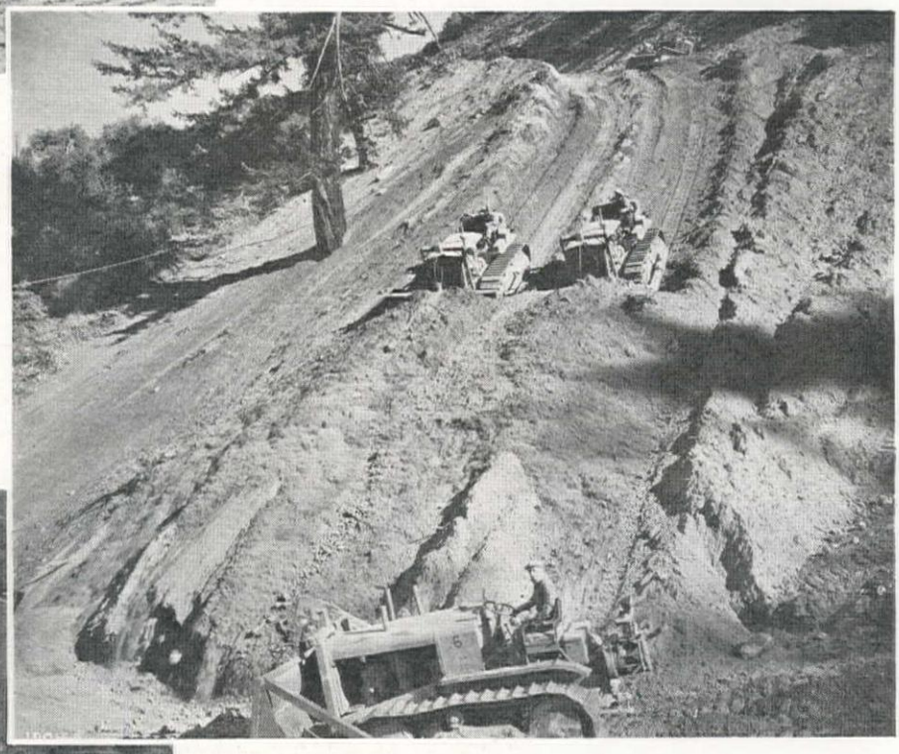
In the famous old mining town *(below)* of Virginia City, Nev., the steep grades of the streets and the frequent winter storms make snow removal with this Caterpillar Diesel patrol almost a continuous winter operation.



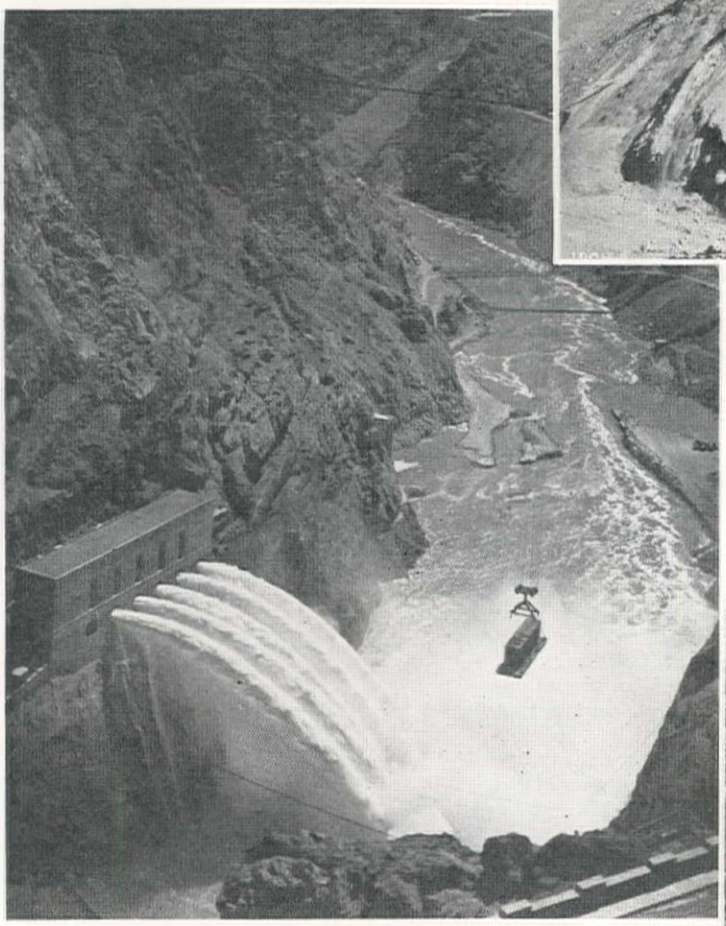
All-American Canal work *(above)* continues with the project more than 50% complete. At Potholes, Calif., on the contract of the Lewis Construction Co., this 2-yd. Lorain-87 is moving material on a 900,000 cu. yd. section of the work.

Casting of concrete piles *(above)* is one of the first steps in the construction of the Imperial Dam, the diversion structure for both the All-American Canal and the canal for the Gila project from the Colorado River. This pile casting work is part of the contract of Morrison-Knudsen Co., Inc., Utah Construction, and Winston Bros.

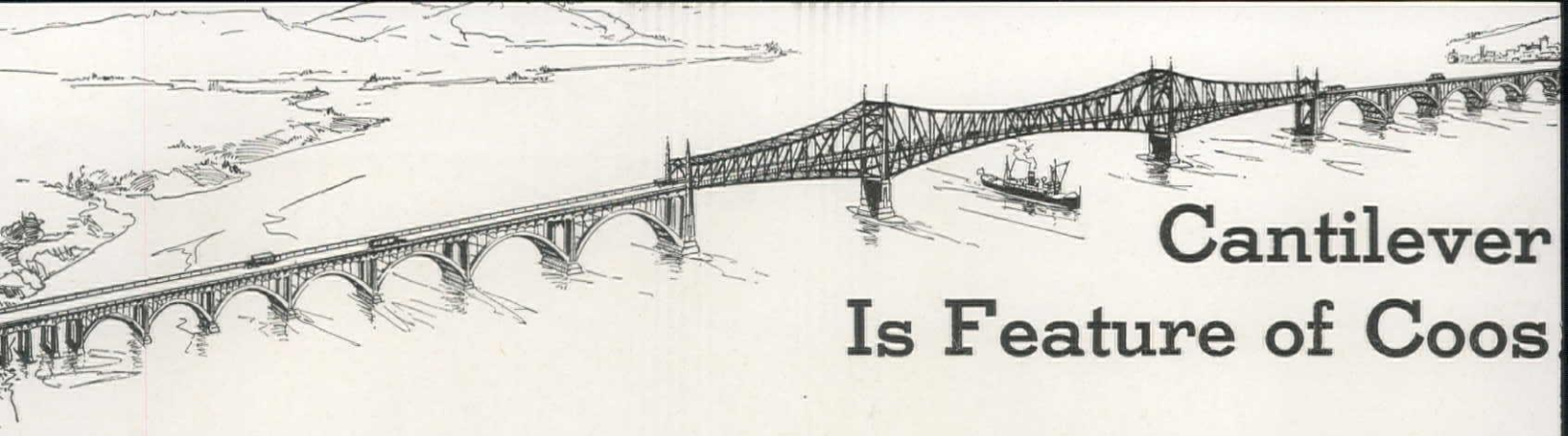
Five canyon wall outlets below Boulder Dam shown under test *(below)* produce a waterfall 180 ft. high, which is 13 ft. higher than Niagara Falls. The regulation-size railroad boxcar filled with electrical equipment is being lowered into the canyon by the 150-ton Government cableway. Power plant installations are now about 75% complete and initial tests are scheduled for the late summer.



Guy F. Atkinson Co. *(above)* is making rapid progress on this $228,471 grading contract for 4.1 mi. on the Angeles Crest Highway in the Angeles National Forest. The Bureau of Public Roads is in charge of the work. LeTourneau bulldozer equipment is shown at work on a large fill.



Site of the Bartlett dam to be built by the Bureau of Reclamation on the Verde River in Arizona. The structure will be a high multiple arch which will provide additional storage for the Salt River Valley development. Contract was recently awarded to Barrett & Hilp and Macco Construction Co. on a low bid of $2,227,495.



Cantilever Is Feature of Coos

Construction method on 793-ft. main span uses falsework under anchor arms with suspended section cantilevered to closure — Long concrete arch approaches provide total length of 5,337 ft. for structure on Oregon coast highway

A MONUMENTAL bridge, more than a mile long, has just been completed, spanning the entrance to Coos Bay at North Bend, Oregon. The outstanding feature of this bridge is the 793-ft. cantilever span over the ship channel, having a vertical clearance of 145 ft., and a height above mean low tide of 120 ft. for a width of 527 ft. This bridge is the largest and most southerly of the five Coast bridges being built by the Oregon State Highway Commission, assisted by a grant from the Public Works Administration. This bridge was opened for traffic on May 9, and formally dedicated with elaborate ceremonies on June 7. The cost will be approximately $2,200,000.

Through an act of the Oregon State Legislature, the highway commission was authorized to buy back the bridge bonds already turned over to the PWA and declared the bridges free from tolls, which will greatly encourage tourist travel over this highway, considered one of the most scenic highways in the country.

Coos Bay, 260 mi. south of Astoria and 230 mi. from Portland, is an important land locked harbor for ocean-going vessels, serving one of the largest timber areas of the Coast. The U. S. Engineers insisted on ample clearance bridge for vessels, and a high steel cantilever span with long concrete approaches was the logical design solution. The central span is 793 ft. between supports with side anchor spans 457½ ft. long. On the north approach are seven concrete deck arches, increasing in span from 157 to 265 ft. and connected with the entrance plaza by means of 492 ft. of concrete viaduct. The plaza has a length of 57 ft. and a width of 80 ft., to permit parking and easy access to the adjacent State Parks.

The south approach consists of six concrete arches, with lengths from 170 to 265 ft. connected with the plaza by 233 ft. of concrete viaduct. The total length of the structure is 5,337 ft.; approach grades are 4%; the roadway is 27 ft. between curbs with two 3½-ft. sidewalks. General features of the structure are shown in the accompanying drawing.

> In the May issue we presented a review of the Yaquina Bay bridge, one of the five projects being carried out by the Oregon Highway Department on the coast highway to eliminate the state-owned ferries across bays and rivers on this important route. This article describes another one of these structures. The Yaquina Bay and the Coos Bay bridges are larger and have more construction interest than the other three of the group.—Editor.

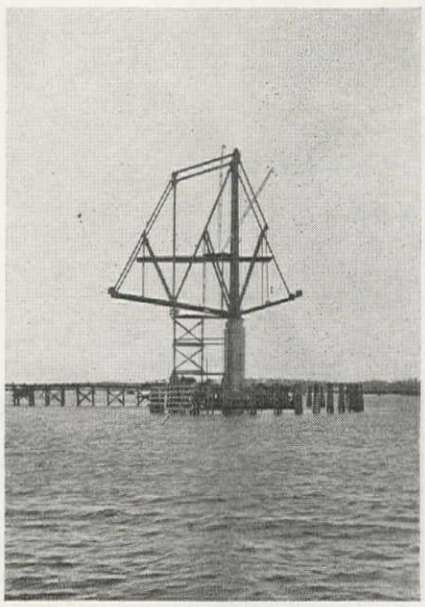
Foundations

All piers rest on pile footings driven to refusal into the underlying sand strata, aided by jetting, except for the final 5 ft. of penetration which was driven with the hammer, only. In general, piles were driven to about 35 ft. below the bottom of the pier footings.

The two main piers (No. 9 and No. 10) rest on 608 piles each with an average penetration of 70 ft. below datum. The usual method of open cofferdam construction with steel sheet piling was used. After excavation, by means of clamshell dredges to the footing depths, piles were driven to the desired depth and a tremie seal poured. After unwatering, the piers were constructed in the dry with no unusual difficulties.

The main piers carrying the central towers of the cantilever span have a concrete seal base 43x90 ft. by 8 ft. high. As the weight of this seal was insufficient to withstand the hydrostatic uplift, additional hold-down power was provided by the foundation piles extending through the seal. Experiments on testing up-lift show that each of the foundation piles has a holding-down power of over 20 tons. Piles driven at 2.5-ft. centers, however, will not develop their full holding-down capacity, and the designers assume that the mass of earth enclosed by the piles will act as a unit in overcoming uplift, thus augmenting the weight of the seal concrete.

The main pier from El.-28, at the top of the seal, to El. 15, the base of the concrete columns, is of mass concrete, heavily reinforced and cored out between load points to reduce concrete. From El. 15 to the top of the concrete section, the pier columns taper, by offsets, from 16x20 ft. to 10x15 ft. with a 4-ft. connecting web wall. The two columns are cross braced by heavily reinforced diagonal beams.



FIRST STEP—Initial falsework bent under second panel point, supported on 16 piles. The derrick has been raised from first position to roadway level.

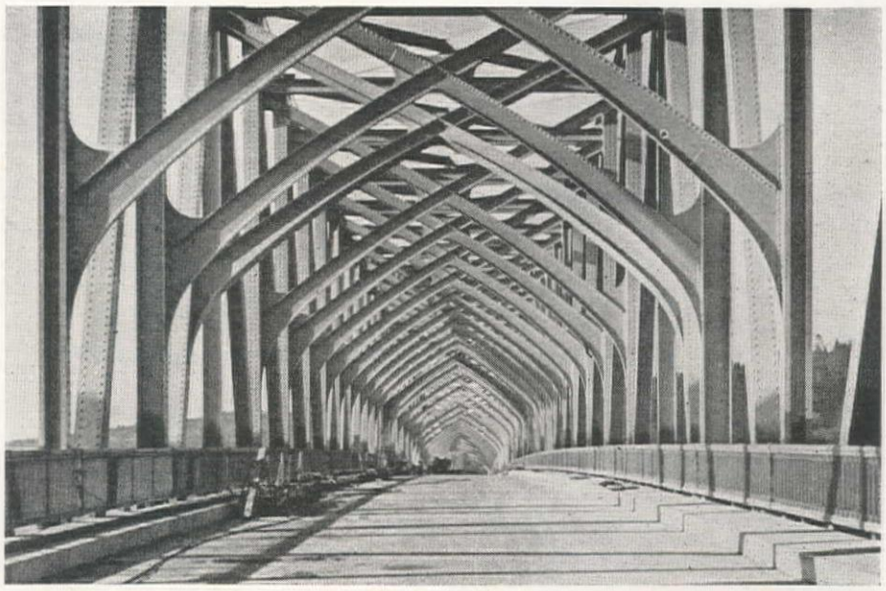
Steel towers

The base members of the steel towers rest on 3-in. steel plates anchored into the concrete by 2½-in. x 6-ft. anchor bolts. The towers are of maltese cross section with overall widths of 8½x4½ ft. at the base, tapering to a section of 1 ft., 8 in. by 4 ft. at the top of the upper chord. Connecting cross bracing is of the usual angle-plate type.

Ornamental tower tops carry navigation lights at an elevation of 280 ft. above the bay. Towers were erected vertical but pulled 1-9/16-in. out of plumb towards the anchor arm to counteract the dead load of the suspended span during erection.

Unusual care was given to the design of the steel structure in an effort to product a pleasing effect. Both the top and the bottom chords are curved in outline approaching the curve line of an arch. An unusual treatment of the cross bracing over the roadway gives the effect of a Gothic cathedral corridor as shown in the accompanying illustration. The steel is painted a light green color.

Erection Plan Bay Bridge



Cross bracing over the roadway in the steel span section of the bridge was designed to give the effect of a Gothic cathedral corridor.

Expansion is provided at the shore ends of the anchor spans by the usual method of end shoes riding on nests of cast steel rollers. Roadway expansion joints, of the finger type, made of cast steel, are provided at the shore ends of the anchor spans and between the suspended and cantilever span. Sidewalk expansions are provided with copper water stops and bituminous fillers.

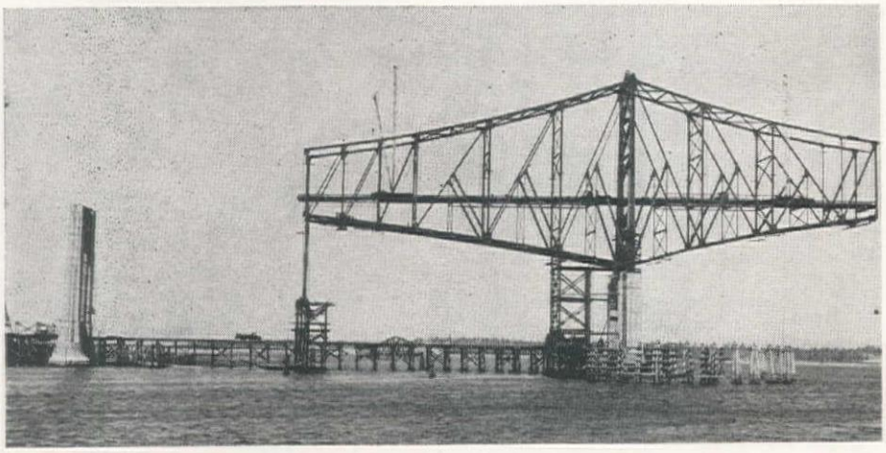
Cantilever span erection

Erection of falsework across the navigation channel was not allowed, although this method might have been used for the approach spans. The contractors selected, as a matter of economy, a rather unusual method of erecting the steel spans.

Following the erection of the concrete portion of the main piers, falsework bents were erected at the second panel point of the anchor span, 61 ft. in shore from the main pier (see illustration.) These bents were of heavy construction as they were to act, together with the center pier, to carry the load of the cantilever and anchor spans during erection. These false bents were made of I-beams (from the deck system) reinforced by 12x12-in. timbers, resting on clusters of 16 piles. A working platform was constructed from the piers to the falsework bents.

The base sections of the piers, weighing 36 tons each, were placed with a stiff leg derrick placed on these working platforms. The second section of the main pier and the floor system next to the piers were then placed from this position, after which the derricks were raised to the floor elevations and the towers completed. A second derrick was installed at the floor level and the erection of the cantilever span and the anchor span carried on simultaneously so as to balance the loads over the false work bents and the center piers. As a matter of precaution, 275-ton hydraulic jacks, fitted with pressure gauges, were placed between the tops of the falsework bents and the lower chords, to check on the actual loading at all stages of the erection.

Erection of the anchor arm was kept in advance of the cantilever arm so that at all times the falsework bent would carry only from 200 to 400 tons. When the anchor arm reached 275 ft. out from the main pier, a second falsework bent, similar to the first one was erected, and the anchor arm then extended to the inshore end of the span. The hydraulic jacks placed on the falsework bents assisted in landing the anchor spans on the approach piers.



SECOND STEP—275 ft. out from the tower the second falsework bent is added. Hydraulic jacks fitted with pressure gauges were used to check loads on falsework and later aid in landing the anchor arms.

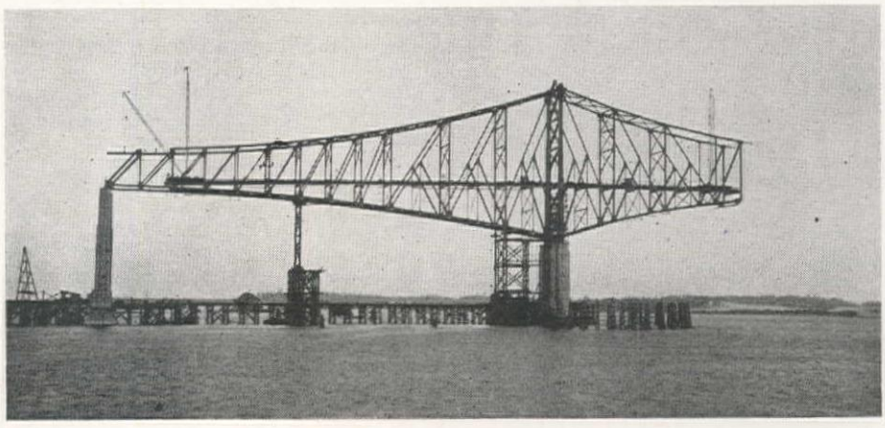
As a matter of precaution, the riveting was kept close up to the erection. This being especially necessary as the bridge was exposed to high winds and no side guy lines were provided.

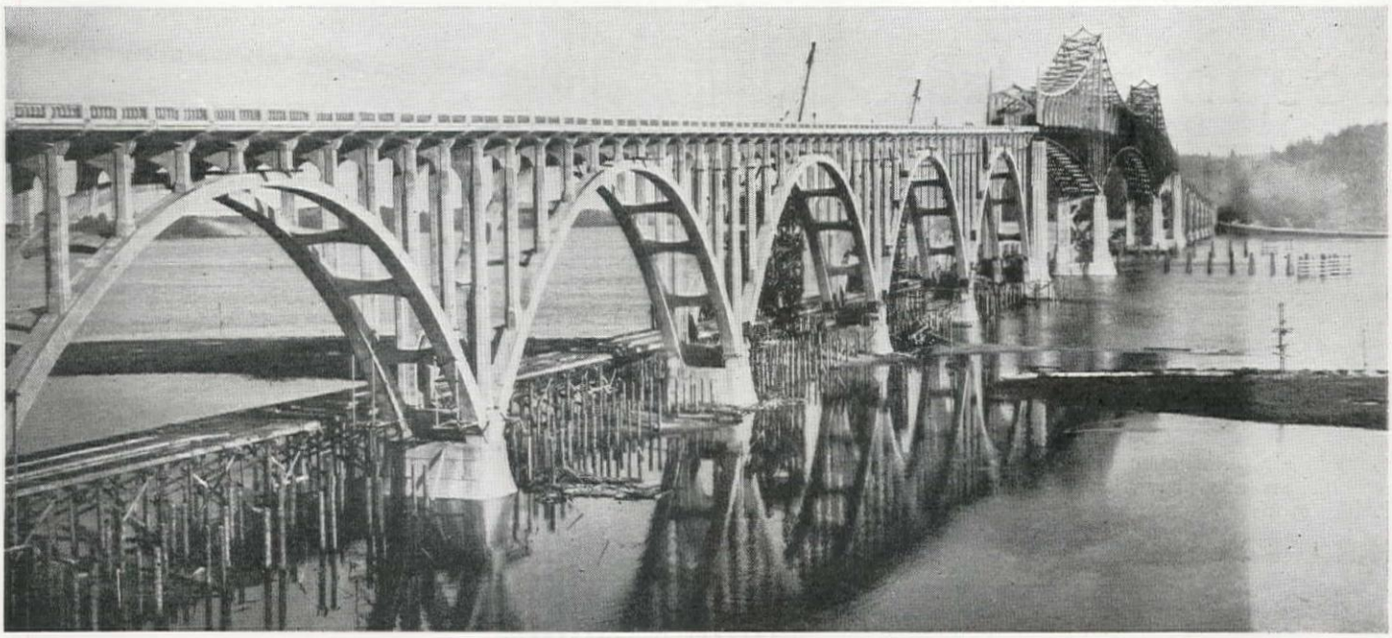
The suspended span, 366 ft. long was erected from each end of the cantilever span, closure being at the center of the suspended section. This closure was effected by means of hydraulic jacks inserted between the bottom chords of the suspended span and the cantilever span.

Concrete arches

The concrete deck arches vary in length from 157 ft. to 265 ft. and are symmetrical about the cantilever span. The 265 ft. span is typical of the other lengths, except as to size. There are two arch rings having a section 5 ft. by 7 ft. at the skewback and tapering to 5 ft. by 4 ft. at the crown. The

THIRD STEP—457-ft. anchor arm landed on approach pier. Although exposed to high winds, the erection was carried out without side guy lines.





Concrete arches of pleasing proportions flank the main steel span. Arches vary from 157 to 265 ft. and were erected as three-hinge structures with the introduction of Considéré hinges during construction.

arches were erected as three-hinge arches by the introduction of "Considéré hinges" at the crown and the skewbacks. These hinges are simply a reduction of the section of the arch at the hinge point to a minimum area which, when very heavily reinforced, will carry the load and also permit bending during construction. This method of construction eliminates negative movements and permits more economical design. After the dead load is all placed the span is swung free from the falsework and the reinforcing steel at the hinge points is welded and the arch poured to the full section with concrete.

The deck on the concrete arches is carried by columns tied together with web walls pierced by large Gothic arch openings. The deck is of the usual beam-stringer type; the beams spaced about 24 ft. centers and the stringers spaced 5 ft., 9-in centers. The deck on the arch section is 6½ in. thick. On the viaduct section the floor slab is 7¼ in. thick and 6 in. thick on the steel span.

The viaduct approach spans are of the usual beam-stringer design. Bents are spaced from 56 ft. to 70 ft. on centers. There are four longitudinal beams 18x51 in. spaced 8-ft. centers, and the 10x50-in. cross beams are spaced 14-ft. centers. Expansion joints are carried on cast chromium steel segmental rollers.

Sidewalks are carried on cantilevered brackets located at each cross beam point. The slab is 5 in. thick. Sidewalks on the concrete structures have concrete railings made up of precast pilasters and cast in place rail. The railing on the steel span is made up of 3-in. pipe, top and bottom, connected with iron spindles and held in place by 6-in. channels fastened to sidewalk stringers and deck beams. Approach bents have concrete footings resting on timber piles cut off below the water line.

Piers were constructed in steel sheet piling cofferdams which were sealed by tremie placed concrete. After unwatering, the piers were built in the dry. The columns are of reinforced concrete, cored out to reduce volume, and connected by web walls which are cut away in the form of large Gothic windows; resulting in a most pleasing effect when viewed from below.

All concrete structures were constructed on timber bents resting on piling. Forms were usually built in sections on the framing platform or carpenter shops and assembled on the job, thus greatly reducing the cost of form work. Exposed faces, where possible, were lined with plywood to ensure a better concrete finish. Sections of forms were delivered to position by the gantry cranes.

Coarse aggregate was obtained from a river deposit in the Umpqua River and hauled to site by rail. Fine aggregate was a coarse sand and found along the Coast.

Concrete plant

Concrete was mixed in a central mixing plant and distributed by trucks. All concrete was carefully controlled as to water-cement ratio, and constant check was made of both materials and concrete cylinders to obtain the required strength. The cement used was varied from time to time to meet the special conditions of the pour, regardless of the specified mix. This variation was possible as the contractor was paid only for cement ordered into the mixture by the engineer. Electric vibrators were used for all concrete and were found to be indespensible, especially where there was a large amount of reinforcing steel and a dry mix were desirable.

Both channel piers are protected by fender piling driven in the form of 5 or 7-pile dolphins, connected by Port Orford cedar waling. These fender piles were treated with a solution of white arsenic, copper sulphate, and zinc sulphate, forced into the piles under the mineral cell process.

Major contract quantities were:

Excavation, 24,000 cu. yd. @	$ 8.00
Piling, 190,000 lin. ft. @	.50
Concrete, 8,000 cu. yd. seal @	12.00
Concrete, 19,000 cu. yd. pier and footings	15.80
Structural steel, 3,635 tons @	.10
Reinforcing steel, 2,205 tons @	.0465

In addition to materials in the structure is a large amount of materials used in falsework and forms. Practically all materials were produced locally except the steel, which was shipped from eastern mills.

Approximate total of materials used:

Piling, 504,000 lin. ft.
Lumber, 16,000,000 ft. B. M.
Sand, 54,000 cu. yd.
Gravel, 110,000 cu. yd.
Cement, 182,000 bbl.

Equipment

This job was completely equipped with the following major equipment:

1—A central concrete mixing plant equipped with two 2-cu. yd. Ransome mixers, Blaw-Knox batchers, and Fairbanks scales for weighing aggregate. Cement was shipped in bulk from the Oregon portland plant at Oswego, Oregon.

2—Four gantries equipped with stiff leg derricks, two on each approach. These ran on a construction trestle on the west side of the bridge and delivered all kinds of materials from trucks to the construction point on the bridge.

3—2 Vulcan No. 1, hammers, and 1 McKiernan-Terry 9-B-3 double acting hammer for pile driving.

4—2 Byron-Jackson 8-in. centrifugal; 1 Pulsometer pump; 1 Worthington 1½-in. centrifugal pump; 8 Byron-Jackson pumps, 1½-in. to 4-in. centrifugal; 1 Pacific Pump Co. 6-in. centrifugal sand pump.

5—13 hoists of different makes; 4 steam swing engines.

6—Y Clamshell buckets, ½ yd. to 1 yd.
7—1 Ingersoll-Rand electric driven compressor.

Personnel

Contract for all piers and the concrete approaches was let to the Northwest Roads Co. of Portland. E. C. Panton was superintendent for the contractor.

Contract for the steel structure was let to the Virginia Bridge and Iron Co. of Roanoke, Virginia, represented on the job by H. E. Robinson.

Erection of the steel was sub-contracted to F. L. Holser Co. of Los Angeles, with William Kelly, superintendent.

The bridge was designed by C. B. McCullough, bridge engineer, Oregon State Highway Department, assisted by O. A. Chase, designing engineer. The structure was built under the direction of the Oregon State Highway Commission of which R. A. Baldock is state highway engineer, with G. S. Paxson as acting bridge engineer.

The Public Works Administration is represented by C. C. Hockley, state director, and R. H. Corey, state engineer inspector. Resident engineers on the job were S. M. P. Dolan, and A. E. Eberhart, assisted by E. L. Vinton, and J. J. O'Farrell, assistant resident engineer inspectors.

In direct charge for the state were the following: A. G. Skelton, project engineer; Raymond Archibald, resident engineer; Dexter Smith, resident engineer, assisted by L. C. Smitton, L. L. Jensen, and O. R. Kennen, with the following inspectors: R. D. McGilvra, E. T. Bellew, Rockwall Simpson, M. W. Gallagher, A. Benschedt, Irwin Cooper, Earl Mershon, and F. P. Rawson.

Work was begun Aug. 1, 1934, and completed June 15, 1936.

Butane Gas—Facts Every Contractor Should Know

A general description of this relatively new motor fuel, its characteristics, requirements for handling, and operating results

By G. L. HOLZAPFEL
President, Holzapfel Instrument Co.
Los Angeles, Calif.

ALTHOUGH butane has been in use as a motor fuel for about seven years, its use on a commercial basis dates back only about three. Since the time that such contractors as the Ransome Co. in Emeryville, Calif.; Morgan Paving Co. in Loomis, Calif., and Clyde Sheets in Los Angeles began to use it extensively, its use has increased rapidly and it has now taken its place with other automotive fuels as a commodity of proven value. One of the largest fleets of trucks using butane as a fuel is that of the Griffith Co. at Cajalco Dam, described in *Western Construction News* March, 1936. This fleet of thirty new trucks has never used any fuel but butane.

The actual value of butane has proven to be greater than that of gasoline, and only one thing has retarded the rapid extension of its use—the necessity for holding it under pressure. This requires special storage tanks, tank trucks, vehicle fuel tanks and special equipment for handling. Three years ago these points presented serious problems, but they have been successfully solved. Not only are there over a dozen filling stations in California already, but tank trucks are numerous, and good tank fittings, meters, pumps, and flexible hose are obtainable at reasonable prices.

The problem therefore resolves itself chiefly into the question of whether it is convenient for the vehicle owner to obtain the fuel and supply the necessary capital for the extra equipment. This fuel is obtainable almost anywhere in California and should soon be available in Oregon, Washington, Montana, Nebraska, Utah, Nevada—in fact, anywhere within reasonable distance of oil wells.

Butane can be shipped long distances in tank cars at about the same cost as gasoline and for shorter distances the tank truck and trailer can be used. It is even being shipped to Europe from Gulf ports. There is, therefore, no reason why butane should not be available practically anywhere where gasoline is sold. It costs less than gasoline at the refinery and should, therefore, cost less to the consumer. Butane, so far, has not been the cause of any serious price war, because there are relatively few firms selling it. Butane is not subject to state or Federal gas tax.

As for capital required the sum of $5,000 is sufficient to pay for storage tank and enough vehicle tanks, carburetors and equipment for a fleet of considerable size. The cost to equip vehicles varies from $120 to $200, depending chiefly upon the capacity of the fuel tanks.

At present there are about 3,000 butane equipped vehicles in California and not less than 30 or 40 tank trucks, besides a large number of trailers. Completely equipped trailers for refueling tractors and similar equipment can be bought for as little as $250. (275 gal. capacity.)

Why pressure is necessary

It is often asked why butane must be kept under pressure and how that pressure is maintained. Crude oil, as it comes from the wells, consists of a vast number of compounds or "fractions," each of which has a different boiling point. When oil comes from the well, it is usually preceded by the lightest fraction, known as methane. This is a gas and with the next fraction, ethane, goes to make up the fuel supplied in the city gas mains, being known as natural gas. Next come propane and butane, both gases in their natural state, which means that they boil at atmospheric temperatures and pressures.

These gases may be liquefied either by a reduction in their temperature or an increase in their pressure. In sub-zero temperatures, pure butane would be liquid at atmospheric pressure, but propane would be a gas at temperature as low as 50° F. However, as soon as the pressure on these gases is increased, they liquefy, and, once liquid, will exert a pressure on the container. The pressure, known as vapor pressure, varies with the temperature. For example, pure normal butane exerts a pressure of 11 lb. (gage) at 60° F., while pure propane has a vapor pressure of 107 lb. A mixture of the two gases will have a vapor pressure somewhere in between those limits, so that these two fuels may be blended in any desired proportions, admitting of their use in sub-zero temperatures when desired. At 100° F., the gage pressures are 37 lb. and 175 lb., respectively.

It is apparent, that as soon as the pressure is reduced, i.e., by opening a valve in the tank, the liquid inside will boil and gas will come out. Or, if desired, the liquid may be removed from the tank and, by application of heat, reduced to a gas at any convenient point.

A butane carburetor is therefore simply an apparatus for vaporizing the liquid butane, reducing its pressure and mixing the true gas so obtained with the proper amount of air for combustion.

Carburetion

The methods by which this carburetion is carried out may vary in detail, with different carburetors, various manufacturers of these instruments claiming various desired characteristics. The construction of a butane carburetor may mean a great deal to the user. It must be easily fitted, reliable, durable, economical, easily adjusted and so designed that the average mechanic can meddle with it and not get it out of order.

The butane system, in most installations, is merely supplementary to the gasoline system, the latter being in no way disturbed, so that gasoline may be used if at any time or place butane is not available. The conversion of a truck to butane does not, therefore,

limit its activities in any way, but only extends them, for if the conversion is properly made, power will be increased and grade can usually be taken on one gear higher. Average speed is increased and much time saved.

It has been suggested that the use of butane fuel adds increased complications, that is, that refueling is not so easy as with gasoline. This is not the case. Refueling is, if anything, quicker than with gasoline and is very simply carried out. The hose being hermetically sealed to the tank, there is no danger of overfilling and no possibility of spilling the fuel on the ground. Therefore, once the equipment has been installed, butane admits of greater speed in refueling and brings increased safety.

If the gasoline carburetor is used without any alterations, and butane vapor fed to its venturi, the power obtained is slightly less than with gasoline. If, however, a larger venturi is employed, the power output is increased somewhat and if every opportunity is taken of the advantages offered by butane, such as using a cold intake manifold, larger venturi and higher engine compression, the power obtained with butane is considerably greater than with gasoline. This has been very carefully tested in engine laboratories and is in no way a matter of conjecture.

Power

Economy has been similarly tested and it has been found, by dynamometer on a multicylinder engine, that about 10% more energy can be produced from a gallon of gasoline than from a gallon of butane, provided the compression is not increased. If the compression is increased the economy with butane is, of course, improved so that the energy per gallon of fuel is about the same in both cases.

On the road, however, with the constant throttle movements and constant wastage of gasoline, with varying intake manifold temperatures and similar variables, it is possible to go considerably further on a gallon of butane when the engine compression is increased to the desired amount. If a truck is converted to butane without any change in the compression, the mileage per gallon is just about the same as with gasoline and where the gasoline carburetion has not been as nearly perfect as is possible, the mileage is greater than with gasoline.

Economy

The economy of butane is, of course, due to the wastefulness of gasoline. This becomes evident when it is considered that a gallon of gasoline (6.2 lb.) contains 25% more heat units than a gallon of butane (4.8 lb.) and is capable of driving a car no further, which means really, that 20% of the gasoline is wasted. This wasted gasoline leads to a consideration of the question of wear. Undoubtedly most of the increased engine life found when butane is used is due to lack of dilution of oil by the gasoline. It is common observation that when a crankcase is filled with fresh oil, the engine can be run much further before the first quart of oil is needed than before the second quart is needed. This is due to two facts: (1) gasoline actually goes into the oil and increases its volume, and (2) the oil, having become thinned by this gasoline, more easily passes the piston rings. Actually, this dilution goes on even in a hot engine, a fact which has been amply demonstrated by tests.

With butane there is no dilution whatever, and the oil remains in good condition for very much longer periods. In trucks on heavy duty, oil changes every 10,000 miles are the rule, although it is recommended that oil be tested if it is kept more than twice as long as was the case with gasoline. Of course, the amount of oil added to the engine between changes is much less in the case of butane than in the case of gasoline.

Obviously, a piston will not be properly lubricated if the oil is diluted with gasoline. In starting, the oil is washed off the cylinder walls by the wet gasoline that enters and it is some time before more oil takes the place of that which has been washed away. The latest test made on a truck belonging to the Van Velsir Trucking Co. of Los Angeles, operating on butane, showed less than .001-in. wear after 44,000 mi.

There is much to be learned about the lubrication of butane-equipped vehicles and when more knowledge is available, the life of a cylinder block when butane is used, will be at least three times as long as when gasoline is used; it is already more than twice as great. Use of too heavy an oil with butane results in much poorer results, but the fact that good results have been achieved by many users means that such results are available for all if due attention is paid to the necessary details.

Recently a careful survey of butane costs was made by this company on a truck and trailer (gross capacity 68,000 lb.). Resultant operating costs were: gasoline 5.4c per mile, and butane 3.2c per mile. These figures included cost of fuel, maintenance and oil.

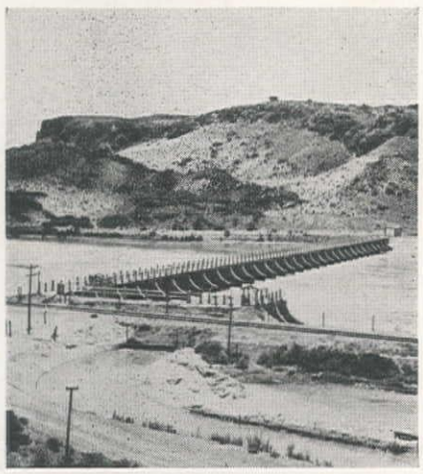
Rye Patch Dam Completed in Nevada

RYE PATCH DAM on the Humboldt River in Nevada, has been completed and placed in service by the Bureau of Reclamation, according to a recent report from Acting Commissioner John C. Page. Rye Patch Dam, like Hyrum Dam in Utah and the Agency Valley Dam in Oregon, was begun in 1934 with funds allotted to the Bureau of Reclamation by the PWA.

The structure is an earthfill dam 75 ft. high, and creates a reservoir with a capacity of 80,000-ac. ft. of water. At present 4,000 ac. ft. have been stored and by the close of this season it is expected that the storage may be increased to 25,000-ac. ft. The Humboldt River has an exceptionally erratic record for water production. It produced 522,609 ac. ft. in 1907 and only 7,350 in 1920. Storage of the surplus waters in the wet years under these conditions becomes essential to safe irrigation. The Rye Patch dam will store water for 33,000 acres in the narrow valley of the Humboldt. All this land is at present farmed, but with an indefinite water supply. Water rights held by an acreage equally as large, but of submarginal character, were purchased and this land retired. The cost of Rye Patch dam project was approximately $1,250,000.

Contract was carried out by J. A. Terteling & Sons, Boise, Idaho, on a low bid of $256,322. Unit bids were published in *Western Construction News,* December, 1934, page 40. L. J. Foster was construction engineer for the Bureau of Reclamation.

Middle Rio Grande District Concludes Basic Program



The San Acacia diversion dam, one of the four dams built by the District to divert water for the four irrigation districts into which the valley has been divided. Besides these four dams there are two additional diversions directly from the river.

Important New Mexico conservation development begins regular operating procedure following completion of construction work for flood control, drainage of water-logged lands and irrigation of 121,000 acres—System includes 334 mi. of drains, 1,000 mi. of ditches, and involved 30,000,000 cu. yd. of excavation

By C. A. ANDERSON
Chief Engineer, Middle Rio Grande Conservancy District
Albuquerque, New Mexico

With the construction program of the Middle Rio Grande Conservancy District completed and this important New Mexico development on an operating basis, it is logical to present a concluding general review of the undertaking, supplementing the previous articles which *Western Construction News* has presented on this project. In the present summary of the development, Chief Engineer Anderson outlines the need for the development, reviews the construction program carried out, and indicates the present status of the project.—Editor.

COMPLETION of the basic construction program and the start on regular operating procedure on the project of the Middle Rio Grande Conservancy District makes this an appropriate time to review the work of the last five years and summarize the planning, building program and characteristics of the District as it is now functioning. Today, at the conclusion of the construction period, the District is providing irrigation service to about 30,000 properties with an operating staff of about 120, which also handles the drainage and flood control work on the project. Previous articles in *Western Construction News* have reported on various phases of the work, and the following review is intended to present a brief outline of the entire development from its inception.

Historical

Raising of the water table and the consequent waterlogging and destruction of valuable irrigable farm land along the Rio Grande through central New Mexico had become so serious that in 1925 the land owners in the region formed the Middle Rio Grande Conservancy District in order to cooperate in overcoming their problems.

The District is located in a long and narrow valley, extending along the Rio Grande from about White Rock Canyon on the north to a point some 20 mi. above the upper end of the Elephant Butte Reservoir, the entire length of the District along the river being about 150 mi. The valley floor varies in width from one to five miles. In this area is located Albuquerque, the largest town in the state; also a number of thriving smaller communities, including the towns of Bernalillo, Belen, Los Lunas and Socorro. The gross area of the valley floor is some 210,000 ac., of which 121,000 ac., are irrigated by works constructed by the District.

The practice of irrigation in this valley is ancient. The Spanish conquistadores, at the time of their entrance into the valley about 1540, found that the Indians had been irrigating and cultivating their lands for many years previous. It is estimated that in the year 1540, the Indians had approximately 25,000 ac. of land under ditch.

Following the Spanish conquest the Crown of Spain made grants of land to white settlers who began the construction of ditches and the cultivation of land within the now "white owned" area of the District. The town of Bernalillo was established in 1700. Albuquerque was settled in the year 1706 on an old site originally settled by the Spanish and destroyed in the rebellion of 1680. Tome was settled in 1739; the San Clemente Grant dates from 1716; the Belen area was developed from another grant made in 1642. The settlers in each area built their own *acequias* or ditches diverting water from the Rio Grande until, counting those built both by the Spanish and the Indians, there were at the inception of the District some seventy ditches in operation. The area in cultivation increased to a maximum about 1880, when it is claimed there were not less than 124,000 ac. under cultivation.

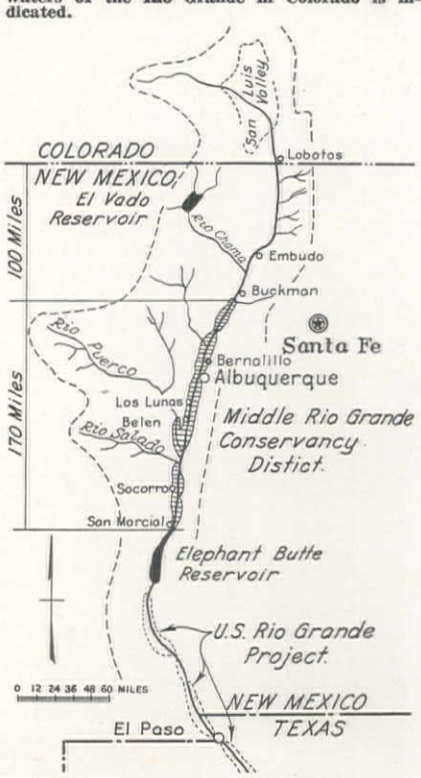
Settlement of the San Luis Valley in Colorado, which commenced about 1852, along with the building of immense canals in that area about the year 1880, following the construction of the D. & R. G. Railroad, caused large depletions in the flow of the Rio Grande through New Mexico. The resulting smaller flows caused silting and raising of the river bed. This condition raised the water table throughout the entire area of the Middle Valley and waterlogged the land, thus diminishing the area available for cultivation.

With the cultivated area reduced to less than 50,000 ac., the situation became acute. Conditions were such that all land values in the valley were decreasing rapidly, and coöperation among the owners of the valley and a resulting organization through which to work were necessary. The Middle Rio Grande Conservancy District was organized to bring about a correction of these features. It was financed in spite of almost insurmountable difficulties and, after years of preparation, active construction was commenced in the year 1930.

Construction program

For the purpose of reclaiming the valley, it was necessary to drain the waterlogged area, relocate and rebuild the canal systems, and protect the land

General location map of the Conservancy District showing the principal cities and waterways in the area. The San Luis Valley on the headwaters of the Rio Grande in Colorado is indicated.



against floods. The latter feature was especially necessary for the reason that the rising river bed was no longer able to handle comparatively small floods, which resulted in the river overflowing its banks and flooding the valley lands nearly every spring. Albuquerque lies directly in the path of low flood stages, since the main part of the town lies in a former river channel.

