WCN-07-1930

WESTERN CONSTRUCTION NEWS

CIVIL ENGINEERING AND CONSTRUCTION IN THE FAR WEST

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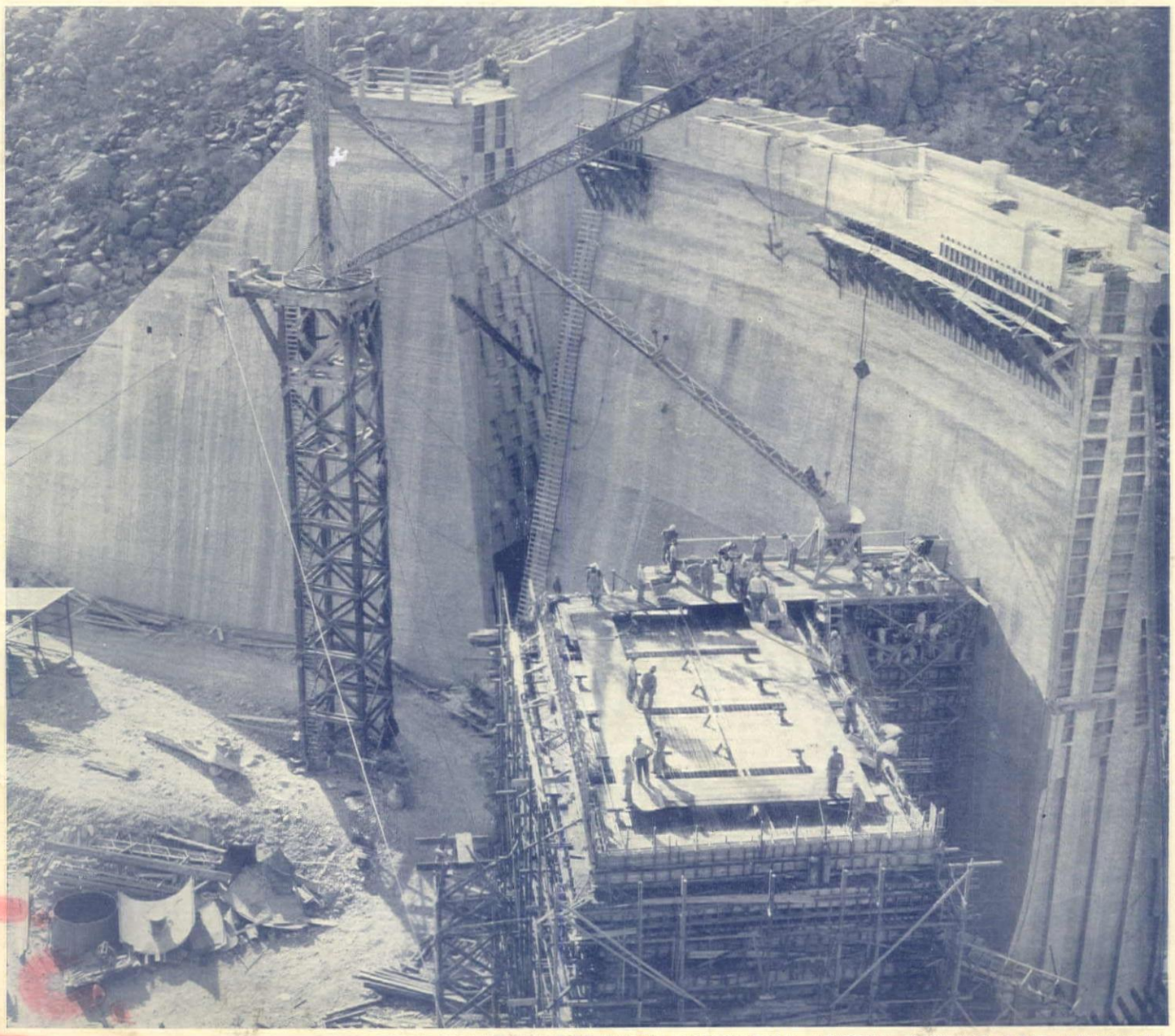

STEWART MOUNTAIN DAM FOR SALT RIVER VALLEY WATER USERS' ASSOCIATION, ARIZONA, SHOWING WEST ABUTMENT, WEST GRAVITY SECTION, COMPLETED PORTION OF ARCH, AND POWERHOUSE, DECEMBER, 1929

The HEAVIEST SHOVELS BUILT

MANY of the P & H Models are heavier than any other machine of similar rating. For instance Model 300-B, 5/8-yd. machine, weighs 48,000 lbs.; the model 600-A, 1-yd. machine, weighs 81,000 lbs.

P & H machines are heavy because all main frames, including carbody, revolving frame and corduroy frames, are heavy single-piece steel castings. This unit cast steel construction gives strength and rigidity that cannot be obtained with structural frames or combination cast and structural frames.

The carbody and tractions are much heavier than those employed on other machines. This heavy construction provides a solid foundation that permits the machine to travel through the deepest mud—or over rocks without danger of springing.

Unit cast construction preserves perfect alignment and cuts maintenance costs.

For particulars, write the HARNISCHFEGER CORPORATION, 3890 National Ave., Milwaukee, Wisconsin. *Write for full particulars.*

Structural Features that Mean Great Strength

Steel construction. All frames are single-piece castings. Engine is mounted directly upon revolving frame. Shafting of chrome-manganese steel, forged, heat treated and machined. Gears and pinions cut from heat-treated steel forgings. Drum clutches operated by power. Combined swing gear and roller path extra heavy steel casting. Heavy axles carry entire weight—no weight on drive shafts. P & H patented chain crowd—the most positive crowding motion known. Large size motors.

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Established 1884
3390 National Avenue, Milwaukee, Wis.
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ROBERT M. TAYLOR, Pacific Coast Manager
Service Stations, Complete Repair Parts Stocks and Excavators
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P&H Gasoline · Diesel · Electric EXCAVATORS

NEVER BEFORE—

. . . . . Such speed, simplicity and ruggedness in a 1/2-yard shovel

The 1020 Bucyrus-Erie gives you an entirely new conception of a ½-yard shovel. Ruggedly built from start to finish — a high-grade machine in every way — it wins immediate respect and confidence.

Note, at the left, some points of construction. Such features leave no doubt about the reliability of this machine. And when you get reliability with the perfectly balanced power and speed of the 1020, you have a small shovel without an equal. Users everywhere are amazed at its performance!

Built by the world's largest manufacturers of small shovels — the 1020 is an achievement of commanding importance. Behind it is actual field experience with nearly 11,000 machines.

1020

POINTS FOR COMPARISON

Check these features of the 1020 against any other ½-yard shovel: Large oversize shafts, bearings and clutches. Unit steel construction. Rugged box-girder boom. Frictionless bearings. Gears incased and running in oil. Gas, electric, Diesel power. Quick convertibility to shovel, crane or dragline. The 1020 Bulletin gives complete description.

SEE THE 1020 IN OPERATION

We'll tell you where you can see it. Examine it carefully, point by point. Watch it dig with its remarkable speed. Then you'll say, as 1020 users declare — it's the greatest ½-yard shovel ever built!

Write today for the 1020 Bulletin — get all the facts at once!

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DEVOTED TO CIVIL ENGINEERING AND CONSTRUCTION IN THE FAR WEST

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HANDLES a 2-cu. yd. bucket at 40 ft. radius with a 50 ft. boom, and like all Northwests can be shipped on one flat car without dismantling.

NORTHWEST ENGINEERING CO.

The world's largest exclusive builders of gasoline, oil burning and electric powered shovels, cranes and draglines

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The Model 8 has even less ground bearing pressure than the Model 7. Send for the booklet "Ground Pressure Data."

WCN 7-10 Gray

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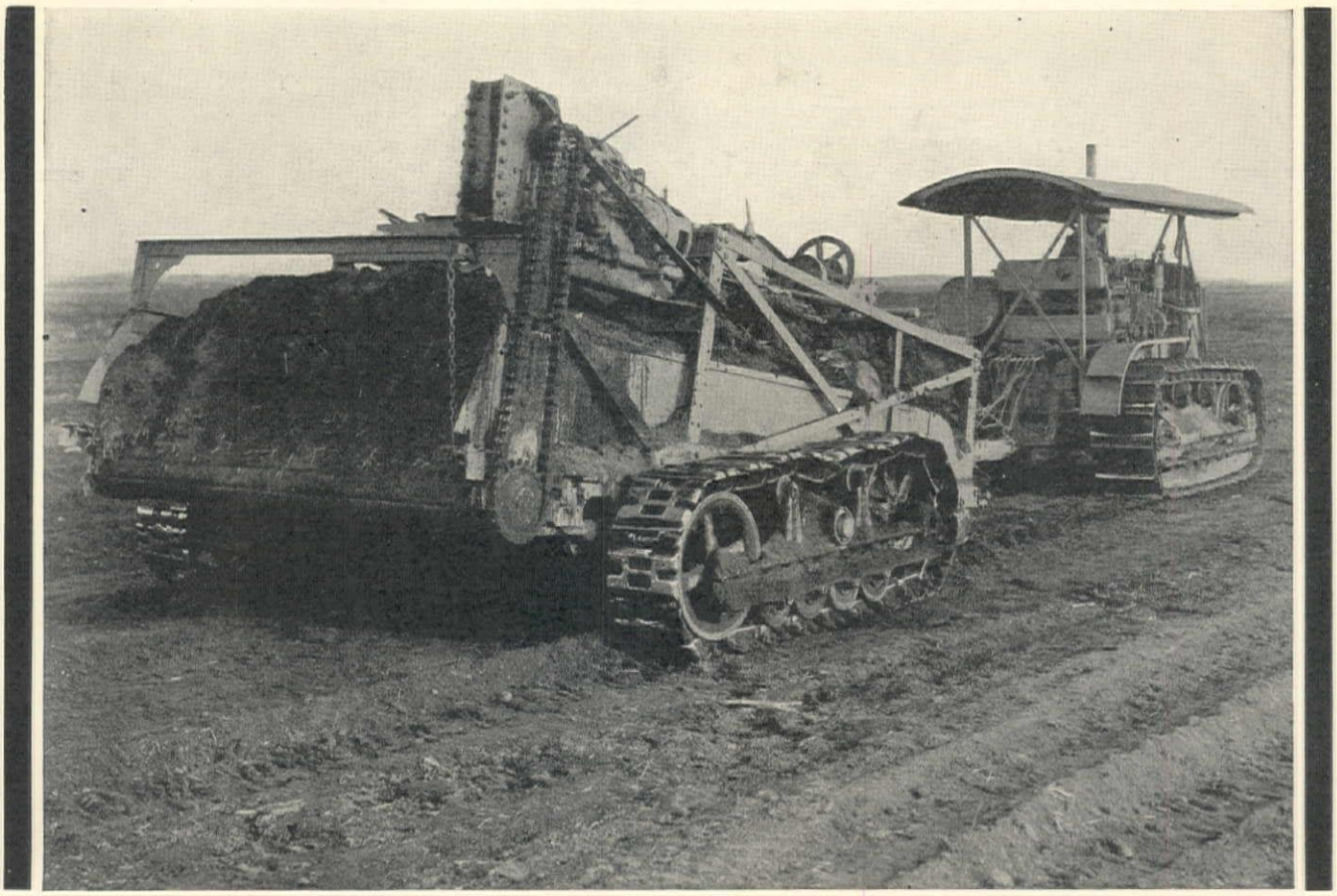

WHOLESALE earth moving

TWELVE CUBIC YARDS—electrically operated—one man drives tractor and operates leveler! Here's a "Caterpillar" Sixty pulling a new kind of earth-mover developed and used by Guy Brothers. It is typical of new equipment that alert manufacturers are putting on the market—big, rugged wagons and scrapers and bull-dozers that convert the extra power and extra traction of "Caterpillars" to extra yardage and extra profits.

Prices—f. o. b. Peoria, Illinois

TEN	$1100	TWENTY	$1900
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Caterpillar Tractor Co.

PEORIA, ILL. *and* SAN LEANDRO, CALIF., U. S. A.

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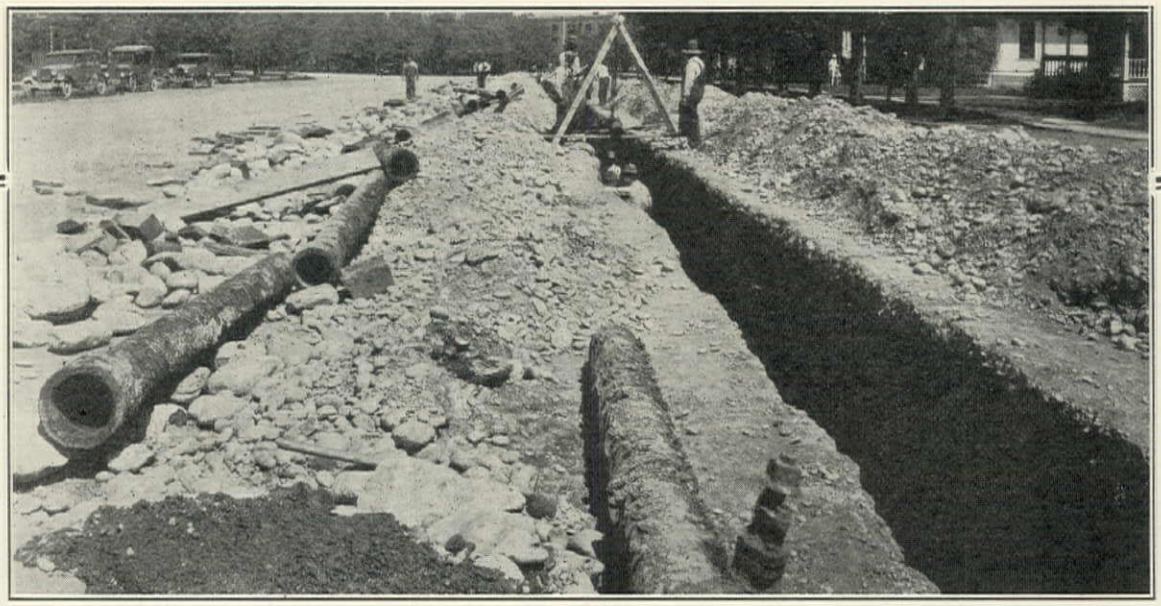


THE *LAST* REPLACEMENT

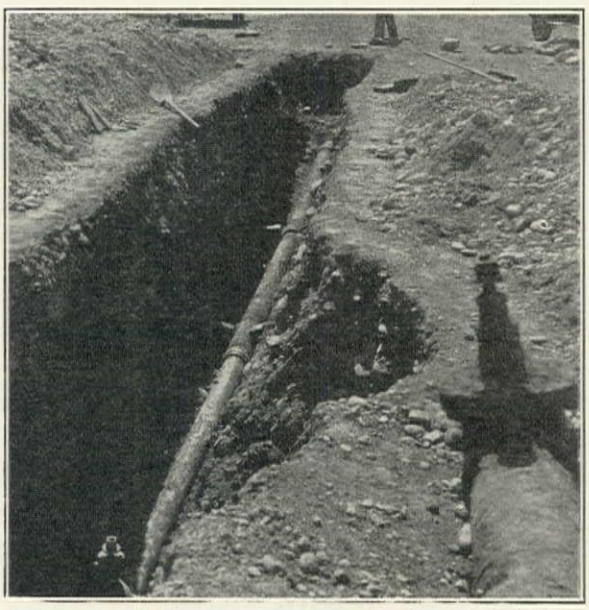
WHEN a water main is NOT cast iron pipe, replacement sooner or later causes a duplication of its first cost all over again. But a cast iron main NEVER HAS TO BE TOUCHED AGAIN. That is why McWANE-PACIFIC CAST IRON PIPE is going in here in this Montana city.

No Rust

Cast iron pipe cannot rust out. It *needs* no coating or coddling. Coated or uncoated, it "serves by the century." The oldest known line of it still serves, 261 years old now.

Precalked Joints

McWane Precalked Joints are not only simple and inexpensive to use, but they make a better, more positive connection than a trench-made joint. All are uniform and can be inspected before calking.



"Where Permanence Begins"—McWane-Pacific Cast Iron Pipe in the Foreground.

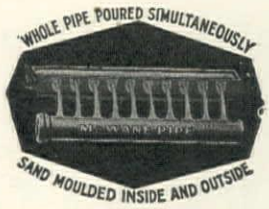
No Rot

Before McWane-Pacific Cast Iron Pipe was made at the Provo, Utah, plant, cast iron pipe was costly and difficult to obtain in the inter-mountain region. But now substitutes for the everlasting cast iron are unnecessary.

Western-Made Pipe

"What the West makes, makes the West;" and here is Utah iron and coal transformed into Utah-made cast iron pipe that is unsurpassed in strength and quality. Modern weights and modern strengths, yet sand-cast.

WRITE FOR ILLUSTRATED LITERATURE



Pipe Sizes:
1¼ thru 12 inches

McWANE
CAST IRON PIPE

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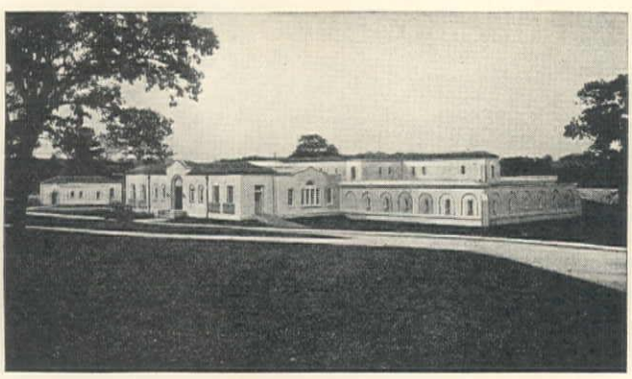
DORRCO

Gas Collection in Dorr Digesters

.... in separate sludge digestion sewage treatment plants.

In the separate sludge digestion plant of the Sanitary District of Aurora, Illinois, three gas collection type Dorr Digesters are used for digestion of sludge. Gas production at this plant has been more than sufficient for requirements. In the month of February the lowest temperature recorded in the Digester was 70° F. In April the average was upwards of 80° F.

In addition to regulating the temperature of the sludge in the Digesters, the heat generated by combustion of the gas is used for heating the main plant building, which consists of laboratory, office, locker rooms, pump station, garage and boiler rooms.



The plant at Aurora was designed by Alvord, Burdick & Howson, Chicago. In addition to the three Dorr Digesters, a Dorrco Bar Screen, Dorr Detritor and four Dorr Clarifiers are installed

Considering the fact that results similar to those at Aurora are being obtained at separate sludge digestion plants in all parts of the country, it is not surprising that this method of treatment is being selected so frequently by leading engineers for both large and small sewage treatment projects.

Ask our nearest office for a copy of the new edition of our booklet, "Modern Sanitary Engineering Practice" and also bulletin 6691, the Dorr Digester.

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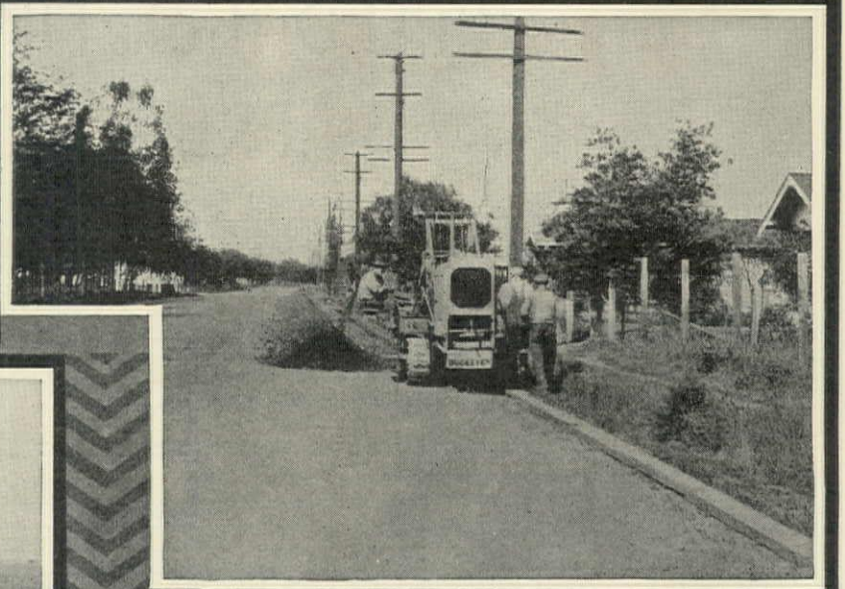
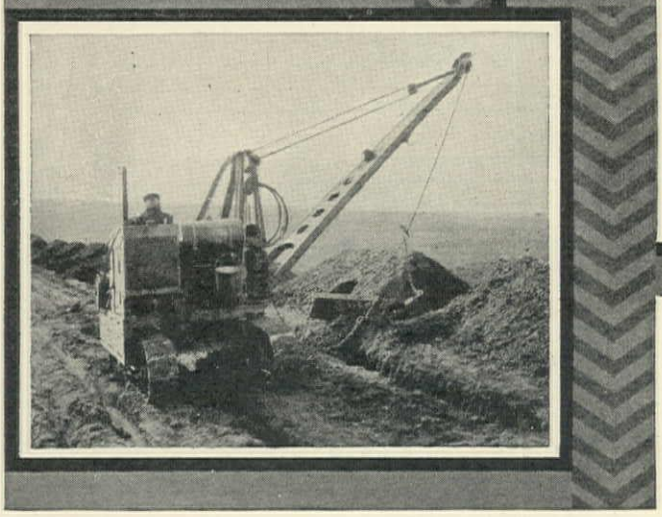
OVER 30 YEARS of Confidence Building





Model F *Service* Backfiller

A little Buckeye that will show new speed and remarkably low costs in refilling both service and smaller main trenches.