The drainage situation was also acute and it was finally decided that this item should be the first feature of the work undertaken. Drainage was effected by the construction of open surface drains. Along both banks of the river and approximately parallel thereto, intercepting riverside drains were located. Excavated to a depth of about some 10 ft. deep at their upper ends, these drains have a flatter gradient than the river which they parallel and at the lower ends they are allowed to flatten out, reaching the river and discharging into it at low water level. The upper end of the drain below an outlet extends some distance about the outlet, thus creating drainage for that area above the mouth of the upper drain. To relieve the high water table of lands within the interior of the valley, drains were constructed through these interior areas, emptying eventually into the riverside drains or directly into the river. Drains have been built across the valley at intervals of approximately 1 mi. and it is believed that such construction in the character of soils encountered here is sound and that all the valley area is properly handled as to drainage.

Construction of drains totals 334.2 mi., of which 180.9 were riverside drains and 153.3 were interior drains.

The spoil from the riverside drains was used in the building of dikes or levees along the river to provide protection from high water. These levees are from 8 to 10 ft. in height and about 10 ft. in top width. For further protection of the valley and of the flood protection works constructed, provisions had to be made against cross currents prevalent in the Rio Grande. In many cases channelizing was resorted to, which involved straightening of the river through bends and at critical points. At other important points protection consists of round piling connected by a curtain of heavy wire with a ground apron of the same material.

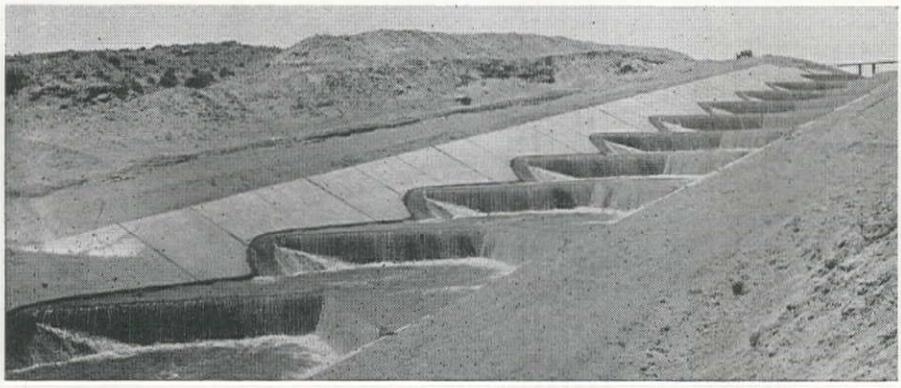
As further protection and as training works for the river, jetties and revetments of trees anchored to the bank by piles and cable were used. Several other types of jetties, including the "squirrel cage," were also used.

For the diversion and transportation of water it was necessary to entirely rebuild the network of 70 small canals, each of which had its temporary heading in the river. One of the difficulties of construction was the keeping of these old ditches and headings in operation while the new system was being constructed.

The District has been divided into four irrigation divisions with a permanent diversion at the head of each division. The system as completed in the four divisions embraces approximately 1,000 mi. of newly constructed irrigation canals and reconstructed old ditches. Two of the diversions constructed by the District are of the overflow type, while the other two are of the barrage type with radial gates throughout their entire length. In addition to these four diversions, two additional diversions headings without dams were constructed in the river.

Of the thousands of structures in the system, most are of concrete construction and many original features were incorporated in their designs. The smaller structures on laterals carrying less than 100 sec. ft. of water are generally of creosoted lumber. During the design and construction period a small hydraulic laboratory was maintained and many types of structures were tested and experimented with, and several original designs were evolved.

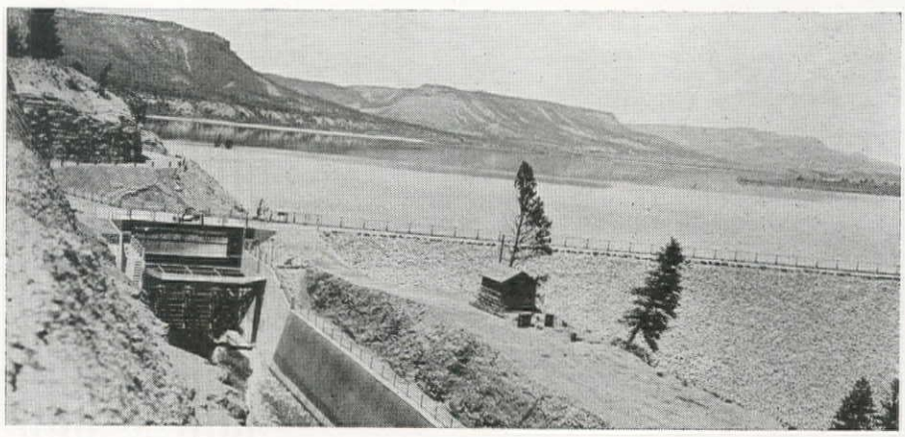
Special design of wasteway from the Belen canal, based on experiments made in the laboratory of the district. The V-shaped drops provide stilling action. At the time the picture was taken there was only a small head in this section of the canal.



Equipment and costs

It was originally intended to let much of the work by contract but, after due consideration, it was decided that the interests within the area could be better served by carrying on most of the work by force account under District direction. A fleet of sixteen draglines was purchased at the beginning of work. This consisted of 10 1¼-yd. P&H machines and 6 1½-2yd.-Bucyrus-Eries, all equipped with diesel engines. Approximately 30,000,000 cu. yd. of material were moved, of which about 1,000,000 cu. yd. were in river channel changes. All this work was done at most satisfactory costs.

The 20,000-sec. ft. spillway channel of the El Vado dam showing the steel lining and the 36 x 23.5-ft. automatic radial gate used to regulate the outflow.

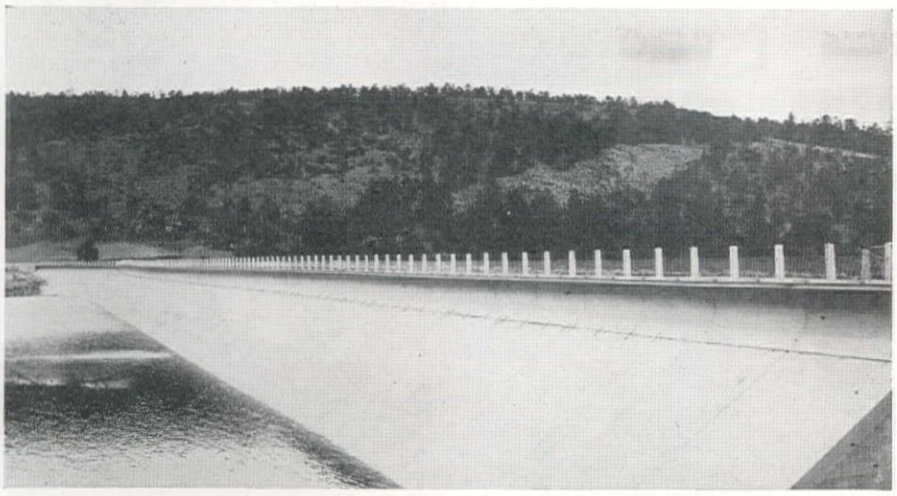


Accurate cost records were kept on all items of work and District construction costs include 100% depreciation on all of its excavating equipment. Excavating costs on District work ranged from 4.4¢ on heavy excavation in drainage work to 7.51¢ per cu. yd. on the light irrigation lateral construction, the average cost for all work being about 6.25¢ per cu. yd. The District also handled considerable yardage by means of Ruth dredger equipment and also by means of teams in the rehabilitation of old canals.

El Vado dam

The completed project includes a dam and storage reservoir at El Vado on the Rio Chama. This river is a tributary of the Rio Grande and the point of construction is approximately 150 mi. north along the river from Albuquerque. Full details of the construction of this dam appeared in *Western Construction News* in the issue of Feb., 1935.

El Vado Reservoir has a capacity of 198,000 ac. ft. The dam is a compacted gravel fill about 190 ft. high. The structure has a steel face built up of ¼-in. plates, electrically welded, the area of



The El Vado storage dam on the Rio Chama, New Mexico. The dam is a compacted gravel fill structure, 180 ft. high, having a steel face approximately 5 ac. in area. This was one of the first large steel faced dams to be constructed in this country.

which is approximately five acres. Other features of the dam are a steel lined spillway channel about 1,000 ft. long, with a capacity of 20,000 sec. ft.; a 36-ft. x 23.5-ft. automatic radial gate; a 78-in. diameter penstock 630 ft. long, connecting a 78-in. diameter butterfly valve with two 48-in. diameter outlet valves of a new type known as the horizontal sleeve type. Further spillway capacity is provided for by an earth plug in a natural saddle at the south end of the reservoir, which was left somewhat lower than the dam for additional safety against overtopping.

ARTICLES ON THE MIDDLE RIO GRANDE CONSERVANCY DISTRICT

Plans for the Project Reviewed ..... Nov. 25, 1930
Data on Cochiti Diversion Dam ..... May 25, 1932
Review of Construction Progress ..... Jan. 25, 1933
Detailed Review of the El Vado Dam ..... Feb. 1935

Organization

Upon completion of District construction there was set up an organization for the maintenance of the constructed works and for the operation and repair of the entire system. Headquarters for operation and maintenance are maintained at Albuquerque, with smaller offices and yards in each of the other three divisions. A maintenance force of approximately 120 is now being retained.

The management of the District is charged with furnishing service to approximately 30,000 properties, about 60% of these being farms whose owners demand service throughout the entire irrigation season. The maintenance of drainage and flood protection works is carried on with the same forces which operate the irrigation system. It is the management's responsibility to man its system in such a way that all agricultural areas receive service within a given maximum number of days and to so deliver its water that the best interests of the owners under the system and the best interests for which it was built are satisfied.

Work Stopped; Suit Filed by Contractor On Broadway Tunnel in Oakland

Six Companies file $3,295,695 suit in Federal Court against highway district —Project to be completed with bond funds

WORK on the Broadway low-level vehicular tunnel in Oakland, Calif., was stopped by the Six Companies of California, Inc., when crews were called off the project June 13. On July 1 the contractor filed suit against Joint Highway District No. 13 in the Federal Court for $3,295,695 charging breach of contract. The District has announced that the project would be completed, although final decision as to the method of carrying out of the work has not been announced. The District has funds available from a surety bond of more than $1,750,000, which was required of the contractor, but whether the work will be carried forward by the District, or by bids called for completing the project, has not been determined.

Termination of the contract for the project marked the end of a rather extended controversy between the contractor and the highway district over asserted discrepancies between geological conditions as indicated by a report and those encountered in the work, differences of opinion on the adequacy of the original design, and the methods used in prosecuting the work. A serious accident about a year ago resulted in the temporary suspension of operations. At that time, the State Industrial Accident Commission assumed authority in the matter in the interest of safety for the men. Since that time, work has been carried forward under a modified program, which included the driving of drifts ahead of the full-face operations.

The time limit for the work, specified in the contract, was May 24, 1936, and the $500 a day penalty provided in the contract was deducted by the District from the progress payments made to the contractor between this date and the end of the month.

When this deduction was made in the progress payments, the directors of the Six Companies of California notified the District that the penalty would not be accepted, and that work would be discontinued. Statements issued at the time by the highway district, comprising the counties of Alameda and Contra Costa, stated that the work had been about 70% completed, and that the project would be carried to completion without delay. District officials asserted that delay in the work had resulted from the methods used by the contractor, which resulted in prolonging the construction period, and adding to the cost of the work. Further, the District contends that the conditions met in the tunnel did not differ materially from those found in other tunnels previously driven through the coast range, and were known to engineers and contractors.

Six Companies of California, Inc., through its president, Henry J. Kaiser, asserts that the problems encountered on the work differed materially from those indicated by information presented by the geological report of the District, which indicated that the ground through which the tunnel would be driven, was of a self-sustaining nature. The portions of the tunnel which were open to full section required extensive timbering, and the pioneer drifts indicated that this condition obtained through the remainder of the ground. These conditions, according to the contractor, were reported on various occasions to the District, with the contention that the original designs were not adequate. Following the cave-in and fatal accident of last year, the contractor and the District agreed, through the agency of the State Industrial Accident Commission, to a modified construction procedure for carrying out the work.

Six Companies of California, Inc., presented the low bid on this project in May, 1934, at $3,683,900. The unit bids were published in *Western Construction News*, June, 1934.

Highway Drainage Structure Rebuilt With Metal Arch

Old culvert reconditioned and lengthened by introduction of corrugated steel lining and backfilling with grout—Work did not interrupt traffic

By ROY L. ANDERSON
Engineer
California Corrugated Culvert Co.

THE salvaging and extending of an existing drainage structure on an important California state highway route was recently carried out without interruption of traffic, and the fill subsequently widened to increase safety. The job consisted of installing a 100-ft. length of corrugated culvert inside an old concrete structure, backfilling with grout, and adding new head walls. Assembling of the metal arch material was done by a crew of four men in four days.

The job was located on the California state highway between Moorpark and Somis in Ventura County, where widening of the existing route presented a problem as the result of an old concrete culvert in rather bad condition. The widening of the highway at this location required the extending of the drainage structure about 20 ft., and any disturbance of the existing fill would have necessitated the re-routing of traffic. The Division of Highways decided to reline the existing culvert with a Multi Plate arch and extend this lining for the required distance.

A crew of four men was used by the contractor to assemble the necessary plates for the No. 3 gage corrugated arch 135x69 in. in section and 100 ft. long. When assembled the arch was drawn through the existing structure by a tractor. It was then placed in position and securely fastened to new concrete footings with anchor bolts.

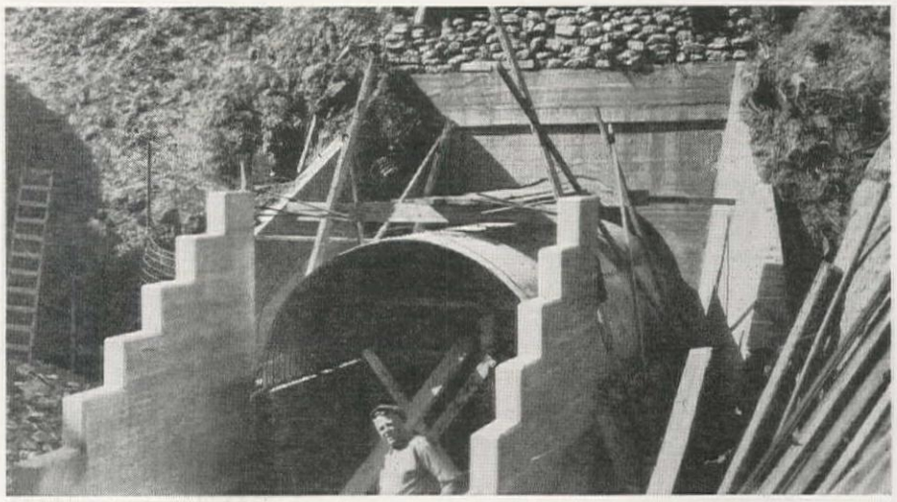
With the arch in place and fastened, the space between the old culvert and the arch was back-filled with cement grout (cement and sand) placed by compressed air through a 2-in. pipe. The remainder of the work consisted of extending the floor slab and building new head walls. Upon completion of the structure the highway fill was increased and the roadway widened.

The contract was carried out by Oswald Bros. of Los Angeles. The major bid prices were: $2,500 for the 100 ft. of corrugated culvert arch, including material and assembly; $20 per cu. yd. for the structural concrete for rebuilding the footings and floor slab and the new head walls; $25 per cu. yd. for the cement and sand grout for backfill.

Work was carried out under the general direction of the California Division of Highways, S. V. Cortelyou, district engineer, A. N. George, district construction engineer, and Paul Ruplinger, resident engineer. Tex Fisher was superintendent for Oswald Bros.

Placing cement grout by air pressure to backfill between the new arch and the old culvert. Material was mixed on the fill and chuted into the grout machine.

Arch in position and new head wall being built. Note and 20-ft. of added length needed to allow the highway to be widened on the fill.



California Highway Projects for 1936–37

Major items in the program for the current fiscal year

County	*Miles*	*Location*	*Amount*
		DISTRICT I	
Del Norte	5.1	Grade & surf. Winton Corner to 0.7 mi. S. of State Line	$140,000
Humboldt	7.3	Grade & surf., Salmon Cr. to Bucksport	165,000
Humboldt	2.1	Grade & surf, Trinidad to McNiel's Ranch	125,000
Lake	1.2	Grade, surf. & bridge, Upper Lake	71,000
Mendocino	4.5	Grade & surf., Outlet Creek to Reeves Creek	196,000
Mendocino	0.8	Grade, surf. & bridge, Eleven Oaks to Willits	60,000
		DISTRICT II	
Lassen	6.15	Grade & 7.55 mi. grade & surf	103,500
Lassen	6.6	Surf. Westwood to Coppervale	110,000
Shasta	1.5	Grade & surf., Sulphur Cr. to Boulder Cr. Hill	132,000
Shasta	5.0	Grade & surf., near Shasta to near Redding	220,000
Tehama	13.8	Surfacing, Rt. 3 to 1½ mi. E. of Dales	175,000
		DISTRICT III	
Butte	19.0	Grade & surf., Biggs Road to Chico	101,000
El Dorado		Bridge and approaches, Lower Crossing Truckee	40,000
Glenn	2.0	Grade & pav., Orland to northerly boundary	80,000
Glenn	10.0	Grade & surf., Willows to Orland (Por.)	250,000
Nevada	2.4	Surf., Sta. 123 to Junc. with Rt. 38	50,000
Nevada	3.8	Grade & pave., Fox Farm to Summit Station	145,000
Nevada	2.3	Grade & surf., Donner Grade to Sta. 123	110,000
Nevada and Sierra	5.0	Grade & surf., Floriston to State Line	50,000
Placer	5.5	Grade & pave., Roseville to Loomis	165,000
Yolo	0.4	Pave shoulders, "M" St. Subway to "M" St. Bridge	9,000
Yolo	10.8	Surface, Woodland to Knights Landing	17,000
Yuba and Sierra		Grade & surf., Nevada City to Downieville	49,190
		DISTRICT IV	
San Mateo	5.9	Grade, Farralone City to Rockaway Beach	425,000
San Mateo	4.5	Grade & pave, Beresford to Redwood City	390,000
Santa Clara	1.2	Grade & surf., 4th St. Extension in San Jose	81,000
Santa Clara	3.7	Grade, pave & bridge, Santa Clara-Alviso Rd. to San Jose	425,000
Santa Clara	10.0	Grade & surf., San Jose to Coyote	200,440
		DISTRICT V	
Santa Barbara	1.6	Grade, pave & bridge, Rincon to Carpinteria	125,000
Santa Barbara	1.6	Grade & pave, Sheffield Drive to Olive Mill	110,000
San Luis Obispo	3.5	Grade, pave & struc., Cuesta Grade	665,000

County	*Miles*	*Location*	*Amount*
		DISTRICT VI	
Fresno	3.4	Grade & pave, Biola Jct. to Herndon	230,000
Kern		Structures, bridges & dips East of Taft	36,000
Kern		Bridges (3), Oak Street Road	20,000
Kern	8.0	Grade & pave, Bakersfield to Arvin Road	260,000
Kern	6.0	Grade & surf., Maricopa to Taft	250,000
Tulare	6.83	Grade & pave, Strathmore to Lindsay	190,000
Tulare		Appr. Cottonwood Cr. Bridge	25,000
		DISTRICT VII	
Los Angeles	1.03	Grade & pave, Longden Ave. to Fairview Ave	70,000
Los Angeles	1.8	Grade & pave, Rosemead Ave	96,500
Los Angeles	2.0	Grade & surf., Palos Verdes Drive to Western Ave	200,000
Los Angeles		Grade & surf., Washington Blvd., Spence St. to Downey	100,000
Los Angeles		Grade & pave, Calabasas School to Brent's Junc	161,400
L. A. and Orange	11.93	Grade, pave & drainage, Firestone Blvd. & Manchester Ave.	242,000
Los Angeles		Grade & pave, Manchester Blvd. through Downey	62,000
Los Angeles	1.2	Grade & pave, State St., Lime St. to Stanley Ave	60,000
Los Angeles		Bridge across San Gabriel River	70,000
Los Angeles	1.5	Grade & pave, N & O Sts., Wilmington Blvd. to Alameda St.	150,000
Los Angeles	0.6	Grade & surf., Spadra Road to Rt. 19, Anaheim	30,000
Los Angeles		Bridge across L. A. River on Atlantic Blvd	186,000
Los Angeles	3.0	Grade, pave & bridge, Foothill Blvd	295,000
Los Angeles		Grade & pave, Atlantic Blvd. crossing L. A. River	85,000
Los Angeles	1.3	Grade & pave, Sepulveda Blvd., Lincoln to La Tijera	70,000
Los Angeles		Grade & pave, Sepulveda Blvd., La Tijera to Centinella	125,000
Los Angeles	1.1	Grade & pave, Marengo & Daly Sts	120,000
Los Angeles	2.0	Grade & surf., Azusa to San Gabriel River	100,000
Los Angeles		Grade & pave, Calabasas northerly (portions)	38,600
Los Angeles		Grade, pave & struc., Sepulveda Blvd	210,000
Los Angeles	2.5	Resurf. shoulders & culverts, Artesia, Atlantic to Cerritos	55,000
Los Angeles	1.2	Grade & surf., Philadelphia Ave. to Southerly boundary	41,700
Los Angeles		Remove tunnel, grade & surf. cut at Newhall Tunnel	150,000
Los Angeles		Grading, Red Box to Mt. Islip	263,000
Los Angeles		Oil shoulders, grade & pave, Rosemead Blvd	286,500
Orange		Bridge & approaches across Santa Ana River	50,000
Orange		Bridge & appr. across Santa Ana River	48,000
Orange	3.5	Grade & surf., Carolina Ave. to Yerba Linda	130,000
Orange	1.0	Grade & pave, S. E. of Placentia	56,000
Orange		Grade & surf., jog at Placentia Ave	20,000
Orange		Grade & surf., jog at 17th St. & Tustin Ave	20,000
Ventura		Bridge across Conejo Creek	14,375
Ventura		Bridge across San Antonio Creek	39,000
Ventura		Bridge across Todd Baranca	18,000
Ventura		Bridge across Hopper Canon Barranca	26,000
Ventura		Bridge across Big Sycamore Creek	45,000
Ventura		Teague-McKevitt Grade crossing S. P. R. R.	10,000
Ventura	1.0	Grade & pave, Big Sycamore Cr. Line change	105,000
Ventura	1.2	Grade & surf., San Antonio Cr. & Ferguson Line changes	106,000
Ventura		Grade & pave., Sespe Ranch to Fillmore	118,600
Ventura		Grade & pave., Camarillo to Oxnard	100,000
		DISTRICT VIII	
Riverside	2.3	Grade & surf., Beaumont to Bad Lands	95,000
Riverside		Bridge, Temecula Cr. at M. P. 72.3	27,000
Riverside		Structure across San Timoteo Creek	10,000
Riverside		Bridges and appr., Santa Ana River & Chino Cr.	40,000
Riverside	1.5	Grade, surf. & bridge, Rt. 26 to Palm Springs	200,000
Riverside	3.9	Grade & pave., West Boundary to Prado	205,000
San Bernardino	2.8	Grade, surf. & bridge, Java Cr. Separation Appr	60,000
San Bernardino		Grade, drainage & bridges, Ludlow to 20 mi. E. Amboy	20,000
San Bernardino		Grade & pave., Verdemont Cr. Separation Appr	20,000
San Bernardino	15.3	Grade & surf., Mt. Pass to Nevada State Line	415,000
San Bernardino		Bridge, Chino Drainage Canal	38,000
San Bernardino		Bridge, across Indian Creek	10,000
		DISTRICT IX	
Inyo	18.0	Grade & surf., 6 mi. W. Darwin to Panamint Sink	70,000
Mono	4.0	Grade & surf., Conway Summit to 1 mi. N. Bodie Rd.	182,615
Mono	2.7	Grade & surf., 4 mi. to 1.3 mi. S. of Coleville	34,000
Mono		Grade & surf., Bridgeport to 3 mi. E. of Walker Dam	38,250
		DISTRICT X	
Merced		Grade shoulders & resurf. Los Banos	210,000
Solano		Grade & resurf., in Benicia	10,000
Solano	2.0	Grade & pave., Vacaville	135,000
		DISTRICT XI	
Imperial		Grading & bridges, Brawley to Calapatria	75,000
Imperial		Surfacing, Holtville to Brawley	104,000
Imperial		Grade, surf. & bridges, Midway Wells to Calexico	75,850
San Diego	0.73	Grade & surf. appr. to Santa Margarita Cr. Bridge	48,900
San Diego	6.3	Grade & pave, Del Mar to Encinitas	245,000
San Diego	3.1	Grade & surf., Lake Hodges to Escondido	94,000
San Diego	2.75	Paving, El Cajon Ave	275,000
San Diego	3.0	Grade, Cuca Grade	25,000
San Diego	10.5	Grade, pave & struc., Las Flores Underpass to San Mateo Creek	480,000
San Diego	7.8	Grade & pave, Oceanside to Las Flores	440,000

Colorado News

WORK has started on the $1,000,000 Ralston Creek Dam project of the $7,500,000 Denver water works development. The United Construction Co., Winona, Minn., was successful bidder, and will soon have work well underway on outlet works and spillway. Water was diverted into the Moffat Water Tunnel early in June when a celebration was held at the .tunnel. Construction of additional tunnels and flumes on the project to bring water from Little and Big Vasquez Creeks into the tunnel was scheduled to be started during June by Utah-Bechtel-Morrison-Kasier Co. The remaining project for this extensive Denver water works development is a $1,000,000 pipeline job, which will be required from the Ralston Creek reservoir to the filtration plant (under construction), and from there to Denver.

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One of the major PWA projects recently placed under contract in Colorado is the Denver sewage disposal plant, which was awarded to Peter Kiewit Sons of Omaha, Nebr., for about $1,250,000. Work on the plant was scheduled to start early in July. The Monarch Engineering Co. has just completed a preliminary contract for cleaning up and leveling the site. The plant was described in *Western Construction News*, April, 1936. Chemical treatment will be used until Williams Fork water is diverted to the Eastern Slope and made available for dilution.

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The two bridges replacing those washed out in Colorado Springs by the Memorial Day flood a year ago, have been completed. The two combination steel and concrete structures were erected under the supervision of City Manager Mosley at a total cost of about $100,000.

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The Colorado State Supreme Court has ruled that municipal guarantees of payment for local improvement bonds in cities and towns is unconstitutional. The decision, however, does not invalidate the bond issues affected, but holds that the 1923 act of the legislature, in authorizing cities and towns to guarantee their local improvement bonds, is unconstitutional. Among the larger guarantees believed to have been eliminated are those of the City and County of Denver for the Park Hill storm sewer, the Cherry Creek flood control development and West Denver sanitary sewer district bonds, of which $1,119,000 are still outstanding.

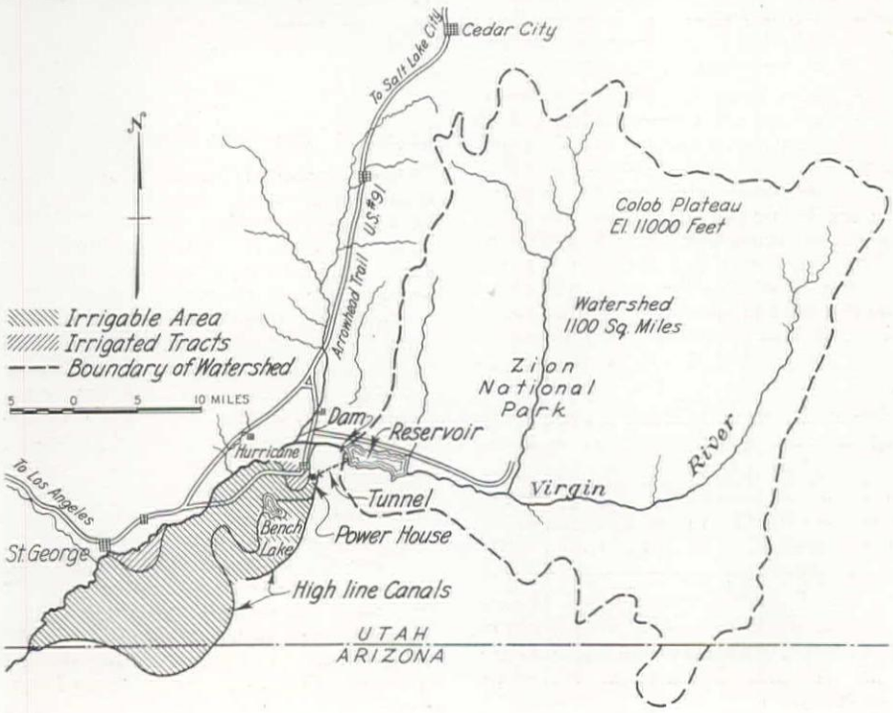
The decision was given in a case involving the issuance of bonds by the town of Aurora to finance a water district, comprising less than one-fourth of the town. The town refused to fulfill the guarantee when the improvement district defaulted.

A Program For Development of the Virgin River in Utah

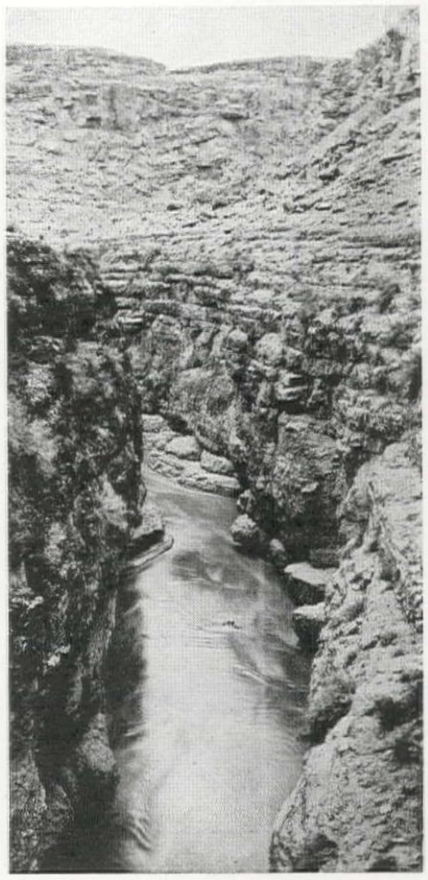
Project of irrigation for 30,000 ac., incidental power and community improvement in the Mormon "Dixie Land" — A preliminary outline of this $5,000,000 plan

LOCATED by scouts of Brigham Young, and one of the oldest settlements in the State of Utah, the valley of the Virgin River has long been referred to as the Mormon "Dixie Land", and is an irrigable area of unusual interest to the Mormon people. Following many studies made by Federal agencies on the possibility of irrigation development, with resulting favorable reports, the area and the available water supply have recently been re-studied by private interests, with the active support of prominent Mormon leaders, and a project has been planned, which would deliver water to 30,000 acres of carefully selected land, and provide homes for more than 2,500 families of Mormons who have already expressed a desire to return to this locality. The entire development, including the necessary water rights, land, power and construction development, is estimated to cost in excess of $5,000,000.

Sketch map of project showing Virgin River watershed, location of main storage, canals, irrigable areas and present settlements.



Damsite for the main storage of 100,000 ac. ft. in a narrow limestone canyon on the Virgin River. A 200-ft. rock and earthfill dam would contain 500,000 cu. yd. of material.



Several factors make this article, which outlines a proposed irrigation development in southern Utah, of immediate interest to readers of *Western Construction News,* even though it must be placed in our classification of "Work Contemplated." In the first place, it constitutes probably the only irrigation development now under serious consideration for private financing and development. Further, it programs an unusually complete plan for community development. Lastly, the area has a long and interesting history directly connected with the founding of the State of Utah. The following description, which may be considered a "preview" of this project, should be of interest to every reader in the field of irrigation engineering or construction.—Editor.

Historical

The valley of the Virgin River in southwest Utah, about 300 mi. south of the Great Salt Lake, was visited by scouts sent out by Brigham Young immediately after the arrival of his immigrants into the Salt Lake Basin. These early reports were particularly favorable to the possibility of settlement and agricultural development in the Virgin River valley, and history records that leaders stated that the area would become the "Dixie Land" of their settlement. This area has been referred to by the Mormons by this name for several generations.

A Mormon colony was founded at the present location of St. George at the time of the discovery of the valley, and the Mormon temple completed at that city immediately became an important factor in the lives of these settlers throughout the southwest.

By primitive methods and in the face of many difficulties, these first settlers built small diversion dams and ditches to irrigate some of the lands along the river. The crops were very satisfactory and the fruits and vegetables from this valley have become widely known for their excellent qualities and flavor.

At the present time, the development in this area includes about 1,800 ac. under irrigation near the small town of Hurricane, which has a population of 1,300, and also about 3,000 ac. under irrigation in the vicinity of St. George, which has a population of 3,000. Indicative of the high value of this soil when placed under irrigation, bankers in the community are reported to be lending up to $300 per acre on the developed and improved land.

Physical features

The Virgin River has its headwaters at an elevation above 11,000 ft. on the Colob Plateau, and discharges into the reservoir formed by Boulder Dam on the Colorado River. The watershed area of 1,100 sq. mi. includes Zion National Park. The government runoff record from 1909 to date indicates an average annual flow of 180,000-ac. ft. in the Virgin River at the point of proposed diversion.

The irrigable area in the valley occupies a position along the river for a distance of about 20 mi., with a maximum width of about 10 mi.

The elevation of this land is from 2,500 to 3,000 ft. above sea-level, and climatic and soil records, supported by the existing development, indicate that the area is suited to all types of deciduous fruits, nuts, vegetables, melons, grain, sugar beet seed, alfalfa and dairying.

For many years this valley had no adequate transportation facilities, but a modern paved highway now extends along the Virgin River valley; this highway is known as the Arrowhead Trail and is the principal route between Los Angeles and Salt Lake City, providing trucking access to these metropolitan areas.

Previous study

During the World War, and shortly after, government engineers made studies and presented favorable reports upon the possibility of successful irrigation development in the Virgin River valley. These reports encouraged the Mormon leaders and groups in their endeavor to undertake an enlarged development.

About the time the government highway was extended through the valley prominent Mormons obtained by appropriation and established, by court decree, water rights on the Virgin River sufficient to irrigate the most available areas, and undertook preliminary surveys for a project with the encouragement and coöperation of Federal and State agencies.

This project was beginning to take definite form when the depression stopped all such development. During the depression, however, the U. S. Bureau of Reclamation made a routine survey of this project, and has reported it to be a feasible and desirable reclamation project worthy to be undertaken by the government, if not developed by private interests.

Present program

Recently, through the active interest of groups of Mormon people throughout the West, and of officials of the State of Utah and of Washington County, these Virgin River water rights holdings have been consolidated under a single head, in order to render the development practical from the standpoint of control and financing, and the state engineer of Utah has extended these rights in good standing for a two year period, until June, 1938. These existing water rights are estimated to provide an adequate supply for 30,000 ac. of the best land in the valley, selected from the 60,000 ac. which could be placed under water. The annual duty has been estimated at 4-ac. ft. per acre per annum, with 5 ft. evaporation loss allowed in the reservoirs.

More than half of the land under consideration is owned by the government, and the balance is owned privately by about fifty owners who use the area in large tracts for sheep grazing. Based on a program which contemplates the selective colonization of Mormon families settling on 10 and 20-ac. tracts, the area of 30,000 ac. is estimated to provide homes and support for a population of about 12,000 inhabitants. The interest of the Mormon people throughout the West in this Virgin River development, according to reports, indicates that there are more than enough well qualified families available which are eager to make their permanent home on this area.

Irrigable land under the canal line on the first unit planned for development. The view looks west from Bench Lake, which is the site of the distribution reservoir.

Construction plan

Present preliminary plans for constructing the project, which may be revised with further study, include a main storage dam about 220 ft. high at a narrow site in solid limestone at the edge of the Hurricane Ridge Plateau. A rock and earth fill dam at this point would contain about 500,000 cu. yd., with a crest of 400 ft. long. This dam would provide 100,000-ac. ft. of storage, with a reservoir 4 mi. long and nearly 1 mi. wide covering about 2,000 ac.

The outlet from the reservoir would be through a 2-mi. tunnel which would terminate in the penstock for a power plant. With an 8x8-ft. cross section, this tunnel excavation would amount to about 30,000 cu. yd. of rock material. The power installation is incidental to the main project, and details have not yet been studied. The penstock drop, however, would permit of the generation of several thousand horse-power—ample for the needs of southwestern Utah.

Below the power house a regulating reservoir will be provided by expanding the present natural reservoir site known as Bench Lake. This enlargement can readily be accomplished by a levee about 25 ft. high and a little over a mile long connecting the low hills which border three sides of this lake area. This levee will involve about 500,000 cu. yd. of earth fill. The regulating reservoir will provide a storage of 50,000 ac. ft.

From this distribution reservoir the main conduit will continue through a system of smaller canals, laterals and pipes. This distributing system will require nearly 30 mi. of high-line canal, with bottom width ranging from 12 to 24 ft., and about 65 mi. of main distributing and main lateral ditches, with 4 to 10-ft. bottom width. Together with acreage laterals, the total canal system will require an excavation of approximately 2,000,000 cu. yd. Several miles of the above canals will be lined with concrete, and at several locations large diameter pipes and siphons will be necessary.

The development plan contemplates a civic center with modern utilities, and complete facilities for marketing, packing, refrigeration, warehouses, and industries using agricultural products.

The engineering of the project, and the program for financing and construction, are under the direction of Melville Dozier, Jr., consulting engineer of Los Angeles, who has been carrying out the necessary engineering and economic studies, with the coöperation of official representatives of the Mormon people and of the State of Utah.

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Asphalt Specifications

Three specifications for asphalt road construction have been published by the Pacific Coast Division of The Asphalt Institute. These specifications cover the following types of construction and repair work:

Surface Treatment 2 (S-2)—Original treatment of tightly bonded surfaces, such as water-bound macadam, clay gravel, sand clay, shale, limerock and similar types. The specification covers both hot and cold application.

Surface Treatment 3 (S-3)—Original treatment over loosely bonded surfaces, such as traffic-bound macadam, sandy gravel and cinders.

Base 6 (B-6)—Patching, reducing crown and correcting profile of old surfaces, to serve as foundations.

Copies of these publications are available at the office of the Asphalt Institute, 206 Sansome St., San Francisco.

A.W.W.A. National Meeting Held in Los Angeles

Record attendance at convention—Fifty-five technical papers presented—California projects and developments feature discussions

WITH a record-breaking attendance and a technical program which included the presentation of 55 technical papers, the American Water Works Association held its annual convention at Los Angeles, June 8 to 12. As an indication of the interest shown at the convention, which included an official registration of about 900, the banquet and entertainment, sponsored by the manufacturers division of the A. W. W. A., was attended by 1,015 delegates and guests. The California Section of the A. W. W. A. was the official host of the national body, and only complimentary remarks were heard from eastern delegates and officials as to the organization and effective manner in which the technical sessions and the entertainment was carried out by the local hosts.

In the opening session, President Frank A. Barbour of Boston, pointed the way to more effective service of the A. W. W. A. to water works engineers and operators through the stimulating of public interest in the importance of competent, well paid personnel in water supply and treatment service. Although he visioned an increasing membership in the national body, President Barbour was particularly interested in expanding the local sections to include all of the states, and to have these sections take more active interest in the welfare of the water works employees.

The reports of the secretary and treasurer of the National Association indicated a healthy condition of membership growth and financial stability. The next annual convention will be held in Buffalo, N. Y.

The new national president, inducted into office during the convention, is W. W. Hurlbut, engineer of water works, Bureau of Water Works and Supply, Los Angeles.

Because *Western Construction News* confines it coverage exclusively to the region of the eleven western states, papers which presented subjects by eastern engineers or discussion of eastern projects will not be reviewed in this report. Further, there is no need to present information to our readers on western projects which have already been covered by comprehensive articles in our previous issues. The following reviews some of the more important papers and subjects presented on western topics during the several technical sessions:

R. L. Derby of the Los Angeles Water Department, discussed methods of testing for boron, and its significance in water supplies of the West. This constitutes a typical western subject, because of the use of water for irrigation, and the serious effect of this element on plant growth. During the past decade, the subject has been studied with increasing care to determine the effect of boron in irrigation water and its particular significance in plant development. The special problem in the Los Angeles Water Department program results from the fact that the water supply from the Owens Valley aqueduct is used for extensive irrigation in the San Fernando Valley. Further, it has been found that during certain seasons of the year, this water contains boron in serious amounts as a result of spring runoff flushing out thermal areas in the headwaters of the Owen River. Analyses made of the waters from one particular creek running through a geyser area indicate that it contained 500 lb. of boron per day during this season of the year. As a result of this condition, the water department has diverted and wasted the flow of the aqueduct during certain weeks of the spring season of 1935 and 1936. This wastage amounted to about 6,000 ac. ft. of water, and it is estimated to have removed 78 tons of boron during the period from February 13 to April 20. The maximum boron content in the water during this period was 3.17 p.p.m., and as a result of this diversion, the water served for irrigation in the San Fernando Valley did not exceed from .55 to .70 p.p.m. at any time. This represents a decided improvement in water quality, compared to a figure of 1.0 to 1.5 p.p.m. during previous irrigation seasons.

Joseph M. Sanchis of the Los Angeles Water Department, discussed the testing for flourides and the significance of these compounds in water supplies. His paper dealt with the details of chemical analysis and the relative advantages and disadvantages of the several methods in use. As to the harmful effect of the element in water supply, an upper safe limit of 1 p.p.m. was given by Mr. Sanchis.

G. E. Arnold, sanitary engineer, San Francisco Water Department, discussed the problem of algal growths and insect larvae in water supplies. He pointed out that the sunshine and warm temperatures characteristic of the West, result in an unusual problem for water supply engineers in the control of plankton growths and insect life. Part of his paper consisted of a review of present copper-sulphating methods used at Pasadena, Los Angeles and San Francisco. The method developed at Los Angeles was reviewed in *Western Construction News*, December, 1935. The method more recently developed at San Francisco consists of a water spray to distribute the bluestone over the surface of the reservoir. The paper concluded with a review of various common insects, whose larvae live in water and a discussion of methods of preventing or removing these forms.

A symposium on filtration was presented, which included several papers by western sanitary engineers. The discussion was led off by C. M. Hoskinson, Sacramento Water Department, with a discussion of pre-treatment, which indicated the value of a rapid initial mix of chemicals and raw water, followed by a marked reduction in velocity.

The subject of coagulants was reviewed in detail by K. W. Brown, sanitary engineer, California Water Service Co., Stockton, covering the different types of chemicals in common use, with a discussion as to their characteristics and methods of handling.

H. N. Jenks, consulting sanitary engineer, Berkeley, Calif., reviewed filter design. He pointed out that the design of the filters during the past few years had become practically standardized, with most of the emphasis applied to the pre-treatment of the water to prepare it for filtering, so that the actual load on the filters would be reduced with resulting increase in efficiency.

J. D. DeCosta, sanitary engineer, East Bay Municipal Utility District, reviewed the design and operation of the Orinda filter plant, which has been

California Section Officers Elected

At the annual business meeting of the California Section, American Water Works Association, held during the Los Angeles convention, the following officers were elected:

President—R. F. Brown, Stockton.

Vice-President—J. E. Phillips, Los Angeles.

Secretary-Treasurer — Carl M. Hoskinson, Sacramento.

Executive Committee — J. R. Barker, San Francisco; H. H. Van Norman (Past President), Los Angeles; N. A. Eckart, (Ex-officio, Director, A.W.W.A.), San Francisco; George Hawley, Sacramento; J. S. Longwell, Oakland; J. S. Peters, San Rafael, and Fred Porter, Long Beach.

Director, A.W.W.A. — N. A. Eckart, San Francisco.

G. E. Arnold is chairman of the Purification Division.

described in *Western Construction News*, June, 1933.

The major water supply developments of California were discussed by the following: H. A. Van Norman, chief engineer and general manager, Los Angeles Bureau of Water Works and Supply, traced the development of the Los Angeles Water Supply System from the original grant of the water in the Los Angeles River by the King of Spain to the present extension of the system into Mono Basin, as reviewed in our June issue. The benefits of the Hetch Hetchy project to the water supply system of San Francisco were reviewed by N. A. Eckart, general manager and chief engineer of the San Francisco Water Department.

R. F. Goudey, sanitary engineer, Los Angeles Water Department, described in some detail the development of an automatic residual chlorinator, which controls the rate of chlorine feed through the taking of samples at 3-min. intervals, and automatically comparing them with a standard sample. This equipment, developed through the cooperation of the department and the engineering organization of the Wallace-Tiernan Co., has been under way for several years, and has resulted in permanent installations.

The equipment does not interfere with the usual variations of chlorine feed based on changes in flow through the conduits, but in addition, varies the feed in accordance with the demand of the water. Samples are removed from the conduit about 300 ft. below the point of chlorine application, and are compared with the samples by means of a photoglow tube with resulting change in dosage by the machine, depending on the result of this automatic examination. Mr. Goudey indicated that the changes in chlorine demand, indicated by the action of this machine, are far greater than anticipated.

"FORE" ENGINEERS: J. D. DeCosta (left), East Bay Municipal Utility District; K. W. Brown, California Water Service Co.; E. W. Green, San Jose Water Co.; C. P. Harnish, American States Water Service Co.

Entertainment features

The first of the major entertainment features on the program was the All-Division Dinner, which featured Bill Orchard and his "California Forty Niners." Drilled to the point of perfection, but incipient exhaustion, by the Wallace & Tiernan impresario, this group of entertainers, recruited entirely from the water works fraternity, provided an evening of exceptional entertainment. Bill Orchard, as master of ceremonies and feature entertainer, presented the officers of the Association to the gathering during the entertainment, with appropriately embarrassing remarks.

The dinner dance, sponsored by the Manufacturers Division, was the highlight of the week's entertainment, and broke all previous records when 1,015 delegates and guests sat down to this banquet.

Golf Prize Winners

Low Gross (Active Member)—Peter Diederich, Glendale, Calif., wins cup.

Low Net—O. Nelson, Council Bluffs, Iowa.

2nd Low Net—G. C. Northrop, New York City.

3rd Low Net—S. E. Tyberg, Los Angeles, Calif.

4th Low Net—H. E. Howard, Los Angeles, Calif.

5th Low Net—C. C. Casad, Bremerton, Wash.

6th Low Net—E. A. Rutledge, Los Angeles, Calif.

7th Low Net—H. A. Van Norman, Los Angeles, Calif.

8th Low Net — Ralph Hyde, Campbell, Calif.

9th Low Net—Frank Bachman, Chicago, Ill.

10th Low Net—R. H. Allen, Los Angeles, Calif.

11th Low Net—Tie—J. D. De Costa and E. W. Green. Prize drawn by J. D. DeCosta, Oakland, Calif.

12th Low Net—E. W. Green, San Jose, Calif.

13th Low Net—E. C. Brisbane.

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The golf tournament was held Wednesday afternoon under the direction of a committee headed by Claude Faw, chairman.

CALIFORNIA STARTS NEW BUILDING FOR PUBLIC WORKS DEPARTMENT

California is constructing a new building to house the State Public Works Department. The $750,000 structure is located near the capitol in Sacramento and is being built with the department's own funds, without legislative appropriation.

Of reinforced concrete construction, the building is 226 by 146 ft. in plan and four stories high, with provision for the addition of another story. The frame is designed for earthquake resistance and the equipment in the building provides air conditioning in all offices. General design features efficiency and practicability, rather than monumental appearance.

The Department of Public Works, of the State of California includes the following divisions: Highways, Water Resources, Architecture, Contracts and Rights of Way, and Ports.

Dedication ceremonies were held June 4, Earl Lee Kelly, Director of Public Works, presided.

Montana to Hold Conference On Bituminous Highways

THE Second Annual Montana Bituminous Conference, which will be devoted to technical papers and discussions on bituminous highway design and construction problems in the western region, will be held in Glacier National Park at Many Glacier Hotel, September 8-10. This meeting follows the initial conference held at Butte last year, which demonstrated an unexpected interest in such a session, with representatives from fourteen western states and the Province of Saskatchewan.

As the result of the 1935 meeting, this year's conference will emphasize open discussions of current problems, rather than the presentation of formal papers. It was the consensus of opinion expressed at last year's meeting that the greatest benefit was derived from informal discussions. There will be four papers presented at the 1936 conference, and three of these are to be analyses and summaries of a number of papers covering problems typical to certain localities. These summarizing papers will be presented by the chairman of the particular meeting, and this will be followed by a general discussion.

The first paper will be on the "Development and Fundamentals of Successful Bituminous Practice," and will be followed by the second on "Developments in Practical Design and Construction of Bituminous Surfaces," and by a third on the "Maintenance of Bituminous Surfaces." A highway engineer or official from one state in each of the groupings indicated below, will prepare a paper on one of these subjects, and these papers will be submitted to a general chairman for analysis and summary. At the present time, the temporary assignments for the presentation of papers are as follows:

"Developments and Fundamentals of Successful Bituminous Practice"

Chairman: Prof. F. C. Lang, engineer of tests, inspection and research, Minnesota Department of Highways; Group 1: C. F. Ramey, assistant chief chemist, Standard Oil Co. of California; Group 2: Levi Muir, materials engineer, Utah State Road Commission; Group 3: N. W. McLeod, research engineer, and H. R. MacKenzie, chief engineer, Department of Highways, Regina, Saskatchewan; Group 4: J. W. Kushing, research and testing engineer, and J. G. Schaub, assistant construction engineer, Michigan Highway Department; Group 5: A. E. Stoddard, assistant engineer of materials and tests, Iowa Highway Commission; Group 6: H. Allen, materials engineer, L. L. Marsh, assistant maintenance engineer, and J. R. Benson, assigned to bituminous research, Kansas Highway Commission.

"Developments in Practical Design and Construction of Bituminous Surfaces"

Chairman: N. F. McCoy, highway engineer, Bureau of Public Roads, San Francisco, Calif.; Group 1: Don Bourne, The Asphalt Institute, Olympia, Wash.; Group 2: W. A. Norris, past president Wyoming Engineering Society, Cheyenne; Group 3: J. N. Roherty, research engineer, North Dakota State Highway Commission; Group 5: F. V. Reagel, engineer of materials, Missouri State Highway Department; Group 6: F. S. Gilmore, The Asphalt Institute, Kansas City, Missouri; Group 7: Van T. Moon, chief engineer, Oklahoma Highway Dept.

"Maintenance of Bituminous Surfaces"

Chairman: H. G. Nevitt, manager, Road Oil and Asphalt Department, Socony-Vacuum Oil Co., Kansas City, Missouri; Group 1: R. P. Newland, division engineer, State Highway Commission, Washington; Group 2: D. L. Cheney, bituminous engineer, and Seward Mason, testing engineer, Montana Highway Commission; Group 3: W. N. Lovejoy, construction engineer, and J. F. Jacobs, maintenance engineer, South Dakota Highway Commission; Group 4: L. L. Allen, assistant maintenance engineer, Minnesota Department of Highways; Group 5: T. R. Perry, bituminous engineer, Iowa Highway Commission; Group 6: Prof. C. M. Duff, testing engineer, University of Nebraska; Group 7: L. C. Campbell, materials engineer, New Mexico Highway Department.

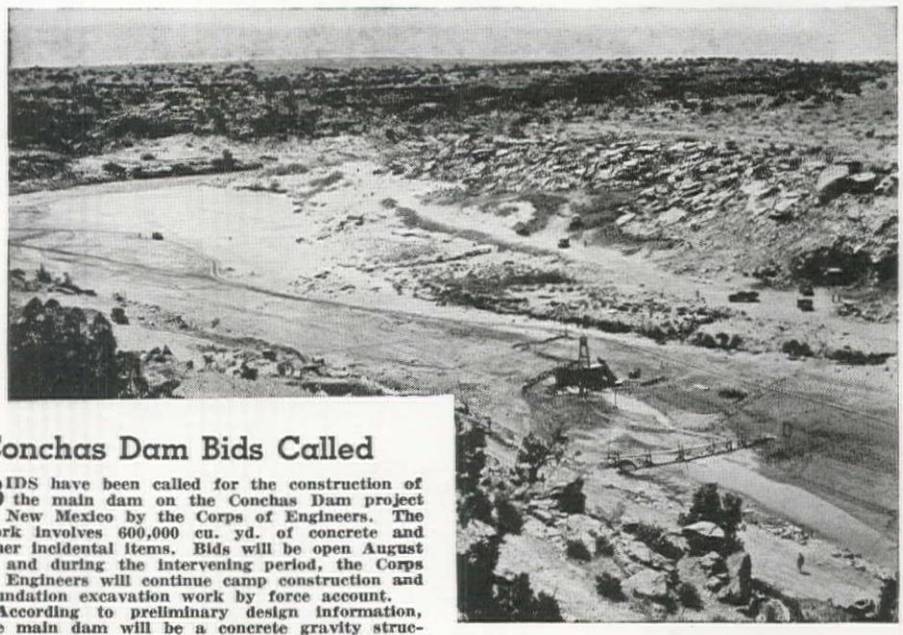
The fourth formal paper to be presented will be one titled, "A Review of Analytical Engineering Methods as Applied to Bituminous Construction," by Prof. L. D. Conkling, civil engineering department, Montana State College. This paper is intended to set forth some thoughts on importance of research in connection with bituminous construction and maintenance.

The territory to be covered by the discussions has been divided into the following grouping:

Group 1—California, Oregon and Washington.
Group 2—Utah, Idaho, Montana and Wyoming.
Group 3—North Dakota, South Dakota and the Province of Saskatchewan.
Group 4—Minnesota, Wisconsin and Michigan.
Group 5—Missouri and Iowa.
Group 6—Nebraska and Kansas.
Group 7—Texas, Oklahoma and New Mexico.

The Montana State Highway Commission, which is sponsoring this conference, is particularly pleased to announce the securing of the Many Glacier Hotel in Glacier Park for the sessions. The Hotel company has agreed to furnish meals and lodging at $6.00 per day.

The foregoing information relative to the 1936 conference was furnished by E. B. Donohue, assistant state highway engineer of Montana. D. A. McKinnon is state highway engineer of Montana.



Conchas Dam Bids Called

BIDS have been called for the construction of the main dam on the Conchas Dam project in New Mexico by the Corps of Engineers. The work involves 600,000 cu. yd. of concrete and other incidental items. Bids will be open August 1, and during the intervening period, the Corps of Engineers will continue camp construction and foundation excavation work by force account.

According to preliminary design information, the main dam will be a concrete gravity structure about 220 ft. high and 1,160 ft. long, located in the canyon of the South Canadian River, near Tucumcari, New Mexico. A general preliminary statement concerning the project appeared in "Western Construction News," February, 1936. The main dam will be supplemented by earth dikes having an aggregate length of about 4 mi., and containing about 3,400,000 cu. yd. of fill.

The reservoir will have a capacity of about 600,000 ac. ft., which will provide 300,000 ac. ft. for irrigation, 200,000 ac. ft. for flood control, with 100,000 ac. ft. for dead storage.

The photograph shows the site with work under way in the rock quarry and exploratory operations in the river channel.

Captain Hans Kramer, Corps of Engineers, is district engineer in direct charge of the work.

Construction Design Chart

X. Spans for Form Joists: Deflection

By JAMES R. GRIFFITH
Professor of Structural Engineering
Oregon State College

THE accompanying chart for deflection, like the preceding two for flexure and shear in joists and studs, requires for a solution two lines intersecting on the "SUPPORT." Lines have been drawn on this chart in order to determine the allowable span for deflection using the same problem:

Height of concrete = 2 ft.
Spacing of studs = 24 in.
Size of studs = 2 × 4, S4S

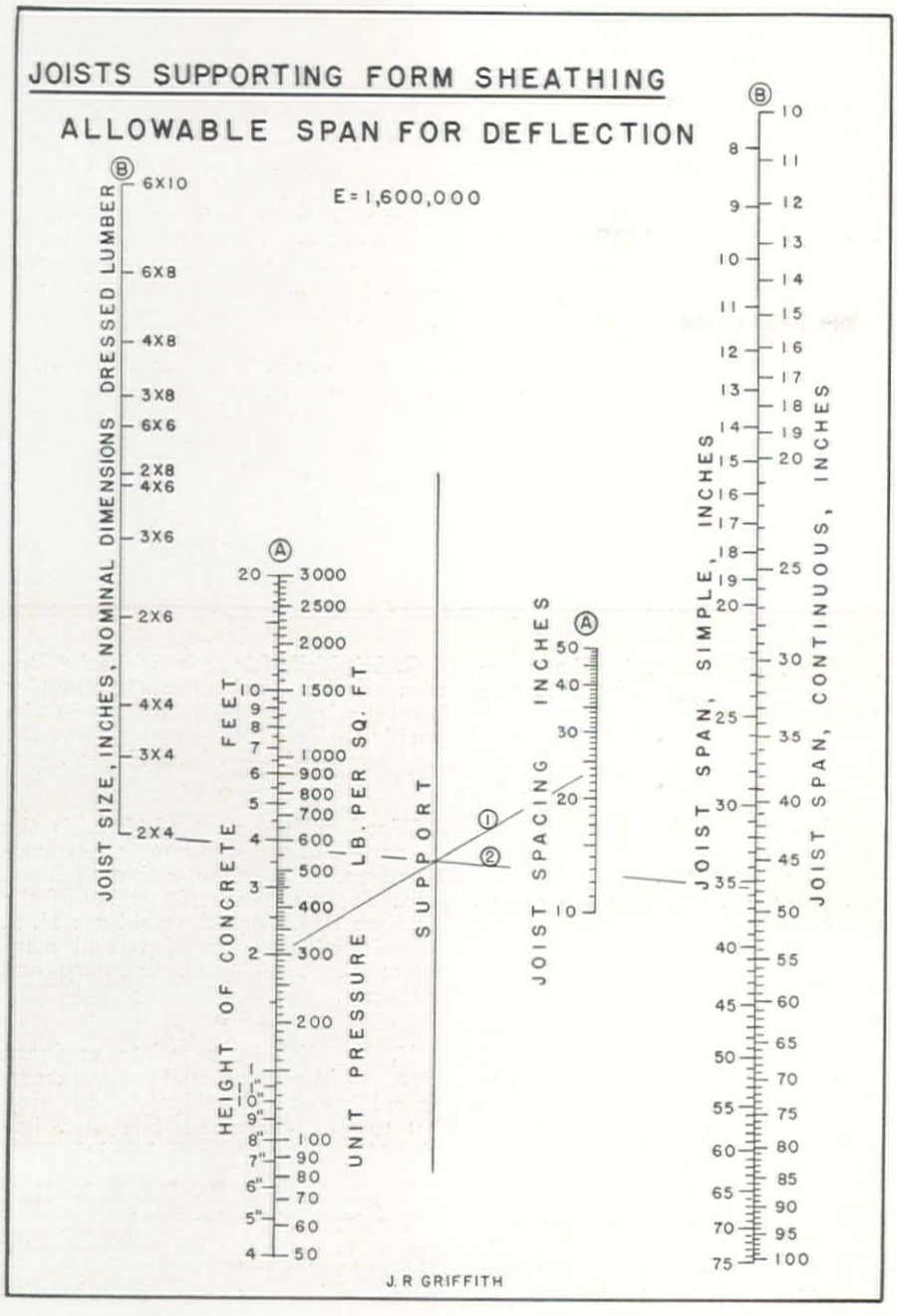
When the stud is continuous over more than two supports, the allowable spacing of the ties, as indicated on the chart, is slightly less than 48 in.

The above value found for the allowable spacing of ties for deflection is checked in the following solution:

Total span load, $W =$

$$2 \times 300 \times \frac{48}{12} = 2400 \text{ lb.}$$

Moment of inertia of 2 × 4 stud, $I =$ 6.45 in.⁴



Max. deflection, $D = \frac{0.0054 \times W \times L^3}{E\,I} =$

$$\frac{0.0054 \times 2400 \times 48^3}{1{,}600{,}000 \times 6.45} = 0.1388 \text{ in.}$$

Allowable deflection =

$$\frac{L}{360} = \frac{48}{360} = 0.1333 \text{ in.}$$

This result checks that obtained by the chart for the span of 48 in. as used gives a deflection slightly in excess of that allowed. On the chart we saw that the allowable span was slightly less than 48 in.

The assumption made in computing the maximum deflection in a continuous beam is that the end span acts as a single span fixed at one end and hinged at the other end. This is the same assumption made in computing the allowable deflection in form sheathing. If instead of being a continuous span a single simple span is to be used, the adjustment is made on the chart by using the scale marked for simple spans.

Summarizing the values found for the allowable spacing of the ties in the problem solved in this and the two preceding issues, we have:

Stress Condition	Allowable Spacing of Ties
Flexure, 1,200	29 in.
Shear, 120	15 in.
Deflection	48 in.

Thus it will be seen that shear is the controlling factor in this particular problem even with the allowable shear at 120 lb. per sq. in. If flexure is taken as the controlling factor, as is frequently done, the maximum unit horizontal shear would have been

$$v = \frac{29}{15} \times 120 = 232 \text{ lb. per sq. in.}$$

Short time loadings at first may seem to justify the use of high allowable unit stresses. But on the other hand, when we ignore the effect of impact from concrete being dumped into the form, we are doing so on the justification that timber can safely carry excessive loads for short durations.

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Yakima Tunnel Awarded

CONTRACT was awarded June 18 for the construction of a 4,272-ft. section of tunnel No. 1 on the Yakima Ridge Canal, Roza Division of the Yakima Project to the Morrison-Knudsen Co., of Boise, Idaho, on its bid of $292,013.25. The successful bid was low among five received and opened by the Bureau of Reclamation at its Yakima, Washington, office May 28. Morrison-Knudsen Co. already has begun work on the upper end of tunnel No. 1 and on tunnels No. 2 and No. 3 on the Yakima Ridge Canal, having been awarded the contract for this construction several months ago.

Superintendents on the Job. . .

C. D. Delbiss is the superintendent on the Bodenhamer Construction Co., Oakland, contract for an undergrade crossing at San Leandro St. in Oakland. Contract was awarded on a bid price of $214,065.

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Howard R. Richardson will be superintendent on the 6-mi. highway grading contract held by B. D. Palfreyman, Provo, Utah, between Ovid and Sharon in Bear Lake County, Utah.

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Guy V. Isbell, will serve as superintendent on the 9.8-mi. grading and surfacing job of the Isbell Construction Co., Reno, Nev., in Esmeralda County, Nev. John Parmeter will be grading foreman, and C. C. Davis, timekeeper.

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L. W. Hansen has been named superintendent for the grading and paving job between Gypsum Creek and Riverside County line in Orange County, Calif. This contract amounting to $165,000 is held by Gibbons & Reed of Burbank, Calif.

•

E. R. Goldapp will serve as job superintendent on the $410,000 overcrossing project under construction by the Hoffman Construction Co., Portland, Ore. This crossing will span the S. P. Railway on Union Ave. in East Portland and the Oregon City Highway. O. F. Sunde is general superintendent of the Hoffman Construction Co. operations.

•

Ben Williams has been appointed superintendent on the present construction work on the YGB Line, and the grading project in Lewis and Clark National Forest, Cascade County, Mont. The contractor holding the contract for this work is James Crick of Spokane, Wash.

•

Charles Crosby will be superintendent on the steel bridge project over the Belle Fourche River, near Moorcroft, Crook County, Wyo. This job is being carried out by the Inland Construction Co. of Omaha, Nebr. James O'Marr will be timekeeper and contractor's engineer.

•

M. P. Butler will be superintendent on the $85,000 construction project consisting of two undercrossings of the Great Northern Ry. in Wenatchee, Wash. The contract for this project is also held by Mr. Butler of Seattle, Wash. Carl Heinrick will be grading foreman.

•

William Vonder Hellen will be in direct charge of the $369,000 contract awarded to him for the 5.8-mi. grading job on the Big Oak Flat Road, in Yosemite National Park, Mariposa County, Calif.

•

C. A. Wellman is the superintendent on the $122,247 contract held by the Sibley Grading and Teaming Co. of San Francisco for construction of the Marina-North Point discharge sewer in San Francisco.

•

Max J. Dunham is field engineer on the Hanrahan Co. contract for state highway work between Fresno, Calif., and Biola Junction. He formerly served as field engineer with the Aqueduct Construction Co. on the Colorado River aqueduct project and prior to that time was with the engineering department of the Metropolitan Water District.

•

Ted Y. Johnston has resigned from the Asphalt department of the Associated Oil Co. to become superintendent for the Hanrahan Co. on the highway project to be carried out by that organization, at Fresno, Calif.

•

C. H. Merrill, formerly of Warren Bros. of Boston, will succeed Mr. Johnston in the asphalt department of the Associated Oil Co.

•

R. C. Sheedy has been appointed superintendent on the large undergrade crossing contract of Eaton & Smith, San Francisco, for work near Niles, Calif. The work consists of six highway structures under the S. P. and W. P. tracks and 2.9 mi. of grading and paving; the bid price was $453,162.

Personnel Changes in Oregon Highway Staff

Because of increased activities, a new division for the purpose of administration and supervision has been created by the Oregon Highway Department. The new division embraces the territory in the vicinity of Portland, new headquarters, and includes a part of old division No. 1 which had headquarters at Salem together with Hood River County to the east in old division No. 3.

E. A. Collier, formerly No. 2 division engineer at Roseburg, will have charge of new division No. 1 at Portland. T. A. Eason, assistant division engineer at Salem, will be promoted to district engineer at Salem, headquarters for district No. 2, K. D. Lytle will be transferred from Bend to Roseburg and W. E. Chandler, previously at Salem, will be in charge of the Bend office. W. E. Williams will remain at La Grande in charge of district No. 5.

Several changes have also occurred in the maintenance department. C. C. Seely, engineer at Klamath Falls, replaces George Gray at Astoria and George Southman of Redmond will replace Seely. W. S. Hodges of The Dalles will go to Redmond and U. V. Koons, in charge of maintenance work at Baker, will be transferred to The Dalles. Henry J. Miller, construction engineer at Baker, has been promoted to maintenance engineer. R. H. Baldock is state highway engineer of Oregon with headquarters at Salem.

Personally speaking. . . .

Joseph A. Whetstone has been appointed superintendent of the Seattle Water Department.

•

Francis J. Thomas, associate engineer, Bureau of Reclamation, has been assigned to duty on the Caballo dam in New Mexico.

•

Roy Randall, office engineer in the Colorado State Highway Department, is acting as temporary district engineer of District No. 7, with headquarters at Greeley, Colo., a position occupied by the late A. B. Collins.

•

William Kilmore, Bureau of Reclamation, is serving as chief inspector on the Taylor Park dam in Colorado during the present season.

•

Charles G. Anderson, engineer in the Denver office of the Bureau of Reclamation, has been transferred to the Casper-Alcova project in Wyoming.

G. Waddell, formerly with the Bureau of Reclamation on the Boulder Dam project, is now serving in the position of concrete inspector on the Alamagordo dam in New Mexico.

•

Woodworth & Cornell, Inc., is the new name of the well known construction firm of Albertson & Cornell Bros., Inc., Tacoma, Wash. Members of the firm are D. I. Cornell, president; H. S. Woodworth, vice-president and manager; G. L. Falskow, secretary and treasurer.

•

F. H. Nichols, associate engineer, Bureau of Reclamation, has been transferred from the Boulder Canyon project to take charge of dam investigations in southwestern Colorado.

•

Stanley M. Mercier, in charge of the elaborate conveyor installation at the Grand Coulee and Fort Peck dam projects has joined the sales engineering

"After TALKING TO MARION CLUTCH TYPE OWNERS . . . TO BUY ONE OURSELVES WAS THE OBVIOUS THING TO DO" SAYS

George L. Potts

President

POTTS & CALLAHAN CONTRACTING CO., INC.

Baltimore, Md.

"Marion shovels are not new to 'Bill' Callahan, my partner, and me. Our first shovel was a Marion Type 41 steamer which led to the purchase of other Marions of various sizes and capacities. When the question of a small shovel came up we watched several Marion Clutch Type Excavators very critically . . . talked to several owners . . . compared their production records . . . and consistent high yardage performance with low maintenance cost led us to buy the Marion Type 371 Clutch Type excavator we now own. It is a real machine." « « « « « «

MARION

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A MACHINE FOR EVERY MATERIAL HANDLING JOB

WRITE FOR BULLETIN DESCRIBING MARION FEATURES

THE MARION STEAM SHOVEL COMPANY

MARION, OHIO, U. S. A.

The Marion Type 371 owned by Potts & Callahan Contracting Company, Inc., Baltimore, Md., which along with two other Marions handled 252,000 cubic yards of material in 90 days in digging the foundation for the Department of Interior Building, Washington, D. C. It was on the job 24 hours a day.

Marion Excavators are distributed in the West by Myers Company, 530 East Overland Street, EL PASO; Wilson Machinery Company, 2811 Walnut Street, DENVER; Marion Steam Shovel Company, 1231 Woodswether Road, KANSAS CITY; Marion Steam Shovel Company, 316 East Third Street, LOS ANGELES; Howard-Cooper Corporation, 307 S. E. Hawthorne Blvd., PORTLAND; Lang Company, 267 W. First St., South, SALT LAKE CITY; Edward R. Bacon Co., Folsom at 17th Street, SAN FRANCISCO; Howard-Cooper Corporation, 1520 Fourth Avenue South, SEATTLE; Howard-Cooper Corporation, S. 126 Walnut Street, SPOKANE; Howard-Cooper Corporation, Shoshone and 3rd Street, TWIN FALLS; C. G. Cotteral Machinery Co., 519 Metropolitan Building, VANCOUVER, B. C.

staff of the Boston Woven Hose & Rubber Co., with headquarters in Boston.

•

R. R. Skinner, associate engineer, Bureau of Reclamation, has been transferred from the Boulder Dam project to the position of concrete engineer on the Roza project at Yakima, Wash.

•

Charles D. Vail, state highway engineer of Colorado, was awarded an honorary degree in civil engineering by the University of Illinois at the recent commencement exercises of that institution. He graduated from the University of Illinois in 1891 with the degree of B. S. in Civil Engineering.

•

Nathaniel A. Carle, consulting engineer of Seattle, has been named city engineer of that municipality. Mr. Carle is a graduate of Stanford University, and has served in a wide variety of engineering positions in various parts of the country. His first engineering work was in Alaska in 1899, and after several years with construction equipment companies, he spent three years with the Puget Sound Bridge and Dredging Co., followed by a ten-year service as chief engineer of the Public Service Electric Co. in New Jersey. He also has had extended experience in hydroelectric management and operation. Mr. Carle succeeds Thomas R. Beaman.

•

Koebig & Koebig, consulting engineers, Los Angeles, have been retained by Bell, Calif., to make an appraisal of the holdings of the American States Water Service Co., within the city and the holdings of the Mutual Water Co., within the same corporate limits. The purpose of this appraisal is for the Council to ascertain whether they wish to make an offer to purchase the holdings of both companies or build an entirely new water system.

•

Major H. A. Skerry, executive officer of the Bonneville section of the U. S. Engineers' Office at Portland, has been assigned to duty at Iowa State College at Ames. Major Skerry was transferred from Fort Lawton in Seattle to Bonneville early in 1934 when major construction on the Bonneville project was started.

•

Capt. J. S. Gorlinsky, resident engineer at Bonneville dam on Columbia River, has been assigned to duty at the War Department's Industrial College at Washington, D. C. Captain Gorlinsky has been associated with the Bonneville project since its inception, having first served as executive officer in the Portland office until July, 1934, when he was transferred to the field office as resident engineer for all phases of construction. **Capt. Colby M. Myers,** executive officer at Bonneville dam, has been named resident engineer for the project to succeed Capt. J. S. Gorlinsky. **Lieut. C. D. Bonesteel** will replace Captain Colby as executive officer.

Obituaries . . . . .

Francis Gordon, internationally known civil engineer, who was connected with the design and construction of the Assuan Dam on the Nile River in Egypt died in Burlingame, Calif., June 16.

•

John A. Holmstrom, vice-president of the Griffith Company of Los Angeles, died June 17, in Whittier, Calif. Mr. Holmstrom had been with the Griffith Co. and its predecessor organization continuously for more than 20 years. He had been in charge of many important construction jobs carried out by the Griffith Co. in Southern California, including important highway projects and work on the All-American canal.

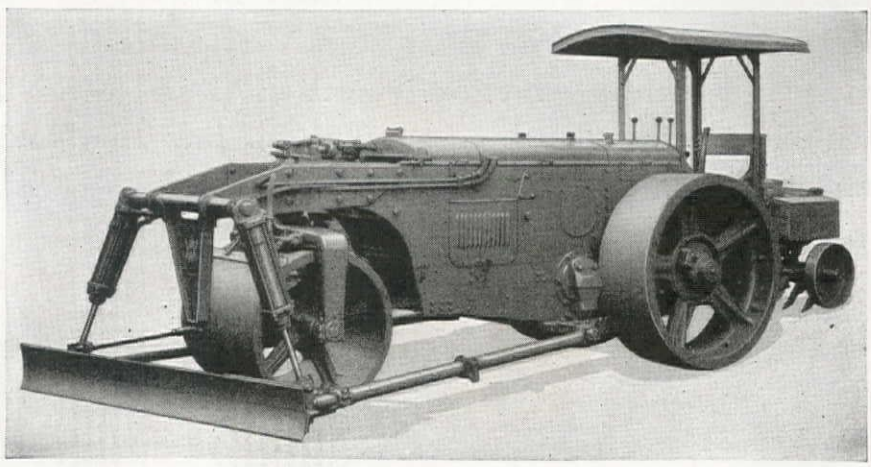
•

Burton P. Fleming, age 55, chief engineer of the Federal Soil Conservation Service in the states of Colorado, Arizona, New Mexico, and Utah, died recently in Glendale, Calif. He was a well known engineer in the intermountain and southwest regions and had served on several important projects. He was for several years the manager of the Elephant Butte Irrigation District, with headquarters at Las Cruces, New Mexico, and was the author of the book, "Practical Irrigation and Pumping."

•

Charles K. Cadman, well known San Francisco engineer, and one of the veterans of the Panama Canal project, died at his home in San Francisco, June 28, at the age of 74. Mr. Cadman came to San Francisco in 1877 from his early home in Michigan. He served for a 3-year period on the engineering staff of General Goethals, during the construction of the Panama Canal, and was connected with several large eastern projects, in addition to directing work on many western developments, including dam and railroad construction. During the past several years, Mr. Cadman devoted himself exclusively to safety engineering. He was a member of the American Society of Civil Engineers, American Society of Safety Engineers, and the Engineers Club of San Francisco. He is survived by Charles M. Cadman, president of Pacific Coast Aggregates, Inc., and Dr. Paul F. Cadman of the University of California.

New Materials and *Equipment* . . . . .



Planer Attachment for Rollers

Austin-Western Road Machinery Company, of Aurora, Illinois, has developed a new hydraulically controlled planer attachment for use with six, seven, and eight-ton rollers. It consists of a seven-foot blade designed for finishing subgrade and other types of grading where rolling is required. A two-foot extension may be added at either end if desired. The blade bit is reversible.

The blade may be set to remove excess of material at any height and may be set straight across the machine or angled to allow material to windrow to the left of the roller. Adjustment is accomplished by hydraulic control valve operated from the roller platform.

•

New Ateco Welder

A new welder, designed for portability and sturdiness, has been announced by American Tractor Equipment Company, Oakland, Calif., manufacturers of earth

. . . And the real difference begins to show up after the rope is put to work. It is on the job that "HERCULES" (Red-Strand) Wire Rope has proved, and continues to prove, its exceptional value.

Quality in wire rope, which means those properties which insure *consistent* durability, is never a matter of chance—and we are always glad to supply full particulars on our products to everyone interested in saving money on their wire rope purchases.

Why not give "HERCULES" (Red-Strand) Wire Rope a chance to prove to you how different it is from just wire rope? Check its actual service for uniformity, durability and long-run economy. You will find there is a world of difference.

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Established 1857

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Portland . . . . . Foot of Sheridan Street

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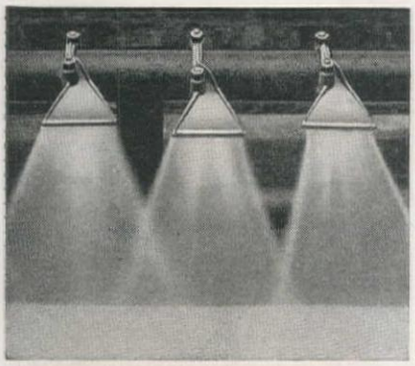
MISSOULA . . . . . Westmont Tractor & Eqpt. Co.
PHOENIX . . . . . Pratt-Gilbert Hardware Co.
RENO . . . . . R. D. Jenkins & Son
SALT LAKE CITY . . . . . Z. C. M. I.
SEATTLE . . . . . H. J. Armstrong Company
SPOKANE . . . . . Nott-Atwater Company
STOCKTON, CALIF. . . . Hickinbotham Bros., Ltd.

moving equipment. This new welder is available with or without a rigidly connected trailer undercarriage. A bail is attached directly to the main frame so it can be lifted into difficult locations by a crane or loaded and unloaded from a truck readily, also the ends of the main frame members are bored for insertion of bars for hand lifting.

Power is supplied by a four-cylinder Ford industrial motor, developing 23 h.p. SAE rating. Radiator, electric starter and fan of Ford make are provided. The generator is of Ateco-Roe design and construction, with a capacity of 300 amperes. This generator is built especially for welding service.

Design is for continuous operation without exceeding a temperature of 60 degrees Centigrade.

●



New Spray Nozzle

Announcement is made by Link-Belt Company that it has developed a simple, effective non-clogging spray nozzle for spraying, washing, cleaning all kinds of materials.

It is described as a scientifically shaped, curved bronze deflector with U-bolt for clamping the deflector securely to water pipe, in such a position that it is just above the orifice (a plain drilled hole) in wall of pipe. The width of deflector permits a comparatively large water jet, and thus allows fairly large dirt particles to pass through the orifice without clogging it.

A new four-page illustrated Folder No. 1407 describes the nozzle, and gives capacities in gallons of water per minute. Copy may be obtained by addressing Link-Belt Company's nearest office.

●

LeTourneau Doubling Plant Capacity

Marking the third plant enlargement in little more than a year, R. G. LeTourneau, Inc., builders of large capacity earthmoving machinery, have started construction of an addition to the Peoria, Illinois, factory that will more than double its present size and capacity.

The new addition will give the Peoria plant a total length of 1,200 ft., an area of 174,000 sq. ft. Present capacity of this plant is rated as three Scrapers per day, supplemented by the production of various other LeTourneau units. Enlarged capacity will be seven Scrapers per day, plus a large number of other units.

The present Stockton plant was built

UNIT BID SUMMARY . . .

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

Water Supply Systems . . . . .

Denver, Colorado—City—Tunnel, Conduit, Dams, and Siphon

Contracts awarded to Utah Const. Co., Box 726, Ogden, Utah, and Morrison-Knudsen Co., Inc., 319 Broadway, Boise, Idaho, $573,571 (Units Nos. 10 and 11) and to Thompson Mfg. Co., 3001 Larimer St., Denver, Colo., $79,688 (Unit No. 12) by Board of Water Commissioners, City-County Bldg., Denver, Colorado (subject to PWA approval), for constructing the Vasquez Creek Tunnel, Vasquez-St. Louis Collection Conduit, Diversion Dam and Intake Works and Steel Siphons Nos. 1 and 2. Bids from:

	Unit No. 10	Unit No. 11	Unit No. 12	Grand Total
(1) M. E. Carlson, Denver, Colo.	.....	$596,685	.....	.....
(2) Thompson Mfg. Co., Denver	.....	.....	$79,688	.....
(3) Crook & Henno, Denver	$ 80,731	.....	.....	.....
(4) Peter Seerie, Denver	123,623	499,883	.....	$623,507
(5) Chicago Bridge & Iron Works, Chicago	.....	.....	85,358	.....
(6) Hinman Bros. Constr. Co., Denver	127,969	.....	.....	.....
(7) Utah Const. Co., & Morrison-Knudsen Co., Denver	128,051	445,520	.....	573,571
(8) Engineers' estimate	107,623	384,276	77,243	569,142

UNIT No. 10—Tunnel No. 1, Vasquez-St. Louis Collection Conduit:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
700 cu. yd. excav. in open cut	.....	.....	$.60	$1.50	.....	$1.50	$.90	$1.50
5,800 cu. yd. excav. in tunnel	.....	.....	9.25	15.00	.....	14.65	16.50	$14
20 M ft. BM timb. in tunnel	.....	.....	$72	$80	.....	$90	$115	$90
715 cu. yd. conc. tunnel lining, No. 1	.....	.....	$14½	$22	.....	$28	$20	$16
330 cu. yd. same, No. 2	.....	.....	$16	$22	.....	$28	$20	$16
179 cu. yd. conc. intransitions	.....	.....	$24	$28¼	.....	$35	$27	$16
60 cu. yd. grouting in tunnel	.....	.....	$39	$60	.....	$35	$23	$30
18,200 lb. reinf. steel	.....	.....	.07	.06	.....	.08	.07	.055
1,400 lb. steel pipe & vent pipe	.....	.....	.26	.15	.....	.20	.11	.12
1,000 lb. stl. water tight door	.....	.....	.45	.25	.....	.20	.15	.12
Lump sum, drain at East Portal	.....	.....	$475	$250	.....	$90	$220	$300
15 cu. yd. cement gunite, tunnel	.....	.....	$25	$35	.....	$35	$34	$40

UNIT No. 11—Canals and Dams	(1)	.....	.....	(4)	.....	.....	(7)	(8)
218,900 cu. yd. com. excav. for canals	$.80	.....	.....	.48	.....	.....	.45	.30
38,900 cu. yd. rock excav. for canals	1.50	.....	.....	1.50	.....	.....	1.00	1.05
7,650 cu. yd. com. exc. bench flumes	1.00	.....	.....	1.50	.....	.....	.70	.50
7,650 cu. yd. rock exc. bench flumes	2.00	.....	.....	2.25	.....	.....	1.00	1.05
7,200 cu. yd. com. exc. struc. dry	1.00	.....	.....	1.00	.....	.....	1.15	1.25
540 cu. yd. exc. struc. wet	$10	.....	.....	3.00	.....	.....	3.00	3.00
1,460 cu. yd. rock exc. struc. dry	2.00	.....	.....	2.50	.....	.....	3.00	3.00
60 cu. yd. rock exc. struc. wet	5.00	.....	.....	6.00	.....	.....	8.00	5.00
2,225 cu. yd. rolled earth fill, for Little Vasquez and Big Vasquez Dams	1.50	.....	.....	.60	.....	.....	.85	1.00
2,300 cu. yd. rolled earth back fill	1.50	.....	.....	.20	.....	.....	.65	1.25
750 cu. yd. conc. Little Vasquez and Big Vasquez Dams	$24	.....	.....	$23	.....	.....	$21	$16
700 cu. yd. conc. intake struc., etc.	$24	.....	.....	$28	.....	.....	$30	$19
1,015 cu. yd. concr. bench flumes	$24	.....	.....	$26	.....	.....	$22	$19
560 cu. yd. conc. pier & anchor piers	$24	.....	.....	$26½	.....	.....	$23	$20
9,680 cu. yd. conc. canal linings, etc.	$22	.....	.....	$19	.....	.....	$17	$17
370 sq. yd. cobblestone paving	3.00	.....	.....	3.00	.....	.....	2.30	2.00
280 sq. yd. stone riprap, spillw., etc.	5.00	.....	.....	4.00	.....	.....	3.00	2.00
350 cu. yd. dumped & spread stone riprap	3.00	.....	.....	3.00	.....	.....	5.70	1.50
229,000 lb. reinforcing steel	.056	.....	.....	.06	.....	.....	.06	.055
2,020 lin. ft. copper expansion joints	.50	.....	.....	.75	.....	.....	.70	1.00
16,800 lb. taintor gates & trash racks	.20	.....	.....	.20	.....	.....	.18	.12
Lump sum, sluice gates, opr. stands & gatev.	$1,500	.....	.....	$1,200	.....	.....	$2,900	$1,500
Lump sum, creo. timb. & rubbel belting seals	$100	.....	.....	$150	.....	.....	$460	$75
251 lin. ft. pipe railing	4.00	.....	.....	4.00	.....	.....	2.30	2.50
3 drains (L. S. per drain)	$500	.....	.....	$500	.....	.....	$400	$250
Lump sum, vortex orifice tubes	$800	.....	.....	$1,200	.....	.....	$575	$200
110 cu. yd. grout for sealing rock	$50	.....	.....	$20	.....	.....	$46	$30
50,000 sta. cu. yd. haul exc. matls	.03	.....	.....	.04	.....	.....	.04	.005

UNIT No. 12—Steel Siphons No. 1 and No. 2	.....	(2)	.....	.....	(5)	.....	.....	(8)
883,000 lb. struc. steel towers	.....	$.0877	.....	.....	$.094	.....	.....	$.085
7,100 lb. gates, valves and appurt.	.....	.0805	.....	.....	.081	.....	.....	.08
Lump sum, gates, valves & appurtenances	.....	$245	.....	.....	$265	.....	.....	$200
350 lin. ft. vitrified pipe drain	.....	1.90	.....	.....	2.00	.....	.....	2.00
960 cu. yd. backf. trench, Siphon No. 1	.....	.80	.....	.....	.85	.....	.....	.75

River and Harbor Work . . . . .

Seattle, Wn.—Gov't—Jetty—Grays Harbor

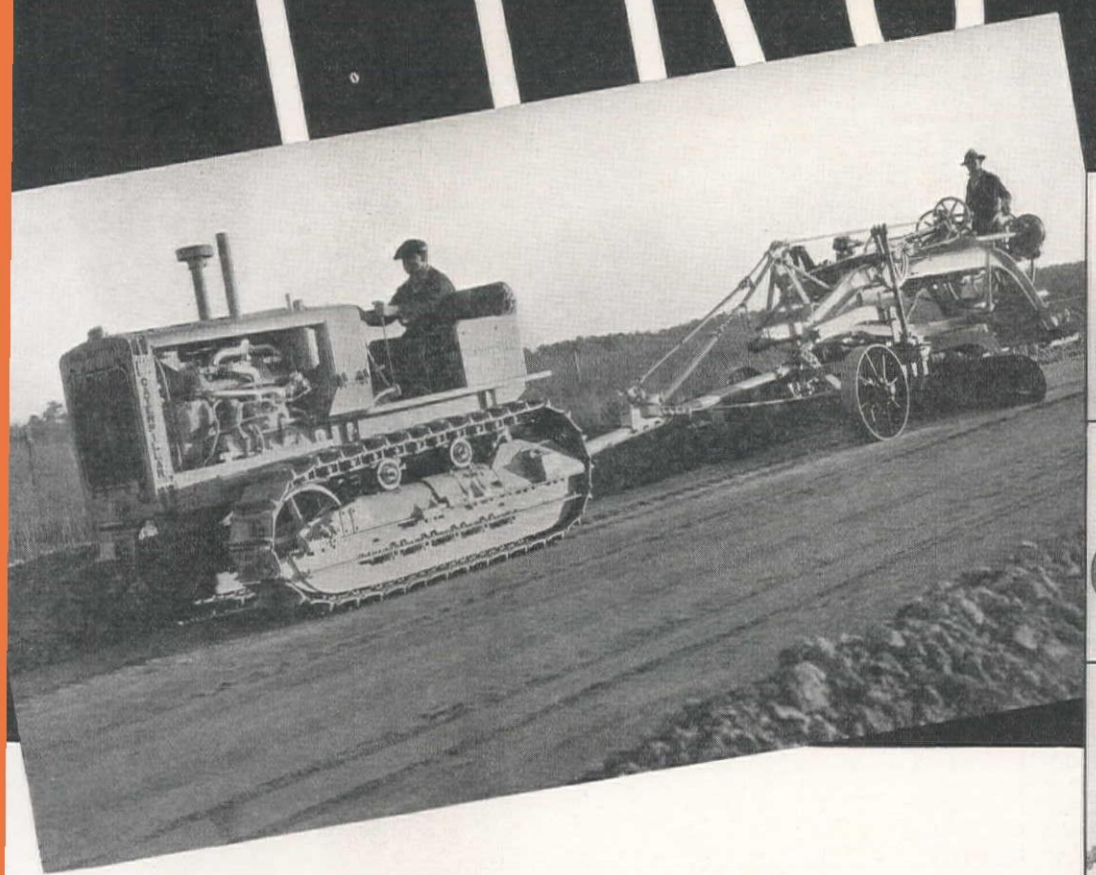
Contract awarded to Columbia Const. Co., Bonneville, Ore., $2,799,458, by U. S. Engineer Office, Federal Office Bldg., Seattle, Wn., for completing the reconstruction of the Grays Harbor south Jetty. Bids from:

(1) Columbia Const. Co., Bonneville..$2,799,458
(2) Winston Bros. & Guy F. Atkinson 3,069,836
(3) Merritt Chapman & Scott Corp.....$3,761,063
(4) Engineer's estimate..... 3,405,528

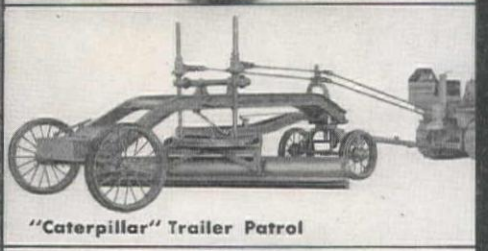
	(1)	(2)	(3)
235,000 ft. D. F. piling	.40	.56	.55
22,300 ft. D. F. piling (cutoff)	.20	.28	.275
2,215 MFBM lumber	$45	$48	$46
54,500 lb. drift bolts	.035	.04	.05
111,800 lb. machine bolts including washers	.05	.06	.06
144,000 lb. boat and wire spikes	.046	.06	.05
41,300 lb. railroad spikes	.036	.04	.05
522 s. tons 65# rail (splice bars & bolts)	$40	$30	$31½
16,900 ea. railroad ties	1.20	.85	1.18
6 ea. turnouts	$170	$325	$400
84,000 ft. wire cable not less than ⅝"	.025	.03	.07
2,800 ea. steel straps on jetty tramway	.75	.65	1.10
5,570 ea. metal pile shoes	1.50	1.10	1.75
7,500 ea. anti-rail creepers	.32	.40	.40
300 cu. yd. embankment	.60	1.50	1.00
1,290,000 s. tons stone in jetty, including maintenance stone	1.96	2.14	2.67

FIRST

—IN EASE OF CONTROL—IN RUGGED STRENGTH

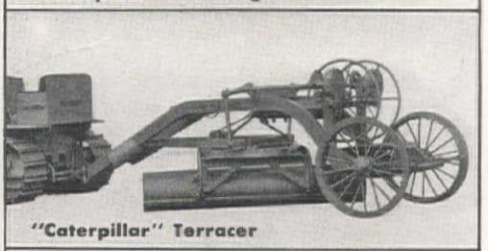


"Caterpillar" Diesel Auto Patrol

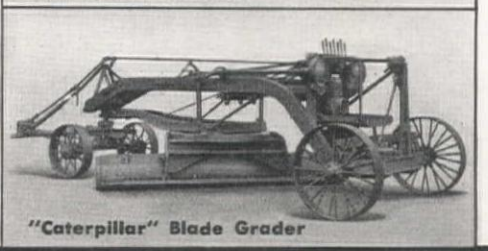


"Caterpillar" Trailer Patrol

"Caterpillar" Elevating Grader



"Caterpillar" Terracer



"Caterpillar" Blade Grader

This money-saving team of "Caterpillar" Blade Grader and "Caterpillar" Diesel Tractor is cutting the time and cost of sub-grading for a Georgia paving contractor. With plenty of strength for the heaviest grading, with fast and accurate controls for fine finishing, the "Caterpillar" Grader can do the job in fewer trips. With a wide range of blade positions, unsurpassed blade visibility, and sure, easy control, it is first choice on the country's roads today. Ask your "Caterpillar" dealer for the complete SHOW-DOWN. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

DIESEL ENGINES · MACHINERY

REG. U. S. PAT. OFF.

in 1930 and enlarged in 1932. Its capacity is rated at one and a half Scrapers per day. Thus, with the new enlargement to the Peoria plant, the two factories will be capable of producing eight and a half or nine Scrapers per day.