Measuring only 69 inches overall in width (without boom), 7 feet 6 inches in height and weighing but 4 tons, it is easily and quickly maneuvered in close quarters or transported from one job to another. Its adjustable-length boom has a swinging range of 160° and is easily set in position. A "back-action" scraper, furnished at slight extra cost, permits operation from the spoil-bank side of the trench. Twin Disc clutches control each traction unit, enabling the backfiller to turn completely within its own diameter. Traction brakes of ample dimensions allow safe operation on all practical grades. Simplicity of construction assures easy operation and maintenance.

Model F specifications and price will interest you. Both will be sent for the asking.

Wheel-Type Service Ditcher

Contractors, Municipalities and Public Service Companies can rely upon the Model 12 Service Ditcher for more miles of ditch per dollar — in any practical machine digging within its capacity. ¶ It embodies all of the characteristic Buckeye features which make winning a habit. In it, ruggedness is combined with compactness and mobility. Only 61 inches wide overall and weighing but 6 tons, it is easily transported by truck or trailer. Five standard cutting widths range from 11½ to 22 inches, with an extreme cutting depth of 5½ feet. Over-size power unit and steel-tread Alligator crawlers provide sure-footed traction everywhere. ¶ This handy little Wheel-Type Buckeye eliminates or minimizes costly hand labor in ditching through lawns, between sidewalks and curbs, and close up to trees, poles and other side obstructions. In the open, too, it can be depended upon for profitable results. Following the ditch line and grade accurately, it leaves the trench ready for the pipe or conduit to be laid immediately. ¶ From motor to digging wheel, Model 12 welcomes your rigid inspection and comparison. Ask for descriptive and illustrative bulletin.

THE BUCKEYE TRACTION DITCHER COMPANY
FINDLAY, OHIO

for over thirty years

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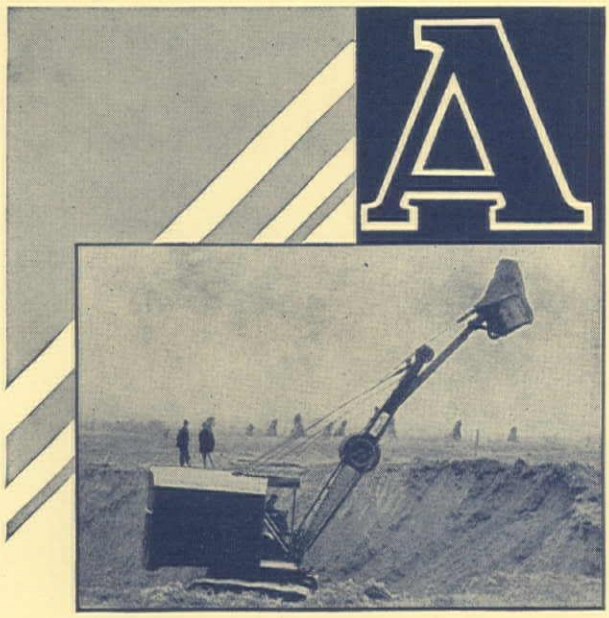

A LORAIN machine with Center Drive Shovel boom, will reach out farther, dig and dump higher up than any other shovel of equal length boom and dipper stick. And it will dig deeper below the treads. ▲ ▲ ▲ ▲

THE THEW SHOVEL COMPANY • LORAIN, OHIO

THEW LORAIN

45 . . 55 . . 75 . .

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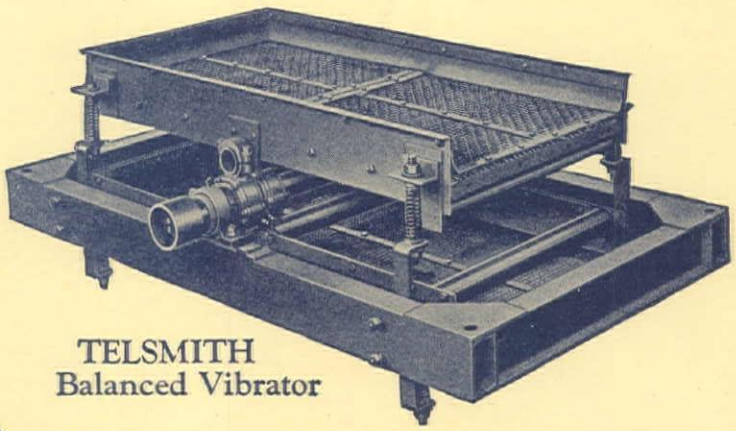
The Screens Vibrate—*not the Frame*

TELSMITH



TELSMITH
Balanced Vibrator

Something new in screen design

A hundred hours of continuous operation under overload! The Telsmith Balanced Vibrator stood this test and was still running smoothly, with bearings cool and all bolts tight—where other screens would have shaken themselves to pieces.

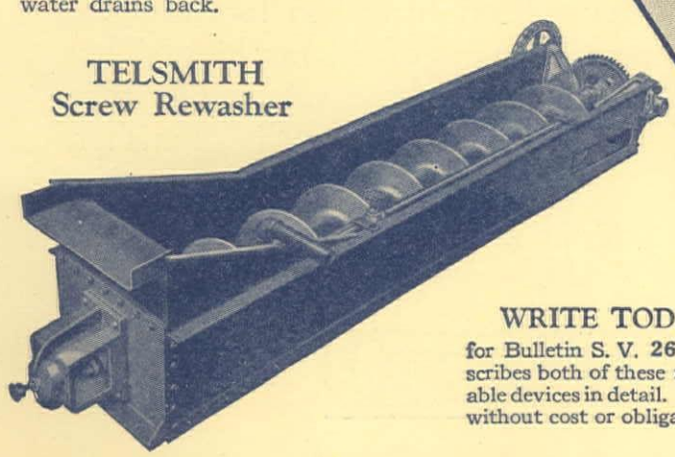
Telsmith's rate of vibration is 1200 R. P. M.—and it's *uniform*, on every inch of both decks, under any load. Yet a thimble will remain stationary on the steel skids—so slight is the vibration transmitted to the screen and so smoothly balanced is the opposite movement of the two decks. Opposed eccentrics do the work—one screen tray going up while the other is going down, and vice versa. For rapid replacements, an extra tray is furnished for each of the two decks. Even with its remarkably large capacity Telsmith uses less than two horsepower. It is built for economy and long life.

No Free Water — no clay no trash

Sand from Telsmith Screw Rewasher is all sand—no dirt—no water. Reverse currents in the washing trough battle valiantly with lignite, mica, bark and trash—bringing them to the surface and pushing them back until they finally float off over the spillway. Clay balls, too, are chewed to pieces by the big screw.

When your trucks haul the sand, there'll be no complaints about drippage—there's no free water in it. Telsmith's discharge vent is *above the trough floor*. The sand piles up at the end of the screw—the dry aggregate discharges from the top of the pile while the water drains back.

TELSMITH
Screw Rewasher



Consult the Nearest Representative or write or wire direct to

Smith Engineering Works
1826 Holton Street
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S. V. 3

WRITE TODAY
for Bulletin S. V. 26 It describes both of these remarkable devices in detail. Mailed without cost or obligation.

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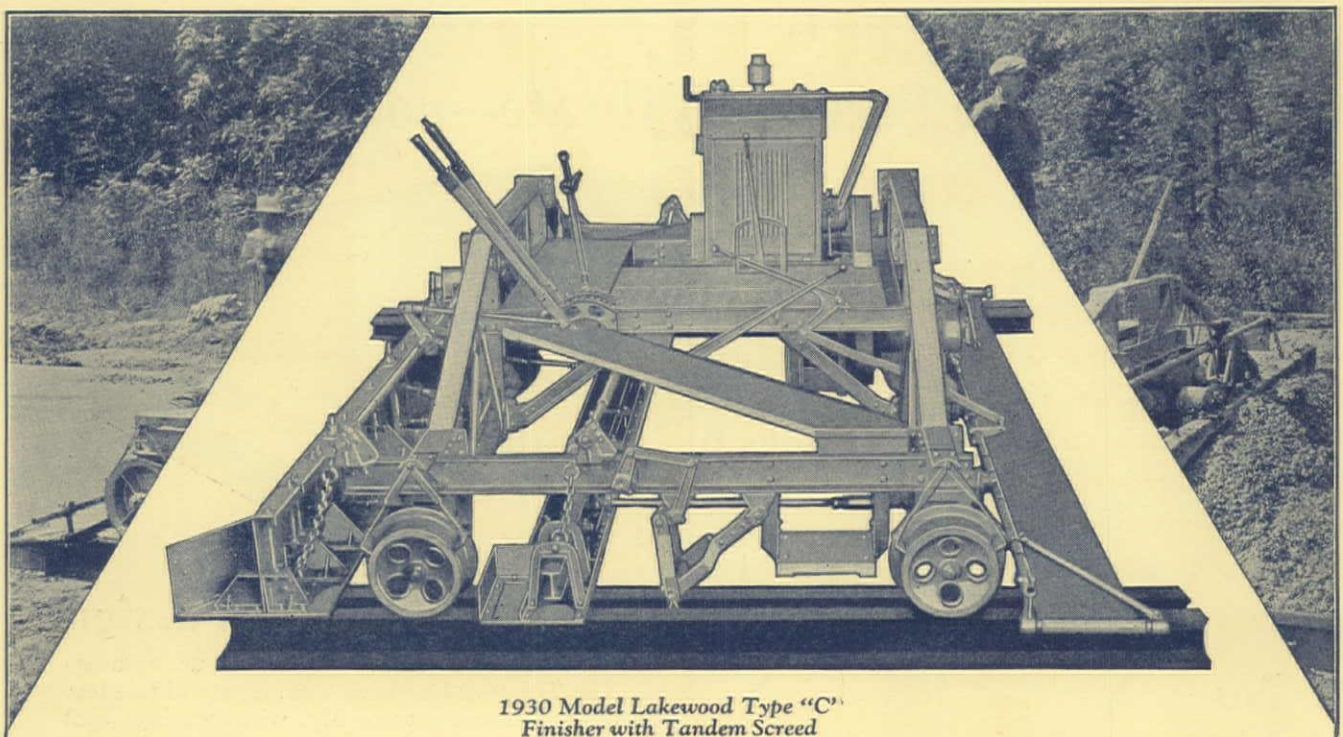
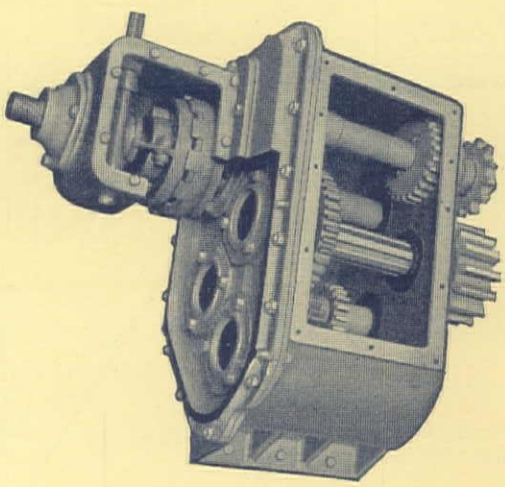


1930 Model Lakewood Type "C" Finisher with Tandem Screed

4 *years without a replacement*

That's the Record of the main transmission of the Lakewood Type "C" Finisher



Automotive transmission means alloy steel, heat treated gears and shafts running in oil mounted on Timken bearings.

WITH hundreds of machines in operation all over the world - no replacement gears or shafts have ever been furnished for this gear box which transmits power to all operating parts of the machine. That record stands as silent testimonial of the value of the automotive type transmission obtainable only in the Lakewood Type "C" Finisher.

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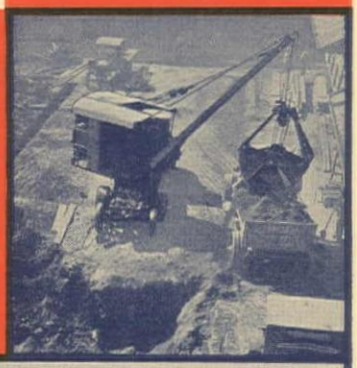
The UNIVERSAL Truck Crane Says it in Dollars and Cents!

TRAVELING from job to job at motor truck speed the Universal Truck Crane can easily serve a territory of 50 to 125 mile radius, a territory which in the average community is full of profitable crane jobs. The illustrations and figures here tell the story. More facts will be sent you on request.

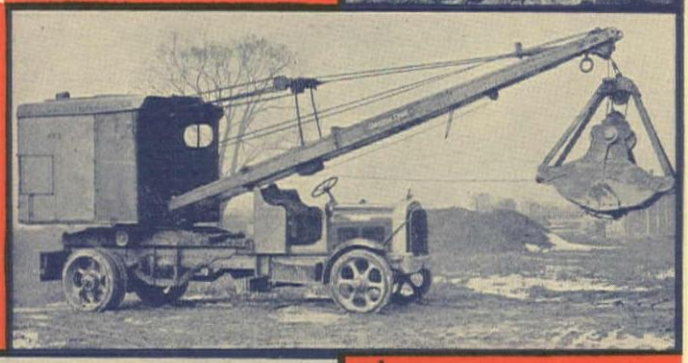
THE UNIVERSAL CRANE COMPANY
LORAIN, OHIO

$450.00 earned in 5 days. The job was a garage basement excavation where both trucks and cranes worked from the top.



$

A 7½ ton capacity crane with 24 ft. boom and ½ yard clamshell that earned $1379.54 in 25 days on 20 different jobs.



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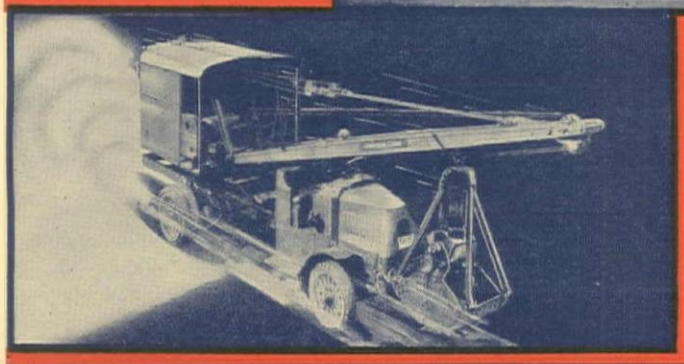
This one Universal Truck Crane earned $3311 in three months, working on jobs that required anywhere from 2 hours to 3 days. The owner has a fleet of six Universal Truck Cranes — all making money.



For big jobs or little, sooner or later you will need a machine that combines the mobility of a motor truck and the versatility of a 5 to 7½ ton crane.

UNIVERSAL

Truck Crane and Universal "35" Representatives: The Universal Crane Co., Los Angeles, Calif.; The Universal Crane Co., San Francisco, Calif.; The Feenaughty Machinery Co., Portland, Seattle, Spokane.

Universal "35" Representatives only: The Smith Booth Usher Co., Los Angeles, Calif.; The Jenison Machinery Co., San Francisco, Calif.

When writing to THE UNIVERSAL CRANE COMPANY, *please mention Western Construction News*

SPECIAL
Water Works Issue
October 25th

ANNUAL CONVENTION
American Water Works Association, California Section
PASADENA, OCTOBER 29th to NOVEMBER 1st

THE Water Works Convention issue of WESTERN CONSTRUCTION NEWS will again be entirely devoted editorially to modern methods of Water Works practice in the Far West.

Our editorial department has consistently carried on an educational campaign, editorially as well as by a selection of articles on water purification, filtration, water conservation by metering, greater distribution capacity, and adequate fire protection. In fact, WESTERN CONSTRUCTION NEWS is the only magazine, especially in the Far West, which is continually advocating water, clear and sparkling, and more of it.

It is conceded that the standing of an industry is reflected in no better way than the class of representative trade paper it supports, and with this thought in mind, we succeeded last year in giving the Water Works profession an extremely good issue that was much in demand long after the convention.

This issue will be well illustrated, and worthy of your representation in our advertising pages. It will contain an extra run for wide distribution at the convention, and will be a valuable souvenir which Water Works engineers and superintendents will want to retain in their libraries.

We urge you to let us have your space reservation at the earliest possible date so that you may have preference of position.

GREATER COVERAGE—LOWEST COST

Special rates for this issue are in effect. Reserve your space now.

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WESTERN CONSTRUCTION NEWS

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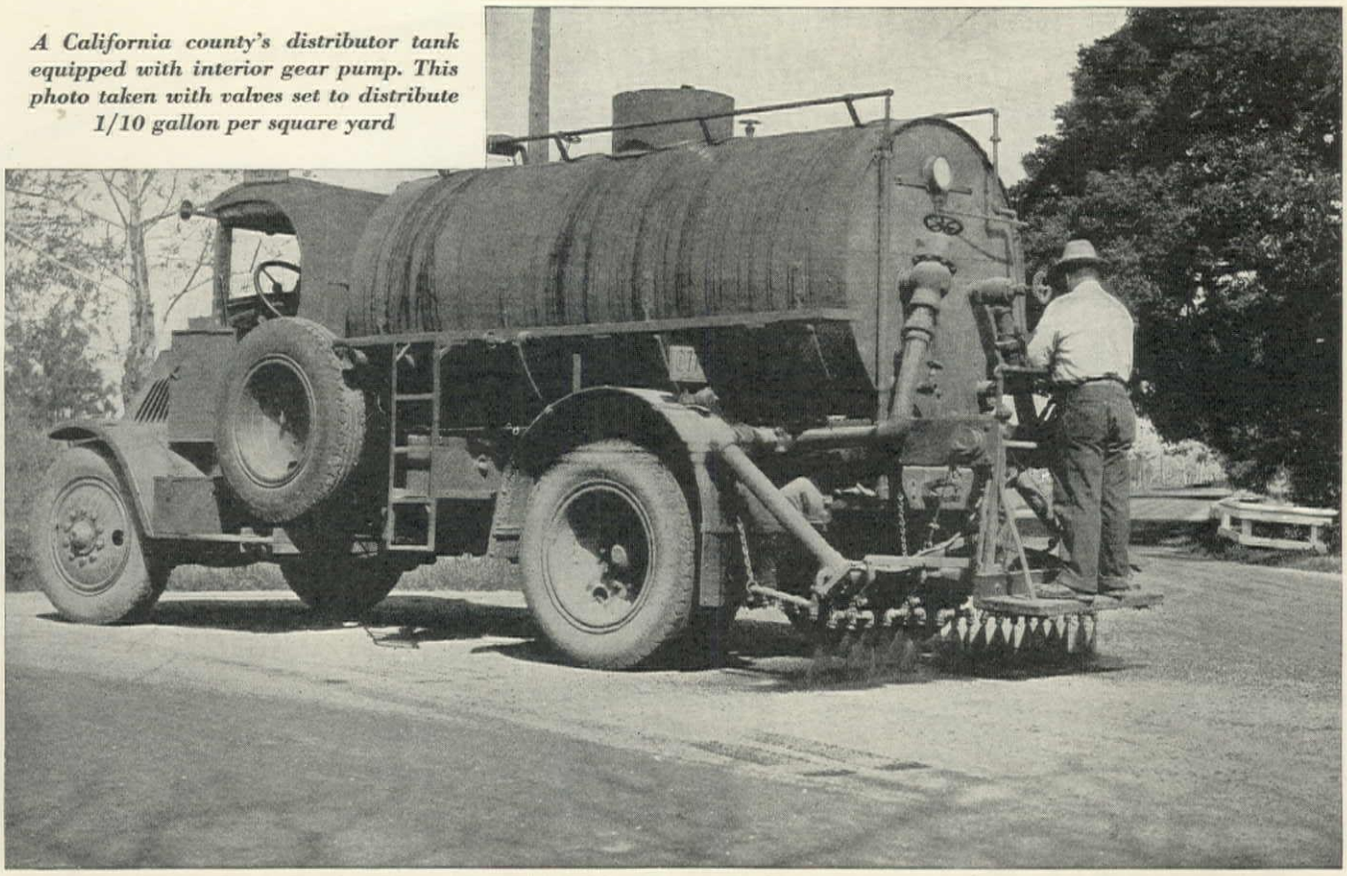
first in editorial value



A California county's distributor tank equipped with interior gear pump. This photo taken with valves set to distribute 1/10 gallon per square yard

Every road engineer should know about Colas

SHELL Colas is a superior cold asphalt road emulsion that permeates thoroughly throughout any aggregate, setting quickly and binding it tightly into a non-skid, traffic-proof, waterproof unit.

This economical labor-saving emulsion is ideal for new construction or maintenance. Resistant to heat, cold and adverse climatic conditions, Colas solves the problem of economical good roads. Shell technical men are at your service. No obligation.