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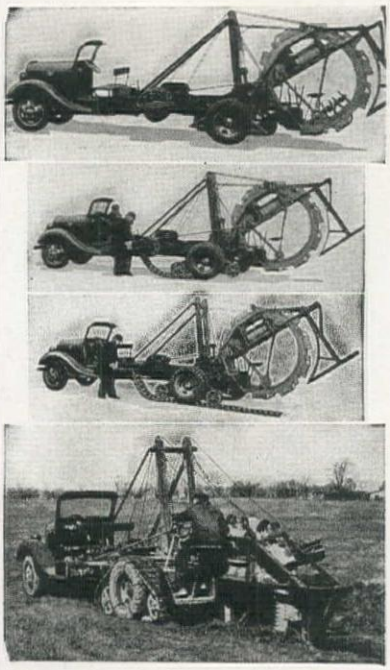

Buckeye Ditcher

The Model 16 Utility Ditcher, built by The Buckeye Traction Ditcher Company, of Findlay, Ohio, has a wide range of service in small trench digging.

Mounted on Ford, Chevrolet, or other standard truck chassis, the ditcher can be moved readily from one location to another at road speeds. The truck motor furnishes the power for the ditching mechanism through a special transmission. The motor is supplied with an oversize radiator for better cooling facilities.

"Alligator" crawlers are applied direct to the dual rear wheels. Small detachable idler wheels in front and behind the rear wheels increase crawler area, thereby enabling the ditcher to work on soft ground. Traction wheels may be put on or taken off in approximately twenty minutes.

Maximum cutting depth is 4 ft. 6 in., and cutting width from 9¼ in. to 16½ in., and with digging speeds from 1.45 ft. to 15.85 ft. per min. Complete information is contained in a booklet describing Model 16.

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Jeffrey Quick Adjusting Double Roll Crusher

The Jeffrey Manufacturing Co. of Columbus, Ohio, has developed a new design of double roll crusher. The chief feature of this machine is a self-contained endless belt drive between the rolls which allows quick adjustment of the rolls within the limits of the sizing range while the machine is running. The crusher is also provided with an all steel frame having heavy steel cross-ties.

Complete information may be obtained from the manufacturer.

Bridges and Culverts . . . . . .

Sacramento, Calif.—State—Undergrade Crossing and Bridge—Alameda County

Contract awarded to Eaton & Smith, 715 Ocean Ave., S. F., $453,162 low to Calif. Div. of Highways, Sacramento, for 6 undergr. crossing struc. under the S. P. and W. P. RR. tracks and const. 1 bridge and 2.89 mi. grading and concrete paving and plant mix surfacing on crusher run base near Niles, in ALAMEDA COUNTY, Calif. Bids from:

(1) Eaton & Smith, San Francisco.....$453,169
(2) J. F. Knapp, Oakland..... 467,356
(3) MacDonald & Kahn Co., Ltd., S. F. 476,344
(4) F. O. Bohnett, Campbell, Calif.....$482,272
(5) Wood & Bevanda, Stockton..... 486,903
(6) Guy F. Atkinson, S. F..... 513,134

	(1)	(2)	(3)	(4)	(5)	(6)
1 remove bridge	$7,500	$10,000	$9,000	$7,500	$5,000	$14,200
870 cy. remove concrete	3.70	4.00	3.50	3.00	3.00	4.00
152 sta. clear & grub	37.00	10.00	15.00	15.00	15.00	35.00
500 M gallons water	1.25	2.00	2.00	1.00	1.00	1.00
110,000 cy. roadway exc.	.45	.40	.39	.40	.50	.45
11,690 cy. struc. exc.	.75	1.25	1.50	1.50	1.00	1.50
1,200,000 sta. yd. overhaul	.003	.005	.01	.004	.005	.005
144 sta. finish roadw.	6.00	8.00	8.00	10.00	10.00	15.00
9,600 tons cr. run base	1.50	1.75	1.90	1.65	1.80	1.65
7,300 tons miner. aggreg.	2.05	2.50	2.85	2.50	2.75	2.50
365 tons liq. asph. MC5	17.00	20.00	18.00	16.50	17.00	16.50
50 tons liq. asph. MC2	22.50	22.50	19.00	18.50	17.00	18.50
280 tons screenings	3.00	2.50	2.50	2.50	2.70	2.50
30 tons liq. asph. MC3	22.00	22.50	20.00	18.00	17.00	18.00
70 tons liq. asph. SC2	15.20	16.00	14.00	12.50	12.50	12.50
105 tons liq. asph. SC1A	14.00	15.00	13.00	11.50	12.00	11.50
2,430 cy. A conc. (std. pavem.)	7.90	10.00	9.50	10.00	10.00	9.00
635 cy. B conc. (thick pavem.)	6.40	11.00	9.00	9.00	9.00	7.00
4,080 ea. pavem. dowels	.25	.25	.25	.25	.25	.20
853,000 lb. reinf. steel	.05	.045	.045	.05	.05	.05
7,722 cy. A conc. (struc.)	14.61	14.00	15.00	15.00	16.00	18.00
31 cy. F conc. (railing)	60.00	75.00	50.00	60.00	60.00	50.00
365,000 lb. struc. steel	.07	.07	.083	.08	.07	.07
1,048,000 lb. str. stl. (fur. & pt.)	.06	.055	.055	.07	.065	.06
1,650 ft. furn. D. F. piles (tr.)	.63	.55	.70	.65	.50	.75
66 ea. drive D. F. piles	25.00	15.00	25.00	13.00	10.00	20.00
4,544 ft. furn. steel piles	1.67	1.50	1.30	1.55	1.40	1.50
144 ea. drive steel piles	18.00	20.00	5.00	18.00	10.00	20.00
620 lb. bronze expan. plates	.30	.30	.55	.50	.35	.50
20 cy. rubble masonry	14.50	15.00	13.00	15.00	20.00	15.00
600 cy. riprap	4.85	5.00	2.00	1.50	3.00	4.00
800 ft. 15" reinf. conc. pipe	1.80	2.50	2.10	1.50	1.25	2.50
160 ft. 24" reinf. conc. pipe	3.00	3.50	3.50	2.00	2.50	3.50
1,542 ft. 8" corr. met. pipe	1.00	1.00	1.00	.90	1.00	1.00
1,320 ft. 10" corr. met. pipe	1.21	1.10	1.20	1.00	1.50	1.25
580 ft. 12" corr. met. pipe	1.27	1.25	1.35	1.20	2.00	1.50
362 ft. 15" corr. met. pipe	1.60	1.50	1.60	1.50	2.00	2.00
1,470 ft. 18" corr. met. pipe	1.70	1.75	1.90	2.20	2.25	2.50
52 ft. 24" corr. met. pipe	2.50	2.50	3.00	2.50	4.00	3.50
590 ft. 30" corr. met. pipe	3.30	3.00	3.50	3.00	5.00	4.50
770 ft. 8" perf. met. pipe	1.00	1.00	1.00	.90	1.50	1.00
2,280 ft. 8" perf. met. pipe (State furn.)	.25	.40	.35	.20	1.00	.50
435 cy. rock filling material	2.10	2.00	2.30	1.75	2.00	2.50
418 ft. rem. & relay pipe culv.	.50	1.00	1.10	1.25	1.00	1.50
887 ft. rem. & salv. pipe culv.	.36	.50	.60	.50	.50	1.00
1,200 ft. 8" vitr. pipe	.60	.60	.60	.55	.75	.60
755 cy. A conc. (curbs, etc.)	14.50	18.00	14.00	15.00	15.00	16.00
1,240 ft. guard railing	1.25	1.00	1.00	.85	1.00	1.50
48 ea. guide posts	3.10	2.00	2.50	1.50	2.00	2.50
32 ea. culvert markers	3.00	2.00	2.50	1.80	2.00	2.50
933 ft. pipe handrail	2.40	2.00	2.20	1.75	2.00	2.00
3.5 mi. new fences	600.00	550.00	600.00	600.00	400.00	600.00
2 ea. tubular gates	18.00	20.00	15.00	16.00	20.00	25.00
2,580 sq. yd. membr. waterpr.	.80	.75	1.00	.80	1.00	.35
70 ea. monuments	3.50	2.50	3.00	3.00	3.00	3.00
3,220 ft. 1¼" C. I. irrig. pipe	.30	.30	.45	.35	.30	.50
32 ea. ¾" irrig. outlets	6.00	1.00	5.00	2.00	2.00	2.00
150 ft. 10" C. I. disch. pipe	2.50	2.00	2.70	2.25	2.00	5.00
820 ft. 12" C. I. disch. pipe	2.75	2.50	3.00	2.75	3.00	6.00
3,290 ft. misc. iron & steel	.25	.20	.25	.25	.25	.15
2 ea. spillw. assemblies	12.00	10.00	25.00	15.00	40.00	15.00
1,700 lb. copper strips	.40	.30	.45	.50	.35	.60
300 ft. light conduit	.36	.50	.40	.25	1.00	.50
1 lot pumping equip.	$4,480	$3,500	$4,500	$5,000	$2,000	$4,000
1 brick manhole	100.00	100.00	200.00	75.00	100.00	150.00
17 cy. A conc. (ditch lining)	11.00	15.00	20.00	15.00	15.00	16.00
1,300 ft. tree stakes	.05	.075	.10	.10	.05	.065
170 cy. top soil	1.25	1.25	1.50	1.25	1.00	1.00
134 ea. trees	1.90	2.50	2.50	2.50	2.50	2.20
1,070 ea. roses	.30	.70	.75	.65	1.00	.60
1 lot miscell. work	$1,200	$12,000	$4,400	$5,000	$2,000	$2,600

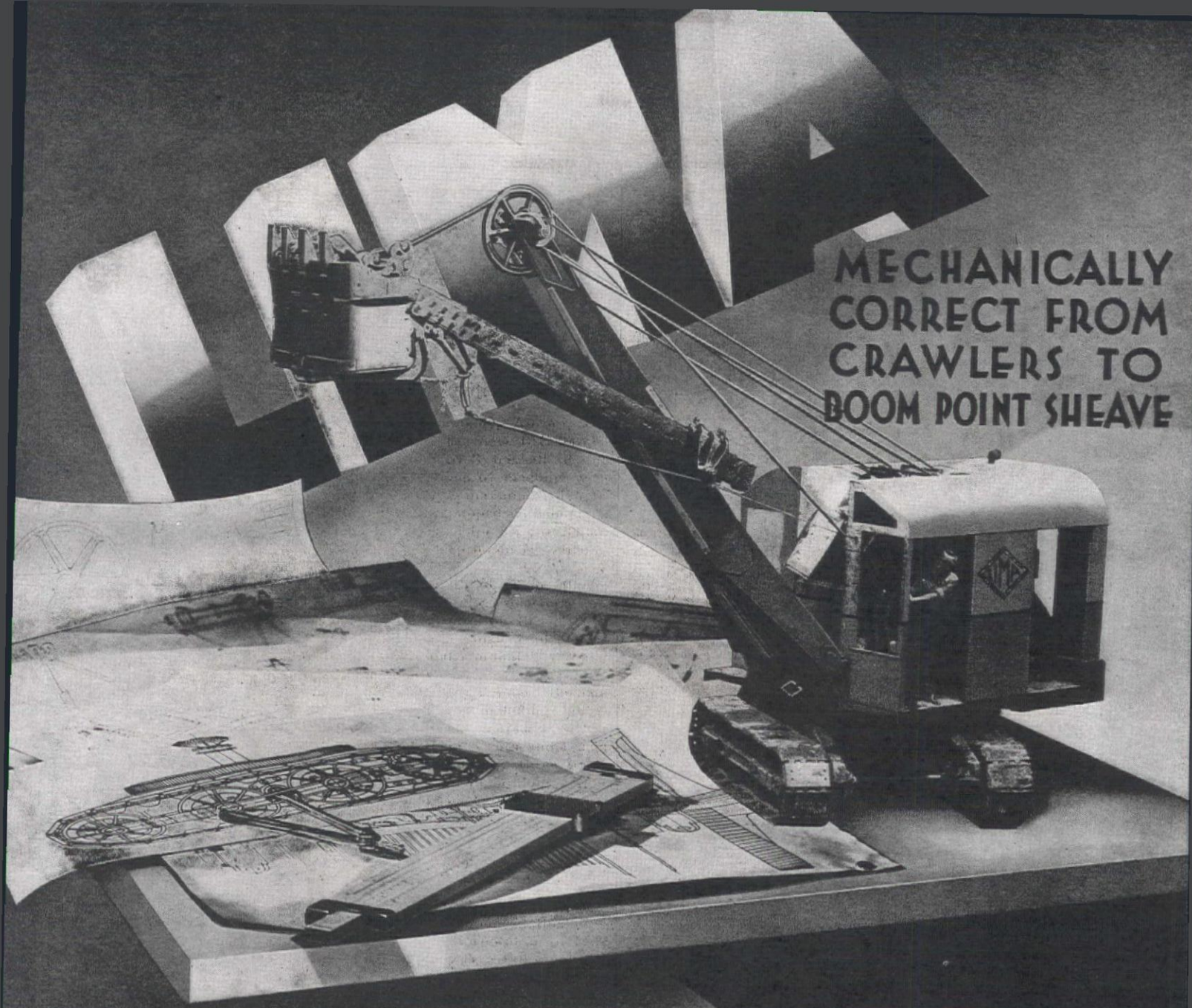
Machinery and Supplies . . . .

Los Angeles, Calif.—City—Steel Pipe and Fittings

Contract awarded to Emsco Derrick & Equipment Co., 6811 S. Alameda St., Los Angeles, $560,536, by Purch. Agent, Dept. of Water & Power, Los Angeles, for furnishing fusion-welded steel water pipe and fittings, under Spec. No. X-17. Bids from:

(1) Emsco Derrick & Equip. Co., L. A...$560,536
(2) Southwest Weld. & Mfg. Co., L. A. 667,403
(3) Western Pipe & Steel Co., L. A..... 689,606
(4) Consolidated Steel Corp., L. A.....$727,270
(5) American Concrete & Steel Pipe Corp., Los Angeles..... 741,903

ITEM No. 1—36" diameter, 30 ft. sections:	(1)	(2)	(3)	(4)	(5)
9,000 lin. ft. wall thickness 3/8"	$5.23	$6.25	$6.40	$6.73	$6.85
7,850 lin. ft. wall thickness 7/16"	6.10	7.18	7.40	7.74	7.98
15,440 lin. ft. wall thickness 15/32"	6.48	7.72	7.90	8.28	8.60
30,410 lin. ft. wall thickness 1/2"	6.93	8.20	8.50	8.95	9.15
11,100 lin. ft. wall thickness 17/32"	7.31	8.70	8.95	9.45	9.65
7,800 lin. ft. wall thickness 9/16"	7.75	9.20	9.60	10.01	10.30



MECHANICALLY CORRECT FROM CRAWLERS TO BOOM POINT SHEAVE

Time has changed the methods of handling material by power excavators and with this change of methods come new and modern shovels, draglines and cranes. A comparison of the machines on the market today will reveal that LIMA engineers have developed a line of shovels, draglines and cranes that are as new and modern as tomorrow. From crawlers to boom point sheave not a single item has been overlooked that will tend to speed up production and give longer, profitable production under all conditions. Their great earning power, low cost of up-keep and their ability to give unsurpassed service in hard digging have gained for them the reputation of being the most modern excavators on the market.

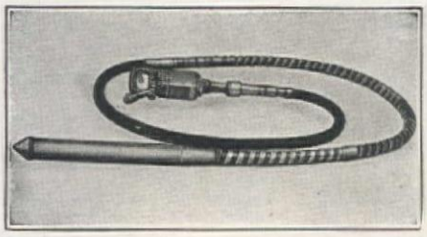
LIMA

LIMA LOCOMOTIVE WORKS, INCORPORATED

SHOVEL and CRANE DIVISION LIMA, OHIO, U. S. A.

SEATTLE—H. J. Armstrong Co., 2244 1st So. SPOKANE—General Machinery Co., E. 3500 Block Riverside. PORTLAND—Western Steel & Equipment Corporation, 734 N. E. 55th. SAN FRANCISCO—A. L. Young Machinery Company, 26-28 Fremont. SALT LAKE CITY—C. H. Jones Co., 236 W. S. Temple Street. LOS ANGELES—Smith-Booth-Usher Company, 2001 Santa Fe Avenue.

LIMAS ARE BUILT IN CAPACITIES FROM 3/4 TO 3 YARDS



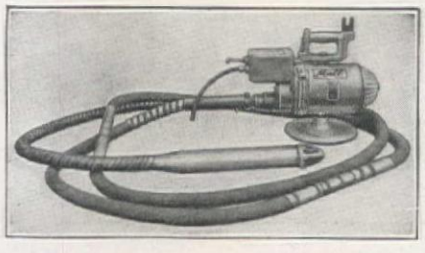
Geared head electric vibrator

Improved Vibrators

The Mall Tool Company, 7740 South Chicago Avenue, Chicago, Illinois, announces the addition of a number of new types of vibrators. These include several three phase and single phase electric models for operation at 4,500 r.p.m., 5,500 r.p.m., and 7,000 r.p.m., a universal machine for operation at 7,000 r.p.m., and an air driven unit which develops frequencies of 4,200 r.p.m., at 80 lbs. air pressure.

Sizes are 1¾-in. diameter for small walls and concrete products, 2⅜-in. diameter for medium sized walls on general construction work, and 3¼-in. diameter for large walls and large masses of concrete.

Air vibrator



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Blaw-Knox Weighing Batcher

In the new one cubic yard semi-automatic weighing batcher for three aggregates, filling gates are manually opened, but close automatically when the correct weight is reached. An intermediate position of the gate closing permits dribble of the aggregates prior to the final cut-off. Batcher is equipped with a three-beam scale and springless indicator with mercury contacts for automatic closing of the filling gate. Further information about this batcher will be furnished upon request by Blaw-Knox Company, Pittsburgh, Pa.

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Harnischfeger Welding Electrodes

An entirely new line of coated rods for D. C. welding is now being made and sold through the Harnischfeger Corporation of Milwaukee, manufacturers of P&H-Hansen Arc welding equipment. The present line includes five different types with both high and low rates of fluidity for various types of work in welding in flat, vertical or overhead positions and with ferrous and non-ferrous metals. The new line, known as "Smoothare," is described in a new bulletin (No. R-1), copies of which may be obtained upon request.

ITEM No. 2—36" diameter, 30 ft. sections:					
30 lin. ft. wall thickness 3/8"	5.16	6.15	6.35	6.70	6.85
120 lin. ft. wall thickness 7/16"	6.03	7.14	7.35	7.70	7.98
210 lin. ft. wall thickness 15/32"	6.41	7.69	7.85	8.20	8.60
390 lin. ft. wall thickness 1/2"	6.86	8.12	8.45	8.55	9.15
150 lin. ft. wall thickness 17/32"	7.24	8.60	8.90	9.20	9.65
90 lin. ft. wall thickness 9/16"	7.86	9.12	9.55	9.85	10.30
ITEM No. 3—36 ea. short 36" x 20" reducers:					
34 ea. 3/8" transition	40.00	83.00	80.00	110.00	105.00
4 ea. 7/16" transition	46.60	96.50	92.00	120.00	110.00
7 ea. 15/32" transition	51.70	104.00	100.00	140.00	112.00
13 ea. 1/2" transition	53.40	104.50	105.00	150.00	120.00
5 ea. 17/32" transition	56.80	117.50	112.00	170.00	122.00
3 ea. 9/16" transition	60.40	124.00	120.00	200.00	130.00
ITEM No. 4—36 ea. long 36" x 20" reducers:					
4 ea. 3/8" transition	69.70	133.65	160.00	200.00	155.00
4 ea. 7/16" transition	82.00	156.20	184.00	225.00	160.00
7 ea. 15/32" transition	90.00	167.20	200.00	240.00	162.00
13 ea. 1/2" transition	93.00	178.20	210.00	250.00	170.00
5 ea. 17/32" transition	100.00	189.20	224.00	260.00	172.00
3 ea. 9/16" transition	106.00	200.00	240.00	270.00	180.00
Discounts	net	1%20	net	net	1%30

Los Angeles, Calif.—City—Cast Iron Pipe

Bids received as follows by D. P. Nicklin, purchasing agent, Dept. Water & Power, 207 South Broadway, Los Angeles, for cast iron pipe. Bids from:

(1) National Cast Iron Pipe Co.
(2) American Cast Iron Pipe Co.
(3) U. S. Pipe & Foundry Company
(4) Florence Pipe Company
(5) Pacific States Cast Iron Pipe

	(1)	(2)	(3)	(4)	(5)
20,000 ft. 12" CIP, FOB Van Nuys Pipe Yard	.....	2.30	2.28	.....	.....
20,000 ft. 12" CIP, FOB Slauson & Compton	.....	2.24	2.22	.....	.....
20,000 ft. 12" CIP, FOB Hewitt Street	.....	2.24	2.22	.....	.....
20,000 ft. 12" CIP, FOB Van Nuys Street	.....	2.27	2.28	.....	.....
15,000 ft. 12" CIP, FOB Slauson & Compton	.....	2.24	2.225	.....	.....
15,000 ft. 12" CIP, FOB Van Nuys	.....	2.30	2.28	.....	.....
15,000 ft. 12" CIP, FOB Van Nuys	.....	2.30	2.28	2.45	.....
15,000 ft. 12" CIP, FOB Van Nuys	.....	2.30	2.28	2.45	.....
20,000 ft. 8" CIP, FOB Van Nuys	1.135	1.145	1.14	.....	.....
20,000 ft. 8" CIP, FOB Slauson & Compton	1.105	1.13	1.125	.....	.....
20,000 ft. 8" CIP, FOB Hewitt Street	1.105	1.13	1.125	.....	.....
20,000 ft. 8" CIP, FOB Van Nuys	1.135	1.145	1.14	.....	.....
20,000 ft. 8" CIP, FOB Slauson & Compton	.....	1.11	1.125	.....	.....
20,000 ft. 8" CIP, FOB Van Nuys	.....	1.13	1.14	.....	.....
20,000 ft. 8" CIP, FOB Van Nuys	.....	1.13	1.14	1.16	.....
20,000 ft. 8" CIP, FOB Van Uuys	.....	1.13	1.14	1.16	1.12
25,000 ft. 6" CIP, FOB Slauson & Compton	.....	.73	.72	.....	.....
20,000 ft. 6" CIP, FOB Van Nuys	.....	.75	.73	.....	.....
25,000 ft. 6" CIP, FOB Hewitt Street	.715	.73	.72	.....	.....
745 ft. 16" CIP, FOB Ducommun Street	.....	3.27	3.22	.....	.....
6,000 ft. 16" CIP, FOB trenchside	.....	3.12	3.07	3.22	.....
12,000 ft. 16" CIP, FOB Ducommun Street	.....	3.01	2.95	.....	.....
3,000 ft. 24" CIP, FOB Ducommun Street	.....	5.71	5.65	5.58	.....
900 ft. 24" CIP, FOB Ducommun Street	.....	5.71	5.65	5.58	.....

All bids net.

Dam Construction . . . . . .

Sacramento, Calif.—Gov't—Core Drilling and Excavation—Kennett Dam Site

Contract awarded to L. E. Dixon Co., Bent Bros., Inc., and Case Const. Co., 609 S. Grand Ave., Los Angeles, $87,217 low to Bureau of Reclamation, Old Post Office Bldg., Sacramento, for core drilling and excavation for investigation of Kennett dam site, Central Valley project, Calif., under Spec. No. 800-D. Bids from:

(1) L. E. Dixon, Bent Bros. & Case Const. ..... $ 87,217
(2) George Pollock Co., Sacramento..... 108,502
(3) Malcom & Bell, Portland..... $118,105
(4) R. G. Clifford, San Francisco..... 140,038

	(1)	(2)	(3)	(4)
L. S. excav. river shaft, 100' deep & 260' under-river tunnel	$12,500	$20,000	$27,000	$21,600
100 lin.ft. exc. addtl. length of under-river tunnel	20.00	30.00	75.00	33.25
L. S. excav. 1,050 lin. ft. tunnels	$24,000	$21,000	$23,100	$44,205
1,355 lin. ft. exc. tunnels, separate from above	11.00	14.00	20.00	20.40
175 lin. ft. excavate vertical shafts	13.75	31.00	20.00	38.40
175 lin. ft. excavate vertic. shafts above river level	13.75	30.00	20.00	33.25
20 MFBM furn. & erect permanent timbering	100.00	70.00	100.00	90.00
1,500 lin. ft. horiz. core drill holes, 50 to 200 ft. long (lump sum)	$8,000	$10,750	$6,225	$7,800
1,850 lin. ft. addtl. horiz. core drilling, 50 to 200 ft.	4.50	5.05	4.15	5.20
450 lin. ft. horiz. core drilling to addtl. depths	4.50	6.00	4.15	4.25
L. S. 200 ft. vertical or inclined core drill, 50 to 150'	$1,000	$1,000	830.00	$1,040
200 ft. addtl. vert. or inclined core drilling 50 to 150'	4.50	5.25	4.15	5.70
800 ft. vertical core drilling, 50 to 200'	4.50	5.30	4.65	4.50
700 ft. core drilling, roofs of tunnel	4.50	6.25	4.65	5.45

Tunnel Construction . . . . . .

Fort Peck, Montana—Gov't—Gate Shafts—Fort Peck Tunnels

Contract awarded to Bartlett Hayward Co., 200 Scott St., Baltimore, Maryland, $1,093,609, by U. S. Engineer Office, Kansas City, Mo., for completion of Emergency Gate Shafts for Fort Peck Tunnels at the Fort Peck Dam site approximately 25 mi. Southeast of Glasgow, Montana, in McCONE COUNTY, Montana. Bids from:

(1) Bartlett Hayward Co., Baltimore..$1,093,609
(2) Spillway Bldrs., Inc., Kansas City. 1,348,565
(3) Frazier-Davis Const., St. Louis.... 1,360,161
(4) The R. C. Mahon Co., Detroit..... $1,515,427
(5) Siems-Helmers, Inc., St. Paul..... 1,978,120
(6) Engineers' estimate..... 1,286,624

	(1)	(2)	(3)	(4)	(5)	(6)
100 sq. ft. furn. & plac. joint filler	.40	1.00	1.25	1.00	.50	.81
5,200 cu. yd. concr. (emergency shafts)	13.50	12.00	7.50	25.00	18.00	5.10

Barber-Greene Ditcher

Barber-Greene Company, Aurora, Ill., has just announced the new B-G Model 64-B Ditcher. The 64-B has all of the features of the previous 64 machine with a digging boom for a maximum of 5 ft. deep. The boom is equipped with buckets which may be adjusted for 8 in. or 11 in. wide. A 3 ft. 6 in. deep boom is available if desired.

A total overall width of 48 in. allows this machine to dig in close quarters, and relatively miniature size of the ditcher makes traveling on a small trailer possible. Being full crawler mounted, it loads and unloads itself.

The 64-B incorporates standard Barber-Greene ditcher features including: automatic overload release sprocket which slips when an overload occurs and resets itself, full crawler mounting, three point suspension, vertical boom, milling action digging, self-cleaning buckets, instantly reversible spoil conveyor, etc.

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Harnischfeger 1½-yd. Shovel

Second in the new 700 series of Diesel-powered excavators, announced this year by the Harnischfeger Corporation of Milwaukee, is the Model 705, a full-revolving machine with 1½-yd. capacity for which the builders claim increased operating speeds at a lower cost per yard.

Completely redesigned to take advantage of the newest developments in high tensile alloy steels and the use of arc welding, considerable emphasis has been laid upon weight reduction to obtain a higher ratio of horsepower per pound of weight, thus reducing the effect of inertia for faster operating speeds with lower fuel consumption.

Standard power is a 6-cyl. Caterpillar Diesel engine rated at 130 h.p. at 900 r.p.m., although gasoline power is available. The model 705 is fully convertible for service as shovel, dragline, crane, trench hoe, skimmer or pile driver.

A 16-page booklet completely describes this new machine. Copies may be had by addressing the home offices of the corporation at Milwaukee. Ask for Bulletin X-4.

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New Owen Grapple

The new Owen Type RA Grapple, manufactured by the Owen Bucket Co., Cleveland, Ohio, has independent action of its tines. Instead of moving simultaneously toward the center in closing, any tine is capable of acting independently of the other three. This Patented

1,000 sq. ft. gunite coating	1.26	1.00	1.25	.20	.50	.11
100 lin. ft. drill grout holes	.77	2.00	6.30	2.50	5.50	1.88
1,000 lb. furn. & inst. gr. pipe & conn.	.185	.25	.40	.20	.70	.18
100 cu. ft. pressure grouting	5.57	3.00	6.30	2.50	1.40	1.50
300 cu. yd. excav. for struc.	2.94	3.00	3.00	4.50	3.00	2.36
100 sqrs. apply sealing solution	5.84	1.50	2.00	2.50	2.80	2.44
1,530 cy. conc. for structures	25.13	30.00	38.00	26.00	50.00	12.75
250,000 lb. reinf. steel (struc.)	.046	.05	.06	.0601	.06	.044
262,000 lb. struc. steel (building)	.063	.07	.073	.102	.07	.062
L. S. 4 emergency control shaft bldg.	$26,235	$46,000	$32,000	$36,000	$24,000	$33,322
L. S. 1 sub-station bldg.	$3,826	$10,000	$2,400	$5,000	$3,500	$5,103
265,000 lb. bronze (emerg. gate guides)	.315	.35	.45	.464	.57	.41
237,000 lb. struc. steel (emerg. gate guides)	.103	.25	.30	.2552	.26	.093
748,000 lb. Manganese bronze liner castings	.247	.30	.33	.346	.50	.32
306,000 lb. spec. Manganese bronze liner castings	.2775	.40	.37	.404	.40	.39
360,000 lb. steel liner plates	.119	.08	.14	.162	.29	.20
77,500 lb. vent pipes	.088	.10	.08	.126	.08	.075
830,000 lb. furn. & plac. reinf. steel	.047	.05	.06	.0603	.069	.044
150,000 lb. misc. struc. steel	.085	.12	.12	.272	.20	.07
8 ea. emergency gates	$28,700	$30,000	$30,000	$33,796	$50,000	$32,701
L. S. mechanical operating machinery	$90,300	$140,000	$120,000	$106,738	$202,000	$142,751
112,000 lb. bronze by-pass valves	.308	.40	.40	.438	.68	.56
L. S. elec. work (tunnel sub-station)	$16,875	$25,000	$20,000	$20,617	$28,400	$16,147
L. S. elec. work (tunn. emerg. gates)	$66,200	$85,000	$85,000	$83,121	$118,800	$71,114
L. S. elec. work (distribution system)	$4,695	$20,000	$4,000	$3,840	$4,760	$2,515
875 lb. spec. Manganese test castings (bronze)	2.00	1.00	2.00	2.00	8.00	2.50

Yakima, Wn.—Gov't—Tunnel No. 1, Yakima Project

Contract awarded to Morrison-Knudsen Company, 319 Broadway, Boise, Idaho, $292,013, by Bureau of Reclamation, Yakima, Wn., for const. Tunnel No. 1, Sta. 59-38 to Sta. 102, Yakima Ridge Canal, Roza Div., Yakima Project, Wn. Work is located near Yakima, under Spec. 682. Bids from:

(1) Morrison-Knudsen Co. $292,013
(2) Sam Orino, Spokane, Wn. 353,191
(3) V. R. Dennis Const. Co., San Diego 384,539
(4) P. L. Crooks & Co., Inc., Portland.. $397,887
(5) L. Romano Engrg. Corp., Seattle.... 415,716

	(1)	(2)	(3)	(4)	(5)
5,920 cu. yd. open cut excav., Class 1	.40	.50	.50	1.00	3.00
1,235 cu. yd. open cut excav., Class 2	.40	.50	.50	1.50	3.00
1,235 cu. yd. open cut excav., Class 3	1.00	1.25	1.50	2.00	3.00
75 cu. yd. backfill	.50	.50	.60	2.00	1.00
50 cu. yd. puddle or tamp backfill	1.00	1.00	1.00	2.00	1.50
49,100 cu. yd. tunnel excavation	4.55	4.90	6.00	6.00	4.00
45,000 lb. furn. & inst. perm. steel tunn. supports	.07	.10	.06	.10	.08
15 MFBM furn. & erect perm. timber	150.00	90.00	60.00	100.00	75.00
40,000 lb. furn. & inst. steel tunn. liner plates	.08	.08	.06	.10	.05
1,400 lin. ft. 6" tunnel drain	1.00	.95	.50	1.00	.25
450 lin. ft. 8" tunnel drain	1.10	1.25	.60	2.00	.25
300 lin. ft. 10" tunnel drain	1.25	1.35	.70	2.50	.25
85 lin. ft. lay 10" drain pipe, cemented joints	1.75	1.50	.70	2.00	.25
150 cu. yd. concrete (portal struc. & transition)	20.00	20.00	15.00	20.00	15.00
12,200 cu. yd. concrete (tunnel lining)	4.00	7.50	6.00	6.00	15.00
15,000 lb. place reinforcing steel	.025	.02	.03	.10	.015
300 lin. ft. drill grout holes to 10 ft.	1.00	1.00	2.00	2.00	2.00
150 lb. place grout pipe & connections	.20	.25	.50	.50	.25
600 cu. ft. pressure grouting	1.50	1.30	1.00	2.00	1.00

Street and Road Work. . . . . .

Sacramento, Calif.—State—Grading and Paving—Fresno County

Contract awarded to Hanrahan Co., 582 Market St., S. F., $229,510, by Calif. Div. of Highw., Sacramento, for 4.5 mi. grad. and concr. and asph. conc. paving betw. Belmont Circle and Biola Junction in FRESNO COUNTY, Calif. Bids from:

(1) Hanrahan Co., S. F. $229,510
(2) Wood & Bevanda, Stockton..... 233,419
(3) Union Paving Co., S. F. $235,897
(4) Griffith Co., Los Angeles..... 242,824

	(1)	(2)	(3)	(4)
Lump sum, clearing and grubbing	360.00	$1,250	$1,500	$2,000
5,100 M gallons water	1.00	1.00	.60	1.00
4,925 cu. yd. remove concrete	1.50	1.55	2.00	1.25
48,000 cu. yd. roadway excavation	.31	.23	.30	.30
425 cu. yd. struc. excavation	1.00	1.00	1.50	1.00
50 cu. yd. ditch excavation	1.00	1.00	1.50	1.00
22,000 cu. yd. imported borrow, Loc. "A"	.48	.40	.50	.45
22,500 cu. yd. imported borrow, Loc. "B"	.50	.40	.55	.70
240,000 sta. yd. overhaul	.005	.006	.01	.003
78,000 sq. yd. prepare subgrade	.07	.10	.10	.10
135 tons coarse rock, subgrade	3.50	2.25	3.00	1.50
236 sta. finish roadway	8.00	6.25	10.00	4.00
7,400 tons min. aggregate, roadmix surf.	2.40	2.20	2.20	2.30
675 tons liq. asph. SC-2 roadmix surf.	13.00	11.25	10.00	12.00
40 tons liq. asph. SC-2 prime ct. & pentr. tr.	13.00	12.50	15.00	12.00
45,500 sq. yd. prep., mix & shape shoulders	.06	.07	.07	.06
35 tons liq. asph. SC-4 retempering	17.50	16.25	15.00	16.00
31,500 sq. yd. remixing roadmix surf.	.07	.06	.07	.05
6,000 tons asph. concrete (base & level course)	3.50	4.54	3.50	4.00
3,160 tons asph. concrete (class A surf. course)	3.80	4.66	3.70	4.10
10,325 cu. yd. "A" concrete (pavement)	9.00	8.90	9.30	9.44
21,000 ea. pavement dowels	.17	.22	.20	.20
15 ea. temporary pav. cross. devices, Type B-10	$36	125.00	25.00	35.00
47,500 lb. reinforcing steel	.07	.078	.05	.065
22 cu. yd. "A" concrete (struc.)	25.00	25.00	25.00	25.00
5 ea. cast steel frames & gates (drop inl.)	40.00	43.75	50.00	35.00
189 lin. ft. 12" std. reinf. concrete pipe	1.00	1.25	2.00	2.00
278 lin. ft. 24" std. reinf. concrete pipe	2.50	2.50	3.00	4.00
20 lin. ft. 12" corr. metal pipe	1.20	1.50	1.80	1.20
80 lin. ft. 12" perf. metal pipe	1.30	1.65	2.00	1.50
75 cu. yd. drainage sumps	5.00	5.00	6.00	25.00
100 lin. ft. remove & salvage pipe culverts	.50	1.25	.60	.60
68 lin. ft. 26" x 6½" part cir. corr. met. culv.	2.10	3.15	3.00	2.00
3 ea. culvert markers	2.00	2.50	3.00	3.00
4.0 mi. move & reset fences	270.00	325.00	300.00	250.00
13 ea. monuments, move and reset	1.25	3.75	1.50	2.00
25 ea. monuments	3.00	3.75	3.00	3.00

action, obtained by combining toggle operated tines and arm controlled tines, cause all four tines to grip any stone regardless of its shape, with practically equal pressure.

This original action enables the operator to place the grapple more easily and quickly and to handle greater quantities of stone with a factor of safety. Grapples with capacities from 3 to 60 tons are illustrated and described in the new bulletin just off the press.

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New Valves for Copper Piping

Jenkins Bros., 80 White Street, New York, has introduced a complete line of Jenkins "Solder-End" Valves for 150 lbs. service on copper lines. Available at the same price are both the plain sweated and Mueller "streamline" type ends, the latter being manufactured by Jenkins under license of Mueller Brass Co. With the exception of the ends, these new valves are identical with the standard Jenkins Valves used for threaded installations. An eight-page folder, giving details can be obtained from Jenkins Bros.

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Arc Welded Design Chart

A new engineering drafting room chart, which presents in concise ready-reference form data necessary for producing arc welded designs, is announced by The Lincoln Electric Company, Cleveland, Ohio.

Data given on the Lincoln arc welded design chart include: Weld symbols for working drawings; illustrations and particulars regarding the 16 types of joints for arc welding; illustrated suggestions for better arc welded design; sketches explaining the nomenclature of welds and weld dimensions; a comparison of welded and riveted drawings; and tables giving properties of base metals, weld metals, electrode metals for hard facing, length of fillet weld to replace rivets, and safe allowable loads for fillet welds in shear. It is printed in such a way as to be suitable for blueprinting.

Copies of the chart may be secured by writing The Lincoln Electric Co., Welding Engineering Dept., Cleveland, Ohio.

Sacramento, Calif.—State—Grading and Surfacing—Contra Costa County

Contract awarded to Union Paving Co., Call Bldg., S. F., $293,291, by Calif. Div. of Highways, Sacramento, for 5.2 mi. grad. and plant mix surf. on cr. run base betw. 2 mi. West of Lafayette and Walnut Creek in CONTRA COSTA COUNTY, Calif. Bids from:

(1) Union Paving Co., S. F. $293,291
(2) Granfield, Farrar & Carlin and J. Carlin 314,037
(3) A. Teichert & Son, Inc., Sacramento 328,169
(4) D. McDonald, Sacramento $328,329
(5) Guy F. Atkinson Co., S. F. 329,826
(6) Geo. Pollock Co., Sacramento 347,841
(7) Hanrahan Co., San Francisco 359,152
(8) Wood & Bevanda, Stockton 361,814

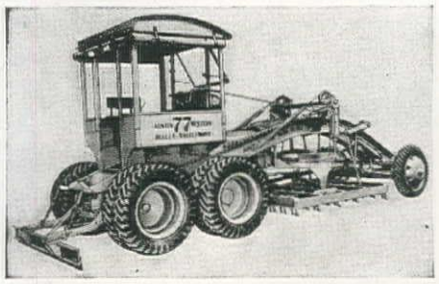
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
273 sta. clearing & grubbing	40.00	20.00	25.00	30.00	60.00	32.00	32.00	30.00
3,000 M gallons water	1.50	1.00	1.00	1.50	1.00	2.00	1.20	1.50
292,000 cu. yd. roadway excav.	.22	.30	.24	.26	.32	.30	.31	.34
3,000 cu. yd. ditch & chann. excav.	1.00	1.25	.75	1.25	1.25	1.25	.80	1.50
4,400,000 sta. yd. overhaul	.003	.004	.0035	.005	.005	.005	.003	.005
40,000 cu. yd. imported borrow	.60	.70	.67	.50	.48	.70	.70	.75
4,600 cu. yd. struc. excavation	1.50	1.50	1.10	1.50	1.50	1.25	1.30	2.00
1,230 cu. yd. remove concrete	2.00	3.00	2.50	3.00	4.00	3.00	1.50	2.50
273 sta. finish roadway	10.00	7.00	5.00	10.00	7.50	10.00	9.00	10.00
31,500 tons crusher run base	1.70	1.65	2.40	2.00	1.65	1.90	2.20	2.00
16,700 tons min. aggreg. (plant mix)	1.85	1.85	2.53	2.50	2.00	2.20	3.00	2.25
806 tons liq. asph. MC5 or ex. hvy	$18	18.60	17.50	20.00	17.50	19.00	18.00	19.00
103 tons liq. asph. MC2 (prime ct.)	18.00	18.60	22.00	20.00	18.50	20.00	22.00	19.00
72 tons liq. asph. MC3 (seal ct.)	18.00	18.60	22.00	20.00	18.50	20.00	22.00	19.00
930 tons screen. (seal ct. & hldr)	3.00	2.50	3.00	2.50	2.50	3.00	3.20	3.00
66 tons liq. asph. SC1-A (shldrs)	15.00	11.50	20.00	12.00	11.50	15.00	14.00	14.00
47 tons liq. asph. SC2 (shoulder)	15.00	13.00	21.00	13.00	12.50	16.00	15.00	14.00
94,000 lb. reinforcing steel	.05	.045	.045	.05	.045	.05	.06	.05
930 cu. yd. A concr. (struc.)	19.00	21.00	20.00	20.00	20.00	25.00	25.00	20.00
1,000 cu. yd. light riprap	5.00	3.00	3.50	4.50	3.00	3.50	4.00	4.00
300 ft. 8" corr. metal pipe	1.10	.90	1.00	1.00	1.00	1.00	1.00	1.00
2,620 ft. 18" corr. metal pipe	2.00	1.75	1.70	1.80	1.75	1.75	1.70	2.25
420 ft. 24" corr. metal pipe	2.60	2.40	2.65	2.60	2.50	2.50	2.80	3.00
186 ft. 36" corr. metal pipe	5.00	4.25	5.00	4.80	4.00	4.50	5.00	4.00
274 ft. 48" corr. metal pipe	7.50	5.95	7.00	7.70	6.50	6.50	8.00	5.00
5,000 ft. 8" perf. underdrain	1.10	.95	1.00	.90	1.00	1.00	.90	1.00
800 cu. yd. rock filling material	2.50	2.25	3.00	1.80	2.50	3.50	2.20	3.00
120 ft. clean & salv. culverts	.50	.50	.75	.50	.75	.75	.60	1.00
376 ft. clean & relay culverts	1.00	1.00	1.00	1.00	1.25	1.00	.80	1.50
10 ea. spillway assemblies	16.00	15.00	15.00	15.00	15.00	15.00	14.00	20.00
2,000 ft. laminated guard rail	1.25	1.00	1.00	1.00	1.25	1.35	1.00	1.00
140 ea. guide posts	2.00	2.50	2.50	2.00	2.50	3.00	1.80	2.50
80 ea. culvert markers	2.00	2.00	2.50	2.00	2.50	3.25	2.00	2.50
10 mi. new fence	$600	$600	$700	$600	$600	$700	$800	$625
25 ea. drive gates	16.00	15.00	20.00	15.00	20.00	20.00	25.00	20.00
100 ea. monuments	3.00	2.50	3.00	3.00	3.00	3.50	3.00	3.00

Carson City, Nevada—State—Grade and Asph. Conc. Pave—Washoe County

Contract awarded to Dodge Const., Inc., Fallon, Nev., $201,765, by Nev. State Highway Comm., Carson City, Nev., for 4.86 mi. grading and asph. concr. paving betw. Lawton and Reno, Rt. 1, Sec. A1, in WASHOE COUNTY, Nev., (FAP 26-73-A). Bids from:

(1) Dodge Const., Inc., Fallon $201,765
(2) Isbell Const. Co., Reno 217,134
(3) Pacific Const. Co., Reno 221,342
(4) Jones & King, Hayward $223,011
(5) Engineer's estimate 213,696

	(1)	(2)	(3)	(4)	(5)
824 lin. ft. remove culvert pipe	1.00	.75	.75	.75	.75
26 ea. remove culv. headwalls and inlets	5.00	10.00	7.50	7.50	7.50
209 cu. yd. remove concrete	5.00	5.00	4.00	4.30	4.00
25,555 sq. yd. remove concrete pavement	.30	.10	.32	.26	.25
24,235 lin. ft. remove fence	.02	.04	.02	.02	.02
40 ea. remove trees	10.00	5.00	10.00	9.00	10.00
65,600 cu. yd. roadway excavation	.35	.45	.35	.36	.35
175,226 sta. yd. overhaul	.02	.01	.02	.015	.02
33,405 cu. yd. imported borrow	.30	.36	.40	.38	.35
26,555 cu. yd. seelct borrow	.35	.50	.45	.59	.40
2,590 cu. yd. structure excavation	1.50	1.25	1.25	1.25	1.00
49,685 sq. yd. subgrade for pavement	.10	.10	.12	.09	.12
4.86 mi. shoulders	200.00	250.00	200.00	155.00	150.00
4.86 mi. finish roadway	200.00	250.00	300.00	275.00	200.00
9,108 tons asph. concrete (base course)	3.50	3.57	3.80	3.80	3.90
5,227 tons asph. concrete (leveling course)	3.50	3.84	4.00	3.95	4.10
5,057 tons asph. concrete (surface course)	3.75	4.13	4.15	4.20	4.25
1,079 tons coarse aggregate	3.00	3.36	3.00	3.50	2.75
174 tons Key rock	3.00	3.36	3.00	3.60	2.90
303 tons screenings	3.00	3.36	3.00	3.70	2.90
97 tons emuls. asphalt penetration	20.00	25.00	25.00	24.00	25.00
43 tons emuls. asphalt mixing	22.00	29.00	28.00	27.15	28.00
416 cu. yd. "A" concrete	25.00	26.10	25.00	23.65	27.00
35 cu. yd. "B" concrete	25.00	26.10	25.00	29.75	26.00
40,482 lb. reinforcing steel	.06	.06	.06	.065	.06
1,075 cu. yd. cyclopean concrete	14.00	15.00	15.00	17.00	15.00
272 cu. yd. hand-placed rock wall	6.00	5.00	4.50	4.30	4.50
4,850 lb. castings	.15	.10	.10	.13	.15
188 lin. ft. 8" corr. met. pipe, dipped	1.00	1.20	1.25	1.05	1.00
564 lin. ft. 12" corr. met. pipe, dipped	1.25	1.40	1.50	1.30	1.25
434 lin. ft. 15" corr. met. pipe, dipped	1.50	1.65	1.75	1.60	1.50
670 lin. ft. 18" corr. met. pipe, dipped	1.75	1.80	2.00	1.80	2.00
634 lin. ft. 24" corr. met. pipe, dipped	2.50	2.70	3.00	2.70	3.00
80 lin. ft. 36" corr. met. pipe, dipped	5.00	5.00	5.00	5.45	4.50
116 lin. ft. 15" corr. met. siphon pipe, dipped	2.50	2.10	2.25	2.50	1.75
213 lin. ft. relay culvert pipe	1.00	.75	.50	.50	.50
42 ea. move pipe culvert headwalls	10.00	10.00	10.00	10.00	10.00
15,821 lin. ft. construct fence	.15	.195	.15	.12	.12
14,018 lin. ft. reconstruct fence	.10	.05	.10	.07	.08
51,276 lin. ft. side forms	.15	.15	.20	.21	.15
4.86 mi. traffic stripe	100.00	146.00	90.00	80.00	90.00
96 ea. culvert markers	2.50	3.50	3.50	3.50	3.50
50 ea. guide posts	2.00	3.00	3.00	3.00	3.00
2,000 lin. ft. metal	1.25	1.25	1.50	1.30	1.25
L. S. move signs	300.00	450.00	100.00	125.00	100.00
L. S. move buildings	300.00	725.00	700.00	750.00	700.00
2 ea. reconst. railroad crossing	150.00	400.00	200.00	215.00	200.00
89 ea. monuments	3.00	3.50	3.50	4.00	3.50
L. S. miscellaneous items	300.00	300.00	100.00	125.00	100.00
1,400 hours traffic control unit	3.00	3.50	2.75	3.25	2.75
60 tons asph. road material, SC-1A	12.50	20.00	20.00	17.50	20.00



Black Top Scarifier

A new scarifier for reworking oil treated gravel and macadam roads has been announced by the Austin-Western Road Machinery Company, of Aurora, Illinois. It consists of a thirty-one tooth unit, mounted in place of the blade and standard scarifier attachment.

The depth of cut is controlled hydraulically from the operator's platform and either end of the scarifier can be raised or lowered independently. This permits the operator to operate with all teeth horizontal with the surface or set the teeth so that the front rows scratch the surface, while the rear teeth carry well into the material.

An adjustable blade set at the rear of the motor grader makes it possible to respread the material and windrow the excess in either direction.

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Sullivan Auger Drill

Due to the inefficiency of the average rock drill when drilling soft material, Sullivan has designed the H-2. However, by means of a simple change it can be made into a machine which will give good performance in hard rock.

The H-2 was specially designed for auger drilling and is, therefore, especially adapted for use in drilling soft iron ore, gypsum, limestone, slate, shale, frozen ground, or any heavy, sticky formation, because of its unusual stalling torque, resulting in an extra strong rotation. Stalling, consequently, is greatly minimized, and the result is a superior auger drill.

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New Ransome Bulletins

The Ransome Concrete Machinery Co., of Dunellen, N. J., have just issued two new bulletins. One covers the new Ransome Mechanical Strike Off, which permits savings in strike-off work on concrete paving jobs. The other provides complete data and specifications on the newest models of the well known 7-S and 10-S Model T Ransome Concrete Mixers.

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Robert T. Banks Goes East

Robert T. Banks, northwest manager of Sullivan Machinery Company, with headquarters in Spokane, has been promoted to division manager at Claremont N. H., where the factories of the company are located. The post was created for Mr. Banks and he will assume it about August 1.

He will be succeeded by O. J. Neslage, manager of the Salt Lake office, who has been with the company 18 years.

Vallejo, Calif.—City—Asphalt Concrete Paving

Contract awarded to A. G. Raisch, 1 DeHaro St., San Francisco, $123,096, by City Clerk, Vallejo, for repaving portions of Georgia, El Dorado, Napa, York, Sonoma, Marin, Florida and Tennessee Sts., in Vallejo. Bids from:

(1) A. G. Raisch, S. F. $123,096
(2) Hanrahan Wilcox Corp., S. F. 127,743
(3) Union Pav. Co., S. F. 129,830
(4) Independent Constr. Co., Oakland .. 132,415
(5) Pacific States Constr. Co. 133,085
(6) Southern Calif. Roads Co., L. A. ... $138,773
(7) A. Teichert & Son, Inc., Sac'to 147,344
(8) Heafey Moore Co., Oakland 148,146
(9) Chas. L. Harney, S. F. 157,874
(10) A. Teichert (conc. alt.) 156,411

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
18,839 cu. yd. grading	.50	.85	.50	.75	.45	1.00	.60	1.04	1.70
9,914 ton 3" cr. run base	1.85	1.90	2.15	1.95	2.40	2.12	2.50	2.15	2.37
634 cu. yd. concrete gutters	10.60	$12	$12	$11	$14	$14	$14	$15½	$15
174 cu. yd. conc. alley cross. wings	11.00	$11	$12	$12	$12	$13	$13	$13	$13
95 cu. yd. conc. curb & gutter	12.00	$14	$13	$13	$16	$15	$16	$15½	$20
2,590 lin. ft. curb armor	.16	.22	.20	.25	.20	.20	.30	.30	.20
1 catch basin type A	50.00	$100	$75	$125	$165	$100	$100	$100	$200
2 catch basins type B	50.00	$90	$100	$50	$120	$100	$75	$120	$100
25 cu. yd. structure excavation	1.00	1.00	2.00	2.00	2.00	2.00	2.00	1.50	2.50
72 lin. ft. 15" vitrified pipe	1.00	1.15	1.25	1.50	1.75	2.00	2.50	3.00	2.25
ALTERNATE SCHEDULE A—ASPHALT CONCRETE:									
78,917 sq. ft. 3" asph. conc. base	.08	.06	.08	.085	.08	.09	.091	.087	.084
447,586 sq. ft. 4" asph. conc. base	.105	.10	.11	.11	.11	.11	.115	.12	.11
517,138 sq. ft. 2" asph. conc. type B top	.06	.06	.06	.06	.06	.055	.073	.06	.06
9,365 sq. ft. 2" asph. conc. type C top	.06	.06	.07	.07	.07	.06	.10	.075	.069
ALTERNATE SCHEDULE B CONCRETE:									
78,917 sq. ft. 5" conc. pavement	....	....	....	....	....	....	.18	....	....
447,586 sq. ft. 6" conc. pavement	....	....	....	....	....	....	.206	....	....

Sacramento, Calif.—State—Grading and Surfacing—Alameda County

Contract awarded to Hanrahan Co., 582 Market St., S. F., $122,538, by Calif. Div. of Highways, Sacramento, for 2.4 mi. grading & crusher run base & plant mix surfacing, betew. Folger Ave. and Camelia St., ALAMEDA COUNTY, Calif. Bids from:

(A) Hanrahan Co., S. F. $122,538
(B) Moore Co., Oakland 123,106
(C) United Contr. Co., Portland $126,673
(D) Union Paving Co., S. F. 128,340

	(A)	(B)	(C)	(D)
20,000 cu. yd. roadway excavation	.22	.25	.20	.30
500,000 station yards overhaul	.005	.005	.005	.005
31,700 cu. yd. imported selected material	.23	.30	.29	.25
78,400 mile yards haul	.15	.10	.12	.15
260 cu. yd. structure excavation	.90	1.25	1.50	1.00
120 stations finishing roadway	8.00	6.00	6.00	9.00
25,000 tons crusher run base	1.86	1.50	1.60	1.50
58 tons liquid asphalt, SC2 (prime coat)	12.00	14.00	13.80	14.00
9,600 tons mineral aggregate (plant-mix surf.)	2.25	2.85	2.80	2.60
484 tons liquid asphalt MC5 or extra heavy	15.00	17.50	18.00	17.00
40 tons liquid asphalt MC3 (seal coat)	19.00	20.00	18.00	20.00
555 tons stone screenings	2.50	2.25	2.50	3.00
73 tons liquid asphalt, SC1A (shoulders)	11.00	12.00	11.00	14.00
38 tons liquid asphalt, SC2 (shoulders)	13.00	14.00	13.80	15.00
220 lb. bar reinforcing steel	.06	.07	.06	.20
6 cu. yd. "A" cement concrete (structures)	20.00	21.00	20.00	35.00
7,700 tons riprap	1.65	2.15	2.25	2.50
220 lineal ft. 12-in. corrugated metal pipe	1.10	1.60	1.50	1.50
130 lineal ft. 12 in. vitrified clay pipe	.85	1.60	1.50	3.00
400 each guide posts	1.25	1.50	1.00	2.00
L. S. alterations to existing ferry pier	$2,000	$1,500	$2,000	$2,000

Sacramento, Calif.—State—Grade and Surface—Alameda and Contra Costa Counties

Contract awarded to Union Paving Co., Call Bldg., San Francisco, $209,335, by Calif. Div. of Highways, Sacramento, for 3.1 miles grade and crusher run base and plant mix surfacing, between Camelia St. and San Pablo Ave., in Alameda and Contra Costa Counties, Calif. Bids from:

(1) Union Paving Co., San Francisco $209,335
(2) Peninsula Paving Co., S. F. 211,386
(3) Hanrahan Co., San Francisco 224,573
(4) Heafey Moore Co., Oakland $268,977
(5) Wood & Bevanda, Stockton 278,888

	(1)	(2)	(3)	(4)	(5)
Lump sum clearing and grubbing	4,000.00	1,500.00	2,200.00	2,000.00	2,000.00
155,000 c. y. roadway ex. without classification	.28	.35	.30	.40	.54
5,500,000 station yards overhaul	.002	.003	.0025	.005	.005
3,800 cu. yds. structure excavation	1.00	1.00	.90	1.00	1.50
163 stations finishing roadway	9.00	5.00	10.00	10.00	10.00
35,000 tons crusher run base	1.50	1.50	2.05	2.00	1.83
96 tons liquid asph., SC-2 (prime coat)	13.00	12.00	12.00	15.00	12.00
15,800 tons mineral aggreg. (plant mix surf.)	2.40	1.70	2.40	2.80	2.40
790 tons liquid asph., MC-5 or MC ex. hvy	17.00	18.00	15.00	15.00	19.00
65 tons liquid asph. MC-3 (seal coat)	20.00	20.00	20.00	20.00	19.00
810 tons stone screenings	3.00	2.25	3.00	3.00	2.50
84 tons liquid asph., SC-1A (shoulders)	14.00	12.00	12.00	15.00	11.00
43 tons liquid asph., SC-2 (shoulders)	16.00	12.00	12.00	15.00	12.00
44,500 lbs. bar rein. steel (structures)	.05	.05	.05	.06	.05
520 cu. yd. "A" concrete (structures)	18.00	20.00	16.00	20.00	20.00
220 ft. 8" CMP (16-gauge)	1.00	.90	.90	1.00	1.25
800 ft. 18" corr. met. pipe (16-gauge)	2.00	1.75	1.36	2.00	2.25
740 ft. 21" corr. met. pipe (12-gauge)	3.00	3.00	2.37	3.00	3.50
350 ft. 24" corr. met. pipe (14-gauge)	3.00	2.50	2.10	3.00	4.00
80 ft. 30" corr. met. pipe (10-gauge)	5.00	5.00	4.16	4.00	5.00
5 each, spillway assemblies	16.00	15.00	15.00	20.00	15.00
106 ft. 18" x 2½" part circle CMP 10-ga.	1.25	1.40	1.05	2.00	1.25
332 ft. 24"x 5" part circle CMP 10-ga.	2.00	1.70	1.35	2.50	1.75
140 ft. 30" x 3⅝" pt. circle CMP 8-ga.	2.50	2.25	1.90	3.00	2.25
2,750 ft. 6" vitrified clay pipe	1.20	1.00	1.00	1.00	.75
40 ft. 12" vitrified clay pipe	3.00	1.50	1.57	1.50	1.00
1,000 ft. 18" vitrified clay pipe	4.00	2.50	2.00	3.00	2.00
155 cu. yd. "A" concrete curb, gut. sdwlk.	14.00	15.00	15.00	20.00	15.00
1,600 ft. redwood curbs	.30	.30	.25	.30	.30
1,640 ft. laminated guard rail	1.00	1.25	.80	1.00	1.00
95 each, guide posts	2.00	1.75	1.36	2.00	2.00
25 each, culvert markers	2.00	2.25	1.36	2.00	2.00
1.0 mile property fence	500.00	650.00	600.00	1,000.00	500.00
50 each, monuments	2.50	3.00	2.00	3.00	3.00
21 each, manholes	75.00	75.00	65.00	80.00	100.00
28 each, adj. manholes to grade	10.00	5.00	10.00	10.00	15.00
3 each, lampholes	15.00	40.00	12.00	20.00	25.00
2,200 M gallons water	1.00	1.50	1.00	2.00	1.50

Lincoln Electric Appoints New Denver Agent

The Lincoln Electric Company, Cleveland, Ohio, manufacturers of "Shield Arc" welders, Electrodes and "Linc-Weld" motors, announces the appointment of the Intermountain Belting and Packing Company as its agent in Denver, Colorado, covering the State of Colorado and part of Kansas, Nebraska and Wyoming. The salesroom is located at 1414 Wazee Street.

President of the Intermountain Belting and Packing Company is J. H. Johnson. M. H. Mickey is vice-president and J. I. Creighton, secretary and treasurer. These men, assisted by Homer Glan and James Kelley, will provide the territory in and around Denver a complete supply service for every arc welding need.

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Cleveland Trencher Head Dies

Augustus J. Penote, 55, president and founder of The Cleveland Trencher Company and The A. J. Penote Company, died May 9 at his home in Cleveland, Ohio, of a heart attack.

He was nationally known throughout the public utility field as a contractor, manufacturer and inventor. Among his many inventions was the full-crawler-type trenching machine, of compact design for city work, which he constructed originally for his own use; subsequently founding The Cleveland Trencher Company for its manufacture.

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General Petroleum Distributes Gargoyle

Announcement has been made by H. W Taylor, manager of the lubrication department of General Petroleum Corporation, that this oil company has recently been appointed exclusive distributor in this area for Gargoyle industrial lubricants. The appointment was made by the Secony-Vacuum Oil Company, of which General Petroleum is the Pacific Coast affiliate.

The new arrangement now makes available to industrialists of the far west the counsel and advisory service of Socony-Vacuum trained lubrication engineers whose experience is of world-wide scope. Through its subsidiary, General Petroleum, the counsel of these engineers on mechanical and lubrication problems develops advice as to the correct lubricant for each individual requirement.

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Novo Announces Distributors Throughout West

Novo Engine Company, Lansing, Michigan, manufacturers of pumps, engines, hoists and other well known construction and water works items, have appointed the following new distributors: Garlinghouse Brothers, 2416 East 16th Street, Los Angeles, Calif.; General Machinery Co., E. 3500 Block, Riverside Avenue, Spokane, Wash.; Wortham Machinery Company, 410 W. 19th Street, Cheyenne, Wyo.; The Sawtooth Co., Boise, Idaho; Contractors Equipment & Supply Co., P. O. Box 456, Albuquerque, New Mexico.

Portland, Ore.—Oil Surfacing—Tillamook and Lincoln Counties

Award of contract recommended to E. C. Hall, 1st National Bank Bldg., Eugene, Ore., $238,675, by Bureau of Public Roads, Portland, Oregon, for 13.531 mi. reconst. surface and oil rock stockpiling on Salmon River Highway, Proj. FHEC 2-A4, B5, C4, Natl. Forest Road project, located in Siuslaw Natl. Forest, Oregon, TILLAMOOK and LINCOLN COUNTIES. Bids from:

(1) E. C. Hall, Eugene.....$238,675
(2) A. C. Greenwood Co., Portland..... 244,912
(3) R. O. Dail and Warren Bros., Inc., Aberdeen, Wn..... 246,969
(4) Homer G. Johnson, Portland..... 248,974
(5) A. Milne, Portland, Oregon.....$256,761
(6) P. L. Crooks & Co., Portland..... 267,959
(7) F. J. Kernan, Saxton & Looney and J. S. Risley, Portland, Ore... 269,741
(8) Babler Bros., Portland..... 274,810

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
12,000 cu. yd. excavation	.40	.45	.50	.40	.50	1.00	.40	.60
100 cu. yd. struc. excavation	1.00	2.00	1.25	1.25	1.00	2.00	1.00	3.00
1,000 cu. yd. borrow excavation	.40	.45	.40	.30	.50	.50	.90	.50
5,000 sta. yd. overhaul	.05	.05	.04	.05	.05	.05	.02	.04
13.531 mi. fine grad., subgr. & shoulders	$500	$400	$400	$800	$200	$300	$200	$500
90,000 tons spec. cr. rock or cr. gravel bottom course	1.37	1.40	1.40	1.55	1.61	1.30	1.72	1.70
20,000 tons cr. rk. or cr. grav. top course	$1½	1.50	1.40	1.50	1.66	1.70	1.77	1.70
L. S. prov. & maintain water plant	$100	$500	25.00	$1,200	$500	$1,000	$200	$500
5,000 M gallons water	1.50	1.50	2.00	1.00	1.00	3.00	1.00	1.50
7,000 tons leveling course	1.40	1.50	1.25	1.40	1.66	1.70	1.72	1.70
3,500 cu. yd. salv. surfacing	.90	.60	.75	.65	1.00	1.00	1.20	.80
6,000 cu. yd. mi. overhaul	.15	.15	.20	.15	.15	.30	.15	.15
300 lin. ft. 6" por. tile underdrain	.50	1.00	.60	1.00	.60	1.00	.50	.50
21,000 tons "A" suppl. cr. rk. or cr. gr.	1.25	1.20	1.40	1.00	1.05	1.70	1.09	1.15
9,500 tons "B" suppl. cr. rk. or cr. gr.	1.30	1.20	1.40	1.00	1.05	1.70	1.09	1.15
2,000 tons "C" suppl. cr. rk. or cr. gr.	1.35	1.20	1.40	1.00	1.05	1.70	1.09	1.15
520 tons liq. asph. SC-1	18.00	30.00	22.60	20.00	24.00	20.00	23.50	21.00
L. S. force account work	$800	$800	$800	$800	$800	$800	$800	$800

Santa Fe, New Mexico—State—Grading, Paving—Valencia County

Contract awarded to R. L. Hanes, Albuquerque, N. M., $195,910, by State Highway Engineer, Santa Fe, New Mexico, for 11.328 mi. grading, minor drainage structures, 11 multiple span concrete box culverts, two course surfacing, etc., on U. S. Highway Route No. 66 betw. Suwanee and Gallup, VALENCIA COUNTY, Proj. 13-B, No. 115. Bids from:

(1) R. L. Hanes, Albuquerque.....$195,910
(2) Skousen Bros., Albuquerque..... 200,054
(3) Wheeler & Silver, Albuquerque..... 202,717
(4) F. D. Shufflebarger, Albuquerque.... 210,797
(5) Henry Thygesen, Albuquerque..... 214,139
(6) R. C. Carrico, Albuquerque.....$216,106
(7) L. R. Allison, Albuquerque..... 218,993
(8) Brown Bros., Albuquerque..... 220,772
(9) Sharp & Fellows, Contr. Co., L. A. 233,266

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L. S. rem. old drain. struc.	$1,000	$1,100	$1,000	$2,000	$845	$500	$800	$1,880	$1,000
153,220 cu. yd. excav. uncl.	.20	.20	.185	.19	.24	.22	.20	.20	.285
3,434 cu. yd. excav. struc.	1.00	1.00	1.50	.60	1.00	1.00	1.50	1.50	1.00
648 cu. yd. exc. pipe culv.	1.00	1.00	.50	.60	1.00	.90	1.50	1.50	.75
169,223 sta. yd. overhaul	.02	.04	.025	.02	.02	.025	.02	.02	.02
57,793 mi. yd. haul	.05	.07	.05	.045	.06	.05	.07	.10	.07
81,171 tons 2 course surf.	.50	.55	.60	.66	.61	.63	.65	.57	.63
4,136 cu. yd. "A" conc.	$18	$17	$17½	$17½	$18¼	$18½	$18½	19.80	$18½
66 cu. yd. "B" conc.	$20	$20	$15	$17½	$18¼	$20	$18½	$20	$20
556,646 lb. reinf. steel	.04	.04	.044	.05	.045	.044	.045	.048	.044
2,772 lb. struc. steel	.10	.06	.07	.10	.07	.075	.15	.10	.10
1,056 lin. ft. cor. galv. culv. pipe, 24" dia.	2.20	2.40	2.30	2.70	2.00	2.70	3.50	3.05	2.50
224 lin. ft. same, 30"	3.00	3.50	3.00	3.40	2.75	3.40	5.00	3.60	3.00
438 lin. ft. same, 36"	4.50	5.00	4.60	5.30	4.50	5.00	6.00	5.00	4.75
3 ea. gate & cattle guard	$400	$400	$450	$525	$500	$440	$500	$300	$400
1 reinf. conc. monument	$50	$25	$15	$25	$25	$30	$30	$25	$50
105,846 lin. ft. galv. wire fence	.05	.05	.05	.055	.055	.06	.055	.05	.06
43 ea. gates	5.00	5.00	2.50	3.00	4.00	4.00	5.00	3.00	5.00
282 ea. bracing	2.00	1.25	1.50	1.50	1.00	1.50	1.20	1.50	1.50
113 ea. R/W markers	3.00	2.25	2.00	2.50	3.00	2.75	3.00	2.50	2.50
12,946 lin. ft. rem. & rebuild fence	.03	.04	.03	.035	.02	.035	.04	.04	.04
1.915 mi. obliterate old road	$50	$150	$100	$150	$75	$150	$300	$550	$125
Lump sum disposal, surf. boulders	$1,000	$300	$300	$350	$300	$150	$500	$440	$250
3,012 cu. yd. earth cushion matl.	.30	.25	.18	.25	.20	.25	.25	.40	2.85

San Francisco, Calif.—Gov't—Grading—Mariposa County

Award of contract recommended to William Vonder Hellen, Medford, Ore., $369,376, by Bureau of Public Roads, San Francisco, for 5.835 mi. grading Sections A3 and A4 of Rt. 3, Big Oak Flat Road, in Yosemite National Park, MARIPOSA COUNTY, Calif. Bids from:

(1) William Vonder Hellen, Medford....$369,376
(2) Ralph A. Bell, Portland..... 440,340
(3) Isbell Const. Co., Reno..... 484,749
(4) Morrison-Knudsen Co., L. A.....$610,955
(5) Engineer's estimate..... 355,716

	(1)	(2)	(3)	(4)	(5)
43 acres clearing	760.00	900.00	600.00	$1,000	500.00
134 acres cleanup clearing	180.00	300.00	200.00	200.00	100.00
262,000 cu. yd. unclass. excavation	1.03	1.12	1.42	1.75	1.00
10,500 cu. yd. borrow excavation	.25	.50	.50	1.00	.35
2,570 cu. yd. struc. excavation	1.00	2.25	1.50	3.00	2.00
575,000 sta. yd. overhaul	.01	.02	.02	.03	.02
19,200 cu. yd. mi. haul	.20	.30	.10	.30	.25
2,004 cu. yd. rock embankment	2.50	4.00	5.50	6.00	4.00
220 lin. ft. 12" perf. corr. metal pipe	1.30	1.75	1.50	2.00	1.50
1,022 lin. ft. 18" corr. metal pipe	1.50	2.50	1.90	2.20	2.00
3,048 lin. ft. 24" corr. metal pipe	2.50	3.50	3.00	2.40	2.75
224 lin. ft. 30" corr. metal pipe	3.30	4.40	3.50	3.00	3.50
110 lin. ft. 48" 12-ga. corr. metal pipe	6.50	11.40	7.25	9.00	7.50
292 lin. ft. 48" 8-ga. corr. metal pipe	9.00	12.50	10.00	11.00	11.00
70 lin. ft. 54" corr. metal pipe	6.50	10.65	9.00	11.00	8.75
44 lin. ft. 60" corr. metal pipe	9.00	14.00	11.70	13.00	13.50
6 pipe culvert anchors	10.00	10.00	35.00	10.00	10.00
1 48" 8-ga. corr. met. pipe elbow	35.00	50.00	30.00	20.00	75.00
2 12" corr. metal pipe elbows	7.50	9.00	7.00	5.00	8.00
50 cu. yd. cr. rock or grav. backfill	5.00	8.00	4.00	5.00	4.00
10 cu. yd. "A" concrete	40.00	40.00	40.00	80.00	40.00
410 lb. reinforcing steel	.10	.08	.10	.15	.10
7 ea. cast steel grates	10.00	56.00	125.00	30.00	20.00
372 cu. yd. masonry	19.00	25.00	20.00	30.00	20.00
60 sq. yd. mortar backfill	2.00	2.00	.25	2.00	.50
L. S. extra work	500.00	500.00	500.00	500.00	500.00

CONSTRUCTION
. . . . . a news summary

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

Steel and wood pipeline for Everett, Wn. Bonds voted. Est. cost $1,300,000.

Sugar refinery at Woodland for Spreckels Sugar Co., San Francisco. Est. cost $2,000,000.

Floating drydock for Navy Dept. at Pearl Harbor, T. H. Est. cost $10,000,000. Bids soon.

Street work, bridges and swimming pool for Reno, Nevada, bond election Aug. 18, $440,300.

Deck paving of Golden Gate Bridge for Golden Gate Bridge and Highway District, San Francisco. Bids soon. Est. cost $400,000.

Central Valley Project for U. S. Bureau of Reclamation, Sacramento. Est. cost $170,000,000. Bids on portions expected shortly.

17,300 ft. tunnel in Tuolumne County, Calif., for Pacific Gas & Electric Co., San Francisco, work to start soon.

CALLS FOR BIDS

4.42 mi. precast concr. or steel pipeline for Metropolitan Water Dist., Los Angeles; bids to July 30.

CONTRACTS AWARDED

Vasquez Creek Tunnel, collection conduit, diversion dam and intake works for Denver, Colo., to: (1) Utah Constr. Co., Ogden & Morrison-Knudsen Co., Boise, $573,571 for Units 10 and 11; (2) Thompson Mfg. Co., Denver, $79,688 for Unit 12.

Cast iron pipe for Dept. of Water & Power, Los Angeles, to: (1) U. S. Pipe & Foundry Co., L. A., $325,818; (2) American Cast Iron Pipe Co., L. A., $146,300; (3) National Cast Iron Pipe Co., L. A., $107,475; (4) Florence Pipe & Foundry Co., L. A., $21,762; (5) Pacific States Cast Iron Pipe Co., L. A., $22,400.

Two grade separation structures in Albuquerque for New Mexico Highway Dept., to F. D. Shufflebarger, Albuquerque, $316,323.

1.3 mi. grade and pave and constr. viaduct on East Portland Highway for Oregon State Highway, to Parker Schram Co., Portland, $243,418.

4.5 mi. grad. and concr. and asph. concr. paving betw. Belmont Circle and Biola Junction, for Calif. Div. of Highways, to Hanrahan Co., San Francisco, $229,510.

170 mi. reclaiming oil pipeline for Standard Oil Co., San Francisco, to Bechtel-Kaiser Co., S. F.

13.531 mi. oil surfacing on Salmon River Highway, for Bureau of Public Roads, Portland, to E. C. Hall, Eugene, $238,675.

Completion of emergency gate shafts at Fort Peck tunnels for U. S. Engr. Office, to Bartlett-Hayward Co., Baltimore, $1,093,609.

4.86 mi. grade and asph. concr. pave. betw. Lawton and Reno for Nevada State Highway Comm., to Dodge Constr, Inc., $201,765.

5.835 mi. grading Big Oak Flat Road for Bureau of Public Roads, San Francisco, to William von der Hellen, Medford, Ore., $369,376.

304 mi. seamless and welded steel pipe for Shell Oil Co., San Francisco, to Columbia Steel Co., Republic Steel Co., Jones & Laughlin Steel Corp., and A. O. Smith Corp. (total 25,000 tons.)

304 mi. laying oil pipeline for Shell Oil Co., San Francisco, to Lindgren & Swinerton, S. F.

36-in. steel pipe and fittings for Dept. of Water & Power, Los Angeles, to Emsco Derrick & Equipment Co., L. A., $560,536.

Earthwork, canal lining and structures, Yakima Proj. for Bureau of Reclamation, Yakima, Wn., to J. A. Terteling & Sons, Boise, $275,213.

Six undergrade crossing structures and 2.89 mi. grade and concr. pave. near Niles for Calif. Div. of Highways, to Eaton & Smith, San Francisco, $453,162.

Reconstruction of Grays Harbor South jetty for U. S. Engr. Office, Seattle, to Columbia Constr. Co., Bonneville, Ore., $2,799,458.

Sewage treatment plant for Denver, Colo., to Peter Kiewit Sons Co., Omaha, Nebr., $1,149,792.

3.1 mi. grade and plantmix surf. betw. Camelia St. and San Pablo Ave. for Calif. Div. of Highways, to Union Paving Co., San Francisco, $209,335.

5.2 mi. grade and plantmix surf. betw. Lafayette and Walnut Creek for Calif. Div. of Highways to Union Paving Co., San Francisco, $293,291.

Tunnel No. 1, Yakima Proj. for Bureau of Reclamation, Yakima, Wn., to Morrison-Knudsen Co., Boise, $292,013.

7.103 mi. gravel surf. betw. Twin Lakes and Granite for Colorado State Highway Dept., to Lowdermilk Bros., Sacra & Watts, Denver, $221,920.

Street and Road Work . . . . .

WORK CONTEMPLATED

RENO, NEVADA—Bond election will be held Aug. 18 by Reno, Nevada, to vote on the following bond issues: $23,800 for Maish Ave. Extension; $36,400 for Ridge St. Extension; $20,600 for St. Lawrence Ave. Extension; $10,700 for Mill St. improvements; $20,300 for Crampton St. improvements. 6-10

CALLS FOR BIDS

LOS ANGELES, CALIF.—Bids to 2 p. m., July 23, by Calif. Div. of Highways, L. A., for 2.7 mi. grade and concr. pav. on El Cajon Blvd. from Texas St. to Euclid Ave., in San Diego, SAN DIEGO COUNTY, Calif. 6-30

LOS ANGELES, CALIF.—Bids to 2 p. m., July 23, by Calif. Div. of Highways, Los Angeles, for: (1) VENTURA COUNTY—16.2 mi.

LeTOURNEAU FLEET OWNER MACCO MAKES A PROFITABLE APPROACH

Steep grades are no bar to the use of LeTourneau Carryalls —these haul down grades as steep as 46%, return empty over slopes up to 31%.

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Many another West Coast contractor like Macco Construction Company has found the use of LeTourneau equipment profitable; has found that its stout construction can be depended on to deliver big yardages day after day with a minimum of time out for repairs; has found that its fast-acting cable control makes for quick loading and fast, accurate spreading; has found that LeTourneau-pioneered pneumatic tires lessen draft and so make bigger loads possible; has found that where LeTourneau equipment is used, costs go down, profits up.

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(portions) surf. with pl. mix surf. and roadmix surf. tr. on portions of shoulders betw. Somis and 1 mi. east of Simi and betw. Castaic Junction and 2.4 mi. west. (2) LOS ANGELES COUNTY—14.3 mi. roadmix surf. tr. on shoulders betw. Palmdale and 14.3 mi. westerly. (3) SAN BERNARDINO COUNTY—0.8 mi. grade and plant mix surfacing betw. Verdemont and 0.8 mi. westerly. 6-30

SACRAMENTO, CALIF.—Bids to 2 p. m., July 22, by Calif. Div. of Highways, Sacramento, for 13.4 mi. crusher run base and plant mix surfacing (medium curing type) between Rt. 3 and 1.5 mi. east of Dales, in TEHAMA COUNTY, Calif. 6-30

JUNEAU, ALASKA—Bids to 9 a. m., July 24, by Bureau of Public Roads, Juneau, Alaska, for: (1) Constr. and improving 0.920 mi. of the Seward Highway, Snow River Bridges Sec., located in Chugach Nat'l Forest, 3rd Judicial Div., Alaska, involving: 33,000 cu. yd. borrow; 510 MFBM tr. timber; 389 cu. yd. concrete; 10, 580 lin. ft. tr. timber piling. (2) Reconstr. and improv. of 0.571 mi. of the Seward Highway, Grouse Creek Bridges Sec., in Chugach Nat'l Forest, 3rd Judicial Division, Alaska, involving: 3,400 cu. yd. borrow; 263 cu. yd. "B" concrete. 6-29

JUNEAU, ALASKA—Bids to 9 a. m., July 23, by Bureau of Public Roads, Juneau, Alaska, for 4.083 mi. grading and surfacing the Sitka Highway, Sitka-Halibut Point Section, located in the Tongass Nat'l Forest, 1st Judicial Division, Alaska, involving: 20,000 cu. yd. excavation; 5,200 cu. yd. grav. bottom; 3,600 cu. yd. cr. grav. top; 38,500 lb. struc. steel and other items. 6-29

JUNEAU, ALASKA—Bids to 9 a. m., July 22, by Bureau of Public Roads, Juneau, Alaska, for 3.287 mi. grading and surfacing on the Eyak Lake Highway, Cordova-3-Mile Bay Sec., located in the Chugach Nat'l Forest, 3rd Judicial Division, Alaska, involving in the main: 37,300 cu. yd. excavation; 6,000 cu. yd. cr. grav. bottom; 5,600 cu. yd. cr. grav. top; 74 MFBM tr. timber; 315 cu. yd. "A" concrete; 924 lin. ft. tr. timber piling; 68,000 lb. struc. steel. 6-29

BIDS RECEIVED

ALAMEDA, CALIF.—Heafey Moore Co., 344 High St., Oakland, $24,211, low to City Clerk, Alameda, for improving Maitland Drive from 3,450 ft. south of Bay Farm Island Bridge, southeasterly, 5,455 ft. to City Limit line. 6-16

PHOENIX, ARIZ.—Barrett & Hilp and Macco Corp., 815 Paramount Blvd., Clearwater, $9,960, low to Bureau of Reclammation, Producer Bldg., Phoenix, for construction of a service road to the Bartlett Dam site, Salt River project, Arizona, under Spec. No. 801-D. Work is located about 52 mi. northeast of Phoenix. 6-19

MODESTO, CALIF.—S. M. McGaw, 425 Lexington Ave., Stockton, $12,935, Low to City Clerk, Modesto, for resurfacing asphalt concr. pavement on "H" St. betw. 5th and 9th streets; "J" St., betw 9th St. and McHenry Ave.; and McHenry Ave. betw. "J" St. and Stoddard Ave. 6-25

SACRAMENTO, CALIF.—Leo F. Piazza, 296 N. 6th St., San Jose, $19,973, low to Calif. Div. Highways, Sacramento, for landscape development at Junction of Rt. 2 and Rt. 22 in SAN BENITO COUNTY, Calif. 6-3

SACRAMENTO, CALIF.—Hemstreet & Bell, P. O. Box 906, Marysville, $163,069, low to Calif. Div. of Highways, Sacramento, for 7 mi. grade and plantmix surf. on cr. run base betw. 4½ mi. N.E. of Tahoe City and Nevada State Line, in PLACER COUNTY, Calif. 6-10

SACRAMENTO, CALIF.—Bids received, as follows, by the Calif. Div. of Highways, Sacramento, for: (A) HUMBOLDT and TRINITY COUNTIES—Helwig Constr. Co., 115 Main St. Sebastopol, Calif., $23,780, low for 0.7 mi. grade and remov. timb. bridges betw. 3.5 mi. and 5.25 mi. east of Blue Lake and Gray Creek. (B) KINGS COUNTY—Leo F. Piazza, 296 N. 6th St., San Jose, $30,540, low for 7.1 mi. cr. run base borders and plant mix. surf. on roadbed and roadmix surf. tr. applied to shoulders betw. Rt. 10 and Hub and betw. Corcoran and 1 mi. east. (C) MONO COUNTY—Basich Bros., 20530 Normandie Ave., Torrance, $26,309, only bid for 0.8 mi. grad. betw. 1.3 and 2.2 mi. north of east entrance of Yosemite Nat'l Park. 6-24

SAN FRANCISCO, CALIF.—The Fay Improvement Co., Phelan Bldg., S. F., $25,980, low to Dept. of Public Works, S. F., for grading and paving Anza St. betw. Arguello and Parker St., S. F. 6-17

SAN FRANCISCO, CALIF.—Lowrie Paving Co., Inc., 1540 16th St., San Francisco, $68,942, low to Dept. of Public Works, S. F., for reconstructing and widening 6th Street betw. Market and Townsend streets, San Francisco. 6-24

DENVER, COLO.—Driscoll Constr. Co., P. O. Box 516, Pueblo, Colo., $65,073, low to State Highway Dept., Denver, Colo., for 4.602 mi. grav. surfacing between Del Norte and South Fork on State Highway No. 10 in RIO GRANDE COUNTY, Colo. 6-11

PORTLAND, ORE.—Bids received, as follows, by Oregon State Highway Comm., Portland, Oregon, for: (1) TILLAMOOK COUNTY (State Project)—McNutt Bros., 351½ E. Broadway, Eugene, Ore., $42,269, low for 1.7 mi. grading on Small Creek-Dolph Sec. of Little Nestucca Secondary Highway. (2) UMATILLA COUNTY (State Project)—A. S. Wallace, Roseburg, Ore., $8,417, low for furn. approx. 5,300 cu. yd. cr. grav. in stockpile on Hermiston-Echo Junction Sec. of Hermiston Secondary Highway. (3) WASHINGTON COUNTY (State Project)—Charles H. Leonard, Albany, Ore., $52,142, low for 1.4 mi. grad. and surf.; also constr. 2 tr. timber trestles on Davies-Banks Sec. of Nehalem Secondary Highway. (4) YAMHILL COUNTY (State Project)—Charles H. Leonard, Albany, Ore., $24,728, low for 1.42 mi. grading and surf. on Dayton-Foster Ranch Sec. of Salem-Dayton Secondary Highway. (5) YAMHILL COUNTY (State Project)—Charles H. Leonard, Albany, Ore., $67,447 and $66,697, ALT. low for 3.06 mi. grading and surf., also furn. 2,800 cu. yd. cr. rock in stockpile on Grub College-Amity Sec. of Amity-Dayton Secondary Highway. 6-29

PORTLAND, ORE.—Bids received, as follows, by Oregon State Highway Comm., Portland, Ore., for: (1) JACKSON COUNTY (State Project)—McNutt Bros., 351½ E. Broadway, Eugene, Oregon, $53,485, low to 2.1 mi. grading on Unit 3, McCallister Sec. of Little Butte Secondary Highway. (2) MARION COUNTY (WPGS 294-BWPSS 294-A)—Roy L. Houck, Independence, $104,058, low for 4.08 mi. grad. and constr. 2 tr. timb. pile trestles with concr. superstruc. on Butteville Road-White School Sec. of Butteville Road-Hubbard Secondary Highway. (3) MULTNOMAH COUNTY (WPMH 168-D)—Parker-Schram Co., Couch Bldg., Portland, Ore., $243,418, low for 1.38 mi. grading and paving; also const. concr. viaduct and retain. walls on Ross Island Bridge-Schiller St. Section of East Portland, Oregon City Highway. 6-29

SEATTLE, WN.—L. J. Dowell, Inc., 1437 Elliott Ave., W. Seattle, Wn., $29,615, low to Board of County Comm., Seattle, Wn., for 1 mi. grading and paving Puget Sound Marine View Drive. 6-11

CONTRACTS AWARDED

PHOENIX, ARIZ.—Award recommended to H. J. Hagen, Globe, Ariz., $50,594, by Bureau of Public Roads, Phoenix, for 1.854 mi. grading Sec. "B" (portions) of Route 19, the Clifton-Alpine Nat'l Forest Highway, Crook National Forest, GREENLEE COUNTY, Ariz. 6-26

PHOENIX, ARIZ.—To Pearson & Dickerson, P. O. Box 471, Prescott, Ariz., $114,562, by State Highway Engineer, Phoenix, for grading, draining roadway, and select material aggregate base course and cutback plant mix salvage and relay existing oil cake from Jerome to Clarksdale, a distance of about 4.2 mi. on the Prescott-Flagstaff Highway, WPMH 96-D, YAVAPAI COUNTY, Ariz. 6-16

PHOENIX, ARIZ.—To White & Miller, P. O. Box 2350, Tucson, $53,409, by State Highway Comm., Phoenix, for aggregate base course and widening existing pavement with cutback plant mix, beginning in Yuma and extending southerly on the Yuma-Gila Bend Highway, WPMH 82-A, YUMA COUNTY, Ariz. 6-17

FRESNO, CALIF.—To Stewart & Nuss, Inc., 410 Thorne Ave., Fresno, $13,103, by Dist. Engr., Calif. Div. of Highways, Fresno, for 5.8 mi. surf. with armor coat and roadmix surf. tr. applied to shoulders betw. west boundary and Kings River Slough in KINGS COUNTY, Calif. 6-24

LAWNDALE, CALIF.—To John P. Lawlor, 372 7th Avenue, San Francisco, $8,206, by City Clerk, Lawndale, Calif., for improving "F" Street between El Camino Real and a point easterly. 6-23

LOS ANGELES, CALIF.—To Southern Calif. Roads Co., 2145 East 25th St., Los Angeles, by the Citizens Nat'l Trust and Savings Bank, Los Angeles, for improvements to various streets in Inglewood tract, at $41,256. 6-27

LOS ANGELES, CALIF.—Awards as follow, by Calif. Div. of Highways, L. A., for: (1) VENTURA COUNTY—To Dimmitt & Taylor, 815 E. 59th Street, L. A., who bid $24,391 for 1.5 mi. grading and bituminous treatment roadmix at Camarillo State Hospital. (2) LOS ANGELES COUNTY—To George R. Curtis Paving Co., 2440 E. 26th Street, Los Angeles, who bid $28,526 for 1.1 mi. widen roadbed and widen strip of plant mix surfacing (medium curing type) and concrete paving between Potato St. and Florence Avenue. 6-30

LOS ANGELES, CALIF.—To R. E. Hazard & Sons, P. O. Box 1438, San Diego, $22,391, by Calif. Div. of Highways, L. A., for 21 mi. roadmix surface treatment betw. National Forest Boundary and Victorville in SAN BERNARDINO COUNTY, Calif. 6-29

LOS ANGELES, CALIF.—To Matich Bros., Elsinore, $22,891, by Calif. Div. of Highways, L. A., for 0.6 mi. grad. and tr. with liq. asph. betw. a point near 3rd St. in Barstow and 0.6 mi. easterly in SAN BERNARDINO COUNTY, Calif. 6-24

LOS ANGELES, CALIF.—To Gibbons & Reed, 221 E. San Fernando Blvd., Burbank, Calif., $165,813, by Calif. Div. of Highways, L. A., for 2.7 mi. grading and concrete paving between Gypsum Creek and Riverside County Line, in ORANGE COUNTY, Calif. 5-28

LOS ANGELES, CALIF.—To Southwest Paving Co., Roscoe, Calif., $58,816, by Calif. Div. of Highways, L. A., for 14.6 mi. plant mix surf. betw. San Antonio Creek and Ojai; betw. Mound School and 2.7 mi. east and betw. Simi and 0.4 mi. east of Santa Susana Overhead in VENTURA COUNTY, Calif. 6-3

LOS ANGELES, CALIF.—Awards as follows by Calif. Div. of Highways, Los Angeles, for: (1) ORANGE COUNTY—To George R. Curtis Paving Co., 2440 E. 26th St., Vernon, Calif., $143,965, for 9.8 mi. conc. pavement widening betw. Seal Beach and Newport Beach. (2) VENTURA COUNTY—To Oswald Bros., 366 E. 58th St., Los Angeles, $18,164 for grading and concrete and asphalt concrete paving roads within grounds at Camarillo State Hospital. (3) SAN BERNARDINO and RIVERSIDE COUNTIES—To George Herz, 311 Platt Bldg., San Bernardino, $63,603 for 19.4 mi. surf. various locations with plant mix slow curing type and apply seal coat at various locations in above counties. (4) RIVERSIDE COUNTY—To B. G. Carroll, 4396 Maryland St., San Diego, $61,720 for 1.3 mi. grading and concrete paving about 2.2 mi. west of Indio. (5) LOS ANGELES COUNTY—To George R. Curtis Paving Co., 2440 E. 26th St., Vernon, $29,887 for 6.8 mi. shoulder plant mix surf. on bit. macadam between Castaic School and Piru Creek. 5-28

LOS ANGELES, CALIF.—Awards as follow by Calif. Div. of Highways, Los Angeles, for: (1) RIVERSIDE COUNTY—To Oswald Bros., 366 E. 58th St., L. A., $65,160 for 2.4 mi. grade and plant mix surfac. betw. San Bernardino County Line and Beaumont. (2) LOS ANGELES COUNTY—To C. F. Robbins, 307 W. 8th St., Los Angeles, $50,716 for 0.6 mi. grading and concr. paving at Walnut Canyon. (3) SAN BERNARDINO COUNTY—To Oswald Bros., 366 E. 58th St., Los Angeles, $71,273 for 1.3 mi. grading and concr. and asph. concr. paving between Colton and Waterman Avenue. 6-10

OAKLAND, CALIF.—Awards as follow by East Bay Municipal Utility Dist., 512 16th St., Oakland, for street paving repairs for year ending June 30, 1937, under Spec. L.S. 176: (1) To Ransome Co., 4030 Hollis St., Oakland, $9,480 for base course, surface course, and patching. (2) To Charles S. Hughes Co., 1001 Ashby Ave., Berkeley, $12,525 for 1,500 cu. yd. wet mix concrete. 6-19

REDDING, CALIF.—To N. M. Ball Sons, Box 404, Berkeley, $14,961, by Dist. Engr. Calif. Div. Highways, Redding, for 0.3 mi. grad. and concr. pav. at south entrance to Red Bluff, in TEHAMA COUNTY, Calif. 6-5

SACRAMENTO, CALIF.—To Heafey Moore Co., 344 High St., Oakland, $10,942, by City Clerk, Sacramento, for asph. pav. 57th St. from "H" to "J" streets. 6-27

SACRAMENTO, CALIF.—Awards as follow, by Calif. Div. of Highways, Sacramento, for: (1) YUBA & NEVADA COUNTIES—To J. G. Chigris, 2316 31st Ave., S. F., $156,538 for 3.7 mi. grad., cr. run base and applying seal coat betw. Parks Bar Bridge and ¼ mi. east of Nevada County line. (2) ALAMEDA COUNTY—To Hanrahan Co., 582 Market St., San Francisco, $124,748 for 1.4 mi. grade and asph. concr. and concr. pav. betw. 34th St. and 7th St. in Oakland. 6-29

SACRAMENTO, CALIF.—To Hanrahan Co., 582 Market St., San Francisco, $85,588, by Calif. Div. of Highways, Sacramento, for 3.7 mi. grading and crusher run base and roadmix surf. between Knights Landing and Robbins, in SUTTER COUNTY, Calif. 6-30

SACRAMENTO, CALIF.—Awards as follow by County Clerk, Sacramento, for: (1) To Heafey Moore Co., 344 High St., Oakland, $15,439 for asph. armor top surface on Greenback Lane. (2) To J. R. Reeves, R. D. 3, Box 100, Sacramento, $4,687 for const. shoulders on Lower Stockton Road. (3) To Heafey Moore Co., 344 High St., Oakland, $14,397 for asph. concr. resurfacing on Marconi Avenue. 6-22

SACRAMENTO, CALIF.—To Fredericksen & Westbrook, Lower Lake, Calif., $58,430 by Calif. Div. of Highways, Sacramento, for 13.3 mi. grading and tr. with liq. asph. betw. Susanville and Milford and betw. Johnstonville and Lake Leavitt in LASSEN COUNTY, Calif. 6-24

SACRAMENTO, CALIF.—To Union Paving Co., Call Bldg., S. F., $293,291 by Calif. Div. of Highways, Sacramento, for 5.2 mi. grade and plant mix surf. on cr. run base betw. 2 mi. west of Lafayette and Walnut Creek in CONTRA COSTA COUNTY, Calif. (See Unit Bid Summary.) 6-24

SACRAMENTO, CALIF.—Awards as follow by Calif. Div. of Highways, Sacramento, for: (1) STANISLAUS COUNTY—To S. M. McGaw, 425 Lexington Ave., Stockton, $44,163 for 4.2 mi. grad. and bitum. tr. cr.