SHELL COLAS

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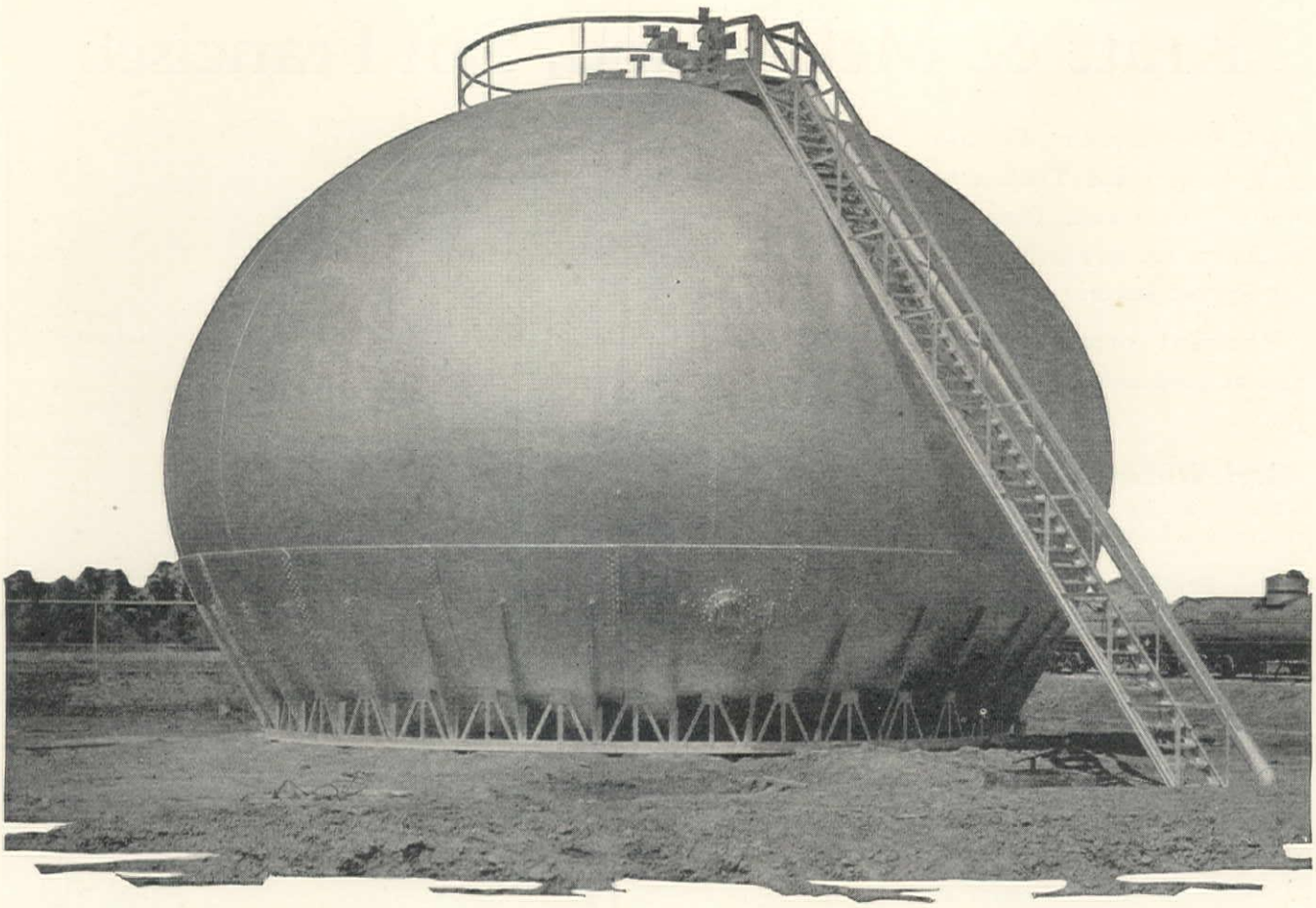
The HORTONSPHEROID



. . . the pressure tank with an ideal shape

The Hortonspheroid is a new type of tank designed to store liquids under pressure. It is used for storing natural and high test gasolines and other volatile liquids which boil at normal temperatures and which must be stored in containers capable of withstanding pressure to prevent excessive evaporation loss.

The shape of The Hortonspheroid is determined mathematically to give the most economical design. It is the form which a flexible container, such as a rubber bag would take when filled with liquid and subjected to a given pressure.

While we are introducing this structure as an innovation in tank building, the structure is not entirely new to us. We have been working on the design for a long time and early in 1928 built a 10,000-barrel Hortonspheroid for 5 pounds pressure. Extensive tests and experiments were conducted on this structure, which proved its practicability as a tank for storing liquids under pressure. Since that time we have made commercial installations which have worked out satisfactorily.

Hortonspheroids are built in the standard capacities for the pressures shown in the accompanying table. According to the results of tests, 10 or 15 pounds pressure is sufficient to stop all evaporation loss from a great many volatile liquids.

When filled, The Hortonspheroid is closed. No vapor escapes and no standing storage loss takes place as long as the temperature does not cause the pressure to exceed the working pressure for which the valve is set. The filling losses are also reduced, as the amount of air drawn in and the amount of air-vapor mixture forced out during filling and emptying are less than with an ordinary storage tank.

Ask for a copy of our new booklet on The Hortonspheroid. It contains detailed information on the structure and illustrations of installations now in service.

Standard Capacity

HORTONSPHEROIDS

Capacity (in Bbls.)	Pressure (in Lbs)	Diam.	Ht.
2,500	15	33′ 0″	25′ 6″
5,000	15	41′ 7″	32′ 6″
10,000	10	53′ 0″	39′ 5″
10,000	15	53′ 0″	39′ 5″
20,000	10	66′ 0″	49′ 5″
20,000	15	66′ 0″	49′ 5″

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TANKS—WIGGINS ROOFS—STEEL PLATE WORK

15 OUT OF 22

Outside boom and inside handle—the type of front end equipment that has dug *twenty times* more than all others combined. Standard on all Marions

FIFTEEN out of twenty-two shovel manufacturers selected Marion inside dipper stick design. These companies came into the field after years of service of both inside and outside types of handles—they had no traditions to uphold and were free to select the best. Results proved the inside handle to be most satisfactory. They last longer, are more flexible and dig better.

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Shovels, Draglines, Cranes, 1 yd. to 20 yds.

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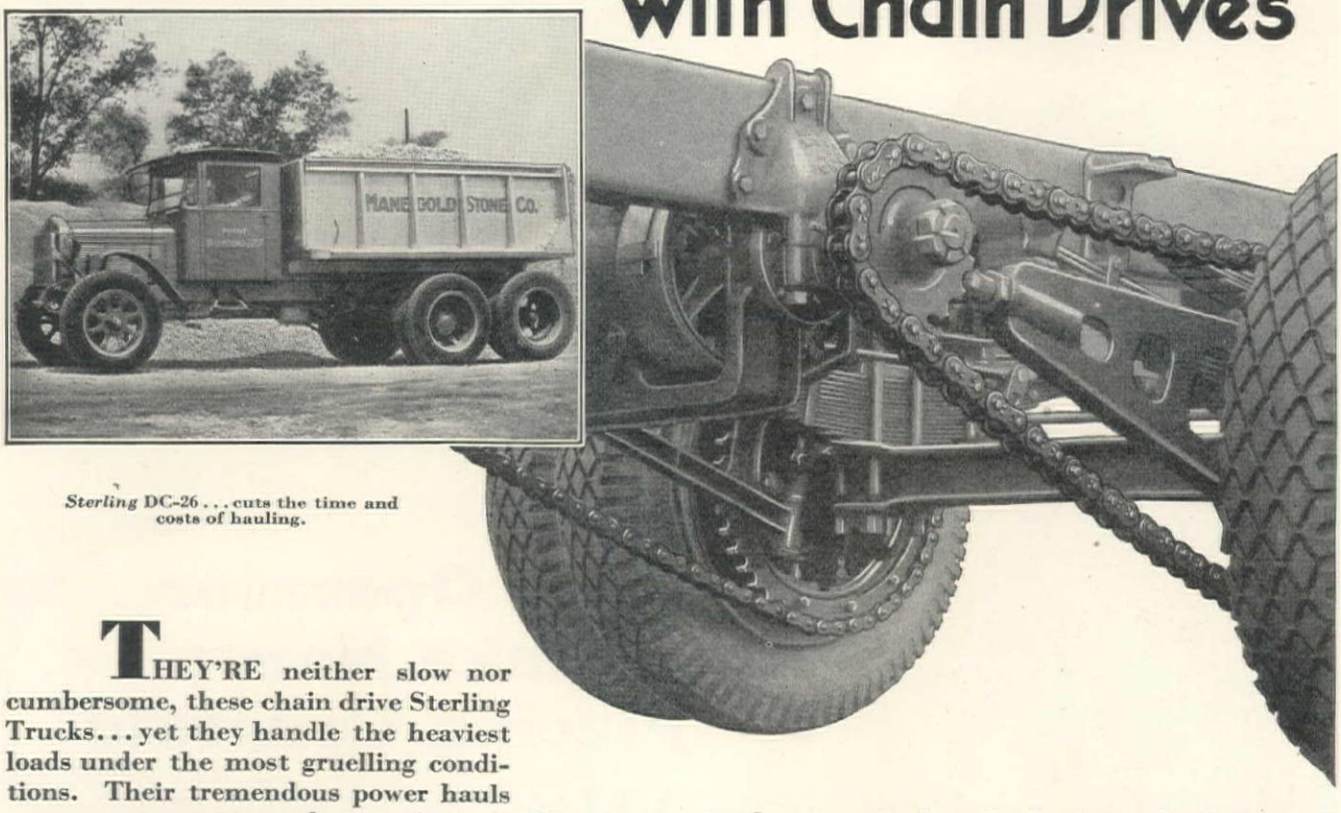
Representatives in the Principal Cities of the World

When writing to THE MARION STEAM SHOVEL CO., *please mention Western Construction News*

POWER + ECONOMY with Chain Drives



Sterling DC-26 . . . cuts the time and costs of hauling.

THEY'RE neither slow nor cumbersome, these chain drive Sterling Trucks . . . yet they handle the heaviest loads under the most gruelling conditions. Their tremendous power hauls more tonnage or yardage . . . their unfaltering speed means more and faster trips. These extra loads . . . combined with marked lowering of fuel and maintenance costs . . . mean the difference between loss and profits.

When the loads are the heaviest and the going the nastiest, your chain drive Sterling will pull through mud or snow, out of an excavation, or up a bad grade, without even hesitating. Sterling chain drives *pull like a locomotive* because they use the same principle of getting pulling power. The locomotive's power is transmitted *directly to the rim of the wheels* instead of through the axle. The chain drive Sterling, by means of large sprockets, transmits its power *directly* to the outside of the rear wheels. The pull is direct, positive and steady.

A Sterling chain drive, with its straight axle, has greater road clearance and can go in *and out* of places that other trucks will not even attempt. Maintenance costs are lower because repairs are less costly . . . fewer . . . and easier to make. There are no long lay-ups to cut into your profits.

There's a chain drive Sterling to suit your needs *exactly*. Write Driver Dan, in care of Sterling Motor Truck Co., Milwaukee, Wisconsin.

Driver Dan Says: «You can haul a bigger load *into* or *out of* almost any place with a chain drive truck.»

175

STERLING MOTOR TRUCK CO. OF CALIFORNIA
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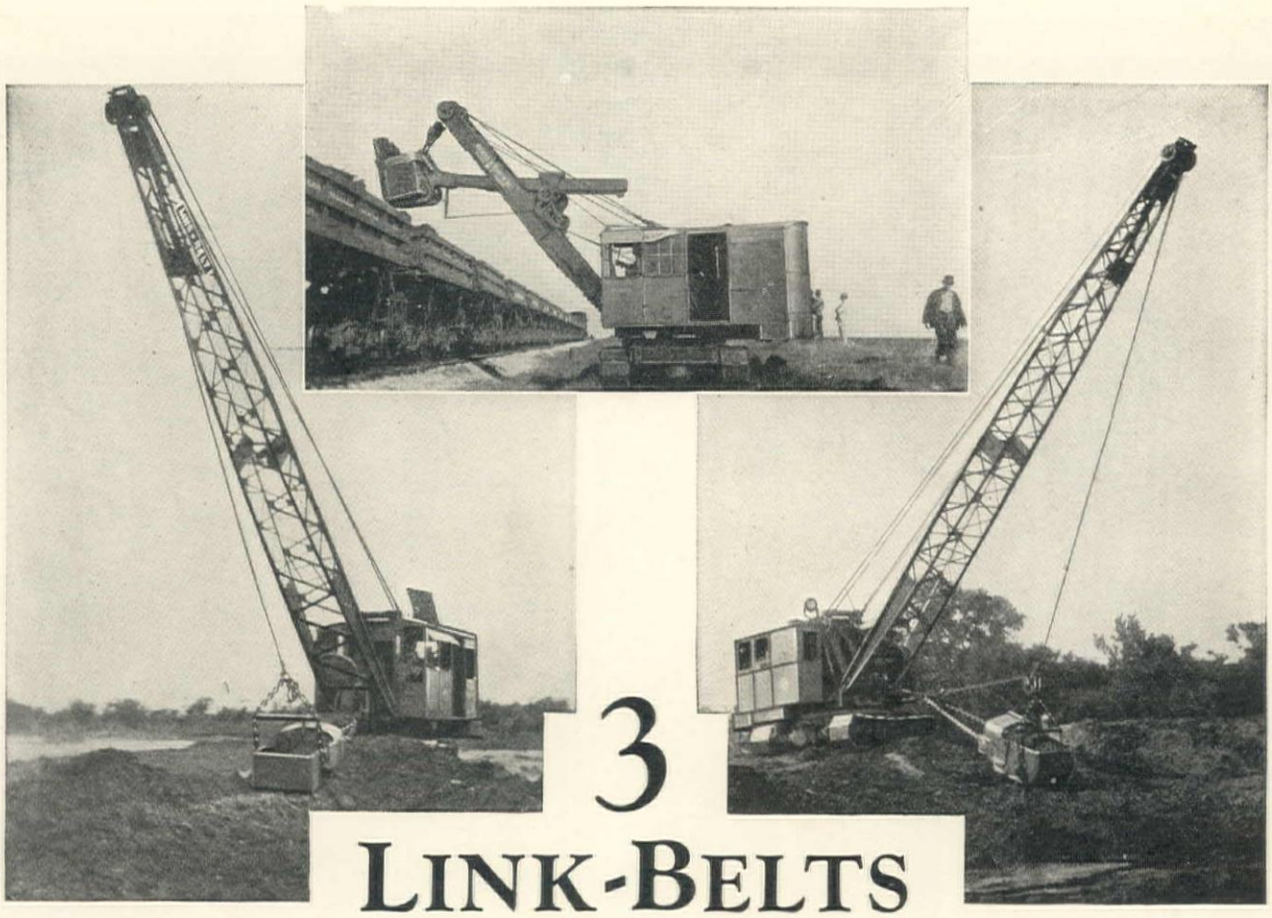
Sterling TRUCKS



3 LINK-BELTS speeded this Texas job

ABOUT 100,000 cubic yards of soft fill material had to be removed in this fill renewal job on the Southern Pacific Railway, north of Houston, Tex.

W. H. Nichols & Co., of Dallas, were contractors, and their two 1-yard Link-Belt Crawlers, used in this service are shown above (at the sides).

The contractor equipped these machines with oversize (1½-yd.) dragline buckets. Conservative factory rating of the machines made this safely possible.

New material for the fill was dug and loaded by the 1¼-yard Link-Belt Shovel shown (at top). Although the new material was of hard formation, 16-yard cars were loaded at the rate of one in 10 to 12 minutes.

The through-and-through good quality in Link-Belt crane-shovel-dragline is the basis of all these stories of good service. Get the details regarding these machines from Book No. 1095, which will be mailed upon request.

LINK-BELT COMPANY

Builders of Locomotive Cranes for 30 years. Portable Loaders — Crawler Cranes — Shovels — Draglines

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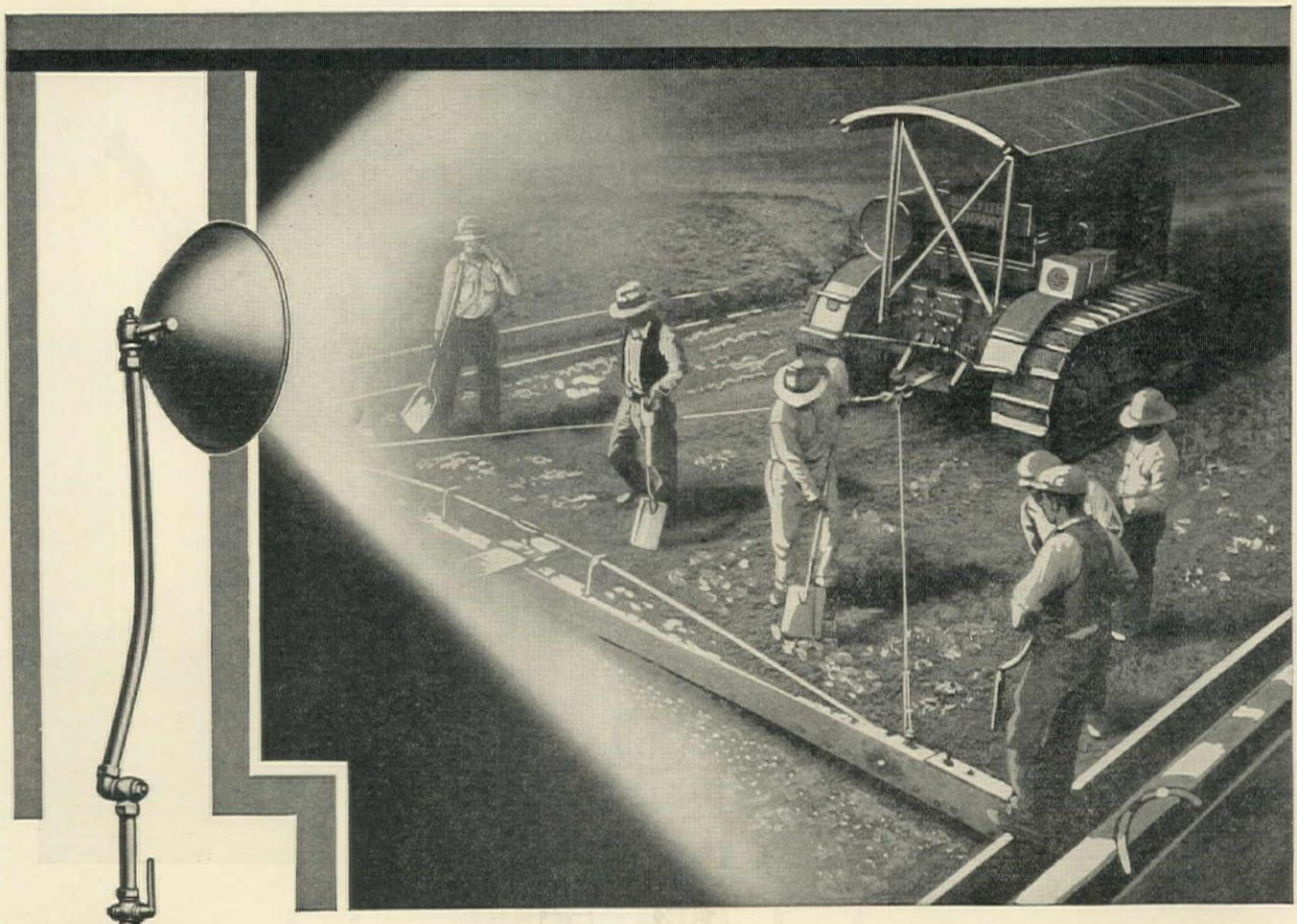

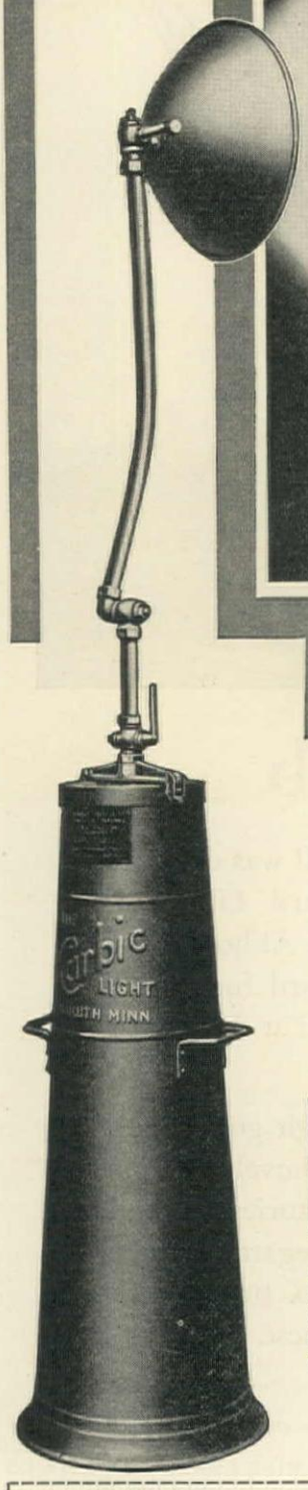

It's never too late with Carbic Lights

Any time is working time for the contractor equipped with Carbic Flood Lights. Whether for an hour or two overtime, or for an all-night shift, Carbic Flood Lights enable the work to continue full blast. Under its clear, diffused light men work rapidly and safely.