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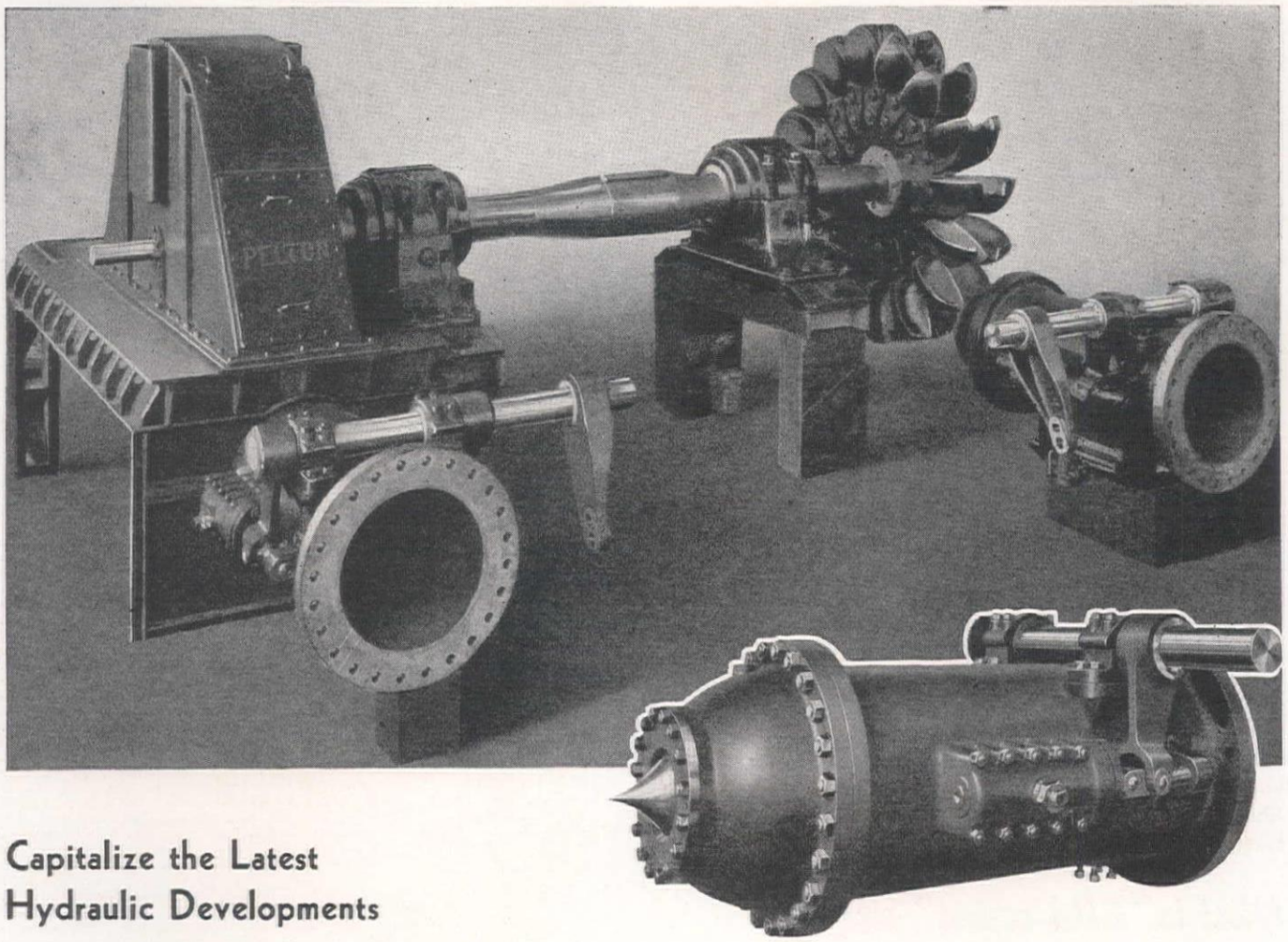

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grav. or stone plant mix surf. betw. Turlock and Keyes, Calif. (2) TUOLUMNE COUNTY—To M. J. B. Const. Co., 319 Elks Bldg., Stockton, $63,529 for 2.4 mi. grading and roadmix surf. on untr. cr. grav. or stone base between 3½ mi. east of Sullivan Cr. and Pooleys. (3) ALAMEDA COUNTY—To Hanrahan Co., 582 Market St., San Francisco, $122,538 for 2.4 mi. grading and cr. run base and plant mix surf. betw. Folger Ave. and Camelia St. (4) ALAMEDA and CONTRA COSTA COUNTY—To Union Paving Co., Call Bldg., S. F., $209,335 for 3.1 mi. grading and cr. run base and plant mix surf. betw. Camelia St. and San Pablo Avenue. (See Unit Bid Summary). (5) SACRAMENTO COUNTY—To A. Teichert & Son, Inc., 1846 37th Street, Sacramento, $49,772 for 0.6 mi. grading and asph. concr. and concr. pav. betw. "C" St. and American River. 6-16

SACRAMENTO, CALIF.—To J. R. Reeves, R.D. 3, Box 100, Sacramento, $10,000, to City Clerk, Sacramento, for 1,000,000 sq. ft. planing bituminous concrete pavement. 6-12

SACRAMENTO, CALIF.—To A. S. Vinnell, 969 Amalia Ave., L. A., $18,211, by Calif. Div. of Highways, Sacramento, for 9.1 mi. surf. with roadmix surf. and seal coat between 3 mi. and 12 mi. north of Mojave in KERN COUNTY, Calif. 6-11

SACRAMENTO, CALIF.—Awards as follow by Calif. Div. of Highways, Sacramento, for: (1) SAN FRANCISCO COUNTY—To California Nursery Co., Inc., Niles, Calif., $13,935, for furn. and planting trees and shrubs, grading and planting lawn and const. water system, at 5th Street Plaza, San Francisco. (2) SHASTA COUNTY—To Fredericksen & Westbrook, Lower Lake, Calif., $59,617 for 2.4 mi. grading, cr. run base and roadmix surf. betw. Viola and Forest Boundary. 6-10

SACRAMENTO, CALIF.—To N. M. Ball Sons, P. O. Box 404, Berkeley, $43,671, by Calif. Div. of Highways, Sacramento, for const. 1.5 mi. of which 0.5 mi. is grading and cr. run base surface (plant mix); about 0.6 mi. to be widened and borders of cr. run base, and reconst. fences; also const. a reinf. concrete bridge betw. 4 mi. north of Willows and 1 mile south of Artios in GLENN COUNTY, Calif. 6-5

SACRAMENTO, CALIF.—To Jones & King, Jackson St., Hayward, Calif., $16,295, by Calif. Div. of Highways, Sacramento, for 1.9 mi. plant mix surf. betw. Irvington and Centerville in ALAMEDA COUNTY, Calif. 6-5

SACRAMENTO, CALIF.—Awards as follow by the Calif. Div. of Highways, Sacramento, for: (1) FRESNO COUNTY—To Hanrahan Co., 582 Market St., S. F., $229,510, for 4.5 mi. grad. and concr. and asph. concr. paving betw. Belmont Circle and Biola Junction in Fresno County. (See Unit Bid Summary.) (2) YOLO and COLUSA COUNTY—To Hanrahan Co., 582 Market St., S. F., $129,708 for 10.3 mi. grading and plant mix medium curing type surf. betw. Dunnigan and Arbuckle. (3) MENDOCINO COUNTY—To Guerin Bros., 2145 20th Ave., S. F., $12,999 for 0.8 mi. grading and removing timber bridges betw. Navarro River and Williams Creek. 6-1

SACRAMENTO, CALIF.—Awards as follow by Calif. Div. of Highways, Sacramento, for: (1) MONO COUNTY—To Basich Bros., 2055 S. Normandie Ave., Torrance, Calif., $119,350, for 9.1 mi. of grade and bitum. treatment, selected materials surface betw. 2 mi. south of Rush Creek and 2 miles north of Leevining. (2) PLUMAS COUNTY—To Fredericksen & Westbrook, Lower Lake, Calif., $29,750 for 5.6 mi. grad. and apply penetration oil treatment betw. 4 mi. east of Beckwourth and Ede's Ranch. (3) TULARE COUNTY—To Palo Alto Road Materials Co., 465 California Ave., Palo Alto, $24,401, for 24.6 mi. apply roadmix surf. treatment to shoulders and portions to be surf. with armor coat, betw. the westerly boundary and 4 mi. east and betw. Yetten and Lemon Cove. 5-25

SAN FRANCISCO, CALIF.—To J. R. Reeves, R.D. No. 3, Box 100, Sacramento, $95,265, by Bureau of Public Roads, S. F., for 4.267 mi. grading Sec. B of Rt. 27, the Sierraville-Hobart National Forest Highw., Tahoe National Forest, SIERRA and NEVADA COUNTY. 5-26

SAN FRANCISCO, CALIF.—Award recommended to Lee J. Immel, 1031 Evelyn Ave., Berkeley, $9,947, by Bureau Public Roads, S. F., for 25.783 mi. bitum. tr. on Secs. F & G and portions of Sec. A, B, C, D and E, Rt. 21, Deer Cr. Meadows Natl. Forest Highway, Lassen National Forest, BUTTE and TEHAMA COUNTIES, Calif. 6-11

SAN FRANCISCO, CALIF.—To A. G. Raisch, 1 de Haro St., San Francisco, $65,065, by Dept. Public Works, S. F., for widening and reconst. Harrison St. betw. the Embarcadero and First St. and betw. Second St. and Fifth St. under Spec. 18,926. 6-17

SAN FRANCISCO, CALIF.—To Lowrie Paving Co., Inc., 1540 16th St., San Francisco, $34,514, by Public Utilities Comm., San Francisco, for repaving street and sidewalk openings where paving has been removed for S. F. Water Dept. for fiscal year ending June 30, 1937. 6-24

SAN JOSE, CALIF.—To Earl W. Heple, 494 Delmas Avenue, San Jose, $13,635, by Board of County Supervisors, San Jose, for improvement of Calaveras Road, betw. State Highway in Milpitas to a point near the Evans Road, in Superv. Dist. No. 3. 6-8

SAN LUIS OBISPO, CALIF.—To Granite Const. Co., Bin No. 9, Watsonville, $11,440, by Dist. Engr. Calif. Div. of Highways, San Luis Obispo, for 34 mi. applying seal coat to exist. pavement betw. Atascadero and San Miguel; and betw. Salinas and Monteray-Santa Cruz County Line, in SAN LUIS OBISPO and MONTEREY COUNTIES, Calif. 6-24

SAN LUIS OBISPO, CALIF.—To L. A. Brisco, Arroyo Grande, $14,950, by Dist. Engr. Calif. Div. of Highways, San Luis Obispo, for 12.2 mi. roadmix surf. tr. applied to existing shoulders between Seaside Road and Castroville in MONTEREY COUNTY, Calif. 6-16

SAN LUIS OBISPO, CALIF.—To Paulsen & March, 8275 Compton Ave., Los Angeles, $11,343, by District Engineer, Calif. Div. of Highways, San Luis Obispo, Calif., for 41 mi. liquid asphalt furn. and applied between Cambria and Route 2, between Morro and Shandon and betw. Santa Margarita and Creston in SAN LUIS OBISPO COUNTY, Calif. 6-5

SAN LUIS OBISPO, CALIF.—To L. A. Brisco, Arroyo Grande, Calif., $10,227, by Dist. Engr. Calif. Div. of Highways, San Luis Obispo, for 16.0 mi. seal coat and roadmix surf. tr. applied betw. Nipomo and Arroyo Grande, betw. Santa Maria River and Pismo and betw. Edna and San Luis Obispo, SAN LUIS OBISPO COUNTY, Calif. 6-3

SAN MATEO, CALIF.—To Union Pav. Co., Call Building, S. F., $25,210, by City Clerk, San Mateo, for grading and paving, etc., on North Fremont St., North Grant St., and North Humboldt St., and East Santa Ynez. 6-16

SUSANVILLE, CALIF.—To Harms Brothers, 5220 21st Ave., Sacramento, $43,802, by District Engineer, Lassen-Modoc Joint Highway Dist. No. 14, Susanville, Calif., for 6.7 mi. grading, const. culverts and one bridge; and 2 cattle guards; and 2.9 mi. cover gravel with binder material between Susanville and Adin, in LASSEN COUNTY, Calif. 6-25

DENVER, COLO.—To Edward Selander, Greeley, Colo., $36,251, by State Highway Dept., Denver, for 1.889 mi. grav. surf. between Oak Creek and Phippsburg on State Highway No. 131, WPSS 388-C in ROUTT COUNTY, Colo. 6-27

DENVER, COLO.—Awards as follow, by State Highway Dept., Denver, Colo., for: (1) PROWERS COUNTY (FAP 216-AR No. 3)—To Kranz Const. Co., General Delivery, Pueblo, Colo., $131,083 for 5.004 mi. grav. surf. and concr. paving betw. Holly and the Colorado-Kansas

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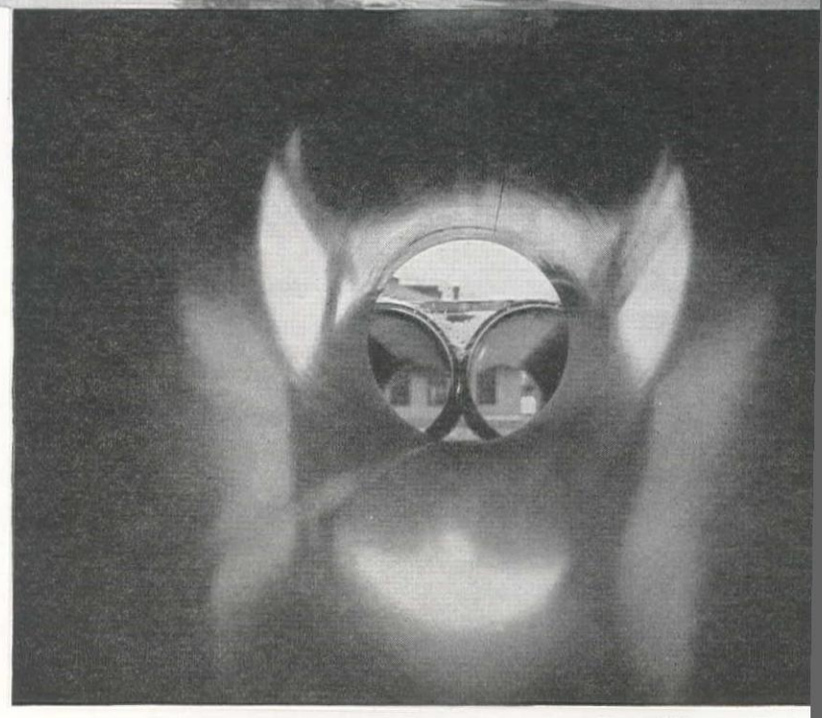


The above illustrates the exceedingly smooth, glossy surface of Barrett Water Works Enamel applied to the interior of a 60"-diameter steel water pipe

State Line, State Highway No. 6. (2) ADAMS and WELD COUNTY (WPSS 352-D)—To Driscoll Constr. Co., P. O. Box 516, Pueblo, Colo., $77,570 for 6.241 mi. grav. surf. betw. Denver and Frederick State Highway No. 185. (3) ADAMS COUNTY (WPSS 421)—To J. B. Bertrand, 301 Union Depot, Denver, $33,626 for 2.501 mi. grav. surf. betw. Broomfield and East Lake, State Highway No. 128. 6-30

DENVER, COLO.—Awards as follow by the Colorado State Highway Dept., Denver, Colorado, for: (1) PROWERS and BACA COUNTIES—St. Proj. 81-310 and 89-0. To Driscoll Const. Co., Pueblo, $40,800 for 76.5 mi. grav. surf. betw. Lamar and the Colorado-Oklahoma State Line, State Highway 59. (2) LARIMER and WELD COUNTIES—St. Proj. 875-0 and 894-0—To Driscoll Const. Co., Pueblo, Colo., $17,621, for 21 mi. roadmix oil processed surfacing, north of Ft. Collins on State Highway No. 1. 5-25

DENVER, COLO.—Award recommended to Taggart Const. Co., Cody, Wyo., $45,621, for 21 mi. roadmix oil processed surfacing, north of Ft. Collins on State Highway No. 1. 5-25

DENVER, COLO.—Award recommended to Taggart Const. Co., Cody, Wyo., $45,471, by Bureau of Public Roads, Denver, for 37.3 mi. bituminous base treatment of the Grand Loop, South Entrance and East Entrance Highways, in Yellowstone National Park, Proj. PEC. 1-E2, 4-A1, A2, 5C, and D2. 5-25

DENVER, COLO.—To Taggart Const. Co., Cody, Wyo., $45,471, by Bureau of Public Roads, Denver, Colo., for 37.3 mi. bituminous base treatment of the Grand Loop, South Entrance and East Entrance Highways, in Yellowstone National Park, Proj. PEC. 1-E2, 4-A1, A2, 5C, and D2. 6-24

DENVER, COLO.—Awards as follow by the State Highway Dept., Denver, Colo., for: (1) FREMONT COUNTY (FAP 113-F & FLHP 2-E)—To Owen, Babb & Thorkildson, 1375 Monaco Blvd., Denver, Colo., $108,600 for 4.109 mi. grav. surf. betw. Cotopaxi and Texas Creek on State Highway 6. (2) CLEAR CREEK COUNTY (FAP 181-E & 181-A)—To M. E. Carlson, 4483 Newton, Denver, $141,753 for 3.461 mi. grav. surf. betw. Idaho Springs and the foot of Floyd Hill on State Highway No. 2. (3) YUMA COUNTY (FAP 351-H & ERP 13)—To Phelps Bros., Fowler, Colo., $13,423 for 0.189 mi. grav. surf. approaches and const. bridge, betw. Idalia and Colorado-Kansas State Line on State Highway No. 102. 6-1

DENVER, COLO.—Awards as follow by State Highway Dept., Denver, Colo., for: (1) LAKE COUNTY (WPSS 423)—To Lowdermilk Bros., Sacra & Watts, 467 So. University St., Denver, Colo., $17,453 for 0.632 mi. grav. surf. betw. Twin Lakes and Granite on St. Highway No. 82. (2) LAKE COUNTY (FAP 152-B)—To Lowdermilk Bros., Sacra & Watts, 467 So. University St., Denver, Colo., $221,920 for 7.103 mi. gravel surf. betw. Leadville and Granite on State Highway No. 4. 6-22

BOISE, IDAHO—To F. H. DeAtley & Co., Lewiston, Idaho, $79,205, by Comm. of Public Works, Boise, Idaho, for 4.360 mi. const. roadbed drainage structures and crushed rock surfacing on the Clearwater Highway from Pierce toward Weippe and channel change construction from Weippe toward Pierce in CLEARWATER COUNTY, Project SAP 223-AB, Idaho. 6-29

BOISE, IDAHO—To Goodfellow Bros., Inc., Box 1332, Wenatchee, Wn., $119,521, by Comm. of Public Works, Boise, for 6.532 mi. grad. and plac. 8-in. select matl. and cr. rock surf. on North and South Highway in Little Salmon River Canyon north of New Meadows in ADAMS and IDAHO COUNTIES, Idaho. 6-26

BOISE, IDAHO—To Dan J. Cavanagh, Twin Falls, Idaho, $60,841, by Comm. of Public Works, Boise, Idaho, for 6.328 mi. grading, etc., of Burley-Oakley Highway, from Burley south, in CASSIA COUNTY, WPMS 170-B, Idaho. 6-1

BOISE, IDAHO—Awards as follow by Comm. of Public Works, Boise, Idaho, for: (1) KOOTENAI COUNTY (WPSO 195-A & WPMS 195-B and 200-C)—To Triangle Const. Co., Spokane, Wn., $97,846 for 9.107 mi. roadbed const., grav. surf., etc., on the Rathdrum to Washington Line Road 0.775 mi. grading, etc., of the Spirit Lake Highway through Rathdrum. (2) IDAHO COUNTY (WPSO 222-A & WPMS 222-B)—To Colonial Const Co., Spokane, Wn., $105,130 for 4.891 mi. cr. rock surf., etc., on Cottonwood-Graves Creek Rd. (3) NEZ PERCE COUNTY (NRH 67-A)—To Kester & Kenyon, Lewiston, Idaho, $4,985 for 0.126 mi. roadside improv. to N. and S. Highway, at Spalding. (4) ADAMS COUNTY (IFAP 104-D)—To Ralph Davis, St. John, Wn., $68,830 for 3.827 mi. grad., etc., on N. and S. Highway, betw. Starkey and Tamarack. 6-1

BOISE, IDAHO—To B. D. Palfreyman, Provo, Utah, $44,863, by Comm. of Public Works, Boise, Idaho, for 6.689 mi. const. roadbed, drainage and irrig. structures and cr. gravel surf. on the Ovid-Sharon Road betw. Ovid and Sharon in BEAR LAKE COUNTY, Idaho, WPSO 218. 6-8

BOISE, IDAHO—To Nick Burggraf, Inc., and J. W. Brennan, Idaho Falls, Ida., $31,960, by Comm. of Public Works, Boise, Ida., for 12.957 mi. plac. cr. gravel surf. on the Roosevelt Highway between American Falls and Aberdeen, SAP 210-B and 134-E & G in POWER and BINGHAM COUNTIES, Idaho. 6-22

BOISE, IDAHO—To Goodfellow Bros., Inc., Box 1332, Wenatchee, Wn., $119,521, low for 6.532 mi. grad. and plac. 8 "select. matl. and cr. rock surf. on North and South Highway in Little Salmon River Canyon north of New Meadows, ADAMS and IDAHO COUNTIES, Idaho. 6-26

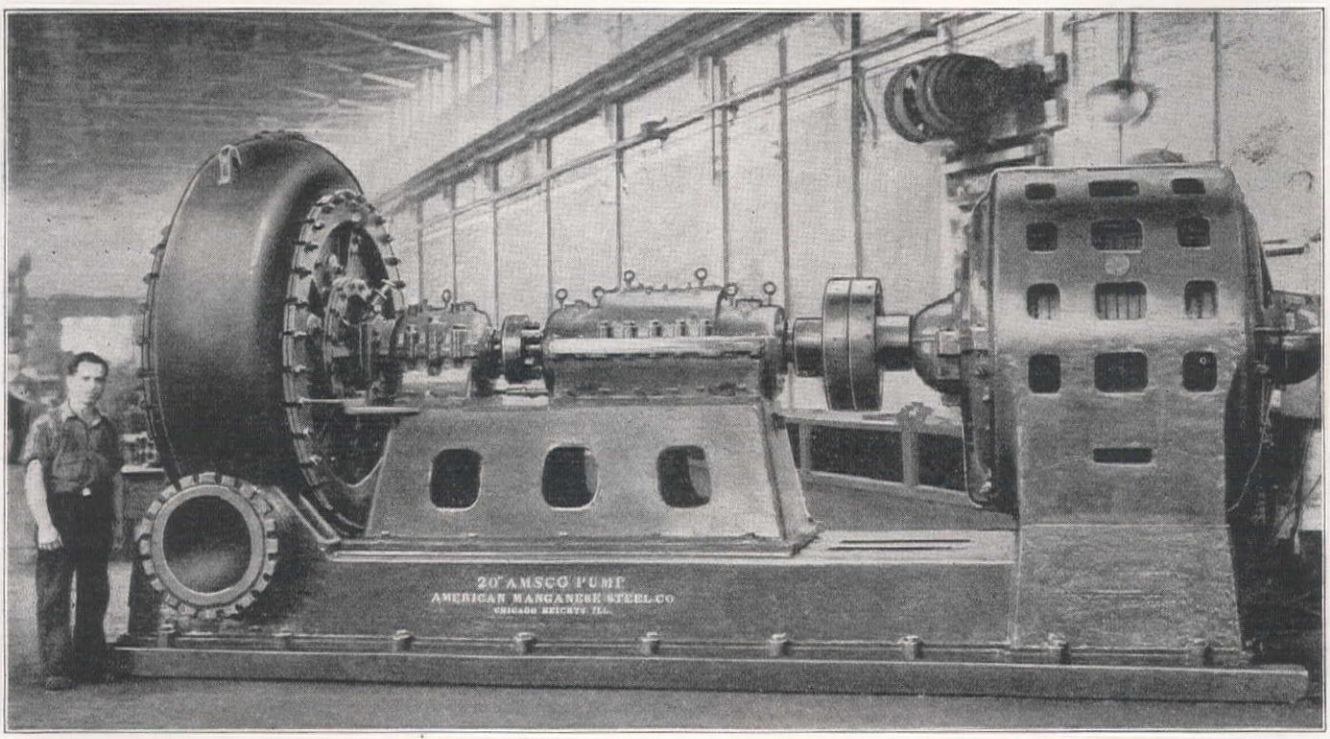
BOISE, IDAHO—Awards as follow by the Commissioner of Public Works, Boise, Idaho, for: (1) NEZ PERCE COUNTY (SAP 216-B)—To Goodfellow Bros., Inc., Box 1332, Wenatchee, Wn., $22,795 for 2.015 mi. grading and drain. struc. on Ahsahka-Kendrick Highway east of Kendrick (Wancher Gulch Sec.) (2) BOISE COUNTY (SAP 107-F)—To Tony Marazzo, E. 618 Dalton, Spokane, Wn., $54,260 for 4.038 mi. grading and cr. gravel surfacing on Payette Highway, Emmet Branch, between the Power Plant and Horseshoe Bend. 6-15

HELENA, MONT.—Awards as follow by State Highway Comm. of Montana, Helena, Montana, for: (1) LINCOLN COUNTY (WPMH 263-C)—To Kirkpatrick Bros., Kalispell, $34,450 for 0.969 mi. grading, surf., roadmix oiling, and const. small drain. struc. in City of Eureka. (2) PRAIRIE COUNTY (NRS 302-A & NRS 302-B)—To Jerome C. Boespflug, Miles City, Mont., $24,764 for 11.383 mi. regrading, resurf. and const. small drain. struc. on Secs. "A" and "B" of the Terry-Brockway Road. (3) CASCADE COUNTY (NRS 329-A)—To Woodward & Johnson, Chinook, $49,915 for 3.612 mi. grading, surf. and const. small drain. struc. on Sec. "A" of the Great Falls-Millegan Road. (4) PROJECT ER-A4PR—To C. W. McGiever, Butte, Mont, $18,783 for furn. and install. five 20-ton platform scales, and grad. and surf. approach driveways at 5 various locations on State Highways. 6-18

MISSOULA, MONT.—Award recommended to James Crick, 3104 N. Monroe St., Spokane, Wn., $53,320.60, by Bureau of Public Roads, Missoula, Montana, for constr. and improv. YGB Line, and reconst. grading Project, located in Lewis & Clark National Forest, CASCADE COUNTY, Montana, Proj. 32-E2. 5-29

MISSOULA, MONT.—Award recommended to E. C. Powell, Missoula, Mont., $24,329, by Bureau of Public Roads, Missoula, Mont., for 5.349 mi. bit. roadmix surf. on Columbia Falls-Glacier Park Highway, Proj. 13-A3, B2, Lewis & Clark National Forest, GLACIER COUNTY, Montana. 6-13

20" Amsco Pump for Quabbin Reservoir!



At the Quabbin Reservoir near Springfield, Mass., the Arthur A. Johnson Corp., is using a 20" AMSCO Manganese Steel Pump for handling approximately 1,800,000 yards of sand, gravel and sediment for the construction of a dike embankment 2,400' long. This dike of conventional shape is to be 130' high over the floor of the valley it traverses, with a base 600' wide and a crest wide enough for a roadway.

The AMSCO Pump has a rated capacity of 500 cubic yards per hour (approximately 750 tons), is 8'6" high by 19'6" long, weighs some 30 tons, and is designed to operate against a dynamic head of 185'.

The Pump unit incorporates the new AMSCO "COUNTERFLOW" feature, which provides for the introduction of service water between the shroud of the impeller and the side plates, to reduce wear and maintain efficiency. It also incorporates a funnel-mouth impeller, differing from previous designs in that the unbalanced area of the impeller is reduced, thereby effecting a reduction in end thrust as well as in internal leakages, formerly one of the greatest sources of centrifugal pump efficiency losses.

Durability of construction and lasting efficiency are in-built qualities of AMSCO Manganese Steel Pumps—they are ideally applied to every pumping work involving the handling of abrasive solids—and feature high efficiency, accessibility of all parts, and long-time satisfactory service because they are of AMSCO Manganese Steel!

AMSCO Manganese Steel Dredging & Materials Handling Pumps are made in all sizes from 3" to 20"—and are built to suit individual requirements. Write for installation data and operating details.

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MISSOULA, MONT.—To James Crick, 3104 N. Monroe St., Spokane, Wn., $53,320, by Bureau of Public Roads, Missoula, Mont., for const. and improving YGB Line, and reconst. grading Project located in Lewis and Clark National Forest, CASCADE COUNTY, Montana, under Project 32-E2. 6-17

CARSON CITY, NEVADA—Awards as follow by Nevada State Highway Comm., Carson City, Nevada, for: (1) LYON and MINERAL COUNTIES—To Silver States Constr. Co., Fallon, Nevada, $28,696 for 14.98 mi. asph. roadmix surf. betw. 9½ mi. east of Yerington and Schurz, Rt. 3, Sec. A3 & G. (2) CHURCHILL and LANDER COUNTIES—To J. C. Compton, McMinnville, Ore., $49,430 for 18.28 mi. asph. roadmix surf. betw. ½ mi. west of Eastgate and Campbell Creek Ranch, Rt. 2, El, F & A. (3) HUMBOLDT COUNTY—To George French, Jr., Box 107, Stockton, $112,064 for 60.95 mi. asph. roadmix surf. betw. the Toll House and Nevada-Oregon State Line, Rt. 8, Secs. B, C, D1 & D2. 6-29

CARSON CITY, NEVADA—To J. C. Compton, McMinnville, Ore., $26,839, by Nevada State Highway Comm., Carson City, Nevada, for 6.21 mi. grad. and asph. concr. and grav. surf. betw. Logandale and 0.74 mi. south of Overton in CLARK COUNTY, Nevada, Rt. 12, Sec. B-2, NRS 127-B. 6-3

CARSON CITY, NEVADA—Awards as follow by Nevada State Highway Comm., Carson City, Nevada, for: (1) WASHOE COUNTY (FAP 26-73A)—To Dodge Const., Inc., Fallon, Nevada, $201,765 for 4.86 mi. grad. and asph. conc. pav. betw. Lawton and Reno, Rt. 1, Sec. A1. (See Unit Bid Summary.) (2) STOREY COUNTY (WPSS 128-B)—To Nevada Rock & Sand Co., Box 1626, Reno, Nevada, $14,123 for concr. and steel overpass over Virginia and Truckee Ry., near Virginia City. (3) DOUGLAS COUNTY (WPSO 145)—To Nevada Rock & Sand Co., Box 1626, Reno, Nevada, $51,822 for 3.66 mi. grad. and grav. surf. from junction of St. Rt. 3 to Genoa. 6-3

CARSON CITY, NEVADA—Awards as follow by Nevada State Highway Comm., Carson City, Nevada, for: (1) WASHOE COUNTY—To Isbell Const. Co., P. O. Box 2351, Reno, $13,738 for 7.98 mi. asph. roadmix surf. on portions of State Highway from Sparks to Junction with Rt. 33; from Junc. of Rt. 3 to United Airport; on Teckham Lane; and on Plumas St. from S. Reno city limits via Moana Lane to Junc. with Rt. 3. (2) WHITE PINE COUNTY—To George French, Jr., Box 107, Stockton, $12,754 for 5.38 mi. oiling betw. Preston and Lunt, Rt. 38, Sec. A. (3) NYE COUNTY—To U. B. Lee, 1059 Carpenter Ave., San Leandro, $30,751 for 15.72 mi. asphalt roadmix surf. between Tonopah and West Forest Boundary, Rt. 4, Sec. A1. (4) NYE COUNTY—To J. A. Casson, Atherton and Warren Sts., Hayward, $42,731 for 14.07 mi. asph. roadmix surf. betw. 7 mi. N.E. of Lockes and Callaways, Rt. 4, Sec. D2. 6-24

CARSON CITY, NEVADA—To Dodge Const., Inc., Fallon, Nevada, $149,160, low to Nevada State Highway Comm., Carson City, Nevada, for 9.405 miles grading and cr. gravel surfacing and const. 5 bridges betw. 6 mi. east of Fallon and Stillwater, in CHURCHILL COUNTY, Nevada. 6-30

SANTA FE, NEW MEXICO—To Wheeler & Silver, Albuquerque, $34,864, by State Highway Engr., Santa Fe, N. M., for 3.631 mi. grading, minor drainage struc., surfacing and misc. construction between Espanola and Truchas, in SANTA FE and RIO ARRIBA COUNTIES, Project NRS 219-B. 6-27

SANTA FE, NEW MEXICO—To F. O. McDaniels, Santa Fe, $8,067, by State Highway Engineer, Santa Fe, for 0.667 mi. grading, planting and miscell. landscaping work in U. S. Highway Route 66-85, between Los Lunas and Albuquerque, VALENCIA COUNTY, NRM 125-A. 5-29

SANTA FE, NEW MEXICO—Awards as follows by State Highway Engineer, Santa Fe, New Mexico, for: (1) VALENCIA COUNTY (Proj. 13-B, No. 115)—To R. L. Hanes, Albuquerque, $195,911 for 11.328 mi. grading, minor drain. struc. 11 multiple span conc. box culverts, two course surfacing, etc., on U. S. Highway, Rt. No. 66, betw. Suwanee and Gallup. (See Unit Bid Summary.) (2) LINCOLN COUNTY Proj. No. 82)—To Armstrong & Armstrong, Roswell, $224,919 for 7.500 mi. grad. surf., etc., box culverts, etc., on U. S. Highway, Route 70, betw. Hondo and Roswell. 5-28

SANTA FE, NEW MEXICO—To Neakins & Gustafson, Taos, New Mexico, $74,521, by State Highway Engineer, Santa Fe, for 9.810 mi. grading, minor dr. structures, one course surfacing and miscell. construction on State Highway, Route 74, between Taos Junction and Tres Piedras, TAOS COUNTY, WPSS 239-A. 5-28

SANTA FE, NEW MEXICO—Awards as follow by State Highway Engineer, Santa Fe, N. M., for: (1) VALENCIA COUNTY (Proj. 2-D)—To S. K. Ousen Bros., Albuquerque, N. M., $148,380 for grad., drain., struc., etc., on U. S. Highway, Rt. 66, betw. Gallup and Los Lunas, involving approx. 4.098 mi. (2) GUADALUPE COUNTY (Proj. WPMH 9)—To Walter Denison, Cushman, Ark., and Roswell, N. M., $81,219 for 17.910 mi. surf. on U. S. Highway, Rt. 60, between Vaughn and Ft. Sumner. (3) McKINLEY COUNTY (WPMH 114)—To Wheeler & Silver, Albuquerque, N. M., $8,991 for 1.118 mi. landscaping, located on U. S. Highway, Rt. 66, beginning within the City Limits of Gallup and extending west toward the N. M.-Arizona State Line. 6-24

PORTLAND, ORE.—To Harold Blake, 400 N. Thompson St., Portland, Ore., $27,206, by Oregon State Highway Comm., Portland, for 2.20 mi. grad. and surf. on Butte Creek-Rock Creek Section of Woodburn-Mt. Hood Secondary Highway, CLACKAMAS COUNTY, Ore., (State Project.) 6-29

PORTLAND, OREGON—Awards as follow, by Oregon State Highway Comm., Portland, for : (1) DESCHUTES COUNTY (State Project)—To J. W. & J. R. Hillstrom, Marshfield, Oregon, $23,102 for 8.0 mi. resurf; also furn. 5,300 cu. yd. cr. rock in stockpile on McKenzie Pass-Little Butte Section of McKenzie Highway. (2) HOOD RIVER COUNTY (State Project)—To Parker Schram Co., Couch Bldg., Portland, Ore., $27,935 for 3.2 mi. surf. and oil mat. surf. tr. on Odell Junction-Dee Sec. of Hood River Secondary Highway. (3) LANE COUNTY (State Project)—To R. O. Dale & Warren Bros., Box 444, Aberdeen, Wn., $84,750 for 16.2 mi. surf.; also furn. 4,100 cu. yd. cr. material in stockpile on Rainrock-Greenleaf Creek Sec. of Siuslaw Highway. (4) MORROW COUNTY (State Project)—To A. S. Wallace, Roseburg, Ore., $11,607 for furn. approx. 7,100 cu. yd. cr. rock in stockpile on Lexington-Sand Hollow Sec. of Lexington-Echo Secondary Highway. 6-29

PORTLAND, ORE.—Contracts awarded as follows by Oregon State Highw. Comm., Portland, Oregon, for: (1) DOUGLAS and JOSEPHINE COUNTIES—To J. C. Compton, McMinnville, $59,515 for 16.01 mi. pavement planing and resurf. on Azalea-Wolf Creek Summit Sec. of Pacific Highway. (2) KLAMATH COUNTY—To Dunn & Baker, Box 431, Klamath Falls, $39,824 for 5.3 mi. oil mat. surf. tr. on Wocus Marsh-Lake River Sec. of Central Oregon Highway. (3) WASCO COUNTY—To Joplin & Eldon, Peninsular Ave. and Columbia Blvd., Portland, $136,200 for 11.5 mi. oil mat. surf. tr. on Criteron-Cow Canyon Sec. of Klamath Lake Secondary Highway. (4) WASCO COUNTY (WPSO 291)—To Hart Const. Co., La Grande, $15,343 for 6 mi. cr. rock surf. on Three-mile Creek Sec. of The Dalles-Dufer County Road. (5) WHEELER COUNTY (WPSS 295)—To Edward F. Weber, Medford, $14,699 for 0.67 mi. grading and 1.25 mi. topping

BETHLEHEM *Steel* H-PILING

For bridges exposed to Scour

This bridge, at San Bernardino, Calif., is built on Bethlehem Steel H-Piles. Note the alignment and sturdy appearance of the steel H-piling bent. The steel girders of the bridge rest on a cap consisting of two structural-steel channels, riveted to the H-piling.

A BRIDGE like the one shown in the above illustration, crossing a shallow stream bed, represents a difficult problem—or did, before the possibilities of steel H-piling were understood.

Dry during most of the year, at certain seasons a stream bed may become a raging torrent, causing deep scour that often undermines bridge foundations. To prevent such damage the bridge foundations must be driven deep—securely below the zone of possible scour. Steel H-piles are so useful in meeting this problem because they have strength and toughness to stand up under the continuous hard driving that is needed to force them through beds of sand and gravel to the required penetration.

The effectiveness of piers and abutments of steel H-piling for bridges exposed to scour is shown by the thousands of bridges, built on steel H-piles, that are successfully withstanding floods and freshets, year after year. Many of them replaced bridges of other types that had been weakened or destroyed by scour.

Bridges exposed to scour represent only one of the types of foundation problems to which engineers are applying steel H-piling. It is being used for industrial plants, piers, buildings, sheeted trenches and many other kinds of construction . . . Bethlehem Steel H-Piling is rolled in a complete range of sizes and weights.