With Carbic Flood Lights you can get ahead of schedule, and stay ahead.

Make Carbic Flood Lights part of your equipment. They are portable. Any workman can operate them. They last indefinitely. Initial cost is low and operating expense is negligible.

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PROCESSED CARBIDE FOR CARBIC LIGHTS & GENERATORS

Carbic is distributed by the Union Carbide Sales Company through its national chain of warehouses and is sold by jobbers everywhere.

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Without obligation, I would like to have additional information on Carbic Lights.

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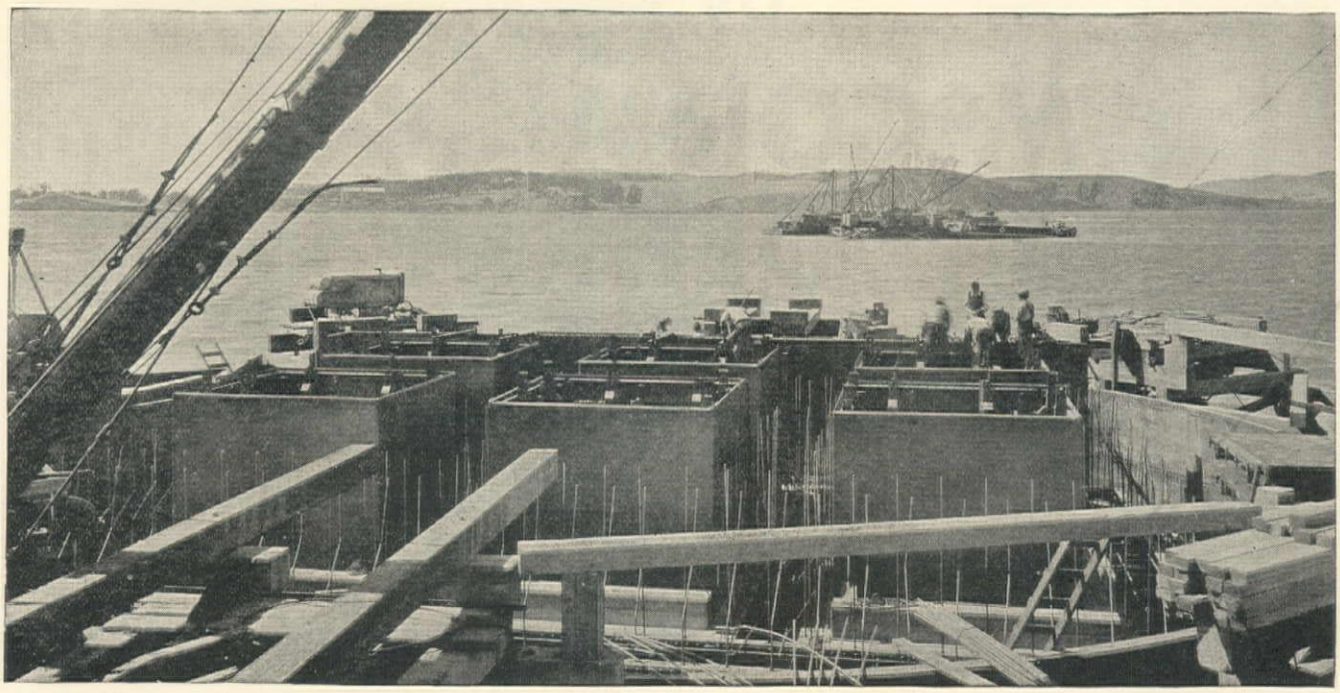
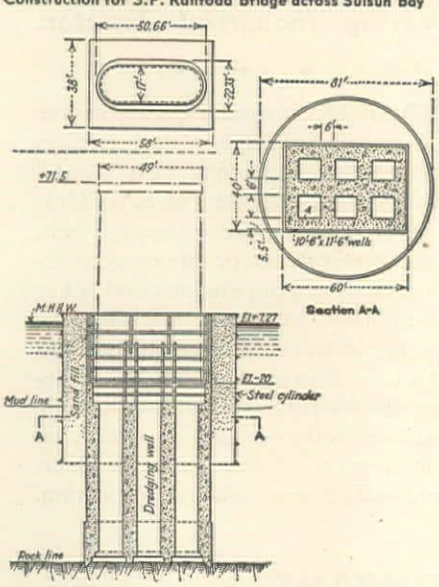


The illustration below showing pier construction methods appeared in the "Engineering News-Record" issue of January 30, 1930, in connection with an article by C. R. Harding, Asst. to President, Southern Pacific Railroad, entitled "Pier Construction for S.P. Railroad Bridge across Suisun Bay"



PLAN AND SECTIONS OF TYPICAL SAND ISLAND PIER

Blaw-Knox STEEL FORMS were adapted to the unusual pier construction methods employed by Siems, Helmers & Schaffner, Inc., on the Suisun Bay Bridge, near San Francisco, Calif.

The progressive system of concreting, dredging out and sinking the re-inforced concrete caissons (each containing six dredging wells) was expedited by the continued re-use of Blaw-Knox Steel Forms.

When a concreting job is to be done—usual or unusual—it pays to consult with *experienced* BLAW-KNOX.

BLAW-KNOX COMPANY

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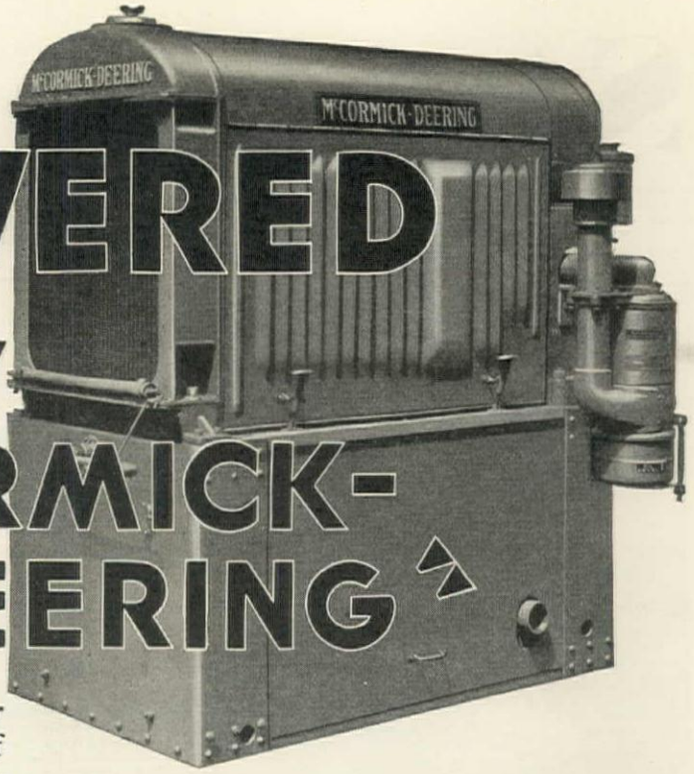
Garlinghouse Bros., 16th Street and Santa Fe Avenue, Los Angeles, Calif.; Harron, Rickard & McCone, 1600 Bryant Street, at 15th, San Francisco, Calif.; J. L. Latture, 312 E. Madison Street, Portland, Ore.; Pacific Hoist & Derrick Co., 818 First Avenue, S., Seattle, Wash.; L. A. Snow Co., 1032 Sixth Avenue, S., Seattle, Wash.

SUCCESSFUL PERFORMANCE ROS. A.G.C.-A.-E.

BLAW-KNOX

TRADE MARK BLAW-KNOX REG. U.S. PAT. OFFICE

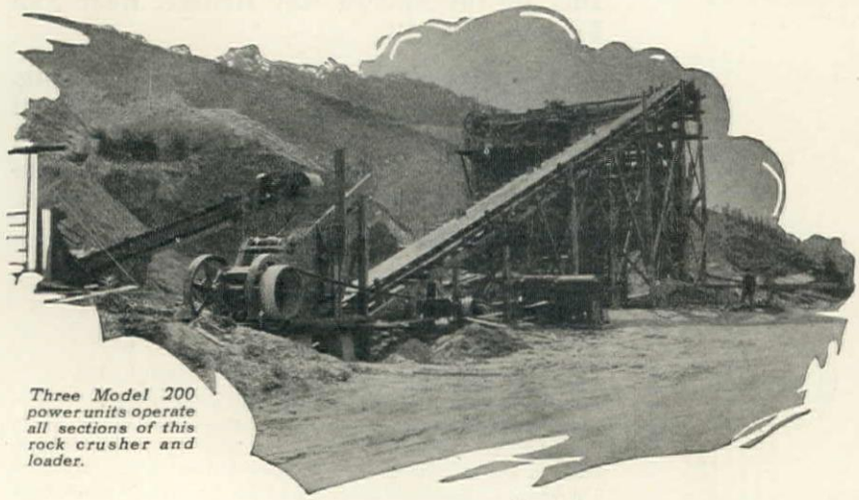
POWERED by McCORMICK-DEERING



EVERY YEAR the words "Powered by McCormick-Deering" are of more importance to contractors in every field. The ***McCormick-Deering Power Unit,*** illustrated above, has proved itself of tremendous utility in a thousand-and-one connections. It is applicable to many purposes without special equipment. It is available as an independent power plant; as an integral part of high-quality power equipment; or replacement for inadequate forms of power.

Turn this flexible, versatile, compact, liberal power to your own advantage. Run your equipment with it; build it into your operations for the sake of efficiency and economy; see that the power equipment you buy is "powered by McCormick-Deering." Scores of equipment manufacturers today are powering with this standard unit.

Our nearest distributor will cooperate with you in securing this equipment and safeguard its performance on the job. Drop a line to the nearest branch of this Company and we will be glad to mail you catalogs and give you specific information regarding the ***McCormick-Deering Power Unit*** and the ***McCormick-Deering Industrial Tractor.***



Three Model 200 power units operate all sections of this rock crusher and loader.

THE McCormick-Deering power unit is available in two sizes — Model 200 developing 25 h. p., and Model 300 developing 40 h. p. Utilized to deliver power through belt, gear, chain drive, or direct connection. The rugged engines and other component parts are the same as in McCormick-Deering industrial tractors. Features include ball-bearing crankshaft, removable cylinders, built-in factory-sealed governor, oil air cleaner, oil filter, fuel strainer, and circulating-splash lubrication.

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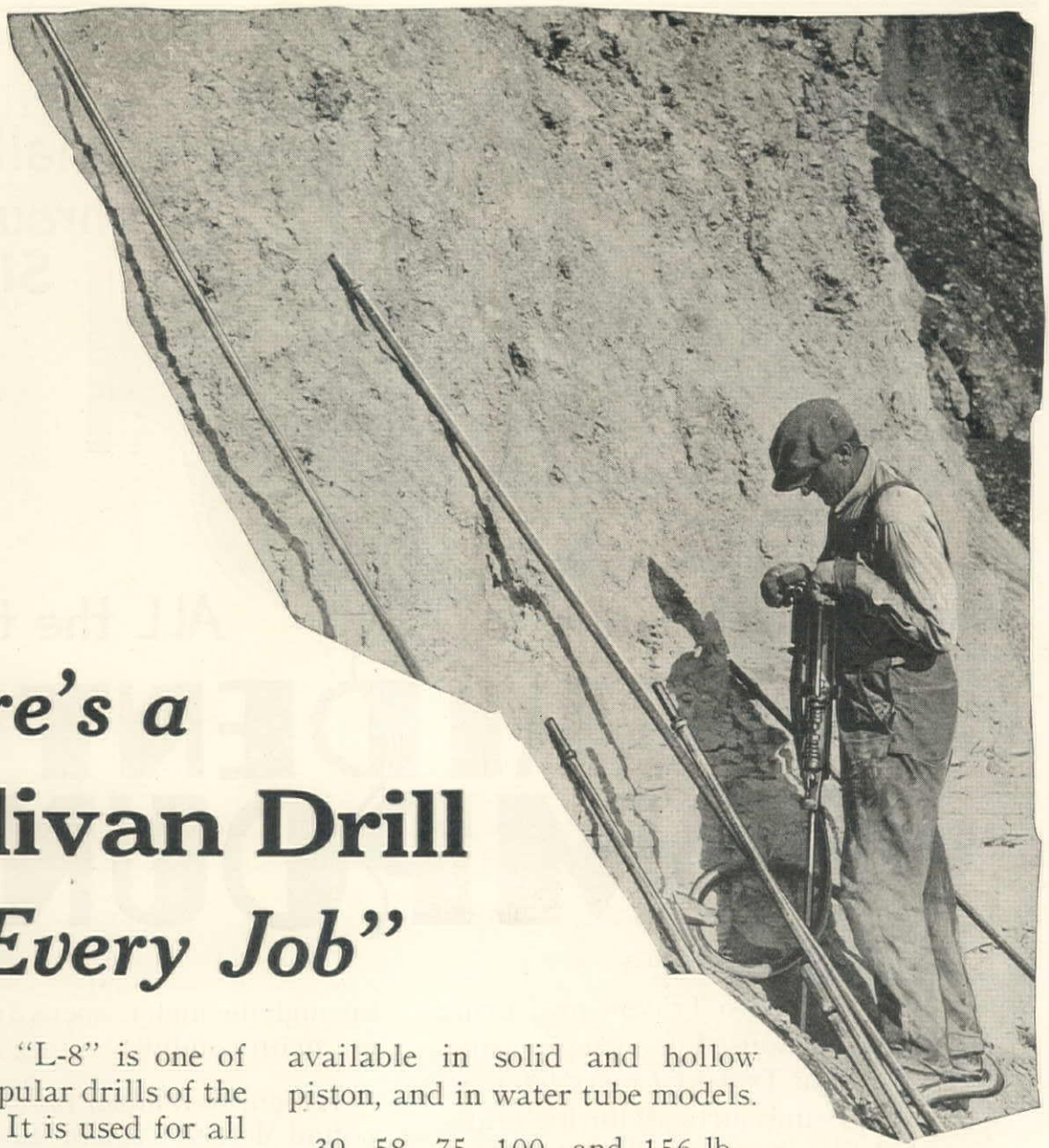

"There's a **Sullivan Drill** *for Every Job"*

SULLIVAN "L-8" is one of the most popular drills of the Sullivan Line. It is used for all kinds of rock drilling encountered in highway or street construction, or for deep drilling in quarries.

"L-8" weighs only 39 lbs., and is economical of air. Yet it is good for 2⅛-in. holes, 6 to 12 feet deep. "L-8" is a fast driller, and cleans holes effectively. It is available in solid and hollow piston, and in water tube models.

39, 58, 75, 100, and 156-lb., sinkers and drifters, are included in the Sullivan line of solid and hollow piston, air tube, water tube, and auger drills.

For every rock drilling job, you can get a Sullivan Rock Drill, especially suited to your needs.

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VOLUME V | JULY 10, 1930 | NUMBER 13

When we compare business conditions on the Pacific Coast with those prevailing in the east, especially in engineering construction, we should cease complaining and be thankful that we live in the Far West. It seems to be the consensus of opinion that the bottom has been reached and that the curve of prosperity is on the upgrade. As the mental attitude has considerable bearing on prosperity, let us look forward with a constructive and optimistic viewpoint, and remember that 'it might have been worse'.

It Might Have Been Worse

'It was a good fight while it lasted', the decision went to the Great Northern and Western Pacific, and everyone is happy, Paul Shoup, president of the Southern Pacific (the loser) being one of the first to congratulate the victors. Good competition is acknowledged as a boon to increased business, and undoubtedly the entire Pacific Coast, especially the San Francisco bay region, will benefit tremendously by the entry and hook-up of two more transcontinental railroads. San Francisco is the only large American city with the full service of but one transcontinental railroad, and although the Southern Pacific has built up a wonderful system, there has been lacking the great incentive of competition. We believe that the Interstate Commerce Commission rendered a wise decision.

G.N.-W.P. Victory

This victory also brings immediate prosperity in the form of $15,000,000 of construction (detailed elsewhere in this issue), to be followed probably with large additional expenditures for construction of the entrance tie to San Francisco and other feeders, yards, etc. Needless to say, the construction industry was supporting the victors in this fight.

James Collins, director of the State Department of Professional and Vocational Standards, charged with the licensing of some 20,000 California contractors, has written the following courageous opinion in the 'California Constructor' for June 15, 1930, (Vol. 10, No. 12):

Contractors Can Help

'I declare openly and shout it from the housetops that the public will never receive in full any expenditure of its money until every piece of public work is supervised by an inspector, not at $150 or $200 a month, but an inspector paid from $400 a month to $10,000 a year because of his experience and ability, and the public must be trained to stand behind him.'

It is Collins' wise contention that it is now more important for contractors to raise the level and dignity of the engineers and architects who design and supervise construction of their projects than it is to work for public acknowledgment of their own importance. Further, that in their political activities contractors should see that public officials are elected who look on the appointment of engineers and architects not for demonstrating patronage but as an opportunity to buy ability and integrity.

James G. Tripp, engineer and construction superintendent, writing in the November 10th, 1929, issue, suggested that rating inspectors as assistant engineers, with the dignity and salary of the higher position, would tend to improve an unsatisfactory condition which every public works constructor faces.

Both of these men have voiced a possible solution of the situation which will not only improve the status of the engineer and architect but will be reflected in better treatment of the important profession of construction, whose welfare is their aim.

All far western states have efficient state highway departments which can and should be charged with construction and maintenance of any primary or secondary road outside of incorporated towns or cities. Instead, nearly half of all road money raised through taxation and license fees is spent by counties, townships, and good roads districts for improving local farm-to-market roads. The money is often spent unwisely, as these smaller agencies with limited resources cannot provide themselves with the best in equipment and personnel. Also, their road funds must be spread over too many miles to allow permanent construction—local situations not permitting the concentration of money on one or two important highways within the area.

Too Many Road Builders

Larger road building agencies are needed. The joint highway districts and the state highway departments can best perform this work, giving greater efficiency to the finance, location, construction, and maintenance of farm-to-market roads. Such a change will mean a complete reorganization in many states, with abolishment of the smaller units; it may soon be expected.

What It Has Been---It Will Be

ADVERTISING is a medium for *quick introduction.* It is a medium through which the inventor, maker, chemist, or builder can notify the collective population that he has learned something which will be of benefit; and that he has put that knowledge into tangible form, available for use.

Advertising is a medium for popularizing a demand for articles which advance human welfare—and by it the cost of production is reduced and the selling price brought within reach of the great public.

Business paper advertising constitutes an important division of this utilitarian force.

It has brought to the maker a method for creating a demand among distributors—those who are directly interested.

It has brought to the manufacturer a knowledge of machines and raw materials that lower manufacturing cost and raise the standards of his product.

It has brought to the distributor a knowledge of modern mercantile methods. It has enabled him to take advantage of quick fluctuations of prices.

It has been the pioneer in extending the frontier of sales.

It has paved the way for consumer advertising.

WESTERN CONSTRUCTION NEWS is a business paper. In its advertising pages, manufacturers tell you about their products for use in the engineering construction field.

You should read these advertisements.

For what advertising has been—it will be.

Salt River Project, Arizona

Irrigation and Hydroelectric Development by Salt River Valley Water Users' Association—Six Major Dams

By T. A. HAYDEN
Assistant Engineer, Salt River Valley Water Users' Association, Phoenix

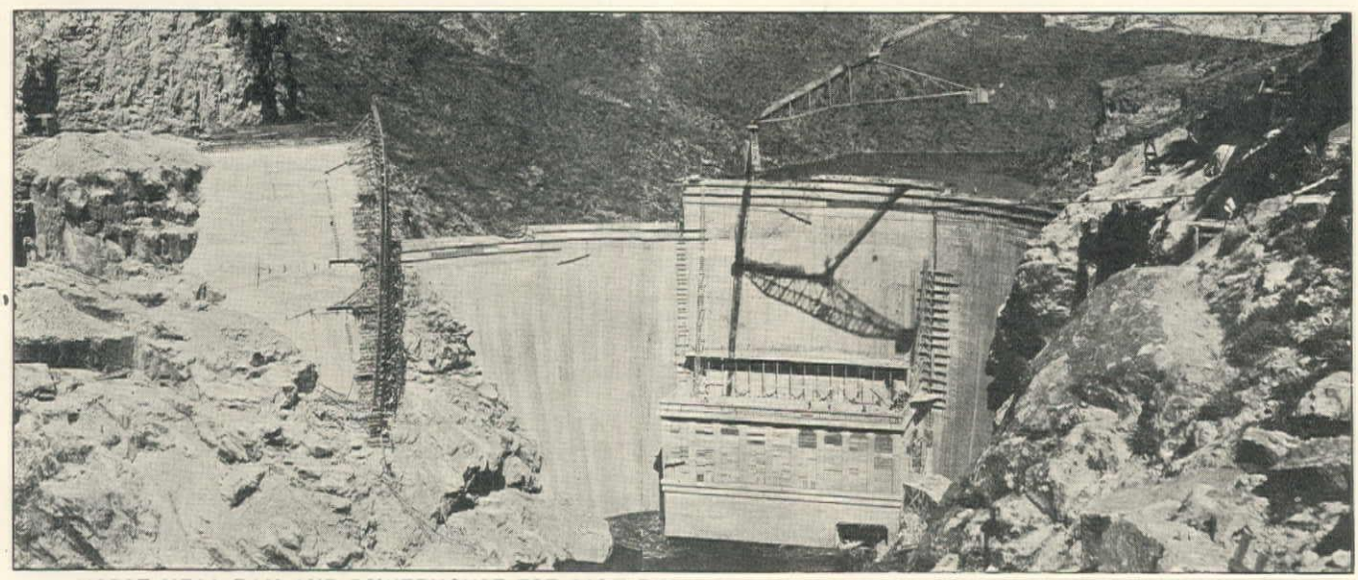
Part II

HORSE MESA DAM

The primary purpose of the 305-ft. Horse Mesa dam is to create head for operating three 15,000-hp. turbines. Although the dam and reservoir are in the river canyon, the lake being 15 miles long and not over one-half mile in greatest width, yet the great depth (272 ft. at the dam), gives the reservoir a storage capacity of 245,000 ac-ft. The upper 6 ft. is available for regulation, giving an additional 15,000 ac-ft. leeway for operation of the Roosevelt power plant in winter.

Topography and Geology—The canyon at the damsite is rugged and precipitous to an extreme degree, with nearly vertical cliffs rising on both sides 1000 to 2000 ft. The rock structure consists of a part of the same rhyolite flow found at Mormon Flat dam and extending continuously over this section of the country. A number of seams and pockets were encountered in the base and sides of the canyon, but it was possible to make them thoroughly watertight by grouting.

Design of Dam—The Horse Mesa dam has the distinction of being the first arched dam actually to be completed in which the 'Trial Load Method' of design was used. As far as known, the LaJogne dam, in Switzerland, designed in 1918 and completed in 1921, is the only dam built previously, in which a somewhat similar method was employed. The Trial Load Method for the first time presents a truly scientific means of arriving at the stresses in arch dams, and is undoubtedly the greatest advance in this branch of engineering practice made since the arch type of dam was first used. The work done by Gruner and Rohn in the calculation of the dam at LaJogne (see paper by Alfred Stucky in the 'Bulletin Technique de la Suisse Romande', 1922) with theories and formulas worked out by engineers of the U. S. Bureau of Reclamation, was combined by engineers of the Water Users' Association, extended still further, and applied to the design of Horse Mesa dam. (See Transactions of the American Society of Civil Engineers, Vol. 93, 1929, pages 1191-1316—Howell and Jacquith on 'Analysis of Arch Dams by the Trial Load Method'.)



HORSE MESA DAM AND POWERHOUSE FOR SALT RIVER VALLEY WATER USERS' ASSOCIATION, MARCH, 1927

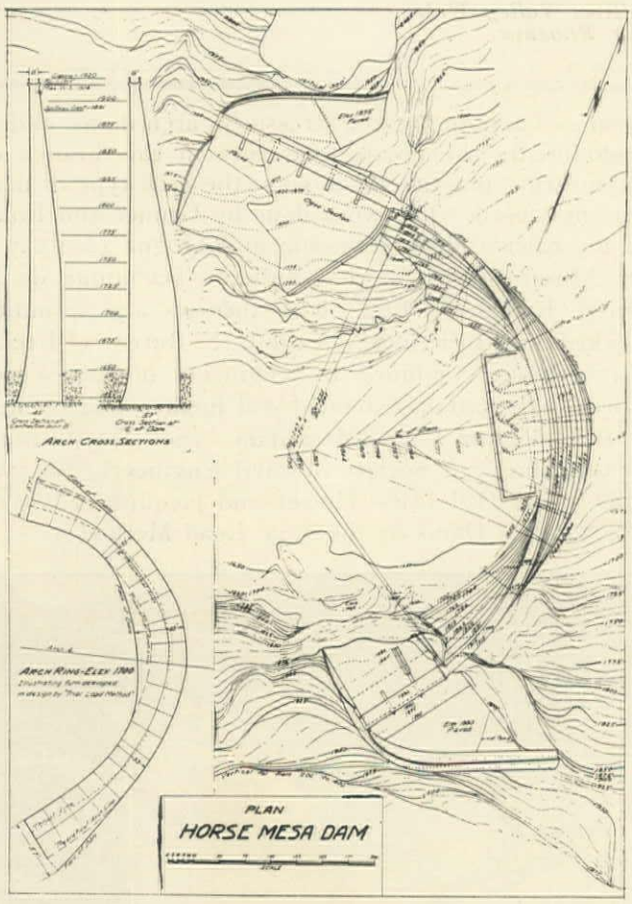
The Trial Load Method is a process of dividing the water load on an arch, part to be carried by arch action and part by cantilever action. A trial design is first made by approximate methods. The dam is then divided into horizontal arch rings at vertical intervals of 20 to 30 ft. and the stresses analyzed by the elastic theory as in a bridge. Vertical sections are then taken at horizontal intervals of 50 to 100 ft. and analyzed by the elastic theory as gravity elements.

The effects of water load, temperature changes, and rib shortening are considered. (The maximum allowable stress was taken at 650 lb. per sq.in.) The development of the final design involves a long drawn out, laborious repetition of computations of trial sections until the deflections of the arch and gravity elements at any point are practically coincident. Six months was required for the development of the first

*Part I was published in the June 25th, 1930, issue.

completed design considered suitable, and this was still further modified at the end of another three months' work.

The final design involved the extensive use of arch rings of irregular shapes, departing considerably from circular arcs. The shapes evolved were such that the center-line of pressure was made to approximate



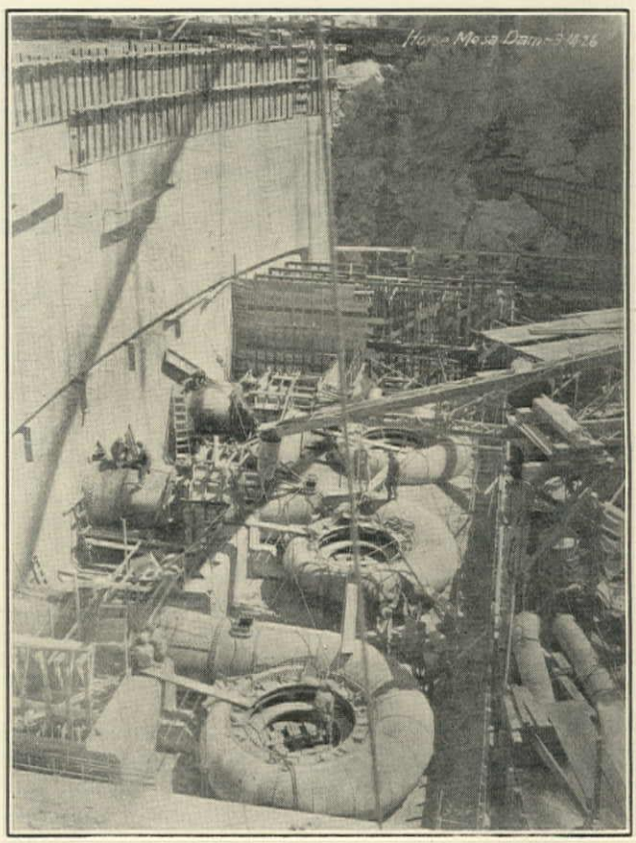
closely the center-line of the theoretical arch ring, and resulted in quite uniformly stressed concrete, understressed concrete being largely eliminated. The saving in material effected over that in the original design using circular arcs was about one-sixth of the whole.

The extra labor involved by the use of this method is seen to be more than justified by the results.

The arch rings, particularly in the lower part of the dam, are thickest at the abutments and thinnest at the counterflexure points (about the ¼ points), thickening again at the crown. These complicated shapes, which varied with the elevation of the sections, required departures from the usual methods of laying out the work in the field. This was accomplished by means of coordinates scaled from a ¼ in. = 1 ft. office drawing and reproduced by ordinary survey methods in the field.

The width of the canyon at streambed is 150 ft., and at the crest of the dam, 272 ft. above streambed and 305 ft. above lowest bedrock, it is 540 ft. The maximum span of the arch is 450 ft. at the top, the upper 175 ft. on the north end thrusting against an ogee gravity overflow section, 140 ft. long on the crest. The thickness of the arch at the top is 8 ft. and at the base varies from 43 to 57 ft. The curvature of the upstream face varies from a minimum at the top, which is a circular arc of 251.4 ft. radius, to a maximum at the base, where the radius of curvature is 82 ft. The sharpest curvature at the downstream face is at the north counterflexure point which corresponds to a radius of about 65 ft. Five contraction joints were provided, the faces of the sections being keyed to prevent seepage and painted with water gas tar before placing new concrete against old. Two 4-ft. openings were left between three main sections to allow for maximum attainable shrinkage in view of the construction requirements, before the opening was finally closed and the arch completed. Water stop strips of 14-gauge copper were placed near the upstream face of the dam.

The dam has two spillways, one at the south end, entirely in excavation, and one at the north end, 140 ft. of which consists of the ogee section and 40 ft. is excavated in the canyon wall. The north spillway has double the length of the south spillway and is closed by six motor-operated taintor gates 27 ft. wide and 23 ft. high, a set of three similar gates closing the south spillway. The capacity is 150,000 c.f.s. with water at



Horse Mesa Powerhouse, September 14, 1926

the top of the dam coping, 29 ft. above the spillway crests. The arch is heavily reinforced for a horizontal distance of 110 ft. and vertical distance of 45 ft. at each end in order to carry the thrust downward into the abutments.

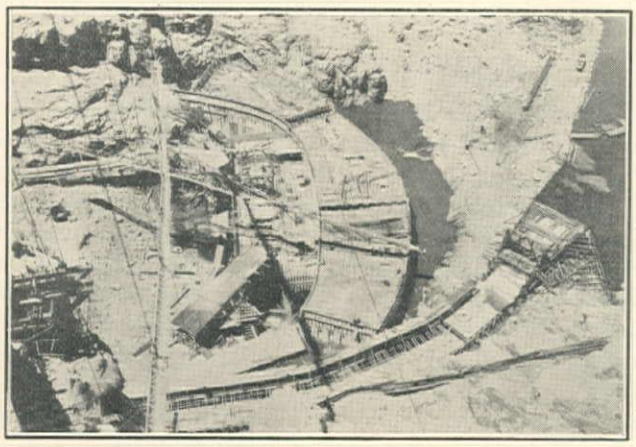
The outlets consist of three 8-ft. penstocks passing through the dam and delivering water to the three 15,000-hp. turbines. A 7-ft. Dow disc-arm pivot valve is provided for closing each penstock near the face of the dam.

The powerhouse is constructed on bedrock at the

base of the arch, directly across the river channel. It operates under a maximum head of 264 ft.

The volume of concrete in the dam and power plant is 151,957 cu.yd.

Construction—The inaccessibility of the damsite made necessary a large expenditure of time and money



Horse Mesa Dam, August 9, 1926, from Mixing Plant 300 ft. Above

preliminary to actual construction on the dam. A road six miles long was required from the main Apache Trail, in addition to the upper and lower roads at the dam. Owing to the exceptionally difficult nature of the terrain, the total cost of road work exceeded $400,000, the solid rock excavation being nearly

elevated tank and chlorinated. The supply for the first road camp was pumped against a static head of nearly 1200 ft. through 4½ miles of pipe-line.

It was necessary to complete all rock excavation for the road, haunches of the dam, and spillways before beginning work at the base of the dam in order to avoid injury to workmen from falling material. River control was handled as at Mormon Flat by means of a wooden flume, deep well pumps, and sand and gravel cofferdams. The width of the canyon and the shallow bedrock made it possible to complete the excavation for the base of the dam by means of an open-cut. The foundation and sides were thoroughly grouted up to 200 lb. maximum pressure. The method of obtaining sand and gravel for concrete was novel in this class of construction. Gravel bars existed in the river bed ¾ to 3 miles upstream. The water ponded by the upper cofferdam (and later by the dam itself) was used to float three 40 by 60-ft. barges, on which were mounted derricks equipped with 3-yd. Blaw-Knox 'Dreadnaught' clamshell buckets. Two of these machines were used to dig gravel from the riverbed and load it into 18 by 40-ft. scows, which were towed back and forth between the dredges and dam by two 40-ft. gasoline-drive marine tug-boats brought by train and motor trucks from San Francisco. The third floating derrick was stationed at the south end of the dam and was used to unload the scows. A steeply inclined double track

HORSE MESA DAM, SEPTEMBER 14, 1926, FROM UPSTREAM. GRAVEL SCOW BEING UNLOADED. INCLINED TRACK, CONCRETE MIXING PLANT, AND PLACING EQUIPMENT IN LEFT FOREGROUND

400,000 cu.yd. The precipitous sides of the canyon at the dam left little room for construction plant. It was necessary to utilize narrow rock ledges, benches excavated in the cliff, spoil dumps, and every small area which could be made available by blasting or use of trestles. The camp was strung out along the canyon from the main camp buildings near the dam for a distance of more than a mile downstream, including the 'hogans' of Apache Indian workmen and their families, sometimes perched on rock ledges near the river and again clinging to the cliffs high up on the mountain side.

The water supply was pumped from the river to an

was built from this point to the screening and washing plant above the south spillway and 350 ft. above streambed. This plant operated successfully and furnished the entire gravel supply. The work was planned so that water could be impounded before the final completion of the dam (two 4-ft. gaps between sections being closed temporarily for the purpose by timber bulkheads). In the final stages the digging barges were stationed 3½ miles above the dam and were operating successfully in over 100 ft. of water.

The mixing and placing plant was of the type which has become practically standard. Two 1-yd. Smith mixers were used, with the 240-ft. Insley tower from

Mormon Flat, extended to a height of 340 ft. (the top being 700 ft. above the stream), equipped with 20-in. chutes and two 75-ft. counterbalances.

The sky-lines were suspended from anchors which were in the cliffs high up in the canyon walls. The 105-ft. guy derrick was mounted above the south spillway near the mixing plant. A Blaw-Knox inundator was employed. Three excavating machines were provided on the job; a 1-yd. P&H gasoline shovel and a 1¼-yd. Osgood steam shovel were used for road work and later converted into draglines for use with the 2-yd. Monighan dragline in foundation excavation.

Twenty-seven 5-ton trucks hauled cement and other material from Mesa, 44 miles distant. Except as otherwise noted, all equipment was electrically operated with power supplied from the project system.

Cost, Horse Mesa Dam and Power Plant—

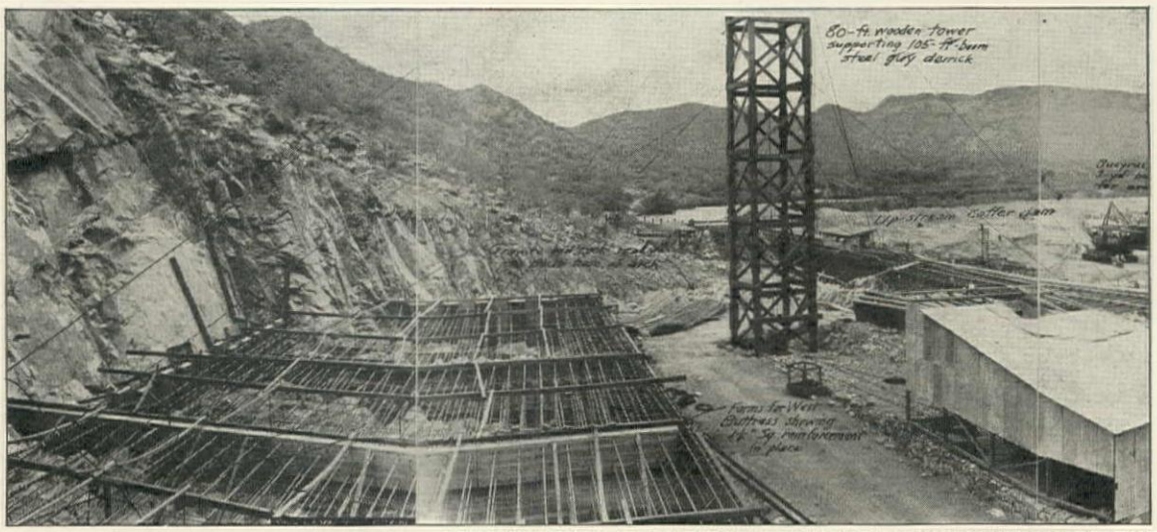
Engineering:		
(including $9938 for diamond-drilling)		$ 125,721
Bond expense		273,135
Hospital fund		1,709
Field clerical, etc.		22,376
Camp		119,412
Roads:		
Horse Mesa	$407,899	
Roosevelt	7,283	
		415,183
Telephone lines		36,492
Temporary power lines and substations (exclusive of $1216 for excavation, concrete, and engineering)		208,921
River control (exclusive of $66,195 excavation)		39,139
Excavation (exclusive of $322,203 road excavation)		376,349
Concrete:		
Miscellaneous items	$ 5,411	
Sand and gravel	442,027	
Mixing	$ 95,389	
Placing	411,867	
Cement	575,919	
Forms	222,606	
		$1,753,219
Concrete—reinforcing steel		46,551
Grouting		37,528
Taintor gates		78,005
Penstocks and valves (exclusive of $4571 for inlet excavation, forms, and steel)		60,183
Horse Mesa power plant equipment, material, labor, tools, etc.		666,689
Miscellaneous items, etc., at dam and powerhouse		30,457
Salvage returned from job (material, not plant)	$15,039	
Adjustment of inventory	$39,331	
		$54,370
		$4,236,699
Cost, transmission lines and substations, part of Horse Mesa development		1,082,713
Total cost of Horse Mesa development		$5,319,412

STEWART MOUNTAIN DAM

Purpose of the Dam—Stewart Mountain dam serves two main purposes. It is the lowest storage dam on the river and thus is adapted for regulating storage to give increased capacity to the Roosevelt, Horse Mesa and Mormon Flat power plants during the winter, and it furnishes head for the generation of 17,500 hp. The storage capacity is 70,000 ac-ft. and the additional power available from the plant itself, and as a result of seasonal regulation from the three upper plants is estimated at 85,000,000 kw-hr. annually. Incidentally, by bringing the lowest storage reservoir within 12 miles of Granite Reef diversion dam, much better regulation of the irrigation draft was made possible, since the time required to run water from the storage to diversion dam was cut in half. Some additional irrigation water is obtained by impounding the runoff from 100 sq.mi. below Mormon Flat dam.

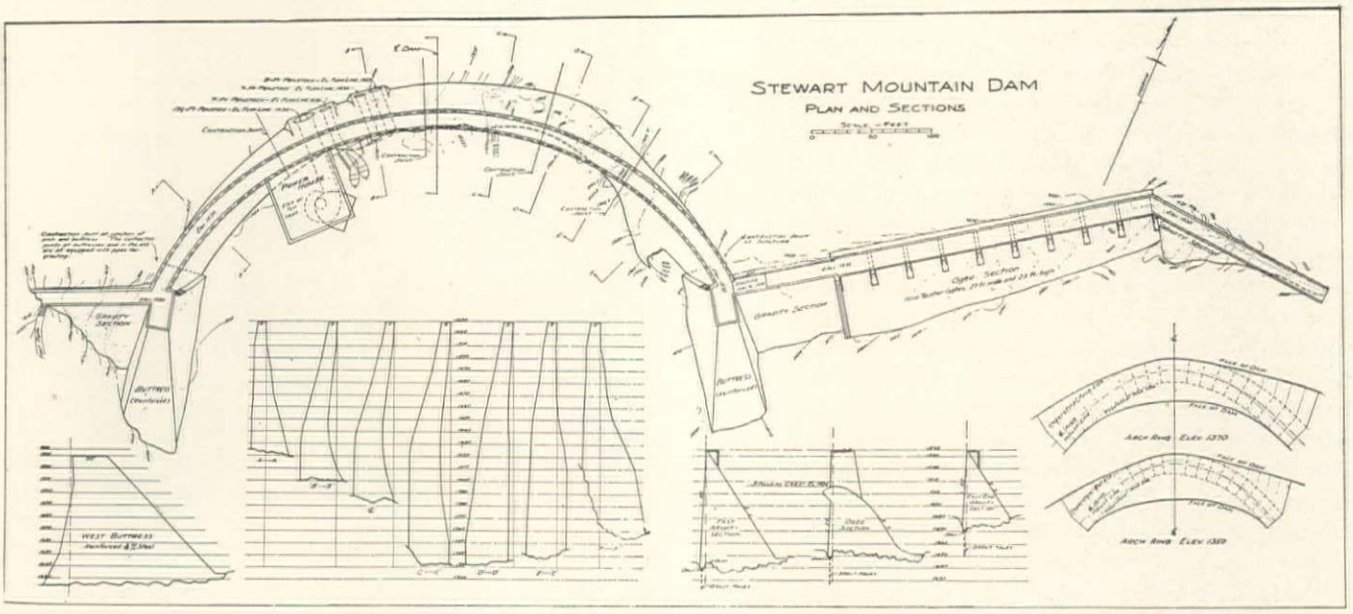
Topography and Geology—The canyon at the damsite is fairly open, being 275 ft. wide at streambed and 1100 ft. at the top of the dam. The general course of the river is west, but a sharp bend occurs a short distance above the dam, so that at the immediate site it flows south. The sidewalls slope irregularly, averaging 1½ horizontal to 1 vertical on the west, and 5 horizontal to 1 vertical on the east. The relatively flat slopes of the canyon make a lake ½-mile wide for several miles above the dam, the canyon for the remainder of the distance to Mormon Flat dam being narrow with abrupt sides.