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BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

on Unit No. 1, Chichester Gulch-Summit Sec. of Shaniko-Fossil Secondary Highway and for 0.58 mi. grading Unit No. 2, on same highway. 5-25

PORTLAND, ORE.—To R. O. Dail & Warren Bros., Inc., Aberdeen, Wn., $59,718 (tar) by Oregon State Highway Comm., Portland, Ore., for 9.7 mi. resurf. and oil on Rocky Point School-South Falls Sec. of Silver Creek Falls, Secondary Highway. 5-28

PORTLAND, ORE.—Contracts awarded as follows by Oregon State Highway Comm., Portland, Ore., for: (1) HARNEY COUNTY—FLH 1-C and State Project—To Babler Bros., 2407 N.W. 28th Ave., Portland, $77,928 for 10.48 mi. pitrun grav. surf. and oil mat. surf. on Cinder Butte-Silver Creek Sec. of Lakeview-Burns Highway and Silver Creek-Sage Hen Hill Sec. of Central Oregon Highway. (2) WASCO COUNTY—To McNutt Bros., 351½ E. Broadway, Eugene, $33,893 for 3.15 mi. grading and 4.86 mi. surf. on Tygh Valley Sec. of Sherars Bridge Secondary Highway. 5-28

PORTLAND, ORE.—To Coos Bay Const. Co., Portland, Ore., $58,061, by Bureau of Public Roads, Portland, Oregon, for improv. the John-Day Burns Reconst. grading project NR-35-A4, located in Malheu National Forest, Oregon, in GRANT COUNTY. 6-10

PORTLAND, ORE.—To C. V. Wilder, Blaine, Wn., $36,049, by Bureau of Public Roads, Portland, Ore., for const. or improving the South Fork Stillaguamish clearing and partial grading project 7-D, National Forest Road project, located in Mt. Baker National Forest, SNOHOMISH COUNTY, Wn. 6-10

PORTLAND, ORE.—To E. C. Hall, 1st National Bank Bldg., Eugene, Ore., $238,675, by Bureau of Public Roads, Portland, Oregon, for 13.531 mi. reconst. surface and oil rock stockpiling on Salmon River Highway, Proj. FHEC 2-A4, B5, C4, National Forest Road project, located in Siuslaw National Forest, Oregon, TILLAMOOK and LINCOLN COUNTIES. (See Unit Bid Summary.) 6-17

PORTLAND, ORE.—To Williams and Douglas, Kalispel, Mont., $183,987, by Bureau of Public Roads, Portland, Ore., for 10.954 mi. grading Glacier National Park Transmountain Highway, West Side, Proj. RTEC 1-A, Unit 2, in Glacier National Park, FLATHEAD COUNTY, Montana. 6-17

PROVO CITY, UTAH—To Lamph, Smith & Stevens, Price, Utah, $28,512, by City Recorder, Provo, Utah, for street paving in District No. 25-A, located in the northeast portion of Provo City, Utah. 6-2

SALT LAKE CITY, UTAH—To W. W. Clyde & Co., Springville, Utah, $42,551, by Utah St. Road Comm., Salt Lake City for 11.321 mi. roadmix oil surf. betw. Pleasant Grove and American Fork Canyon in UTAH and SALT LAKE COUNTIES, Utah (WPMS 138A & 159). 6-6

SALT LAKE CITY, UTAH—Awards as follow by Utah State Road Comm., Salt Lake City, Utah, for: (1) PIUTE COUNTY (WPMS 170)—To J. M. Sumison, Springville, Utah, $29,585 for 1.557 mi. grav. surf. road and const. 50-ft. steel beam pile bulkhead bridge in Kingston Canyon. (2) MILLARD COUNTY (WPMH 9-G-J-K)—To L. A. Young Const Co., Richfield, Utah, $15,085 for 1.130 mi. grav. surf. road betw. Holden and Kanosh. 6-23

COLVILLE, WN.—To D. A. Sullivan & Co., 415 E. Sprague Ave., Spokane, Wn., $13,771, by County Comm., Court House, Colville, Wn., for const. Secondary Road Project No. 26. 6-25

EVERETT, WN.—Awards as follow by Snohomish County Comm., Court House, Everett, Wn., for: (1) To H. P. Dorsey & Co., Bellingham, $23,518 for 6.6 mi. roadmix and seal coat surfacing on Davies; Lake Stevens-Machias; Machias-O. K. Mill Road; and Snohomish-I.O.O.F. Cemetery Road. (2) To H. P. Dorsey & Co., Bellingham, Wn., $14,899 for 5.5 mi. roadmix surfacing on the Warm Beach-Norman and Granite Falls-Robe Roads. 6-18

OLYMPIA, WN.—Contracts awarded as follows by the Director of Highways, Olympia, Wn., for: (1) FRANKLIN and BENTON COUNTIES—To A. Sather & Sons, 8052 15th Ave., N.W. Seattle, $116,453 for .3 mi. paving and const. approach spans on State Road 3, Pasco-Kennewick bridge revision. (2) OKANOGAN COUNTY—To F. R. Hewitt, 420 West 22nd Ave., Spokane, $81,079 for 22.3 mi. surfacing on State Road 4, Tonasket to Waunconda summit. (3) KITSAP COUNTY—To T. Romano, 1833 Dearborn St., Seattle, $11,191 for .4 mi. paving on State Road 21, Sixth St., Naval to Veneta in Bremerton. (4) WALLA WALLA COUNTY—To J. H. Collins & Co., Box 678, Walla Walla. $24,735 (only bid) for .4 mi. grad., surf., pave. and bitum. surf. and reinf. conc. bridge on City Str. in Walla Walla. (5) THURSTON COUNTY—To S. R. Gray, 430 N. Meridian St., Puyallup, $27,996 for grading, draining, surfacing and const. timber overcrossing on County Road, C. M. St. P. & P. Railway overcrossing near McKenna. 5-28

SPOKANE, WN.—To Joslin & McAllister, 3038 E. Trent Ave., Spokane, Wn., $47,429, by County Comm., Spokane, Wn., for 10.9 mi. oil mix resurfacing on the Palouse highway. 6-22

YAKIMA, WN.—Awards as follow by County Comm., Court House, Yakima, Wn., for: (1) To Standard Asphalt Paving Co., Chronicle Bldg., Spokane, Wn., $70,800 for 35.4 mi. oiling county roads. (2) To L. Romano Engr. Corp., 1300 Dearborn St., Seattle, $23,705 for 4.75 mi. grading and grav. in Crusher Canyon. (3) To Mathieson Const. Co., Sunnyside, Wn., $14,716 for grading and graveling the Mabton-Bickelton Road, in Washington. 6-15

CHEYENNE, WYOMING—Awards as follow by the State Highway Comm., Capitol Bldg., Cheyenne, Wyoming, for: (1) PARK COUNTY (Proj. 3-A R & 3-B, and Proj. 207-C, combined)—To John M. Keahey, Buffalo, Wyoming, $51,652 for 10.289 mi. grad., etc., and const. 4 reinf. conc. culverts and 4.351 mi. grad., etc., and const. 2 reinf. conc. culverts and 1 bridge widening on Cody-Thermopolis Road. (2) GOSHEN COUNTY (WPSO 282)—To A. H. Read Co., Cheyenne, Wyo., $34,253 for 12.458 mi. base course surf. of Torrington-Cherry Creek Road. (3) UINTA and SWEETWATER COUNTIES (Proj. 1256, 1260 and 1261)—To Northwest Engrg. Co., Rapid City, So. Dakota, $13,945 for 1.320 mi. oil tr.; 13.640 mi. stone chip seal coat on the Green River-Rock Springs Road; and 13.000 mi. seal coat on the Lyman-Granger Road, and 12.3 mi. seal coat on the Rock Springs-Thayer Junction Road. 6-6

ROCK SPRINGS, WYOMING—To Woodward Const. Co., Rock Springs, Wyo., $34,927, by City Clerk, Rock Springs, Wyo., for grading and paving and const. curbs and gutters on various streets in Rock Springs Street Paving District No. 13. 6-18

Bridges and Culverts . . . . . .

WORK CONTEMPLATED

SAN FRANCISCO, CALIF.—Plans and specifications have been completed by Consulting Engineer, Strauss & Paine, Inc., Room 1016, 111 Sutter Street, San Francisco, and call for bids will be issued shortly, by Golden Gate Bridge and Highway District, 111 Sutter St., San Francisco, for about 8,500 lin. ft. 7-in. reinf. concrete roadway deck paving, 60 ft. wide; and 7,500 lin. ft. 10-ft. sidewalks on each side of the Golden Gate Bridge. Est. cost $400,000. 6-16

RENO, NEVADA—Bond election will be held August 18 by Reno, Nevada, to vote on the following bond issues: $113,500 for Lake Street Bridge; $140,000 for Sierra St. Bridge. 6-10

CALLS FOR BIDS

LOS ANGELES, CALIF.—Bids to 2 p. m., July 23, by Calif. Div. of Highways, L. A., for: (1) RIVERSIDE COUNTY—Constr. timb. bridge with concr. deck and 0.4 mi. grade and roadmix surf. tr. applied on approaches at Temecula River about 8 mi. north of San Diego County Line. (2) VENTURA COUNTY—Widen exist. reinf. concr. bridge across Conejo Creek 2.5 mi. east of Camarillo, consist. of eight 30-ft. spans. 6-20

BIDS RECEIVED

STOCKTON, CALIF.—Bundesen & Lauritzen, P. O. Box 395, Pittsburg, Calif., $8,535, low to Dist. Engineer, Calif. Div. of Highways, Stockton, for removing present fender from East Pier of the Rio Vista Bridge across the Sacramento River and const. a new fender, in SOLANO COUNTY, Calif. 6-22

PORTLAND, ORE.—Hoffman Constr. Co., 715 S.W. Columbia Blvd., Portland, Ore., $49,693, low to Oregon State Highway Comm., Portland, Ore., for constr. undercrossing to carry Milwaukie Avenue over East Portland-Oregon City Highway, in MULTNOMAH COUNTY, WPMH 168-D, Ore. 6-29

PORTLAND, ORE.—R. A. Geary, Yakima, Wn., $23,607, low to Bureau of Public Roads, Portland, for const. Quartz Cr. Bridge, Little Naches River Bridge; and a 65-ft. I-beam span Little Naches River Br., all with timb. decks and concr. abutm. Proj. A2, Columbia National Forest, KITTITAS COUNTY, Wn. 6-11

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To Daley Corp., 4430 Boundary St., San Diego, $128,392, by Calif. Div. of Highways, L. A., for 3 reinf. concr. bridges across Warm Creek, Santa Ana River and const. an overflow channel and appr. grad. and conc. paved in SAN BERNARDINO COUNTY, Calif. 6-10

LOS ANGELES, CALIF.—Awards as follow by the Calif. Div. of Highways, Los Angeles, for: (1) SAN BERNARDINO COUNTY—To John Oberg, 3470 E. 8th St., Los Angeles, $21,136 for const. an overhead crossing over tracks at A. T. & S. F. RR. at Palm Ave., about 3 mi. south of Colton with approaches, graded and paved with plant mix surface. (2) LOS ANGELES COUNTY—To J. E. Haddock, Ltd., 357 N. Chester Ave., Pasadena, $98,671 for const. an undergrade crossing under tracks of A. T. & S. F. at Rivera on San Gabriel Blvd. (3) LOS ANGELES COUNTY—To Oscar Oberg, 150 N. Vista St., Los Angeles, $117,876 for const. a reinf. concrete girder bridge across Rio Hondo, 2 mi. west of El Monte, consisting of nine 67-ft. spans and two 26-ft. spans. 6-5

OAKLAND, CALIF.—To W. J. Tobin, 3701 Balfour Ave., Oakland, $39,829, by County Clerk, Oakland, for const. a steel truss bridge, 125 ft. long, 24 ft. roadway, concrete deck over a creek on the Decoto road, 2 mi. west of Centerville. 6-9

SACRAMENTO, CALIF.—Awards as follow by the County Clerk, Sacramento, for: (1) To P. F. Bender, 1012 Del Paso Blvd., Sacramento, $12,313 for const. the Burton Slough Trestle. (2) To M. A. Jenkins, 3560 "Y" St., Sacramento, $3,495 for const. timber bridge on the Sheldon Road. (3) To M. A. Jenkins, 3560 "Y" St., Sacramento, $2,973 for const. a timber bridge on the California Vineyard Road. 6-9

SACRAMENTO, CALIF.—To Lord & Bishop, Native Sons Bldg., Sacramento, $136,962, by Calif. Div. of Highways, Sacramento, for const. an overhead crossing over the tracks of the S. P. RR. at Jibboom Street in City of Sacramento, SACRAMENTO COUNTY, Calif. 6-19

SACRAMENTO, CALIF.—To Eaton & Smith, 715 Ocean Ave., San Francisco, $453,162, by Calif. Div. of Highways, Sacramento, for 6 undergrade crossing struc. under the S. P. & W. P. RR. tracks and const. 1 bridge and 2.89 mi. grad. and conc. pav. and plant mix surf. on cr. run base near Niles, ALAMEDA COUNTY. (See Unit Bid Summary). 6-23

SAN FRANCISCO, CALIF.—To Sibley Grading & Teaming Co., Ltd., 65 Lander Street, San Francisco, $54,555, by Dept. of Public Works, San Francisco, for constructing the Harrison Street viaduct over Beale Street, S. F. 5-25

DENVER, COLO.—To M. E. Carlson, 4483 Newton, Denver, Colo., $118,318, by State Highway Dept., Denver, for railroad overpass and 1.015 mi. grav. surf. appr. located south of La Salle on G. H. No. 2 in WELD COUNTY, WPGH 226-C, & WPMH 226-C, Colorado. 6-30

DENVER, COLO.—To Claybaugh-Hallenbeck, Grand Junction, Colorado, $121,799, by State Highway Dept., Denver, Colo., for const. a railroad overpass and bridge and 0.568 mi. grav. surf. approaches, located between Leadville and Granite on State Highway No. 4 in LAKE COUNTY, Colo., WPGH 152-A. 6-22

DENVER, COLO.—To McLaughlin Const. Co., Livingston, Mont., $39,652, by Bureau of Public Roads, Denver, Colo., for const. small bridges and culverts on the Tower Junction-Cooke City Highway, a distance of 3.718 mi. located within Yellowstone National Park, Proj. RTEC 8-A1 in Wyoming. 6-24

DENVER, COLO.—Award recommended to McLaughlin Const. Co. & J. L. McLaughlin, Great Falls, Mont., $308,613, by Bureau of Public Roads, Denver, for steel and conc. bridge and 13.758 mi. grad. and surf. east entrance approach road to Yellowstone National Park, PEC A in PARK COUNTY, Wyoming. 6-12

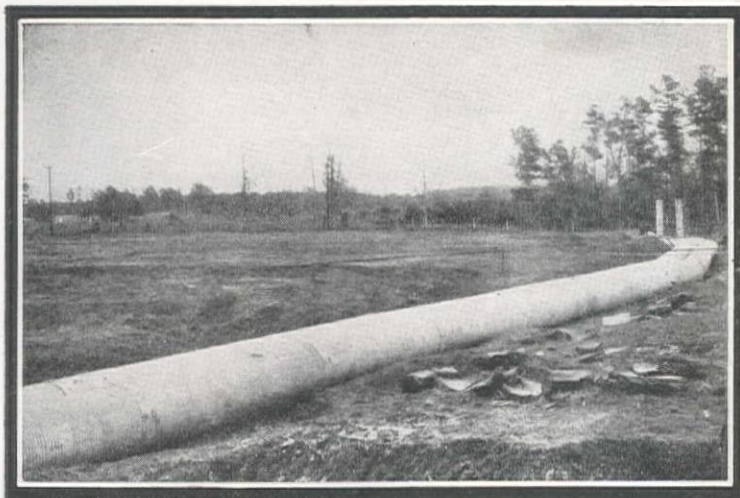
BOISE, IDAHO—To Hoops Constr. Co., Twin Falls, Idaho, $63,186, by Comm. Pub. Works, Boise, for constr. a 189-ft. concr. overhead crossing over the Union Pacific RR. tracks and 0.568 mi. screen. grav. surf. approaches on Old Oregon Trail Highway west of Bliss in GOODING COUNTY, Idaho. WPGH 107-A. 6-26

BOISE, IDAHO—To J. M. Sharp, Boise, Idaho, $47,993, by Commissioner of Public Works, Boise, Idaho, for a 100.6-ft. concrete bridge across Gold Fork of Payette River, a concrete bridge across Willow Creek and a concrete bridge across Boulder Creek, including 0.843 mi. grading and surfacing approaches in VALLEY COUNTY, Idaho. 6-24

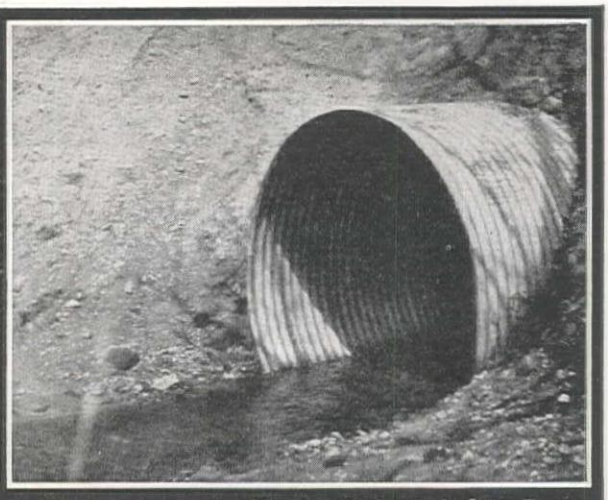
BOISE, IDAHO—To Hoops Const. Co., Twin Falls, Idaho, $63,186, by Comm. of Public Works, Boise, Idaho, for const. a 189-ft. concrete overhead crossing over the Union Pacific RR. tracks and 0.568 mi. screen grav. surf. approaches on the Old Oregon Trail Highway west of Bliss in GOODING COUNTY, Ida., WPGH 107-A. 6-26

BOISE, IDAHO—To G. L. Arnett & Son, Sandpoint, Idaho, $99,885, by Comm. of Public Works, Boise, Idaho, for const. a 400.1-ft. concr. overhead struc. over Union Pacific & C. M. St. P. & P. RR. and 0.681 mi. grad. and surf. appr. on Heyburn Park Highway, east of Plummer in BENEWAH COUNTY, Ida. 6-1

HELENA, MONT.—Awards as follow by State Highway Comm., Helena, Mont., for: (1) MISSOULA COUNTY (FAP 237-C)—To S. Birch & Sons Const. Co., Great Falls, Mont., $92,031 for const. a 5-span, 360-ft.-10-in. steel and concr. bridge across the Blackfoot River approx. 5½ mi. northwest of Bonner on Sec. C of the Bonner-Ovando Road, together with 1.736 mi. grading and const. small struc. (2) CASCADE COUNTY (NRS 329-A)—To L. V. Lockwood, Glasgow, Mont., $7,698

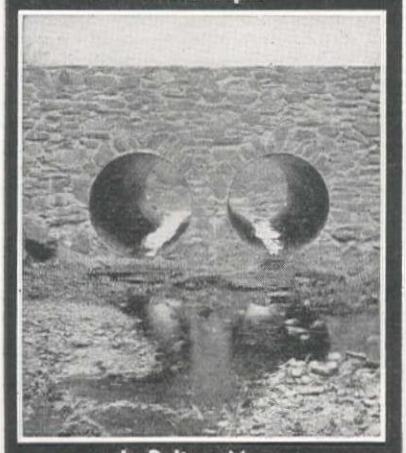


An Installation in Texas Using 475 Feet of 12 Gauge, 54 Inch Diameter Toncan Iron Corrugated Metal Pipe.

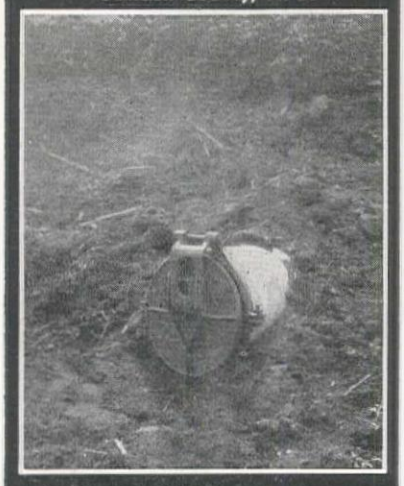


Showing Outlet End of 70 Foot, 72 Inch Diameter Toncan Iron Corrugated Pipe in Camden County, N. J.

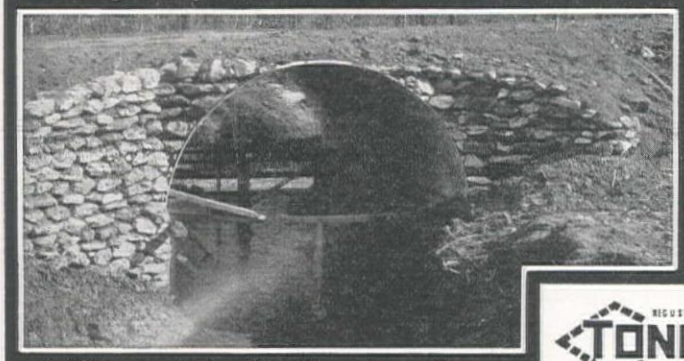
A DRAINAGE STRUCTURE FOR EVERY PURPOSE



In Bolton, Mass. A Twin 60 Inch Toncan Iron Corrugated Pipe Installation.



A Tyton Sluice Gate Installation.



A Thirty Foot, Five Plate Three Gauge Toncan Sectional Plate Arch in Spaulding County, Ga.

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A. N. Eaton Metal Products Co., Billings, Mont.
Eaton Culvert Co. . . Grand Island, Nebraska
Empire State Culvert Corporation, Groton, N. Y.
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Thompson Mfg. Co. . . . Denver, Colorado
Tri-State Culvert Mfg. Co. . . . Memphis, Tenn.
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Truscon Steel Co., Indiana Culvert Division . . . . . Indianapolis, Indiana
Western Pipe & Steel Co. . . . Los Angeles and San Francisco, Calif.
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Wyatt Metal & Boiler Works . . . . . Houston and Dallas, Texas

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for const. one 3-span 57-in. tr. timber pile trestle bridge and one single span 25-ft. bridge with reinf. concr. abutments and tr. timb. deck on Sec. "A" of the Great Falls-Millegan Rd. 6-18

SANTA FE, NEW MEXICO—To F. D. Shufflebarger, Albuquerque, N. M., $316,323, by State Highway Engr., Santa Fe., N. M., for const. 2 grade separation struc. one at Central Ave. and one at Tijeras Ave., 0.327 mi. approaches, track raising and misc. const. in Municipality of Albuquerque, WPGM 118 B & 249. 6-27

PORTLAND, ORE.—To Hoffman Const. Co., 715 S.W. Columbia Blvd., Portland, $410,212, by Oregon State Highway Comm., Public Service Bldg., Portland, Ore., for const. an overcross over the Southern Pacific RR. on Union Ave., on the East Portland-Oregon City Highway, in the City of Portland, MULTNOMAH COUNTY, Oregon, (WPGM 168-D and WPMH 168-H.) 5-28

CHEYENNE, WYOMING—Awards as follow by the State Highway Comm., Capitol Bldg., Cheyenne, Wyoming, for: (1) CROOK COUNTY (WPMH 120-F)—To Inland Const. Co., 3867 Leavenworth St., Omaha, Nebraska, $52,887 for const. 1 struc. steel bridge over Belle Fourche River near Moorcroft. (2) HOT SPRINGS COUNTY (WPMH 141)—To Charles M. Smith, Box 466, Thermopolis, Wyoming, $23,512 for const. 1 str. steel bridge over Owl Creek and 1 reinf. concrete culvert on Worland-Thermopolis Road. (3) ALBANY COUNTY (WPGH 192-E)—To Blanchard, 1641 S. Logan St., Denver, $85,197 for const. one overhead crossing over U. P. RR. on 0.412 mi. of Laramie-Tie Siding Road. 6-6

Water Supply Systems . . . . .

WORK CONTEMPLATED

DENVER, COLO.—Plans and specifications are being completed by Board of Water Comm., Denver, Colo., for const. of the Williams Fork Water diversion project at an estimated cost of $1,500,000. Work involves constructing a 3-mile unlined 8½ ft. diam. tunnel under Jones Pass; two collection canals totaling 16,000 lin. ft.; and a reservoir above the mouth of the Williams Fork River. 5-26

EVERETT, Wn.—The City of Everett, Wn., voted favorably for $1,300,000 in bonds to finance const. of a pipeline to bring additional water from Lake Chaplain to the City. City Engineer G. G. Paine, has filed a formal application with the PWA for a grant of $585,000. The project has been divided into three proposals as follow: (1) Pipeline betw. Lake Chaplain and the east bank of the Snohomish River, involving 129,380 lin. ft. pipe; 27,750 lin. ft. 52-in. heavy wood stave pipe; 20,710 lin. ft. 52-in. steel pipe, and 80, 920 lin. ft. 48-in. steel pipe. Estimated cost $916,585. (2) Pipeline betw. Harrison Ave. and Calif. Street to Reservoir No. 2, involving 15,000 lin. ft. 48-in. steel pipe. Estimated cost $188,200. (3) Pipeline between Reservoir No. 2 and 25th Street and Norton Avenue, involving 8,000 lin. ft. 48-in. steel pipe. Estimated cost $91,335. 6-27

CALLS FOR BIDS

SALEM, ORE.—Bids to 8 p. m., July 17, by City Recorder, Salem, Ore., for furnishing: CONTRACT No. 7—An elevated steel tank of 100,000 gal. cap. on a steel tower. CONTRACT No. 8—Two 500 gpm. deep well type pumping units. CONTRACT No. 9—24-in. to 30-in. welded steel pipe fittings and special shapes. 6-29

BIDS RECEIVED

SAN FRANCISCO, CALIF.—Union Paving Co., Call Bldg., San Francisco, $119,297, low to Public Utilities Comm., S. F., for const. two pipe lines to replace portions of existing aqueducts which are known as the Pilarcitos Aqueduct and Stone Dam Aqueduct, both located in San Mateo County, under W. D. Contract 107. 6-24

CONTRACTS AWARDED

OAKLAND, CALIF.—To W. E. Thomas, 3140 San Pablo Ave., Oakland, $3,080, by East Bay Municipal Utility Dist., Oakland, for electric welding of field joints ½-in. thickness, 36 in. dia. steel pipeline, 20,000 ft. long under Spec. L. S. 277, involv: 7,000 lin. ft. welding. 6-19

SAN FRANCISCO, CALIF.—To Eaton & Smith, 715 Ocean Ave., San Francisco, $19,836, by Dept. of Public Works, S. F., for installing Clay Street Hill extension to Auxiliary Water Supply system. 6-24

DENVER, COLO.—Awards as follow by Board of Water Comm., Denver, Colo. (subject to PWA approval), for construction of the Vasquez Creek Tunnel; Vasquez-St. Louis Collection Conduit, diversion dam, and intake works; and steel siphons Nos. 1 and 2. (1) To Utah Const. Co., Box 726, Ogden, Utah, and Morrison-Knudsen Co., Inc., 319 Broadway, Boise, Ida., $573,571 for Unit No. 10—Tunnel and Unit No. 11—Conduit, dam and intake works. (2) To Thompson Mfg. Co., 3001 Larimer St., Denver, Colo., $79,688 for siphons Nos. 1 and 2. (See Unit Bid Summary.) 6-22

OAHU, T. H.—To George Hess, Honolulu, T. H., $132,150, by Bureau of Yards and Docks, Navy Dept., Wash., D. C., for water supply tunnel and pipeline at the Aiea Naval Reservation, Oahu, T. H., under Specification No. 8139. 6-10

Sewer Construction . . . . . .

WORK CONTEMPLATED

EUREKA, CALIF.—Bonds in amount of $40,000 were carried by a vote of 1,029 to 350 by the City of Eureka, California, to finance construction of the Washington Street sewer outfall between Broadway and Government Bulkhead. A PWA application has already been made and City Engineer is now preparing plans and specifications for the project. 6-25

SAN FRANCISCO, CALIF.—Plans and specifications have been completed by City Engineering and protests will be heard to 10:30 a. m., July 17 by Dept. of Public Works, City Hall, San Francisco, for constructing sewers in Girard Street between Ward and Mansell streets. 6-25

BIDS RECEIVED

LOS ANGELES, CALIF.—V. C. K. Construction Co., 5639 via Corona, Los Angeles, $45,587, low to Dept. of Public Works, Los Angeles, for construction of a sewer in Centinela Avenue and Venice Boulevard. 6-25

CONTRACTS AWARDED

PASADENA, CALIF.—To Oliver United Filters, Inc., 351 California St., San Francisco, submitted sole bid, $10,769, to City Clerk, Pasadena, for sewage sludge dewatering apparatus, for use at the Sewage Dis-

posal Plant at Pasadena, FOB sewage plant, located on the Crown City Ranch, LOS ANGELES COUNTY. 6-16

LOS ANGELES, CALIF.—To Hull-Smale & Robinson, P. O. Box 815, Wilmington, $26,400, by Board of Public Works, Los Angeles, for reconst. the Ocean Outfall Sewer at Hyperion. 6-4

LOS ANGELES, CALIF.—To S. M. Milovich, 208 Cochrum Bldg., Montebello, $27,408, by Purch. Agent, Dept. Water & Power, L. A., for const. a complete sewage system in the town of Independence, INYO COUNTY, including trenching, backfilling, pipe installation, etc., under Spec. X-24. 6-17

DENVER, COLO.—To Peter Kiewit Sons Co., 756 National Bank Bldg., Omaha, Nebraska, $1,149,792. (USING MAGNETITE FILTERS) by Manager of Improvements and Parks, City-County Bldg., Denver, Colo. (subject to PWA approval), for constructing a sewage treatment plant. 6-13

CAMAS, WN.—To C. A. Knapp, Camas, Wn., $3,732, by City Clerk, Camas, Wn., for const. a lateral sewer in Local Improvement District No. 86, Camas, Wn. 6-15

River and Harbor Work. . . . .

CALLS FOR BIDS

LOS ANGELES, CALIF.—Bids to 3 p. m., July 24 by U. S. Engineer Office, Los Angeles, for const. composite type breakwater 4,887 ft. long in Los Angeles-Long Beach Outer Harbors, under Pro. 773, involving: 408,000 tons furn. and place Cl. "A" stone; 328,000 cu. yd. fur. and place Cl. "B" stone; 667,000 cu. yd. dredge and deposit core material. 6-25

PEARL HARBOR, T. H.—Plans and specifications have been completed and call for bids will be issued at a later date by the Bureau of Yards & Docks, Navy Dept., Wash., D. C., for const. a steel floating dry dock to be 1,016 ft. long and 165 ft. beam for the Navy Yard, Pearl Harbor, T. H., under Spec. 8220. 6-3

BIDS RECEIVED

OAKLAND, CALIF.—Healy Tibbitts Const. Co., 64 Pine St., San Francisco, $89,821, low to Port of Oakland, for constructing an extension to the 9th Avenue Pier, including necessary roadwork, rails and trestle. 6-23

SAN FRANCISCO, CALIF.—MacDonald & Kahn Co., Ltd., Financial Center Bldg., S. F., $736,000, low to Public Utilities Comm., S. F., for const. two hangar buildings on Yerba Buena shoals, under Shoals Constr. No. 6. 6-24

SAN FRANCISCO, CALIF.—Franks Contracting Co., 260 Calif. St., S. F., $48,394, low to U. S. Engr. Office, S. F., for dredging in Petaluma Creek, from Haystack Landing to ft. of Western Ave., Petaluma, under Proj. 868-36-39. 6-23

LOS ANGELES, CALIF.—To George J. Bock Co., 1120 N. Las Palmas St., Los Angeles, $10,794, by County Board of Supervisors, Los Angeles, for constructing a training channel in San Jose Creek from Hacienda Blvd., upstream to Rowland Road. 6-18

LOS ANGELES, CALIF.—To Merritt Chapman & Scott, Box 698, San Pedro, $103,320, by Board of Harbor Commissioners, Los Angeles, for suction and bucket dredging in Los Angeles Harbor. 6-18

SAN DIEGO, CALIF.—To Lipscomb & Barclay, 4367 Florida St., San Diego, $3,062, by 11th Naval District, San Diego, for replacement of landing pier, San Pedro, Calif., under Spec. 8246. 6-22

SAN DIEGO, CALIF.—To B. O. Larsen, 1340 E St., San Diego, $27,900, by 11th Naval District, San Diego, for replacement of dolphins at the Naval Operating Base (Destroyer Base.) 6-11

CONTRACTS AWARDED

OAKLAND, CALIF.—To Healy Tibbitts Constr. Co., 64 Pine St., San Francisco, $89,821, by Port of Oakland, for const. an extension to the 9th Ave. Pier, including necessary roadwork, rails and trestle. 6-30

PORT ARGUELLO, CALIF.—Award recommended to Macco Constr. Co., 815 Paramount Blvd., Clearwater, Calif., $117,500, by Office of Associate Civil Engineer Andre Fourchy, U. S. Coast Guard, 219 Administration Bldg., Govt. Island, Oakland, for const. under one general contract, approx. 506 lin. ft. cellular type steel sheet pile breakwater; together with filling and all accessories required to construct the work at the Point Arguello Coast Guard Station, near Arlight, SANTA BARBARA COUNTY, Calif. 6-29

SAN FRANCISCO, CALIF.—To Franks Contracting Co., 260 Calif. St., San Francisco, $48,394, by U. S. Engineer Office, S. F., for dredging in Petaluma Creek from Haystack Landing to foot of Western Avenue, Petaluma, under Prop. 868-36-39. 6-30

SAN FRANCISCO, CALIF.—To S. F. Bridge Co., 503 Market St., San Francisco, $99,960, by U. S. Engineer Office, San Francisco, for dredging at Brooklyn Basin and the Tidal Canal, Oakland Harbor, Calif. 6-30

SAN FRANCISCO, CALIF.—To S. F. Bridge Co., 503 Market St., San Francisco, $131,844, by U. S. Engineer Office, San Francisco, for dredging at Government Island, Oakland. 6-30

SAN FRANCISCO, CALIF.—Award recommended to S. F. Bridge Co., 503 Market St., San Francisco, $131,844, by U. S. Engineer Office, San Francisco, for dredging at Government Island, Oakland. 6-25

SAN FRANCISCO, CALIF.—Award recommended to S. F. Bridge Co., 503 Market St., San Francisco, $99,960, by U. S. Engineer Office, San Francisco, for dredging at Brooklyn Basin and the Tidal Canal, Oakland Harbor, Calif. 6-25

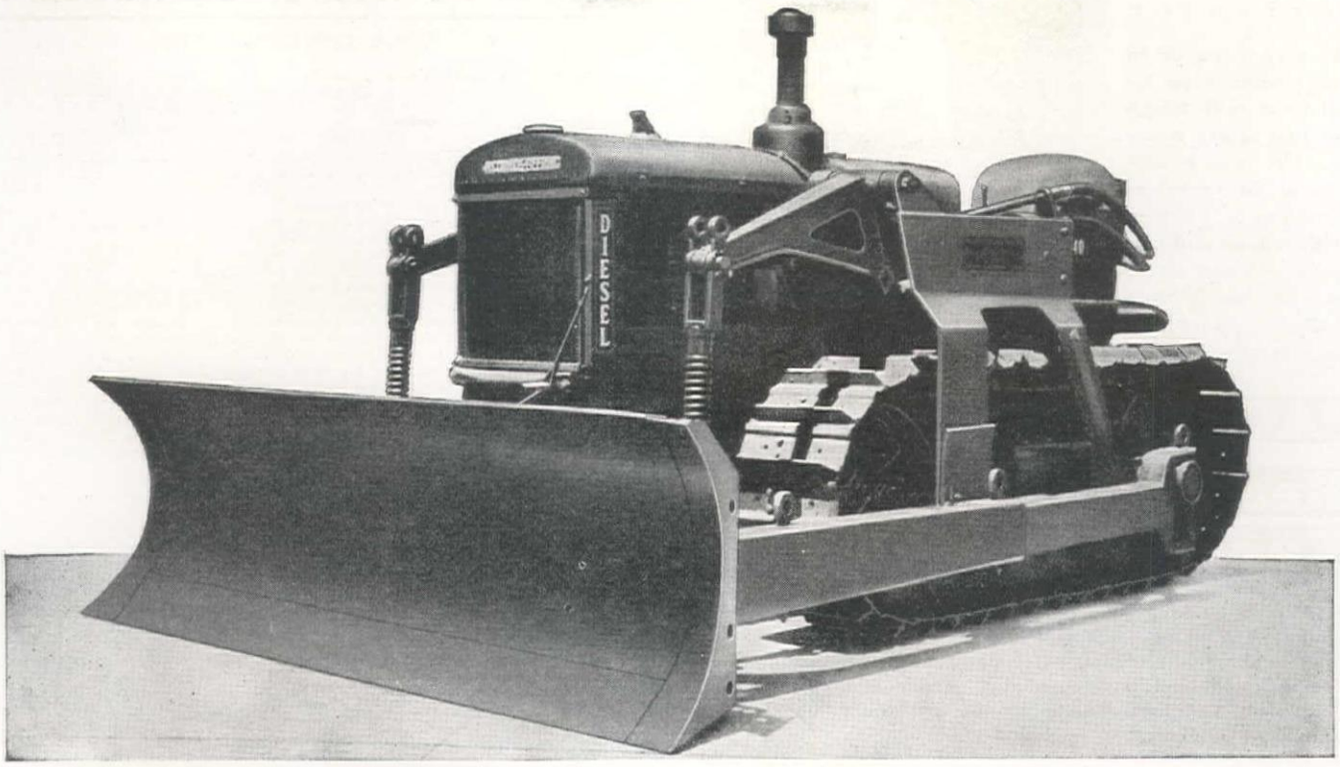
SAN FRANCISCO, CALIF.—To Bethlehem Shipbuilding Corp., 20th and Illinois streets, S. F., $647,000, by U. S. Engineer Office, San Francisco, for const. 1 steel seagoing hopper dredge. 6-2

SAN RAFAEL, CALIF.—To Delta Dredging Co., Pittsburg, Calif., $4,194, by City Clerk, San Rafael, for const. 11 new berths for yachts, dredging the northerly bank of the canal, west of Mary St.; and const. a bulkhead along the canal bank, all at the Municipal Yacht Harbor, San Rafael. 6-23

SEATTLE, WN.—To Puget Sound Bridge & Dredging Co., 2929 16th Ave., S.W., Seattle, Wn., $151,600, by U. S. Engineer Office, Seattle, Wn., for 132,215 cu. yd. dredging in Petersburg Harbor, Alaska; and 78,250 cu. yd. dredging in Wrangell Harbor, Alaska. 6-23

SEATTLE, WN.—To Columbia Co., Bonneville, Oregon, $2,799,458, by U. S. Engineer Office, Seattle, Wn., for completing the reconstruction of the Grays Harbor south jetty. (See Unit Bid Summary.) 6-18

SEATTLE, WN.—Award recommended to Rumsey & Co., 3821 Airport Way, Seattle, $.0825 per cu. yd., total $184,387, by U. S. Engineer Office, Seattle, Wn., for dredging a channel 100 ft. wide and 12 ft. deep in Swinomish Slough between Saratoga Passage, through La Conner into Padilla Bay, ending about 3 mi. east of Anacortes, Washington. 6-15



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Irrigation and Reclamation . .

WORK CONTEMPLATED

SACRAMENTO, CALIF.—The following is a tentative schedule (subject to revision) on major contracts in connection with construction of the Central Valley Project by the Bureau of Reclamation, Old Post Office Bldg., Sacramento, Calif:

DATE	PROJECT	EST. COST
Aug. 25, 1936	Friant Dam	$ 15,000,000
Aug. 25, 1936	Friant-Kern Canal, Sta. P to Sta. 312	1,500,000
Sept. 25, 1936	Friant-Kern Canal, Sta. 312 to Sta. 780	1,850,000
Sept. 25, 1936	Dry Creek Siphon	225,000
Nov. 10, 1936	Friant-Kern Canal, Sta. 780 to end	2,000,000
Sept. 10, 1936	Madera Canal, Sta. 0 to Sta. 380	1,000,000
Oct. 25, 1936	Madera Canal, Sta. 380 to Sta. 704	1,500,000
Oct. 10, 1936	Three siphons—Madera Canal	150,000
Sept. 25, 1936	Contra Costa Conduit, Sta. 0 to Sta. 300	500,000
Nov. 10, 1936	Contra Costa Conduit, Sta. 300 to end	1,000,000
Nov. 15, 1936	Kennett Dam excav.	No estimate
Nov. 1, 1936	R.R. relocation to Mi. 272	7,000,000
Nov. 1, 1936	Highway relocation	2,000,000
Dec. 15, 1936	Additional highway grading	6,000,000
Fall of 1937	Kennett Dam (450 ft.)	117,000,000
Fall of 1937	Kennett Dam (525 ft. Alt.)	130,000,000

Instead of constructing the Kennett Dam, the Bureau of Reclamation has under consideration the construction of two dams, one on the Pit River (Baird Site) and the other on the Sacramento River (Table Mountain Site) downstream from Redding. 6-22

CALLS FOR BIDS

YUMA, ARIZ.—Bids to 10 a. m., July 23, by Bureau of Reclamation, Federal Bldg., Yuma, Arizona, for construction of wash overchutes, drainage inlets, and turnouts, All-American Canal, Station 308-Sta. 1122, All-American canal system, Boulder Canyon Project. Arizona-California-Nevada, under Spec. No. 684. Work is located from about 10 mi. N.E. to about 6 mi. west of Yuma, Arizona, and involves: 210,000 cu. yd. excav. for canal; 71,650 cu. yd. excav. for struc.; 27,200 cu. yd. exc. wash channels and dikes; 3,800 cu. yd. compacting embankments; 23,400 cu. yd. compacting lining; 31,150 cu. yd. backfill; 11,795 cu. yd. concrete; 4,635 sq. yd. dry-rock paving; 8,950 cu. yd. riprap; 2,132,000 lb. reinforcement bars; 591,800 lb. drive steel sheet piling; 1,880 lin. ft. install rubber seal and toes; 3,475 sq. ft. inst. molded elastic jt. material; 4.0 M ft. BM erect timb. railings; 6,550 lb. install metal handrails; 3,500 lb. install gates and gate hoists; 1,700 lb. install miscellaneous metalwork. 6-27

ONTARIO, ORE.—Bids to 10 a. m., July 27, by Bureau of Reclamation, Ontario, Oregon, for const. earthwork, tunnels, canal lining, and structures, Black Canyon canal, Sta. 606 plus 70 to Sta. 643 plus 40 and Sta. 719 plus 70 to Sta. 742 plus 45, Payette division, Boise project, Idaho, under Spec. 688. Work is located near Emmett, Idaho, and involving: 102,700 cy. all cl. excav. for canal; 1,350 cy. excav. for core banks; 6,000 sta. cu. yd. overhaul; 1,140 cy. all cl. excav. for struc.; 33,330 cy. excav. all cl. for tunnels; 500 cy. backfill; 2,100 cy. compact canal embankment; 3,500 sq. yd. trim canal sec. (conc. lined); 7,220 cy. concrete in tunnels; 320 cy. concr. in canal lining; 907 cy. concr. in structures; 2,400 cu. ft. pressure grouting; 425 sq. yd. dry-rock paving; 120,600 lb. place reinf. bars; 452,800 lb. perm. steel tunn. sup. fur. and ins.; 258 MFBM perm. timb. tunn. (furn. and erect); 137,000 lb. steel tunn. liner plt. (fur. and inst.); 2,400 ft. 6-in. tunn. drains (const.); 1,200 ft. grout holes (drill); 1,300-lb. gate and gate hoists (inst.) 6-29

BIDS RECEIVED

YUMA, ARIZ.—Peterson Const. Co., 610 Wesley Temple Bldg., Minneapolis, Minn, $54,862, low to Bureau of Reclamation, Yuma, Ariz., for 748,000 cu. yd. excavation for earthwork for All-American canal and a detour at the turnout for the Central Main canal, All-American canal system, Boulder Canyon project, Arizona-California-Nevada. Work is located from 2 to 5 mi. east of Calexico, Calif. 6-22

ASHTON, IDAHO—Otis Williams Co., Vale, Ore., and Brent Sturgil Co., Inc., Cascade Locks, Oregon (joint bid), $124,531, low to Bureau of Reclamation, Ashton, Ida., for const. the diversion dam, and canal headworks and earthworks, canal lining and struc. for the Cross Cut Canal, Upper Snake River project, Idaho, under Spec. 683. 6-25

ONTARIO, ORE.—J. A. Terteling & Sons, Boise, Idaho, $44,786, low to Bureau of Reclamation, Ontario, Oregon, for const. earthwork and structures, Sage Creek Main drain, Sage Creek drains Nos. 1.68; 1.72; 1-2-5; 18-2-4, and drain No. 1 east extension, Succor Creek division, Owyhee Project, Oregon-Idaho, under Spec. 685. 6-9

ONTARIO, ORE.—H. J. Adler Co., P. O. Box 213, Nyssa, Oregon, $11,555, low to Bureau of Reclamation, Ontario, Oregon, for const. structures, North Canal laterals, 55.1 to 59.5-0.1, Dead Ox Flat division, Owyhee project, Oregon-Idaho, under Spec. 802D. 6-24

AUSTIN, TEXAS—Under a revised contract between the Government and the Lower Colorado River Authority, Arnold and Hamilton Dams of the Colorado River Project of Texas will be constructed by the Authority instead of the Bureau of Reclamation. All bids received by the Bureau of Reclamation for the construction of the Arnold Dam (refer our issue of April 24), have been turned over to the Authority for action. The Colorado River Project of Texas consists of a series of dams between Bluffton and Austin. The project is a flood control, power, navigation and irrigation plan. Address of the Lower Colorado River Authority is Littlefield Bldg., Austin, Texas. 6-27

CONTRACTS AWARDED

ASHTON, IDAHO—To Nevada Const. Co., Nevada, Missouri, $66,890, by Bureau of Reclamation, Ashton, Idaho, for clearing the Island Park Reservoir site, Upper Snake River project, Idaho, under Spec. No. 681. 5-26

HELENA, MONT.—To Clifton-Applegate, Hutton Bldg., Spokane, Wn., $54,776, by Montana State Water Conservation Board, Helena, Mont., for const. a siphon on the Flint Creek Irrigation Proj., GRANITE COUNTY, Mont. 6-22

ONTARIO, ORE.—To Morrison-Knudsen Co., Inc., Boise, Ida., $16,421, by Bureau of Reclamation, Ontario, Ore., for const. structures, North Canal laterals, N.C. 43.2 system, Dead Ox Flat Div., Owyhee project, Oregon-Idaho, under Spec. 790-D. 6-19

ONTARIO, ORE.—To Otis Williams & Co., Vale, Oregon, $13,551, by Bureau of Reclamation, Ontario, Oregon, for construction of structures, North Canal laterals 45.4 to 49.4-0.4, Dead Ox Flat Div.,

Owyhee project, Oregon-Idaho, under Spec. 791-D. Work is located near Ontario, Oregon. 6-19

ONTARIO, ORE.—To Kanrich & Corliss, Ontario, Oregon, who bid $14,214 to Bureau of Reclamation, Ontario, Oregon, for const. structures, North Canal laterals, 50.3 to 54.5-0.5, Dead Ox Flat Division, Owyhee project, Oregon-Idoho, under Spec. 797-D. 6-25

YAKIMA, WN.—To J. A. Terteling & Sons, 2223 Fairview Ave., Boise, Idaho, $275,213, by Bureau of Reclamation, Yakima, Wn., for const. earthwork, canal lining, and struc., Sta. 313-00 to Sta. 576-81.5, Yakima Ridge Canal, Roza division, Yakima project, Washington, under Spec. 675. 6-5

Dam Construction . . . . . .