The rock formation consists of hard gray granite, somewhat weathered at the surface but firm and dense below the weathered portion. It constitutes an ideal foundation on which to build a dam.

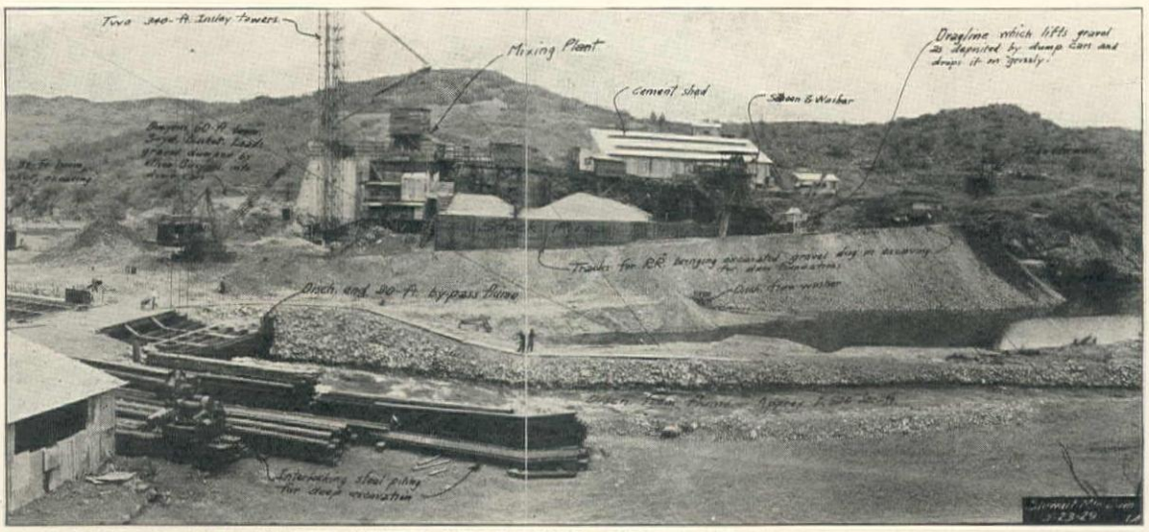


CONSTRUCTION PLANT FOR STEWART MOUNTAIN DAM OF THE

Design—The dam consists of a central arched section of 480-ft. span at the top, about 90 ft. of the upper part of each end of the arch thrusting against massive buttresses of reinforced concrete. The gap between the west buttress and the side of the canyon is closed by a gravity section 115 ft. long on top. On the east, a gravity section 90 ft. long extends from the buttress, connecting with a gravity ogee overflow section 270 ft. long forming the spillway, leaving a 180-ft. gap closed by a plain gravity section.



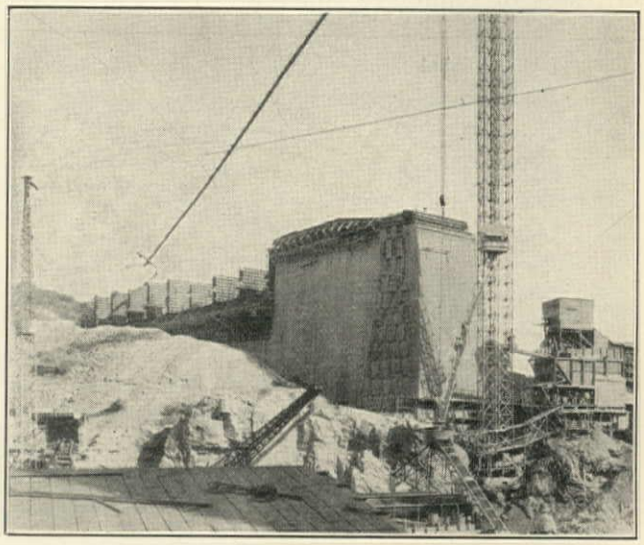
The arch is the second built under the Trial Load Method of design, first used in the design of Horse Mesa dam. In the Stewart Mountain dam, however, the arch is given a downstream inclination from the vertical with a total overhang varying from 10 ft. at the crown to zero 70 ft. from the abutments. The arch thrust due to water pressure against this inclined surface has a downward component at the buttresses, introducing a considerable added factor of safety against sliding. The thickness of the arch is 8 ft. at the top. The minimum thickness at the base, 212 ft. below the coping, is 33 ft. The curvature of the faces of the dam is irregular, the extrados at the top being a circular arc with a radius of 273 ft. and the arch rings in the lower portions being more or less complex curves not developed on geometrical lines. A stress of 650 lb. was used in the design. The buttresses, while of heavy gravity sections, are heavily reinforced to assure against cracking. The spillway is closed with nine 27 by 23-ft. taintor gates similar to those at the Mormon Flat and Horse Mesa dams. The discharge capacity is 150,000 c.f.s. The outlets consist of one 13½-ft., two 7-ft. and one 8-ft. penstock, all passing directly through the arch ring near the west end. Provision is made for carrying the vertical and horizontal stresses across these openings by heavy reinforcement, consisting of Lackawanna steel piling, ordered for the cofferdam. The 13½-ft. penstock discharges through the turbine. One of the 7-ft. penstocks is equipped with a butterfly valve on the downstream end and the other with two 4½-ft. needle valves, originally installed at Roosevelt, later at Mormon Flat,, and finally moved to Stewart Mountain. The 8-ft. penstock is a reserve outlet and is closed by a removable steel bulkhead on the downstream end.



SALT RIVER VALLEY WATER USERS' ASSOCIATION, MAY 23, 1929

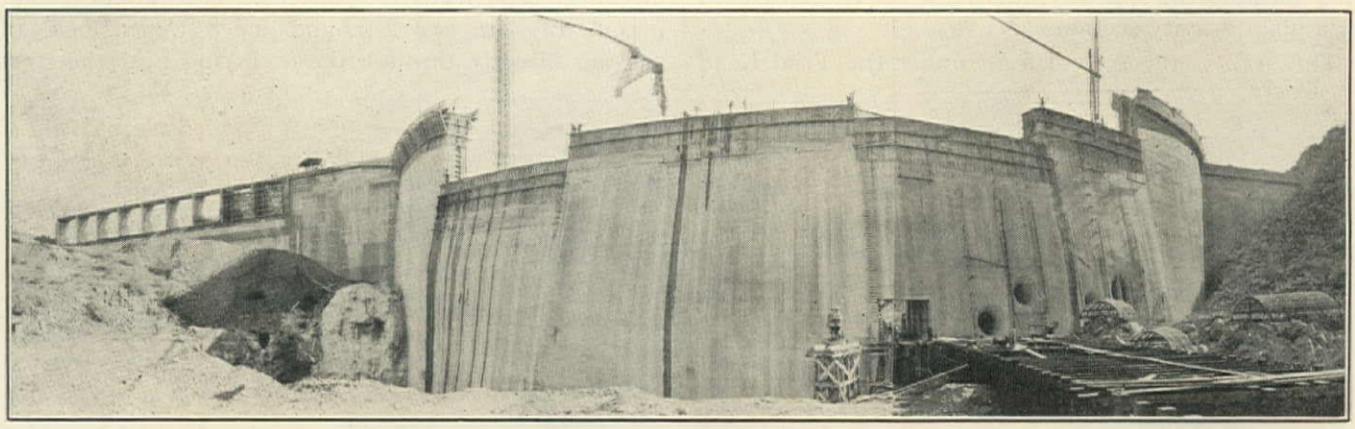
A new feature incorporated in the design consists

of installation of pipes for grouting the vertical joints between the buttresses and the ends of the arch, and between adjacent sections of the arch at intermediate points. The system of grout pipes and their method of installation was developed by J. L. Savage, designing engineer, Bureau of Reclamation, through whose courtesy the plans were made available. The layout consisted of ½-in. pipes placed 3 ft. center to center, extending vertically from the top to the bottom of the dam immediately back of the face of the joint. Nipples extended to a connection with ordinary circular conduit box covers which were nailed to the inside of the forms facing outward, so that when the forms should be removed the conduit box would be exposed with the end of the nails projecting. After removal of the form and before the placing of concrete in the adjacent section, a similar conduit box was placed face to face with the one already in place in the concrete and the projecting ends of the nails bent over to hold it in place. A short nipple closed by a cap was screwed into the opening in the second conduit box in such manner that it would furnish an anchorage in the newer concrete so that in the event of the dam opening a crack at the joint through contraction, the halves of the conduit box would remain firmly in the concrete and be pulled apart at the faces of the boxes through which the grout could be forced into the crack between the dam sections. These conduit boxes were placed at vertical intervals of 8 ft. so that the result of the installation provided a cylindrical chamber every 3 ft. horizontally and 8 ft. vertically, into which grout could be forced through the ½-in. pipes. The vertical ½-in. pipes were installed in panels 24 ft. high, and 1-in. header pipes were run in from the face of the dam and connected to the ends of the ½-in. pipes, thus making it possible to separately grout each 24 ft. in the rise of the joint. In order to prevent the escape of grout to the surface of the dam, the copper water-stop strip, which ordinarily was placed near the water face of the dam at each contraction joint, was duplicated at the downstream face of the dam. Six main contraction joints were left in the dam, including the junction of the arches with the buttresses, and a system of grouting pipes was installed at each of these contraction joints. This provision was for the purpose of making it possible to carry up all sections of the dam as might best suit construction requirements. The grouting, of course, will be left for some future time when the reservoir is practically empty and the dam has reached the maximum degree of shrinkage to be anticipated.



East Abutment, East Gravity Section and Spillway, Stewart Mountain Dam

The power plant consists of a single 17,500-hp. unit operating under a maximum head of 116 ft. A 100% power factor is obtained from this plant by the use of idle generators at the Cross-cut power plant, in the valley (which has excess installed generating capacity) as synchronous motors.



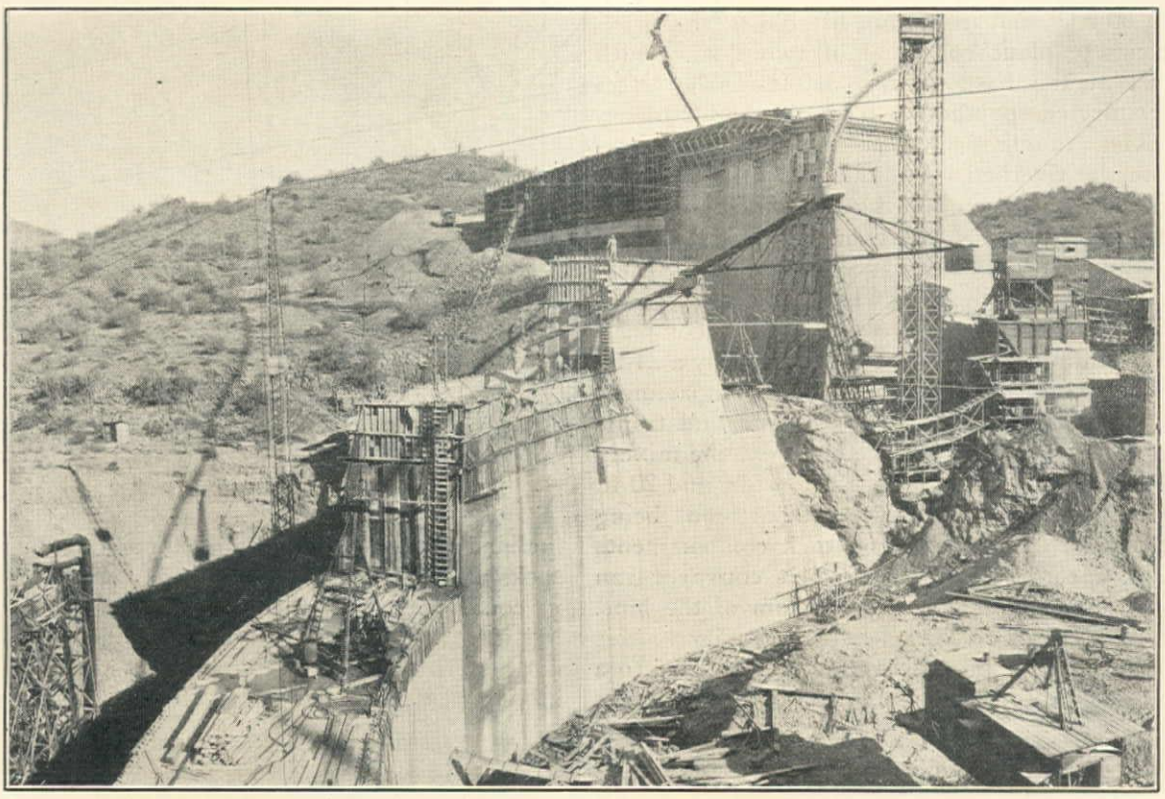
STEWART MOUNTAIN DAM FROM UPSTREAM, FEBRUARY 9, 1930. PENSTOCKS AND DIVERSION FLUME IN RIGHT FOREGROUND

The dam and plant contain 122,000 cu.yd. of concrete, in which 130,000 bbl. of cement was used. The concrete was designed and proportioned for maximum density, a minimum 28-day strength of 2500 lb. per sq.in. being required. Average tests ran 3400 lb., with a maximum of 4200 lb. Additional cement was occasionally added to keep up the water-cement ratio where operating conditions required a rather wet mix.

Construction — The entire construction was completed in 17¼ months from the beginning of preliminary work. The dam and power plant were finished simultaneously, the latter being placed on the line in a test run the same day the last concrete was deposited.

The open nature of the terrain compared to Mormon

Flat and Horse Mesa, gave ample room for plant layout and material storage, with an ideal camp site. This camp is considered a model for the purpose. It consisted of 43 six-men screened frame houses, arranged in an orderly group near the mess-house and other camp and office buildings. This was found a decided improvement over larger houses formerly used, since it provided separate housing for day and night shifts and efficient segregation if required for medical purposes. Water supply was pumped from a well, a short distance from the river, chlorinated, and elevated to a galvanized iron tank on the hillside above the camp. Besides the camp for single men, a separate group of buildings housed white workmen with families, and Mexican and Indian laborers with their familes had quarters in a third and fourth group. Sanitation was strict. A first-aid station was maintained throughout the job with a competent interne in charge, this feature being found a decided improvement.



STEWART MOUNTAIN DAM ON DECEMBER 23, 1929. BUCYRUS-ERIE DRAGLINE IN RIGHT FOREGROUND. CONCRETING PLANT EQUIPPED WITH BLAW-KNOX INUNDATOR, SMITH MIXERS, AND INSLEY STEEL TOWERS

Preliminary work included the building of 15 miles of 30-ft. road from a point on the Apache Trail 9 miles east of Mesa. The total distance from Phoenix is 41 miles. The location was not difficult, a bridge across Salt river three miles below the dam being the only structure required. Little surfacing was needed. An Adams road grader provided surface maintenance. The number of tourists and sightseers was kept down by requiring written passes in order to cross the bridge, where a watchman was on duty at all times.

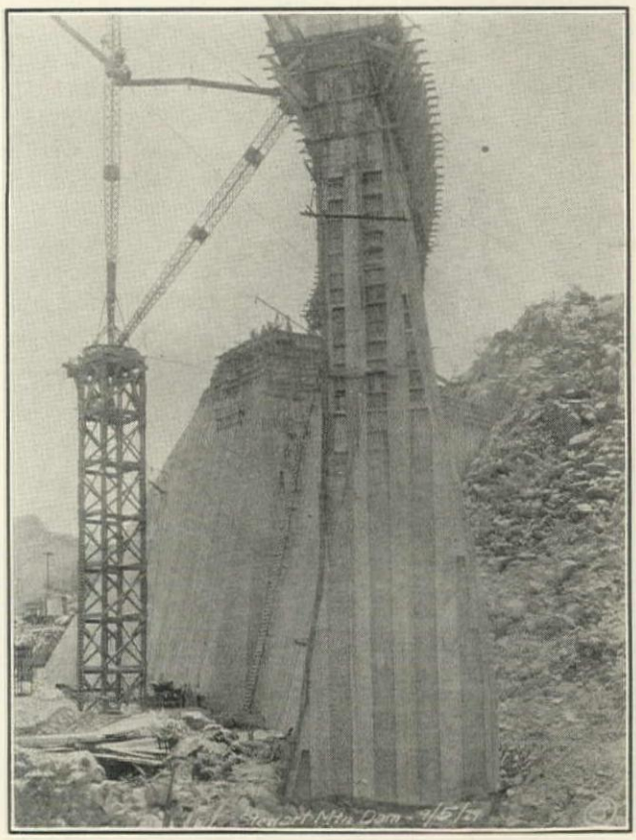
The most noteworthy feature of construction was the excavation for the base of the dam. The depth below the lowest streambed was 90 ft. and on the east end 100 ft. Lowest bedrock at one point reached elev. 1323 ft. and a considerable area was in the neighborhood of elev. 1330 ft., streambed varying from 1413 to 1423 ft. Excavation to elev. 1380 ft. was effected as an open cut, by draglines. A section 210 by 47 ft. below that level was excavated by the use of Lackawanna interlocking steel piling penetrating to a maximum of 55 ft. below the bottom of the open-cut. The piling was driven by a McKiernan-Terry No. 7 reversible double-acting hammer, operated with compressed air using 350 c.f.m. at a pressure of 90 lb. per sq.in. and delivering 225 strokes per minute. The piles were set and the hammer handled by a 120-ft. Insley steel guy derrick. The method of driving and excavating was extremely efficient and successful. Whenever a boulder was encountered in the course of driving a pile, driving was stopped and was not resumed until the excavation inside the cofferdam had reached a point where the boulder could be removed, when the particular piles could be driven further. By the exercise of care in this respect, the piles were driven practically without any spreading, giving an almost watertight job. The piling was held in alignment by 6 by 18-in. double timber waling braced by heavy wooden trusses spanning the space between the upstream and downstream rows. The interval between trusses was 17½ ft., affording ample room for excavating operations.

The cofferdam did not follow the curve of the arch in plan, but was driven in straight horizontal lines along chords of curves outside the edges of the base of the dam. Sufficient room was left between the waling supporting the piling and the face of the dam at the nearest point, to permit the use of forms for concrete above the bedrock. One angle was required in the horizontal alignment of the upstream piling and two in the downstream row. The piling was pulled

by the hammer when no longer needed. Two 3-yd. Bucyrus gasoline draglines, purchased from the Bureau of Reclamation and reconditioned on the job, moved most of the excavated material, a large part of which was suitable for concrete. The 60-ft. boom of one dragline was lengthened to 82 ft. and equipped with a 2-yd. Emsco bucket. Three excavating machines, part of the existing equipment of the Association, were used in addition. These were a 2-yd. Lidgerwood electric dragline, a ¾-yd. P&H gasoline dragline, and a 1-yd. P&H machine used both as a dragline and shovel.

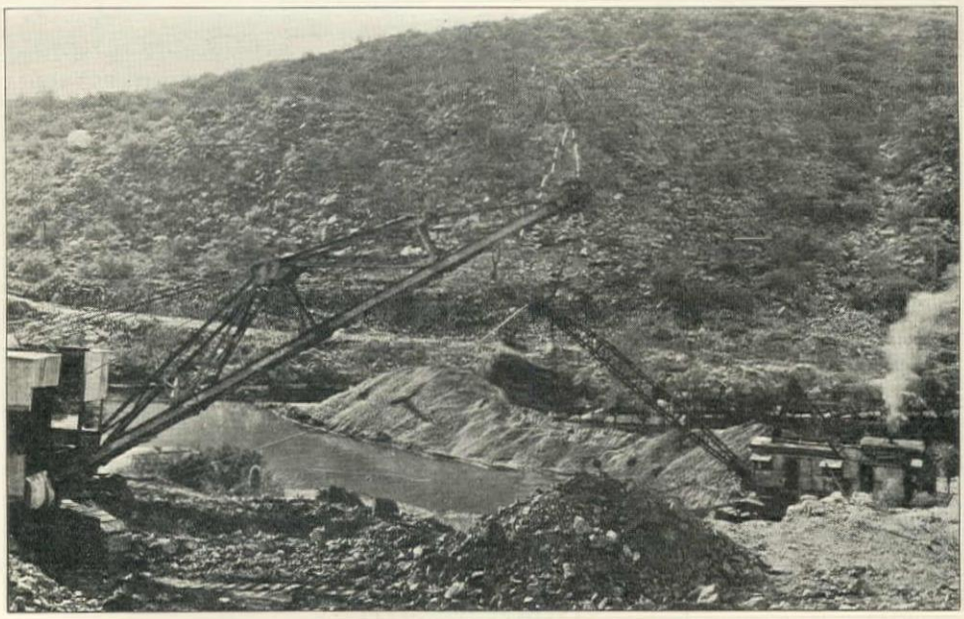
River control was handled as at Mormon Flat and Horse Mesa. Irrigating water was passed by a timber flume 450 ft. long, 30 ft. wide, and 11 ft. deep, along the west side of the canyon. Seepage was handled by six 16-in. Kimball screw type deep well pumps with 150-hp. General Electric motors, the maximum output being 60 c.f.s. and maximum lift 100 ft.

The concrete plant consisted of two 1-yd. Smith mixers set at the base of two 340-ft. Insley steel towers, connected together as a single double-tower. A Blaw-Knox inundator was used. Gravel as excavated from the riverbed was dumped by draglines on a grizzly located at the end of the storage bins farthest from the mixing plant. A 40-ft. bucket elevator lifted it to a 6 by 30-ft. revolving screen. Sand dropped from the screen to a hopper which discharged to a chute leading to the washer, over the near compartment of the storage bin. Gravel was caught by a 24-in. conveyor belt and carried to the middle compartment of the bin, and rock was similarly caught and transported to the compartment at the end next the mixing plant. The bin was 120 ft. long, 45 ft. wide, and 20 ft. deep, the capacity of the gravel compartment being 2000 cu.yd., and of the sand and rock compartments 1000 cu.yd. each. A third 24-in. belt conveyor ran through a tunnel built along the bottom of the bins. The sand, gravel, or rock was fed by gravity to this belt from the storage piles above and transported to a 45-ft. bucket elevator which lifted it to the bins over the mixers, which provided storage of 30 cu.yd. each for sand and rock and 60 cu.yd. for gravel. The cement shed was on the hillside immediately above and parallel to the main storage bins. Cement was unloaded from trucks directly to the upper ends of four



Placing Concrete for Stewart Mountain Dam, September 5, 1929

inclined chutes, which made it possible to place the sacks at any level in the shed, the floor being terraced in conformity with the general slope of the original hillside. A 16-in. belt conveyor ran through the length of the shed and thence directly to the mixers. The mixing plant had a capacity of 1000 cu.yd. per day of



BUCYRUS 2½-YD. DRAGLINE AND P&H 1½-YD. DRAGLINE EXCAVATING FOUNDATION FOR STEWART MOUNTAIN DAM

two 8-hour shifts. The cement shed, screening and washing plant, and storage bins were all built adjacent to the mixers and tower and connected by means of belt-conveyors. Three sky-lines spanned the canyon, passing over the top of the towers and being anchored to deadmen in the hillside at each end. The 105-ft. Insley steel guy derrick previously used at Mormon Flat and Horse Mesa was mounted on an 80-ft. wooden tower at the west end of the dam and used to handle material and to swing chutes and counterbalances to points not accessible directly from the sky-lines. The chutes were 20 in diameter; about 1000 ft. was required, and four 40-ft. counterbalances. The plant had a capacity of 1000 cu.yd. per day in two 8-hour shifts.

Owing to the ample room afforded by topography and the length of the dam, and the great expenditure of time and effort required to reach bedrock in the river bottom, construction was carried on simultaneously along the entire structure. The two buttresses were poured first, then the gravity sections adjacent to the buttresses, then part of the west end of the arch outside the streambed, and the spillway section; the central part of the arch being poured last. The faces of the five main sections of the arch were keyed and painted with water gas tar, with copper water strips. In finally closing the dam, the depositing of concrete in the central part of the arch was kept at a fairly uniform height. This precaution eliminated any likelihood of tension due to the overhanging section of the arch, which would exist if the sections were carried up with material differences in their elevations at any one time. The level of the by-pass flume was lower than the intakes of the penstocks and concreting was continued above the flume by bridging across. This left a rectangular opening through the arch which was not closed until shortly before it was desired to begin impounding water. Pipes were left in place for grouting at a later date, in case any leakage should develop, and to make certain that all parts of the arch should be in compression. A copper water seal was also placed around the edges of the opening near both faces of the dam.

The reservoir was filled to within 20 ft. of the top of the spillway gates 30 days after the last concrete was placed, the newest concrete below water being 60 days old. No leakages developed in the dam. A small seepage flowed from the outlet of the 6-in. drain which follows along bedrock under the buttress and gravity sections on the east end of the dam.

Final figures on the cost of the dam and power plant are not available as this is written.

Additional equipment and materials used by the Salt River Valley Water Users' Association for construction of its dams and power plants includes the following:

Item	Make	Remarks
Air Compressors	Imperial and Chicago Pneumatic	
Hoists	American and Lidgerwood	
Cable	A. Leschen & Sons Rope Co.	2-in. and some 2½-in. 'Hercules' on Stewart Mountain
	Broderick & Bascom	2½-in. 'Yellow Strand' on Horse Mesa and Stewart Mountain
Transformers	Westinghouse and Wagner	
	S. Morgan Smith	For Roosevelt
Penstocks	Llewellyn Iron Works	For Horse Mesa
	(See Part I)	For Mormon Flat
	Western Pipe & Steel Co.	Stewart Mountain

Personnel—C. C. Cragin is general superintendent and chief engineer, F. J. O'Hara is assistant chief engineer, and H. J. Lawson is head electrical engineer for the Salt River Valley Water Users' Association. Field work at Roosevelt, Mormon Flat, and Horse Mesa dams was supervised by P. S. Lynch, assistant general superintendent, and by J. S. Connell, who succeeded Lynch in 1927.

[FINIS]

Editor's Note—Progress articles on two units of the Salt River Project have been published in **Western Construction News** as follows: Horse Mesa—July 10th, 1926, p. 48; April 25th, 1927, p. 54; August 10th, 1927, p. 50; Stewart Mountain—January 10th, 1929, p. 15; February 25th, 1929, p. 121; July 25th, 1929, p. 387; October 25th, 1929, p. 545; December 25th, 1929, p. 671 and 680; and April 25th, 1930, p. 219.

MINIDOKA PROJECT, IDAHO

Hereafter the gravity extension division of the Minidoka project will be officially known as the Gooding division and the main canal as the Milner-Gooding canal.

PHOENIX PASSES WATER AND SEWER BOND ISSUES

At a bond election on June 25, the city of Phoenix, Arizona, voted bonds as follows: $2,364,000 for water supply improvements and $817,000 for sewer mains and a sewage disposal plant. Divisions of work in the water improvements are: $1,300,000 for a 48-in. pipe-line between the sand trap and reservoir; $500,000 for a 48-in. pipe-line from the reservoir; $146,000 for a 42-in. pipe-line; $140,000 for a 24-in. pipe-line; $138,000 for a belt pipe-line distribution system; $25,000 for five pumping plants; $24,000 for a sump station; $110,000 for river bank protection; $92,000 for a 10,000,000-gal. reservoir; $8000 for purchase of a well field; $78,000 for water mains in the city.

DURANGO WATER IMPROVEMENTS

Last November, Durango, Colorado, a mining town of 800 population in the San Juan basin, Colorado, completed water system improvements under a $350,000 bond issue. The work included a new diversion and intake structure on Florida river; a new 20-in. cast-iron gravity supply line, 12 miles long, leading to an existing reservoir at an elevation of 350 ft. above the town; and extension, enlargement, and replacement of distribution mains.

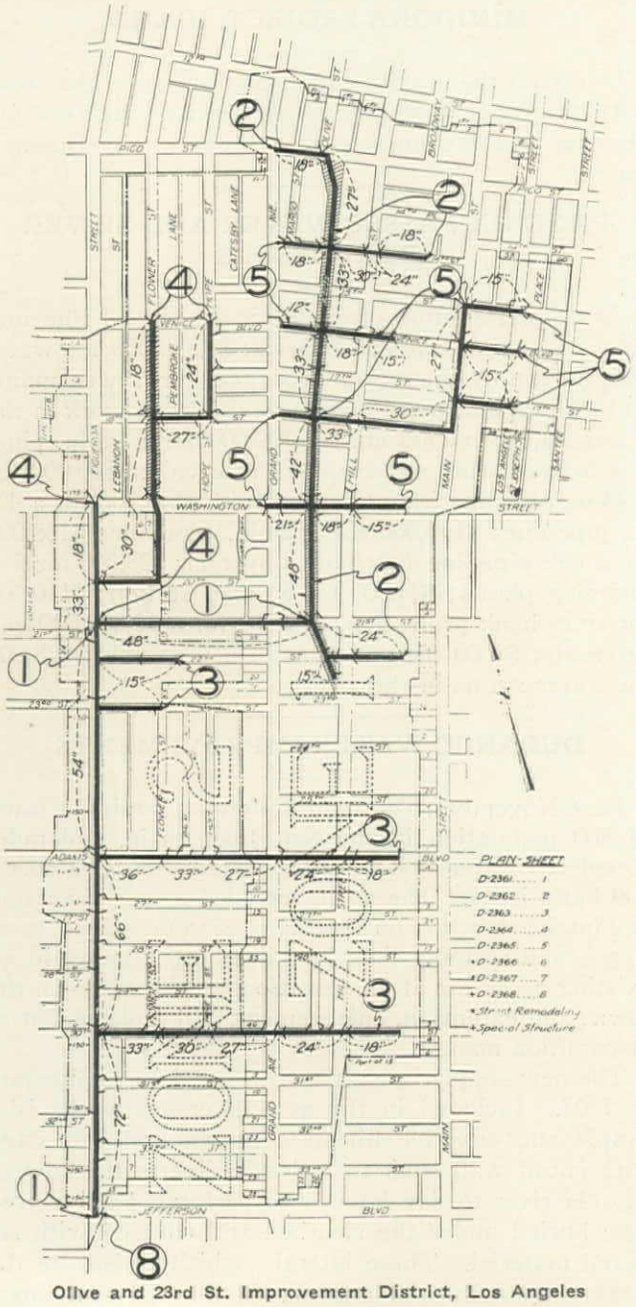
The new supply line replaces a wood-stave pipe laid in 1903. Included in the new diversion works is a simple and effective filtration system. A low dam, with cutoff wall sunk to bedrock, diverts the flow of Florida river to five laterals of perforated galvanized pipe buried under the riverbed and covered with selected material. These laterals, which constitute the intake and deliver to a 20-in. de Lavaud centrifugal cast-iron supply line, effectively keep out mud, fallen leaves, and slush ice.

A. L. Kroeger, of Durango, was the engineer on this work. De Lavaud pipe was furnished by the U. S. Pipe & Foundry Co. Wood, Morgan & Burnett, of Durango, had the contract for laying pipe and for the diversion works.

Olive and 23rd Street Improvement District, Los Angeles

Board of Public Works Will Receive Bids in August for 6.40 Miles of Storm Drains; Paving; Sanitary Sewers; and Ornamental Street Lighting

Bids will be received sometime in August, 1930, by the Board of Public Works, City Hall, Los Angeles, California, for construction of storm drains, paving, sanitary sewers, and street lighting in the Olive and 23rd st. Improvement District, which includes the area bounded on the north by Pico st., on the east by Main st., on the south by Jefferson st., and on the west by Figueroa st. The total estimated cost of this project is over $400,000, of which $267,500 will be paid in cash from an allotment made to the improvement district by the city council. The remainder will be spread over the assessment district at a rate slightly under 2c per sq.ft. of assessable area, plus an assessment of about $46,000 on Olive st. between Pico and 23rd st. for ornamental lights. (The estimated rates of assessment per sq.ft. for zones 1 and 2 are $0.0181 and $0.0192.)



Olive and 23rd St. Improvement District, Los Angeles

Cement pipe will be used in sizes from 12 to 21 in. For the larger sizes, either reinforced concrete pipe or centrifugal concrete pipe may be used. A pipe summary is shown in the accompanying table.

PIPE SUMMARY
Storm Drains

Pipe Diam. (In.)	Remarks	Lin.ft. of Pipe	Corresponding Minimum Diam. of Centrifugal Concrete Pipe (In.)	Required Minimum Strength of Centrifugal Concrete Pipe if Laid Under Case I or Case II (Standard Plan D-1477)	Required Minimum Strength of Centrifugal Concrete Pipe if Laid Under Case III Without Cradle (Standard Plan D-1477)	Required Minimum Strength of Centrifugal Concrete Pipe if Laid in Accordance with Special Bedding Shown on the Plans Other Than Case I, II, or III
72	R.C. Transition	18.20				
72	R.C.P. M	23.00	69			860-D
72	M	1,224.00	69	860-D	1500-D	
66	H	1,262.00	63	1100-D	1930-D	
54	D.M.	1,694.00	52	1470-D	2570-D	
48	D.M.	890.00	46		1510-D	
48	D.M.	861.00	46	1510-D	2640-D	
48	H	260.00	46	1210-D	2120-D	
48	M	32.00	46			1000-D
48	M	267.00	46	1000-D	1750-D	
42	D.H.	519.00	40		1780-D	
36	H	527.00	34	1280-D	2240-D	
33	D.H.	28.00	31			1780-D
33	D.H.	1,201.00	31		1780-D	
33	D.H.	263.00	31	1780-D	3120-D	
33	H	649.00	31	1300-D	2270-D	
33	M	588.00	31	1080-D	1890-D	
30	D.H.	133.00	28	1810-D	3170-D	
30	D.M.	8.00	28			1640-D
30	D.M.	872.00	28	1640-D	2870-D	
30	H	33.00	28			1320-D
30	H	380.00	28	1320-D	2310-D	
30	M	45.00	28			1100-D
30	M	2,145.00	28	1100-D	1920-D	
27	D.H.	23.00	26			1820-D
27	D.H.	789.00	26		1820-D	
27	M	76.00	26			1130-D
27	M	2,208.00	26	1130-D	1980-D	
24	D.M.	526.00	23		1860-D	
24	H	30.00	23			1350-D
24	H	20.00	23	1350-D	2360-D	
24	M	4.00	23			1150-D
24	M	1,062.00	23	1150-D	2010-D	
24	Mono. Conc. S.D.	14.00				
21	Cement Pipe	994.50				
18		3,713.00				
15		4,739.20				
12		5,660.50				
27	R.C. Transition	8.50				
		Sanitary Sewers				
6	Cement Pipe	16.00				
	Total Storm Drain	33,789.70				
	Total Sanitary Sewer	16.00				
		33,805.70				
	Total Miles	6.40				

The average depth of trench will be 10 ft. and the maximum will be 17 ft. (54-in. pipe); the minimum depth being about 3 ft. The soil is sandy in the south half of the district and sandy loam in the north half. The approximate excavation is 15,000 cu.yd.

About 50% of the length of pipe is to be laid in streets paved with asphaltic concrete, the trench resurfacing of which will be the same type of material. Remaining trenches are to be resurfaced with rock and oil, or are to be covered with new pavement (streets shown cross-hatched on the illustration are to be paved). Included in the paving work is 415,000 sq.ft. of asphaltic concrete pavement and asphaltic concrete

resurfacing, of variable thickness; 12,000 sq. ft. of cement concrete pavement; 12,000 lin.ft. of concrete curb; 83,000 sq.ft. of concrete sidewalk; and 15,000 sq.ft. of concrete gutter.

The total number of manholes, including sewer structures, is 131. There are 230 catchbasins, varying in length from 3½ to 28 ft., the great majority being the former length. In addition to the above work, there are 8200 lin.ft. of 8 and 10-in. sanitary sewer, and ornamental street lights on Olive st. The contract time for this project will be 200 days.

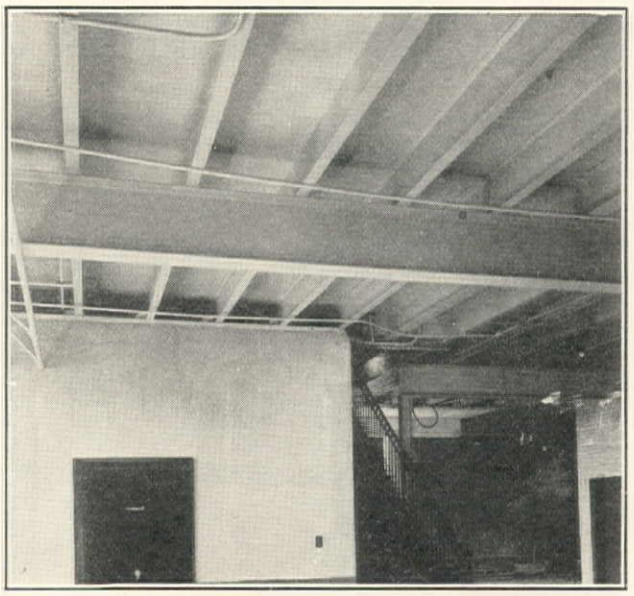
J. J. Jessup is city engineer, R. W. Stewart is chief deputy, D. M. True is office engineer, and L. W. Armstrong is engineer of storm drains.

Midwest Steel Works Office Building, Denver, Colorado

'Battleship Deck' Flooring—Electric-Welded Wall and Roof Joists—Welded Tower Roof—All-Steel Window Sash and Frames

A practical demonstration of the 'battleship deck' type of steel floor, recently advocated by the American Institute of Steel Construction, was afforded Denver contractors and engineers by the new office building of the Midwest Steel & Iron Works Co. This structure is of brick, 28 ft. wide by 90 ft. long on one side and 80 ft. on the other. It is two stories high and joins the company's old office building for half of its length.

'Battleship Deck' Flooring—The ground floor of this new building is of concrete and the second floor is of the 'battleship deck' type, formed of $\frac{3}{16}$ by 24-in. steel plates electric-welded to and over 2 by 4-in. I-beams, the latter being used as joists. The plates were laid with a ¼-in. joint, in which the welds were made to join them together and to the joists. At first, a continuous bead was attempted on the joints, but this was abandoned for tack welds when it was found to cause buckling of the plates. The tack welds were made about 8 in. apart along two seams at a time—welding only one seam at a time showed a tendency to draw the sheets. The method used resulted in a level surface and the cracks were smoothed by filling in with plastic cement. Tests of the 'battleship deck' floor showed a deflection of ⅜ in. under a load of 100 lb. per sq.ft.



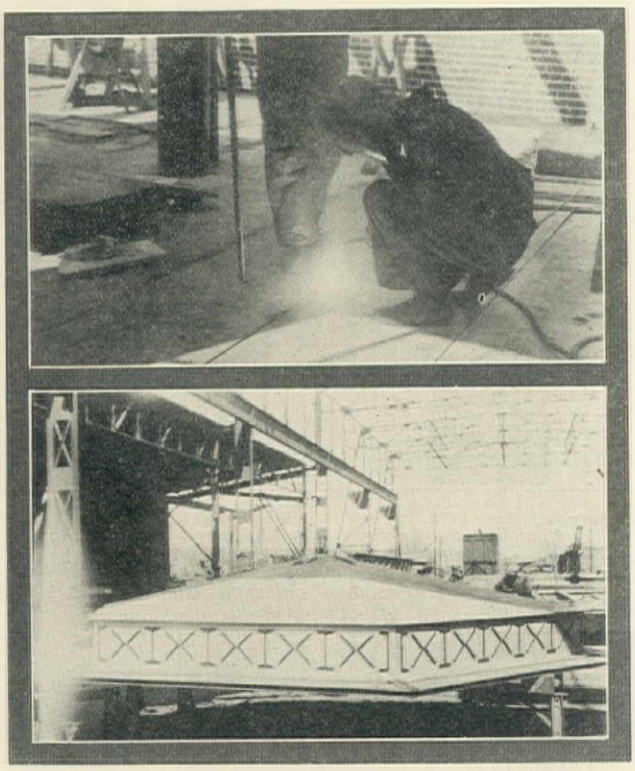
Underneath Side of a Typical 'Battleship Deck' Floor, Using Junior Beams, Cross-Seam Welding in Plates, and Welding in Main Frame of Building

Several advantages are claimed for the 'battleship

MIDWEST STEEL & IRON WORKS CO. OFFICE BDG., DENVER, 4000 SQ.FT. OF 'BATTLESHIP DECK' FLOOR

deck' floor system. These include: saving in dead weight in construction of multiple story buildings where the load must be carried into the girders and columns and thus to the foundations (the weight of this new type of floor being 20 to 60% less than that of floors now commonly used); instant recovery from deflection due to live loads; the tendency to stiffen a building against wind or earthquake stresses; easy application of metal lath and plaster to the under side of the steel joists or insertion of blocks of fire-resistant material on the lower flanges; application of any desired type of floor covering to the surface of the plates. For the Midwest Steel Works office building, felt and linoleum was used for the floor covering.

Wall and Roof Framing—Where both side walls of the building are new construction, the joists are set into the wall at each end. At the end where the old structure is joined, both the second floor and the roof are supported by columns and girders (consisting of 10-in. channels) against the old wall. At this point in



Midwest Steel Works Office Bdg., Denver. (Upper) Welding Floor Plates to Joists. (Lower) All-Welded Roof for Tower

the new wall, the edge of the steel floor plates is also stiffened by short sections of formed channels, welded in between the plate and girder. Through the middle of the building, the floor joists are supported on a 10-in. I-beam girder, set in the end walls and supported on a 4-in. round and square column. The columns are welded to the girder and rest in concrete footings. Similar columns are welded between this girder and the one supporting the roof at the middle. Joints in the girders are placed over the ends of the columns and sections of ½-in. plate are welded between the flanges at the joint.