BIDS RECEIVED

SACRAMENTO, CALIF.—L. E. Dixon Co., Bent Bros., Inc., and Case Constr. Co., 609 S. Grand Ave., Los Angeles, $87,217, low to Bureau of Reclamation, Old Post Office Bldg., Sacramento, for core drilling and excavation for investigation of Kennett dam site, Central Valley project, Calif., under Spec. No. 800-D. (See Unit Bid Summary.) 6-18

CONTRACTS AWARDED

NATIONAL CITY, CALIF.—To Daley Corp., 4430 Boundary St., San Diego, $43,616, by Calif. Water & Telephone Co., 19 W. 9th St., National City, for const. of the Judson Reservoir Dam. Work is located in Quarter Section 116 of National Ranch, about 1 mi. southeast from Chula Vista, Calif., and comprises the const. of an earthfill dam of a crest length of 690 ft. and maximum height of 60 ft. above original ground, together with appurtenant works, consisting of outlet tower, overflow structure and spillways. 6-22

COLORADO SPRINGS, COLO.—To Ed. H. Honnen, Box 391, Colorado Springs, $386,789, by Colorado Springs, for a granitic grav. dam, with ¼-in. electric welded steel plate face, conc. lined spillway, and conc. outlet tunnel. 5-25

COLORADO SPRINGS, COLO.—To American Bridge Co., First National Bank Bldg., Denver, Colo., $117,226, by City Clerk, Colorado Springs, Colo., for ¼-in. electric welded steel plate face for the Catamont Creek Dam. 5-26

Tunnel Construction . . . . . .

WORK CONTEMPLATED

SAN FRANCISCO, CALIF.—Plans and specifications are being completed by the Engineering Dept., Pacific Gas & Electric Co., 245 Market St., San Francisco, and work will be done by Force Account in connection with const. of a 17,300 lin. ft. tunnel, to carry about 350 sec. ft., which is to replace a section of the present Stanislaus Wood flume in TUOLUMNE COUNTY, Calif. 6-23

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To Mike Radich, and C. T. Brown, 410 N. Formosa St., Los Angeles, $75,881, by Purch. Agent, Dept. Water & Power, L. A., for const. the Ivanhoe Reservoir Outlet Tunnel and appurtenant structures, under Spec. X-25. 6-10

FORT PECK, MONT.—To Bartlett Hayward Co., 200 Scott St., Baltimore, Maryland, $1,093,609, by U. S. Engr. Office, Kansas City, Mo., for completion of Emergency Gate Shafts for Fort Peck Tunnels at the Fort Peck Dam site approx. 25 mi. S.E. of Glasgow, Mont., in McCONE COUNTY, Montana. (See Unit Bid Summary.) 6-3

FORT PECK, MONT.—To Chicago Bridge & Iron Works, 37 W. Van Buren St. Chicago., Ill., $908,960, by U. S. Engineer Office, Kansas City, Mo., for furn. all labor and materials for const. of 14,950,000-lb. steel plate lining for Fort Peck Tunnel No. 1. 6-8

YAKIMA, WN.—To Morrison-Knudsen Co., 319 Broadway, Boise, Idaho, $292,013, by Bureau of Reclamation, Yakima, Wn., for const. Tunnel No. 1, Sta. 59-38 to Sta. 102, Yakima Ridge Canal, Roza Div., Yakima Project, Wn. Work is located near Yakima, under Spec. 682. (See Unit Bid Summary.) 6-17

Pipeline Construction . . . . . .

CALL FOR BIDS

LOS ANGELES, CALIF.—Bids to 10 a. m., July 30, by Metropolitan Water Dist., Los Angeles, for const. precast concrete pipe or steel pipe lines and appurtenant works for the Upper Feeder of the Colorado River Aqueduct Distribution System. Work is located in the County of Los Angeles and comprises approx. 4.42 mi. of pipe line const. divided into schedules as follow: SCHEDULES 9P or 9S—Principally in Sierra Madre betw. the Big Santa Anita Wash and Mountain Trail Avenue. SCHEDULE 10P—Principally in the unincorporated area betw. Sierra Madre and Pasadena. SCHEDULE 11P—Across the Arroyo Seco in the western part of the City of Pasadena. The lengths of the respective schedules and the sizes of pipe required are as follow:

		Precast			Steel	
Scheds.	Miles	Ft.	In.		Ft.	Ft.
9P or 9S	1.65	9	8	or	10	3
10P	1.99	9	8		----	----
11P	0.78	9	8		----	----

6-25

CONTRACTS AWARDED

LOS ANGELES, CALIF.—Contracts awarded, as follows, by Shell Oil Co., 1008 W. 6th St., Los Angeles, for seamless steel and welded steel pipe for a new 304-mile pipeline: (1) To Columbia Steel Co., 2087 E. Slauson Ave., Los Angeles; and to Republic Steel Corp., 601 W. 5th St., Los Angeles; and to Jones & Laughlin Steel Corp., 727 W. 7th St., Los Angeles, for various amounts seamless steel pipe.

(2) To A. O. Smith Corp., 152 S. Arden Blvd., Los Angeles, and to Republic Steel Corp., 601 W. 5th St., Los Angeles, for electric welded steel pipe. Total tonnage of above awards is approximately 25,000 tons. 6-4

LOS ANGELES, CALIF.—Contract awarded to Lindgren & Swinerton, Inc., 625 Standard Oil Bldg., San Francisco (price not stated) by Shell Oil Co., 1008 W. 6th St., Los Angeles, for trenching, backfilling and welding 304 mi. of oil pipeline as follows: 90 mi. 8-in. and 10-in. line betw. Bakersfield and Caliola; 180 mi. 10-in. line betw. Caliola and Martinez; 44 mi. 6-in. and 8-in. gathering lines. 6-26

SAN FRANCISCO, CALIF.—To Bechtel-Kaiser Co., 155 Sansome St., San Francisco, by Standard Oil Co., 225 Bush St., San Francisco, for taking up and reclaiming 170 miles of 8-in. pipeline (part of Bakersfield-Richmond line.) 6-1

Miscellaneous. . . . . .

WORK CONTEMPLATED

SAN FRANCISCO, CALIF.—Plans and specifications have been completed by Consulting Engineer, Strauss & Paine, Inc., Room 1016, 111 Sutter Street, San Francisco, and call for bids will be issued in July, to be opened in August, by Golden Gate Bridge and Highway District, 111 Sutter Street, San Francisco, for constructing the Toll Terminal structure, to be one-story, reinforced concrete, about 400 ft. long. Estimated cost $300,000. 6-16

WOODLAND, CALIF.—Bids have been received by Spreckels Sugar Co., care of C. J. Moroney, manager, 2 Pine St., San Francisco, for construction of roadway grading, tracks and rail connections, etc., in connection with construction of a sugar refinery to be located 2½ mi. northeast of Woodland. Bids on the two- and three-story reinforced concrete refinery building and the 96x61 ft. office building; and concrete wood-lined bins, 40-ft. diameter, 100-ft. high, will be asked, about August 1, to be opened later. Total estimated cost $2,000,000. 6-2

RENO, NEVADA—Bond election will be held August 18 by Reno, Nevada, to vote $75,000 in bonds to finance construction of the Idlewild Park swimming pool. 6-10

CALLS FOR BIDS

PHOENIX, ARIZ.—Bids to 10 a. m., August 4 by City Manager, Phoenix, Ariz., for const. Club House and related improvements in Dorris-Norton Park. 6-24

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To B. K. Stoneman, 130 E. 81st St., Los Angeles, $52,000, by Regents of the University of California at Los Angeles, for heating and ventilating of the Administration Bldg. 6-12

LOS ANGELES, CALIF.—To Loverich & Konjevod, 5303 N. Hartwick St., L. A., $69,619, to Purchasing Agent, Dept. Water & Power, L. A., for conc. wall, fence, paving and miscell. items of work at the Hollywood Reservoir. 6-5

SAN FRANCISCO, CALIF.—To Alta Electrical & Mechanical Co., 467 O'Farrell St., San Francisco, at $100,000 additional, by Golden Gate Bridge and Highway District, 111 Sutter St., San Francisco, for additional electrical work on the Golden Gate Bridge, consisting of installing sodium vapor lights and constructing a sub-station. 6-16

QUARRY HEIGHTS, C. Z.—To Morey & Luttrell, Cristobal, C. Z., $282,350, by Dept. Quartermaster, Panama Canal, Quarry Heights, C. Z., for constructing two barracks (140 to 150 men each) including roads and paving; curbs and gutters; sidewalks, sanitary sewer system; storm drain system, water and fire systems at Fort Clayton, C. Z. 6-26

PORTLAND, ORE.—To Acme Metal Works, 2223 W. Williams Ave., Portland, Ore., $12,933, by U. S. Engineer Office, Portland, Oregon, for installing a complete ventilating system in Bonneville Powerhouse at Bonneville, Oregon, under Inv. No. 694-36-362. 6-29

PORTLAND, ORE.—Award recommended to Collins Concrete & Steel Pipe Co., Ft. of N. Albina St., Portland, Ore., $46,580, by U. S. Engineer Office, Portland, Ore., for furnishing concrete stop logs, under Spec. 694-36-388. 6-12

PEARL HARBOR, T. H.—To Alta Electrical & Mechanical Co., 467 O'Farrell St., San Francisco, $26,800, by Public Works Office, U. S. Navy Yard, Pearl Harbor, T. H., for const. an electric switching station (Central Power Plant) at the Navy Yard, Pearl Harbor, T. H., under Spec. 8235. 6-23

LUKEFIELD, T. H.—To Moses Akiona, Honolulu, T. H., $66,950, by Public Works Officer, Pearl Harbor, T. H., for const. landing mat. aprons, etc., at Lukefield, Hawaii. 6-30

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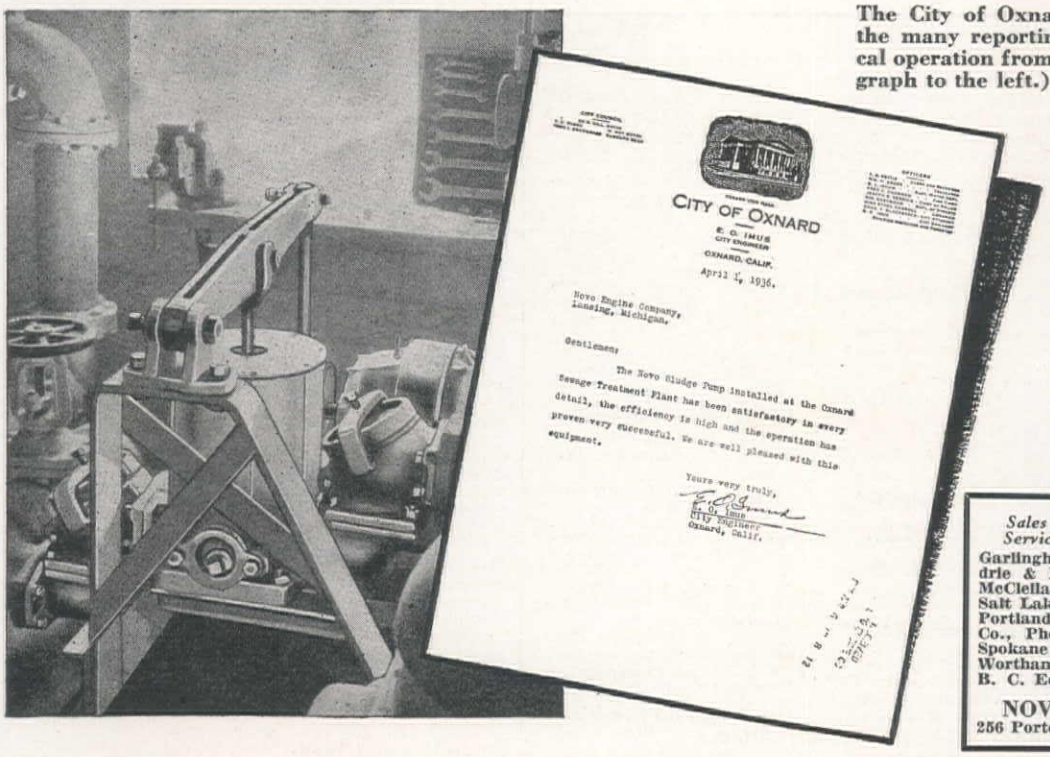
Give the Right Answer

City Engineers, Sanitary Engineers, and Consulting Engineers are finding in the Novo Roller Ring Sludge Pump the right answer to their pumping problem.

The City of Oxnard, California, is among the many reporting trouble-free, economical operation from the Novo Pump. (Photograph to the left.)



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CITY ENGINEER
OXNARD, CALIF.
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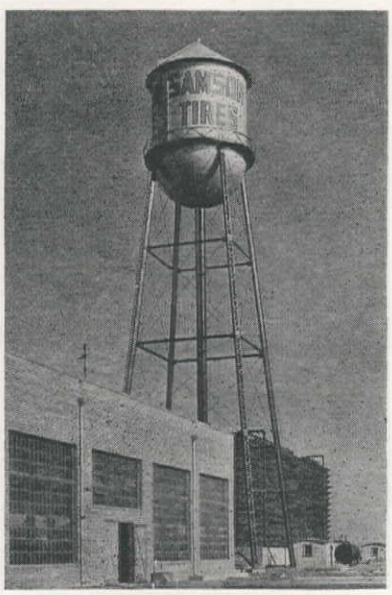

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Foote Co., Inc., The
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Automotive Accessories
Goodrich, B. F. Co., The

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Fuller Co.
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Goodrich, B. F. Co., The

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Timken Roller Bearing Co., The

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Belting, Transmission
Goodrich, B. F. Co., The
Pioneer Rubber Mills

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Crucible Steel Co.
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Blasting Machines
Atlas Powder Co.

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Atlas Powder Co.
du Pont, E. I. de Nemours & Co., Inc.
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Bucyrus-Erie Co.
Electric Steel Foundry Co.
Industrial Brownhoist Corp.
Northwest Engineering Company
Page Engineering Company
Wellman Engineering Co.

Buckets, Automatic
Page Engineering Company

Buckets, Clamshell
Owen Bucket Co.

Buckets, Dragline
Page Engineering Company

Buildings, Concrete
Portland Cement Association

Bulldozers
American Tractor Equipment Co.
Austin-Western Road Machinery Co.
Bucyrus-Erie Company
Caterpillar Tractor Company
Le Tourneau, R. G., Inc.

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American Cable Co., Inc.
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Chlorine
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Ransome Concrete Machinery Company

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Dorr Company, Inc., The

Clarifiers, Water
Dorr Company, Inc., The

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Cast Iron Pipe Research Association
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Curing Compounds, Concrete
Barrett Company, The

Derricks and Derrick Fittings
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Diggers, Clay
Cleveland Rock Drill Co., The

Diggers, Pneumatic
Cleveland Rock Drill Co., The
Worthington Pump & Machinery Corp.

Diggers, Trench
Cleveland Rock Drill Co., The

Dippers, Power Shovel
American Manganese Steel Co.

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Insley Manufacturing Corp.
Koehring Company

Ditchers
Buckeye Traction Ditcher Company
Northwest Engineering Co.

Dragline Excavators and Draglines
Harnischfeger Corp.
Koehring Company
Northwest Engineering Co.
Page Engineering Co.

Drifters
Cleveland Rock Drill Co., The

Drill Bits, Detachable
Crucible Steel Co.
Ingersoll-Rand Company
Sullivan Machinery Co.
Timken Roller Bearing Co.

Drill Rigs
Cleveland Rock Drill Co.,The

Drills, Blast Hole
Bucyrus-Erie Company

Drills, Diamond
Chicago Pneumatic Tool Co.
Sullivan Machinery Co.

Drills, Hammer
Cleveland Rock Drill Co., The
Worthington Pump & Machinery Corp.

Drills, Rock
Chicago Pneumatic Tool Co.
Cleveland Rock Drill Co., The
Gardner-Denver Company
Ingersoll-Rand Company
Sullivan Machinery Company
Worthington Pump & Machinery Corp.

Drills, Wagon
Cleveland Rock Drill Co., The
Sullivan Machinery Co.
Worthington Pump & Machinery Corp.

Drills, Water Well
Bucyrus-Erie Company

Dumptors
Koehring Company

Dumptors and Trail-Dumps
Koehring Company

Dynamite
Apache Powder Company
Atlas Powder Company
du Pont, E. I. de Nemours & Co., Inc.
Halafax Explosives
Hercules Powder Company
Trojan Powder Company

Electrical Wires and Cables for all Purposes
Roebling's, John A., Sons Co.

Elevating and Conveying Equipment
Austin-Western Road Machinery Company
Fuller Co.
Industrial Brownhoist Corp.
Link-Belt Company
Smith Engineering Works

Elevating Graders
Caterpillar Tractor Company

Elevators, Belt
Smith Engineering Works

Elevators, Contractors' Material
Ransome Concrete Machinery Company

Enamels, Pipe Line
Barrett Co., The

Engines, Diesel, Gasoline and Steam
Case, J. I., Company
Caterpillar Tractor Co.
Chicago Pneumatic Tool Co.
General Motors Truck Co.
International Harvester Co.
Northwest Engineering Co.
Page Engineering Co.
Worthington Pump & Machinery Co.

Engines, Gasoline and Gas
Novo Engine Co.

Engines, Truck Replacement
Cummins Engine Company

Equipment, Rebuilt
(See Opportunity Section)

Equipment for Rent
(See Opportunity Section)

Equipment, Used
(See Opportunity Section)

Excavating Machinery, Diesel, Gas and Electric
Harnischfeger Corp.

Excavating Machines
Page Engineering Company

Excavators
Caterpillar Tractor Co.
Euclid Road Machinery Co.
Koehring Company

Excavators, Ditching and Trench
Austin-Western Road Machinery Co.
Buckeye Traction Ditcher Co.
Bucyrus-Erie Company
Byers Machine Co., The
Industrial Brownhoist Co., The
Lima Locomotive Works, Inc.
Link-Belt Company
Marion Steam Shovel Co.
Michigan Power Shovel Co.
Northwest Engineering Co.
Thew Shovel Company
Universal Crane Co.

Excavators, Dragline
Austin-Western Road Machinery Co.
Buckeye Traction Ditcher Co.
Bucyrus-Erie Company
Byers Machine Co., The
Industrial Brownhoist Corp.
Lima Locomotive Works
Link-Belt Company
Marion Steam Shovel Co.
Northwest Engineering Co.
Novo Engine Co.
Thew Shovel Co.
Universal Crane Co.
Wellman Engineering Co., The

Explosives
Apache Power Company, Inc.
Atlas Powder Company
du Pont, E. I. de Nemours & Co., Inc.
Halafax Explosives Company
Hercules Powder Company
Trojan Powder Company

Feeders, Aggregate
Smith Engineering Works

Feeders, Chemical
Wallace & Tiernan Co., Inc.

Feeders (Rotary)
Fuller Co.

Fence Posts
United States Steel Corp.

Fence, Wire
United States Steel Corp.

Ferric Chloride
Great Western Electro-Chemical Co.

Fittings, Hose
Cleveland Rock Drill Co., The

Fittings, Pipe
Crane Company

Fittings and Accessories, Wire Rope
Roebling's, John A., Sons Co.

Flooring, Rubber Tile
Goodrich, B. F. Co., The

Flotation Reagents
Great Western Electro-Chemical Co.

Flumes, Metal
California Corrugated Culvert Co.
Hardesty Mfg. Co.
Pure Iron Culvert & Mfg. Co., The
Toncan Culvert Manufacturers' Assn.
Washington Corrugated Culvert Co.
Western Pipe & Steel Co.

Forms, Concrete
Western Pipe & Steel Co.

Galvanometers
Atlas Powder Co.

Gas Masks
Wallace & Tiernan Co., Inc.

Gasoline
Associated Oil Company
General Petroleum Corp. of California
Shell Oil Company
Union Oil Co. of California

Gates, Discharge
Fuller Company

Gates, Sluice
Crane Company
Ludlow Valve Mfg. Co., The

Gauges
Sparling R. W.

Generator Sets
Harnischfeger Corp.
Novo Engine Co.

Generators, Diesel, Electric
Caterpillar Tractor Co.
Fairbanks, Morse & Co.

Generators, Electric
Fairbanks, Morse & Co.
General Electric Co.

Generators, Turbine
Pelton Water Wheel Co.

Governors, Turbine
Pelton Water Wheel Co.

Graders, Leaning Wheel, Motor Driven, Elevating
Adams, J. D., Company

Graders, Road
Allis-Chalmers Mfg. Co.
Austin-Western Road Machinery Co.
Caterpillar Tractor Co.

Grapples, Rock
Owen Bucket Co.

Gravel Plant Equipment
Austin-Western Road Machinery Co.
Chain Belt Company
Dorr Company, Inc., The
Link-Belt Company
Northwest Engineering Co.
Pioneer Gravel Equipment Mfg. Co.
Smith Engineering Works

Guard Rail Cable
Leschen, A., & Sons Rope Co.

Hard Facing Materials
Air Reduction Sales Company

Hoists, Diesel, Electric, Gas and Hand Power
Caterpillar Tractor Company
Chain Belt Company
Clyde Sales Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Northwest Engineering Co.
Novo Engine Co.
Ramsey Machinery Co.
Wellman Engineering Co., The

Hoppers, Steel
Standard Steel Works
Western Pipe & Steel Co.

Hose, Air, Steam, Water and Suction
Cleveland Rock Drill Co., The
Goodrich, B. F. Co., The
Goodyear Tire & Rubber Co., Inc.

Hydrants
Pacific States Cast Iron Pipe Company

Hydrants, Fire
Ludlow Valve Mfg. Co., The

Inspection Engineers
Hunt Co., Robt. W.

Joints, Asphalt and Cork
Johns-Manville Corp.

Lighting Plants
Harnischfeger Corp.

Liner Plates
Western Pipe & Steel Co.

Loaders
Bucyrus-Erie Co.

Loaders, Log
Bucyrus-Erie Co.

Loaders, Power, Truck and Wagon
Austin-Western Road Machinery Co.
Galion Iron Works & Mfg. Co.

Lubricants, Oils and Greases
General Petroleum Corp. of California
Shell Oil Company
Union Oil Company of Calif.

Lubricants, Wire Rope
Leschen, A., & Sons Rope Co.

Lumber, Creosoted
Baxter, J. H. & Co.

Lumber, Termite, Decay and Fire-Repellant
Baxter, J. H. & Co.

Lumber, Zinc-Chloride and/or Chromated Zinc-Chloride Treated
Baxter, J. H. & Co.

Lye
Great Western Electro-Chemical Co.

Maintainers, Road
Adams, J. D. Company
Caterpillar Tractor Co.

Meters
Crane Company
National Meter Co.
Neptune Meter Co.
Sparling, R. W.

Mixers, Bituminous
Foote Company
Koehring Company

Mixers, Concrete
Chain Belt Company
Jaeger Machine Company
Koehring Company
Ransome Concrete Machinery Company
Western Pipe & Steel Co.

Mixers, Paving
Chain Belt Company
Foote Company
Koehring Company
Ransome Concrete Machinery Company

Mixing Plants
Chain Belt Company
Koehring Company
Ransome Concrete Machinery Company

Mixers, Truck
Chain Belt Company

Motors, Electric
Fairbanks, Morse & Co.
General Electric Co.
Lincoln Electric Co.

Motors, Electric, Squirrel Cage, Slip Ring
Harnischfeger Corp.

Mowers, Highway
Case, J. I. Co.

Mud-Jacks
Koehring Company

Oil, Diesel
General Petroleum Corp. of California
Shell Oil Co.

Oil, Fuel
General Petroleum Corp. of California

Oils, Truck and Bus
General Petroleum Corp. of California

Oxygen
Air Reduction Sales Co.

Paint, Zone Marking
General Paint Corp.

Paints, L & S Portland Cement
General Paint Corp.

Paints, Protective
Barrett Co., The
General Paint Corp.
Goodrich, B. F. Co., The

Pavements, Concrete
Portland Cement Assn.

Pavers, Bituminous Retread
Adams, J. D. Co.
Foote Company

Paving Breakers
Chicago Pneumatic Tool Co.
Cleveland Rock Drill Co., The
Gardner-Denver Co.
Ingersoll-Rand Co.
Novo Engine Co.
Worthington Pump & Machinery Corp.

Paving Mixers
Chain Belt Company
Koehring Co.

Penstocks
Chicago Bridge & Iron Works
Western Pipe & Steel Co.

Petroleum Products
General Petroleum Corp. of California

Pile Drivers
Bucyrus-Erie Co.
Clyde Sales Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Ingersoll-Rand Company
Lima Locomotive Works, Inc.
Northwest Engineering Co.

Piling, Creosoted
Baxter, J. H., & Co.

Pipe, Asbestos Cement
Johns-Manville Corp.

Pipe, Cast Iron
Crane Co.
Pacific States Cast Iron Pipe Co.
U. S. Pipe & Foundry Co.

Pipe, Cast Iron for Industrial Purposes
Cast Iron Pipe Research Association

Pipe, Submarine
U. S. Pipe & Foundry Co.

Pipe, Cement Lined Cast Iron
U. S. Pipe & Foundry Co.

Pipe, Concrete
American Concrete & Steel Pipe Co.

Pipe Fittings and Accessories
Pacific Pipe Company
U. S. Pipe & Foundry Co.

Pipe, Hume Centrifugal Concrete
American Concrete & Steel Pipe Co.

Pipe, Lock Joint Reinforced Concrete
American Concrete & Steel Pipe Co.

Pipe, Rental for Construction Lines
Pacific Pipe Co.

Pipe, Rubber Lined
Goodrich, B. F., Co., The

Pipe, Sewer and Storm Drain
American Concrete & Steel Pipe Co.

Pipe, Steel
Crane Co.
Pacific Pipe Co.
United States Steel Corp.
Western Pipe & Steel Co.

Pipe, Steel Riveted and Welded
Chicago Bridge & Iron Works
Western Pipe & Steel Co.

Pipe, Water
Cast Iron Pipe Research Association

Pipe, Welded Steel
American Pipe & Steel Corp.
California Corrugated Culvert Co.
Crane Co.
Hardesty Manufacturing Co.
Pacific Pipe Co.
Toncan Culvert Manufacturers' Association
Washington Corrugated Culvert Co.
Western Pipe & Steel

Plank, Asphalt Bridge
Johns-Manville Corp.

Powder
(See Explosives)

Power Control Units
Le Tourneau, Inc., R. G.

Power Units
Cummins Engine Co.
International Harvester Co.
Novo Engine Co.

Pressure Regulators
Air Reduction Sales Co.

Pumps
Chain Belt Co.
Fairbanks, Morse & Co.
Fuller Co.
Ingersoll-Rand Co.
Layne & Bowler Corp.
Novo Engine Co.
Relton Water Wheel Co.
Worthington Pump & Machinery Co.

Pumps, Deep Well
Pomona Pump Co.

Pumps, Drainage
Pomona Pump Co.

Pumps, Dredging
American Manganese Steel Company

Pumps, Sump
Chicago Pneumatic Tool Co.

Pumps, Turbine
Pomona Pump Co.
Worthington Pump & Machinery Corp.

Pumps, Vacuum (Rotary)
Fuller Co.

Reinforcing, Steel Bar and Fabric, for Concrete
United States Steel Corp.

Reservoirs, Steel
Pittsburgh-Des Moines Steel Co.

Rheostats for Electric Blasting
Atlas Powder Co.

Rippers
Adams, J. D. Co.

Roadbuilders
Caterpillar Tractor Co.

Road Machinery
Adams, J. D. Co.

Road Materials
Barrett Company, The

Road Oils
Asphalt Institute, The
Associated Oil Co.
Union Oil Co. of California

Rollers, Compacting
American Tractor Equipment Company

Rollers, Road
Austin-Western Road Machinery Co.
Galion Iron Works & Mfg. Co.

Roofings
Barrett Co., The

Roofs, Built-Up
Johns-Manville Corp.

Roofs, Cast Iron
U. S. Pipe & Foundry Co.

Rope, Wire
American Cable Co., Inc.
Broderick & Bascom Rope Co.
Leschen, A., & Sons Rope Co.
Roebling's, John A., Sons Co.

Rubber Goods, Mechanical
Goodyear Tire & Rubber Co.
Pioneer Rubber Mills

Scales
Fairbanks, Morse & Co.

Scales, Recording
Wallace & Tiernan Co., Inc.

Scales, Weight Printing
Fairbanks, Morse & Co.

Scales, Wheelbarrow
Fairbanks, Morse & Co.

Scarifiers
Adams, J. D. Co.
American Tractor Equipment Co.
Austin-Western Road Machinery Co.
Caterpillar Tractor Co.
Galion Iron Works & Mfg. Co.
Le Tourneau, R. G., Inc.

Scrapers
Adams, J. D. Co.
Austin-Western Road Machinery Co.
Caterpillar Tractor Co.
Le Tourneau, R. G., Inc.

Scrapers, Carryall
Le Tourneau, R. G., Inc.

Screens, Sand and Gravel
Austin-Western Road Machinery Co.
Dorr Co., Inc., The
McLanahan & Stone Corp.
Mfg. Co.
Pioneer Gravel Equipment
Smith Engineering Works

Screens, Sewage
Dorr Co., Inc., The

Second Hand Equipment
(See Opportunity Section)

Sectional Plate Pipe & Arches
Toncan Culvert Manufacturers' Association

Sewage Disposal Equipment
Dorr Co., Inc., The
Link-Belt Co.
U. S. Pipe & Foundry Co.
Wallace & Tiernan Co., Inc.

Sewers
Cast Iron Pipe Research Association

Sharpeners, Drill
Bucyrus-Erie Co.
Gardner-Denver Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Co.

Sheets, Corrugated Asbestos
Johns-Manville Corp.

Shovels, Power
Austin-Western Road Machinery Co.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Insley Manufacturing Corp.
Koehring Co.
Lima Locomotive Works, Inc.
Link-Belt Co.
Marion Steam Shovel Co.
Michigan Power Shovel Co.
Northwest Engineering Co.
St. Louis Power Shovel Co.
Thew Shovel Co.
Universal Crane Co.

Shovels, Truck
Michigan Power Shovel Co.

Slings, Wire Rope and Grommet
Roebling's, John A., Sons Co.

Smokestacks
Chicago Bridge & Iron Works

Snow Plows
Caterpillar Tractor Co.

Sockets, Cable
Roebling's, John A. Sons Co.

Standpipes
Chicago Bridge & Iron Works

Steel, Abrasion Resisting
Crucible Steel Co.
Electric Steel Foundry Co.

Steel, Drill
Cleveland Rock Drill Co., The
United States Steel Corp.

Steel, Reinforcing
United States Steel Corp.

Steel, Sheet-Galvanized Corrugated
Toncan Culvert Manufacturers' Assn.
United States Steel Corp.

Steel, Structural
Bethlehem Steel Corp.
Western Pipe & Steel Co.

Steel, Tool
Bethlehem Steel Corp.

Steels, Paving Breaker
Cleveland Rock Drill Co., The

Surfacers, Concrete
Mall Tool Co.

Swimming Pool Equipment
Wallace & Tiernan, Co., Inc.

Tampers, Backfill
Cleveland Rock Drill Co., The

Tanks, Elevated Steel
Chicago Bridge & Iron Works
Pittsburgh-Des Moines Steel Co.

Tanks, Metal
Chicago Bridge & Iron Works
Pittsburgh-Des Moines Steel Co.
Western Pipe & Steel Co.

Tanks, Oil
Chicago Bridge & Iron Works

Telemeters
Wallace & Tiernan Co., Inc.

Terracers
Adams, J. D., Co.

Testing Outfits, Chlorine and pH
Wallace & Tiernan Co., Inc.

Tires, Dump Truck
Goodrich Co., B. F.
Goodyear Tire & Rubber Co.

Tires, Road Machinery
Goodyear Tire & Rubber Co.

Tires, Wheelbarrow
Goodrich Co., B. F.
Goodyear Tire & Rubber Co.

Tires and Tubes
Goodrich Co., B. F.
Goodyear Tire & Rubber Co.

Tools, Pneumatic
Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Tractors, Diesel and Gasoline
Allis-Chalmers Mfg. Co.
Case, J. I., Co.
Caterpillar Tractor Co.
Cleveland Tractor Co., The
International Harvester Co.
Reo Motor Car Co.

Trailbuilders
Caterpillar Tractor Co.
Le Tourneau, R. G., Inc.

Trail-Dumps
Koehring Co.

Trailers, Semi-Trailers
General Motors Truck Co.
Le Tourneau, R. G., Inc.
Six Wheels, Inc.
Utility Trailer Mfg. Co.

Trailers, Four-Wheel
Six Wheels, Inc.
Utility Trailer Mfg. Co.

Trailers, Heavy Duty
Wellman Engineering Co., The

Trailers, Six-Wheel
Six Wheels, Inc.
Utility Trailer Mfg. Co.

Trenching Machines
Harnischfeger Corp.
Northwest Engineering

Truck Cranes and Clamshells
Harnischfeger Corp.

Truck Cranes & Shovels
Thew Shovel Co., The
Universal Crane Co.

Trucks, Motor and Dump
General Motors Truck Co.
International Harvester Co.
Reo Motor Car Co.

Trucks, Tank
Reo Motor Car Co.

Truck Third Axles
Utility Trailer Mfg. Co.

Turbines
Pelton Water Wheel Co.

Turbines, Steam
General Electric Co.

Vacuum Pans
U. S. Pipe & Foundry Co.

Valves
Crane Co.
Pacific States Cast Iron Pipe Co.

Valves, Air
Cleveland Rock Drill Co., The

Valves, Gas Control
Wallace & Tiernan Co., Inc.

Valves, Gate
Crane Co.
Ludlow Valve Mfg. Co., The
Pelton Water Wheel Co.

Valves, Rubber Lined
Goodrich, B. F. Co., The

Vibrators, Concrete
Chicago Pneumatic Tool Co.
Mall Tool Co.

Wagons and Trailers
American Tractor Equipment Co.
Caterpillar Tractor Co.
Le Tourneau, R. G., Inc.

Washers, Sand and Gravel
Smith Engineering Works

Waste, Industrial, Treatment
Dorr Company, Inc., The

Water Purification Apparatus
Wallace & Tiernan Co., Inc.

Water Treatment Equipment
Dorr Company, Inc., The

Water Wheels
Pelton Water Wheel Co.

Water Works Equipment
Wallace & Tiernan Co., Inc.

Waterproofing
Aquatite Co.

Welders, Gas and Electric Driven
Harnischfeger Corp.

Welding and Cutting Equipment
Adams, J. D., Co.
Caterpillar Tractor Co.
Lincoln Electric Co., The

Welding and Cutting Equipment, Gas
Air Reduction Sales Co.

Welding Electrodes
Harnischfeger Corp.

Welding Machines, Electric Arc
Air Reduction Sales Co.

Welding Rods and Wire
Adams, J. D., Co.
Air Reduction Sales Co.
American Manganese Steel Co.
General Electric Co.
Lincoln Electric Co., The
Roebling's, John A., Sons Co.

Whirleys
Clyde Sales Company
Northwest Engineering Co.
Caterpillar Tractor Co.
Northwest Enginering Co.

Winches
Caterpillar Tractor Co.
Le Tourneau, R. G., Inc.

Xanthates
Great Western Electro-Chemical Co.

OPPORTUNITY SECTION

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Reclamation

Earthwork, Tunnels, Canal Lining, Structures, Boise-Payette Project

Washington, D. C., June 26, 1936.

Sealed bids (Specifications No. 688) will be received at the office of the U. S. Bureau of Reclamation, Ontario, Oregon, until 10 a. m., July 27, 1936, and will at that hour be opened for furnishing labor and materials and performing all work for the construction of earthwork, tunnels, canal lining, and structures. Black Canyon Canal, station 606+70 to station 643+40 and station 719+70 to station 742+45, Payette division, Boise project, Idaho. The work is located near Emmett, Idaho. The principal items of work and the estimated quantities involved are as follows: 102,700 cubic yards of all classes of excavation for canal; 1,350 cubic yards of excavation for core banks; 6,000 station cubic yards of overhaul; 1,140 cubic yards of all classes of excavation for structures; 33,330 cubic yards of excavation, all classes, for tunnels; 500 cubic yards of backfill; 2,100 cubic yards of compacting canal embankment; 3,500 square yards of trimming canal sections for concrete lining; 7,220 cubic yards of concrete in tunnels; 907 cubic yards of concrete in structures; 320 cubic yards of concrete in canal lining; 2,400 cubic feet of pressure grouting; 425 square yards of dry-rock paving; placing 120,600 pounds of reinforcement bars; furnishing and installing 452,800 pounds of permanent steel tunnel supports; furnishing and erecting 258 M. ft. b. m. of permanent timbering in tunnels; furnishing and installing 137,000 pounds of steel tunnel liner plates; constructing 2,400 linear feet of 6-inch diameter tunnel drains; drilling 1,200 linear feet of grout holes; and installing 1,300 pounds of gates and gate hoists. This invitation for bids does not cover the purchase of materials which are to be furnished by the Government. Materials to be furnished by the contractor and those furnished by the Government are described in the specifications which will be part of the contract. Bid security in an amount not less than 10 per cent of the amount of the bid and performance bond not less than 50 per cent of the estimated aggregate payments to be made under the contract will be required. Payment bond will be required in the sum of one-half of the total amount payable by the terms of the contract. The work shall be commenced within thirty (30) calendar days after date of receipt of notice to proceed and shall be completed within four hundred (400) calendar days from the date of receipt of such notice. Liquidated damages for delay will be fifty dollars ($50) per day for each uncompleted schedule. No charge to prospective bidders for copies of the specifications and drawings; to others $1.00, not returnable. For particulars, address the Bureau of Reclamation, Ontario, Oregon; Denver, Colorado; or Washington, D. C.

JOHN C. PAGE,
Acting Commsisioner.

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Reclamation

Construction of Overchutes, Inlets and Turnouts, All-American Canal

Washington, D. C., June 23, 1936.

Sealed bids (Specifications No. 684) will be received at the office of the U. S. Bureau of Reclamation, Federal Building, Yuma, Arizona, until 10 a. m., mountain standard time, July 23, 1936, and will at that hour be opened for furnishing labor and materials and performing all work for the construction of wash overchutes, drainage inlets, and turnouts. All-American Canal, station 308 to station 1122, All-American Canal system, Boulder Canyon project, Arizona-California-Nevada. The work is located from about 10 miles northeast to about 6 miles west of Yuma, Arizona. The principal items of work and the estimated quantities involved are as follows: 210,000 cubic yards of excavation for canal; 71,650 cubic yards of excavation for structures; 27,200 cubic yards of excavation for wash channels and dikes; 3,800 cubic yards of compacting embankments: 23,400 cubic yards of compacted lining; 31,150 cubic yards of backfill; 11,795 cubic yards of concrete; 4,635 square yards of dry-rock paving; 8,950 cubic yards of riprap; placing 2,132,000 pounds of reinforcement bars; driving 591,800 pounds of steel sheet piling; installing 1,880 linear feet of rubber seals and rubber toes; installing 3,475 square feet of molded elastic joint material; erecting 4.0 M. ft. b.m. of timber railings; installing 6, 550 pounds of metal handrails; installing 3,500 pounds of gates and gate hoists; and installing 1,700 pounds of miscellaneous metalwork. This invitation for bids does not cover the purchase of materials which are to be furnished by the Government. Materials to be furnished by the contractor and those furnished by the Government are described in the specifications which will be part of the contract. Bid security in an amount not less than 10 per cent of the amount of the bid and performance bond not less than 50 per cent of the estimated aggregate payments to be made under the contract will be required. Payment bond will be required in the sum of one-half of the total amount payable by the terms of the contract. The work shall be commenced within thirty (30) calendar days after date of receipt of notice to proceed and shall be completed within five hundred and twenty (520) calendar days from the date of receipt of such notice. Liquidated damages for delay will be one hundred dollars ($100) per day for each uncompleted schedule. No charge to prospective bidders for copies of the specifications and drawings; to others, $3.50 not returnable. For particulars, address the Bureau of Reclamation, Yuma, Arizona; Denver, Colorado; or Washington, D. C.

JOHN G. PAGE,
Acting Commissioner.

UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Public Roads

Grading Placerville-Lake Tahoe National Forest Highway

San Francisco, California, July 1, 1936.

Sealed bids will be received at the office of the Bureau of Public Roads, Federal Office Building, Civic Center, San Francisco, California, until 2:00 o'clock P. M., July 23, 1936, for performing all work for grading Section H of Route 32, the Placerville-Lake Tahoe National Forest Highway, Eldorado National Forest, Eldorado County, California. The length of the project to be constructed is 2.326 miles and the principal items of work are approximately as follows: 18 acres clearing; 14 acres cleanup clearing; 156,500 cubic yards unclassified excavation; 3,800 cubic yards unclassified excavation for structures; 843,000 station yards overhaul; 2,000 cubic yard miles haul; 2.305 miles finishing earth graded roads; 387 cubic yards concrete; 3,175 cubic yards cement rubble masonry; 55,200 pounds reinforcing steel; 5,150 pounds structural steel; 1,616 lineal feet C. M. pipe; 50 cubic yards hand-laid rock embankment; 58 guide posts; 58 culvert markers; 6 right-of-way monuments. 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. 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 Treasurer of the United States. Plans, specifications and proposals may be obtained at the office of the Bureau of Public Roads, Federal Office Building, Civic Center, San Francisco, California.

C. H. SWEETSER,
District Engineer.

OPPORTUNITY SECTION

POSITIONS AVAILABLE

The Mexican Government has requirement for a number of high grade Superintendents on the construction of rock-fill, concrete, and earth dams. Salary will be such as necessary to obtain the services of thoroughly competent and experienced men. An applicant should communicate with the Director, Comision Nacional de Irrigacion, Balderas 94, Mexico City, stating in detail his qualifications and experience, the names and addresses of former employers, when he can report for duty if offered employment, and salary expected.

POSITION WANTED

SUPERINTENDENT—Twenty years in charge, all types of buildings, specialized in reinforced concrete construction. Carpenter by trade, first-class references, any location. Address Box 195, Western Construction News, 114 Sansome Street, San Francisco, California.

FOR SALE
N-1 Cement Gun
W. H. COWEN
1114 Sutter Street San Francisco
Phone ORdway 0173

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OAKLAND **CONTRACTORS MACHINERY EXCHANGE INC.** OAKLAND
1135-57th Ave. Fruitvale 0715

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Surplus Equipment of the Pat McGovern Estate, Long Island City, New York

PROMPT SHIPMENT can be made from either New York or Denver..stock in both locations.

1—30" x 12-ft. Putnam Heavy duty Quick Change Lathe.
1—3-Drum Lidgerwood Hoisting Engine with swinging gear attachment, direct connected to 80-HP. General Electric hoist motor.
1—65-ft. boom steel stiff leg Derrick with two-drum Lambert hoisting engine, direct connected to 40-HP. General Electric slip-ring motor.
1—77-ft. boom steel stiff leg Derrick with two-drum Lambert hoist direct connected to a 50-HP. General Electric slip-ring motor.
11—Ingersoll-Rand Drill Sharpeners No. 34 and No. 50.
1—90-ft. boom steel guy derrick with two-drum Lambert hoist direct connected to 50-HP. General Electric slip-ring motor.
30—5-ton General Electric storage battery locomotives, type LSB, 2C5-C15, 36" gauge, all in 11,000 serial numbers.
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