The roof joists were made by tack welding 10-in. formed channels (10-gauge metal) back to back, then welding the ends together and tack welding the joist to the top of the girder.

All joists in this framing are electric welded.

A brick tower on the front of the building, 18 ft. high by 16 ft. wide, is supported on a 'battleship deck structure', built upon several steel beams, of which one is a 16-in. I-beam carried by extra columns from the ground floor. To stiffen the construction, 2 by 4-in. angles were welded to the under side of the plate between the joists.

The tower is surmounted by an all-steel welded roof structure, decorated about the cornice with miniature samples of the company's products.

Windows—Another interesting feature of this building is the all-steel window sash and frames, made in one section for both floor levels. These sash and frames are 4 ft. 9 in. by 20 ft. 1 in. and were raised and guyed in place before the brick piers (37 by 17 in.) were built between them. To serve as molding, 1½-in. twisted steel rods were welded in the corners of the frames. The same plan was followed for installing windows in the tower. Except between windows, the walls of the structure are 12 in. thick.

Personnel—Roland L. Linder, of Denver, was the architect, and the C. E. Walker Construction Co., Denver, had the general contract. Steel work was done by the Midwest Steel & Iron Works Co.

WYOMING COUNTY ROAD EXPENDITURES

In the nine-year period of 1921-1929, Wyoming counties report expenditures for county road construction and maintenance totaling $8,448,103.

BOULDER CANYON PROJECT

Congress has approved the President's recommendation for $10,660,000 to begin construction of the Boulder canyon project, the appropriation coming from the second deficiency bill. Divisions of the preliminary work are estimated as follows:

3 miles of highway to top of cliffs	$ 300,000
Layout Government townsite and install water and sewerage systems	100,000
Administration building and living quarters	125,000
30 miles of railroad from U.P. to damsite, and railroad to bottom of canyon	2,500,000
Power for construction purposes	1,750,000
Initial appropriation for constructing diversion tunnels	5,000,000
Purchase of private properties in reservoir site	500,000
Reimburse reclamation fund for preliminary investigations to date	385,000

Contracts for lease of power privilege signed by the United States and Los Angeles and the Southern California Edison Co., acting jointly, provide for purchase of energy to meet requirements of allottees as follows: Arizona—18%, Nevada—18%, Metropolitan Water District and San Diego—36%, Southern California municipalities—6%, Los Angeles—13%, Southern California Edison Co.—9%. Allocations of firm energy are percentages of total firm energy of 4,240,000 kw-hr. per year upon completion of Boulder dam and decreasing uniformly each year thereafter. The rates of payment are 1.63 mills per kw-hr. for firm energy and 0.5 mills per kw-hr. for secondary energy.

Water Works Problems

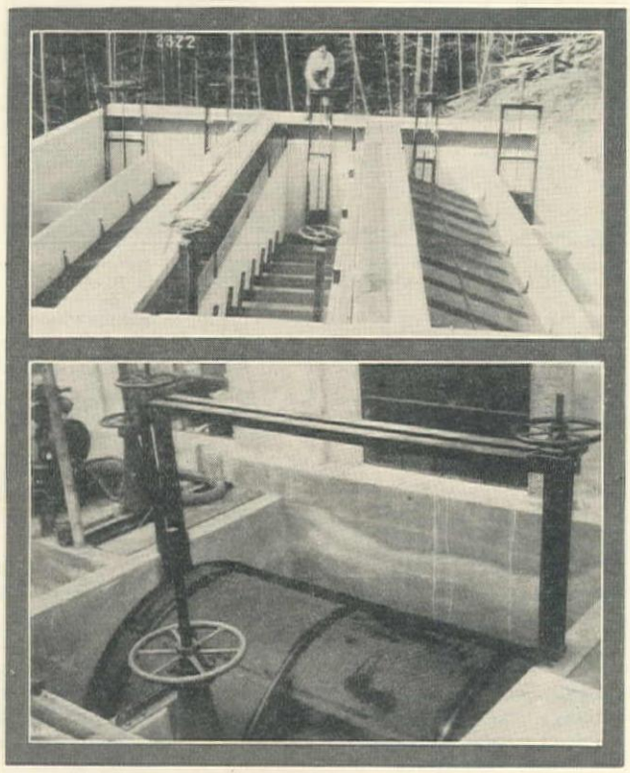
Synopsis of Papers Presented at Third Annual Meeting, Pacific Northwest Section, American Water Works Association, Portland, Oregon, April 25 and 26, 1930

Design and Construction of Intake Screens for Gravity Pipe-Line Intakes, by J. W. Cunningham, consulting engineer (Baar & Cunningham), Portland, Oregon.

Water works intakes and screening plants for diversion from flowing streams are important enough to deserve more thorough study and more careful design than they usually receive.

Surface water from a single source varies with the seasons in its physical characteristics—it may carry slush ice; silt and sediment; logs, brush, roots, pine-needles, etc.; periodical runs of algae; and leaves from deciduous trees. Stain or turbidity resulting from colloidal clays require special treatment, but screening and sedimentation will greatly improve most surface waters.

Above the intake there should be moderate storage and sedimentation space. A dam will check the water, induce settling, and give an operating head on the sluiceway or screens. The



Two Types of Gravity Water Supply Intake Screens

intake should be in the deepest water available and on the concave side if the stream is curved; its floor should be above the streambed. Floating material may be excluded from the intake by a boom or surface baffle board. Coarse racks will keep out floating branches and sticks; they should be inclined (2 to 4 in. vertical to 12 in. horizontal), have a working platform at the top, and be joined by welding so that there may be space for cleaning with rakes. Intake screens will keep out twigs, leaves, grass, roots, and other suspended debris. Screen maintenance is a real problem for the small water works (many Pacific Northwest gravity supplies range from 250,000 to 5,000,000 g.p.d. and have 10 to 15-mile supply lines), as continuous screens are too expensive. A part-automatic and self-cleaning screen to operate in the leaf season is needed. One with relatively large screen area giving low velocities and with only vertical bars or wires is a solution for small supplies, and for larger supplies a more nearly automatic leaf screen can be used. This type of screen is mounted on a rotating drum turned by current action on interior vanes, the water passing through and out the ends. Retained material is carried to the bottom of the screen and back-washed to waste, from 5 to 10% of the available flow being used for this purpose.

The place to remove settleable solids is at or close to the intake and not after they pass through the supply line. A settling chamber with a maximum capacity of one-half hour flow, properly designed and baffled, will reduce turbidity and trap the heavier sand and silt. If the bottom of the chamber is sloped and wash water and cleanout gates are provided, accumulated silt can be blown out. Ordinary intake screens have 2 to 4 meshes per inch, few are finer than 6-mesh. Installation of a fine screen (8-mesh and smaller) may relieve the need of filtration in special cases, such as in the manufacture of certain grades of pulp and paper where the showers and washers are subject to clogging by fine hair-like roots, pine-needles, moss, and some forms of algae. Fine screens will be effective only if they are designed for easy and inexpensive cleaning and have a low velocity of flow with uniform distribution over the entire area.

Municipal Water Utility Accounting, by G. B. Schunke, utility accountant, Water Department, city of Seattle, Washington.

Seattle raises new capital for extensions by (1) utility bond issues, (2) creating local improvement districts and issuing bonds against abutting property for distribution mains and hydrants, and (3) investing some of the surplus or profit of the Department. As water service should be paid for by the property benefited and all localities should be treated alike, the second method seems the most equitable. Water rates should be adjusted to provide for all operating and maintenance expenses, interest charges, and serial retirement of bonded debt, leaving a set and sufficient cash reserve to meet emergencies.

Water plant expenses fall in six categories—(1) supply, (2) distribution, (3) commercial, (4) general or miscellaneous, (5) depreciation, and (6) fixed charges (interest on funded debt). Categories (1) and (2) subdivide into operating and maintenance expense. In general, all expenses for supplying water are those of operation and all incurred in bettering existing facilities are maintenance expenses. On pumped water supplies, greater emphasis should be placed on the first category (supply expense) than with gravity systems.

In water distribution, proper and adequate spread and allocation of costs will assist in economic and efficient management by showing the best type or make of gate valve, meter, auto, truck, etc., on the basis of past experience.

Good will is the most valuable asset of a water utility. It is better to err in judgment on the side of the water patron than to make him think that unfair treatment has been given. Water utility employees are servants of the public and should ungrudgingly give full consideration to the needs and claims of that public. Through the various means available (lantern slides, etc.) the consumers should be kept as much informed as possible about the water system.

Water Works Management, by R. H. Corey, division engineer, Public Works Engineering Corp., Salem, Oregon.

A successfully operated water works is managed with strict regard for the comforts and desires of its public. Every organization has a personality largely composed of individual characteristics of those in authority, and its reputation is just as valuable as that of an individual. It must have character, both individual and corporate, supported by candor and courage. The good name of a water works organization is more essential to its integrity, financial credit, and ability to meet public demands, than any other asset. The organization's cashier must be the goodwill representative, since about 60%

of water utility customers pay their bills in person. He must know how to handle new customers and to treat old ones with consideration. Whereas wholesome criticism of a water works should be welcomed, unjust and unwarranted criticism must be defended. The complaint man must be tactful, discreet, and well informed. Prompt and thorough investigation and settlement of consumer complaints is necessary to good will, but chronic 'kickers' must be promptly cured. The public is predisposed to criticize and to be antagonistic toward any utility which serves it.

The manager or superintendent should be a man of experience and almost perfect in all human qualities. He can obtain results only when he is held solely responsible; he stands between the group making up his board of directors or water board and the public served. He must be an integral part of the city and be first among those planning for its advancement; he must be free from religious and political entanglements, be versatile; at all times ready to furnish pure water to his public. Personnel selection and training, loyalty, and courtesy are important phases of water works management.

Water works sell service through collection, storage, purification, and distribution of water that nature has provided free. Dissatisfaction arising from unexplained and faulty service slowly remedied is a frequent cause of an unfriendly public attitude. No promises or hints should be made prospective or old customers until all facts have been investigated and a plan selected which can be carried through without departure. The utility should have the right to place before its customers facts in connection with its service and business; it should have the privilege of correcting false and misleading statements so as to keep the public fully in its confidence. More public education is needed to obtain proper understanding of the water works and its problems. Advertising space, news items, and general articles in all of the local newspapers will help to sell the water works and to increase efficiency in the use of the service which it offers.

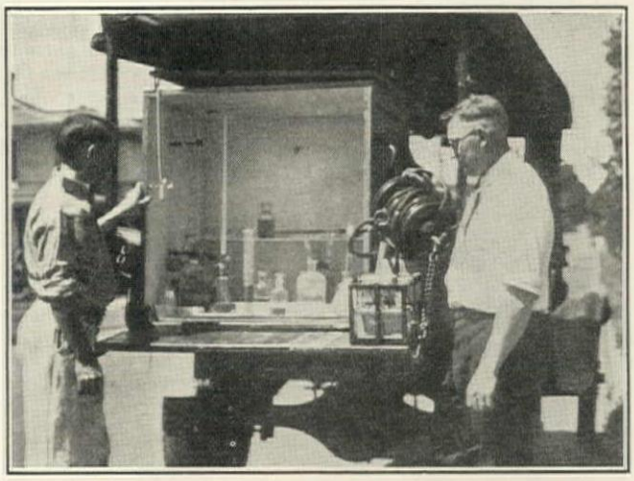
The water system must be kept up to Fire Underwriters' standards. Consumer waste should be cut down by the use of meters on every connection, and at least 75% of the total supply accounted for in delivered consumption. Every system should be equipped with a geophone for locating leaks, a recording pressure gauge on a separate service connection in the business district, an extra recording gauge for 24-hour tests in low-pressure areas; a pressure gauge in each foreman's home for showing abnormal drops due to broken mains, an electric pipe locator, and a pipe pusher for forcing through small pipe in difficult locations. Maintenance of buildings, reservoirs, grounds, and equipment is as necessary as that of the underground plant. Proper records, and especially complete and up-to-date maps, of the system are of great importance in management, as is the correct application of the rate schedule. Systematic inspections will help to decrease the number of unauthorized water users. Meter reading variations must be checked each month; a definite time limit meter testing policy should be adopted; battery meters are best for large consumers because of ease in testing. Guarantee deposits are necessary to secure prompt payment of bills; collections and adjustments must follow a rigid, unvarying policy.

Metering, Maintenance, and Testing in a Small Town, by A. H. Labsap, superintendent of water department, Washington Gas & Electric Co., Longview, Washington.

Longview, an industrial city built by the Long-Bell Lumber Co. on the Columbia river midway between Portland and Astoria (population 10,491, founded 1922), has all utilities placed in 20-ft. alleys except for a zoned wholesale district where the alleys are 40 to 45 ft. wide. In the latter case, mains are placed in the parking. Many miles of paving were laid before building began and to date no pavement has been torn up for water service. A disadvantage in use of alleys is that in long blocks in the business district, hydrants cannot be placed in the center of the block as no easements exist.

Meter maintenance is the greatest problem of the water works. With 50-ft. lots and a 20-ft. garage and 15-ft. woodshed near the rear line of the lot, there is only 15 ft. for a typical water service. Consequently, the meter cannot be lined with the house plumbing. When new meters have been received, they are tested, stamped, and sealed, the register figures being protected against moisture by a sheet of transparent celluloid. Copper tubing is used for the service pipe. The meters are set 1 ft. inside the property line and are enclosed in concrete meter boxes, excepting for the test tee which is buried in the ground on the consumer's premises. The meters are placed 12 to 16 in. below the ground surface (frost line 16 in.) but as there is no protecting curb and often the meters are not guarded by fences or outbuildings, trucks may crush the boxes or drive them into the ground, severing the connection. About 15% of the meter boxes are replaced yearly. Moles have been found to burrow along the pipe and fill the boxes, in many cases completely covering the meter. To prevent dirt from working into the registers, a cedar board is placed underneath the meter.

Washington rules for meter testing give the following minimum intervals: 1-in. or less and 1¼ to 2-in—5 years, 3-in.—3 years, 4-in.—2 years; they require that three rates of flow be



Oregon State College Field Laboratory for Determining Dissolved Oxygen Content and B.O.D. of Willamette River

used. With a total of 2700 meters in the Longview system, 2200 have been tested to date. Less than 10% of the meters tested with a ½-in. orifice were more than 2% in error. Repair parts to meters in service 5 years or longer have been 20¢ per meter since 1927—about 7¢ per year, excluding labor. Testing of meters has averaged 75¢, including labor cost of cleaning and repairs while testing was in progress. The use of meters has, together with leakage reduction, lowered the unaccounted for water from 24.6% in 1927 to 12.1% in 1929.

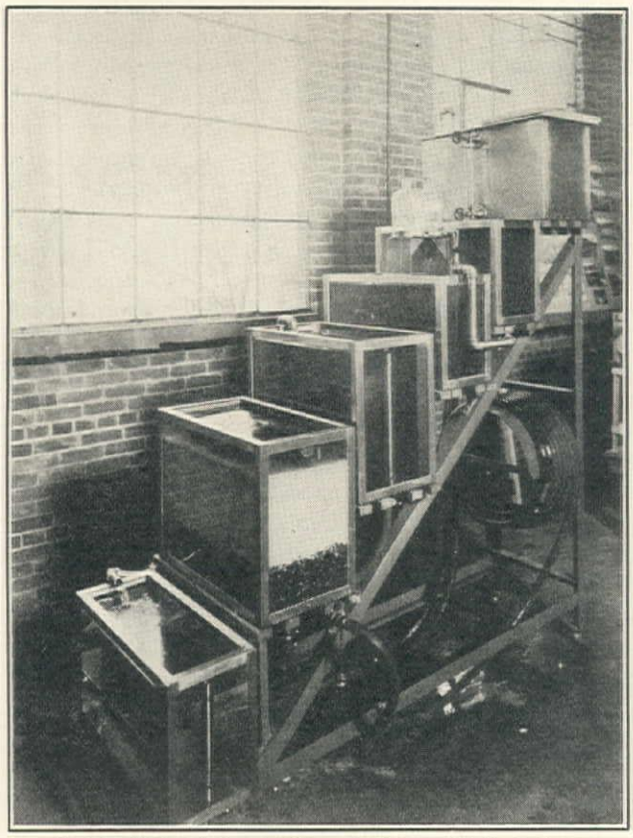
Outline of Method of Rating Water Systems for Insurance Purposes, by C. F. Wagner, engineer, Oregon Insurance Rating Bureau, Portland.

A basic starting point must be determined in establishing insurance rates. The standard grading schedule of the National Board of Fire Underwriters, used in most districts having water systems, allows relative values on major items as follows: water supply—34%, fire department—30%, fire alarm—11%, police department—1%, building laws—4%, hazards—6%, structure conditions—14%. To measure extreme differences in the two major items—water supply and fire department—an equalizing feature is introduced. Water supply is analyzed and measured on 32 points, of which greatest weight is given the following seven: normal adequacy of entire system, reliability of source of supply, sufficiency of reserve pump capacity, sufficiency of reserve boiler capacity, condition and arrangement of equipment, effect of small mains in the high-value district considered, and 4-in. mains in the system.

A measure of adequacy is the ability of the source of supply to deliver a required fire flow to any district. Let this be $G=1020\,P(1-0.01/P)$, where G=g.p.m. and P=population in thousands. For 1000 population, 1000 g.p.m. is the minimum, and for over 200,000 population, 12,000 g.p.m. is the basic requirement, with 2000 to 8000 g.p.m. additional for a second fire. This formula is based on average cities and will handle an average block fire or two simultaneous single fires for 10 hours, in addition to normal consumption. As a second measure of adequacy, maximum consumption plus fire flow is considered. Conflagrations are measured separately. The entire

system is studied and flow tests are made to determine its weakest point.

Reliability of source of supply considers the features of natural supply affecting interruption or possible interruption. Pump-system water supplies require capacity for maximum consumption and fire flow when the two largest units are out of commission. Storage is credited, one pump being out of service, with ability to maintain 10-hour fire flow for 5 days with maximum consumption. Deficiencies in low-lift pumps, compressors, and auxiliary apparatus may be limiting features of the plant. The boiler or electric plant operating the pumps is measured to determine influence on the supply, 25% overcapacity of boilers being required or else a capacity for maximum consumption and fire flow with one boiler out of commission. The condition, arrangement, and reliability of power plant equipment should be such that it will not produce the limiting feature in the system. Small mains in a high-value district furnish a weak spot. A 6-in. main is considered the



Model of Rapid Sand Filter at Oregon State College

minimum for residential and an 8-in. main for principal mercantile districts. Flow tests from hydrants determine actual conditions and allow a percentage measurement of deficiency. Where pumpers are available, the amount of water furnishing a 20-lb. residential pressure is measured. The percentage of 4-in. or smaller mains supplying hydrants measures a deficiency.

With some features expressed by a judgment charged as good, fair, indifferent, and poor, they can be transferred to a percentage or points charge and considered with those developed by formulae.

For defense against fire, a spread of 5000 points of deficiency has been selected. The insufficiency of any subject measures its points of deficiency—1700 points being available for water supply. The relative value of a water system is obtainable in this analysis. The six remaining major items are similarly analyzed, their deficiencies summed with those of water supply, and an abstract figure obtained for insurance rates, cities being divided into 10 classes of relative protection. A first-class city has from 0 to 500 points deficiency and the 500-point increases mark additional classes.

The Relationship of the State College of Washington to Water Works Engineering Practice, by M. K. Snyder, professor of sanitary engineering, State College of Washington, Pullman.

The division of sanitary engineering at the State College of Washington was organized about 1900. Work of the division includes a course in public water supply, one in sewerage and sewage treatment, courses in chemistry and bacteriology, a course in engineering geology, and one year or more in economics, finance, and accounting. Through correspondence, personal interviews, and studies, an attempt is made to assist those Washington municipalities which have problems of a sanitary engineering nature. For highly specialized studies, graduate students are assigned the work. The main effort of the college is to send out properly trained engineering graduates and to give them practical experience on preliminary studies along with their courses.

As part of its general extension service, the College has sent a professor of sanitary engineering to various communities to point out sanitary neglect and encourage needed improvements. Thereafter, if desired, a type of plant is selected, the needed extent of construction and preliminary cost estimated for a preliminary report and, if a favorable decision is made by the community, the employment of a competent engineer for design and construction of the plant is then urged. Analyses are made for communities requesting this service and in all such cases recommendations are given. Materials of construction, especially for concrete, are tested in the college laboratories, and tests of water meters are run for smaller communities.

In What Respect Can Oregon State College be of Assistance to Oregon Municipalities in the Solution of Their Water Supply and Distribution System Problems, by C. A. Mockmore, associate professor of civil engineering, Oregon State College, Corvallis.

Oregon State College can be of valuable assistance in solving many water supply problems because of diversity in laboratories and personnel.

Important functions of a municipal water department are to collect, purify, and distribute potable water under satisfactory pressure for domestic, commercial, industrial, and public service, and furnish an adequate quantity of water under reasonable pressure for fire protection. Control and supervision of the sanitary quality of water is vested in the State Health Department and the larger cities have available consulting engineers, skilled purification plant superintendents, and chemical and bacteriological laboratories. Oregon State College can offer disinterested assistance to these and to smaller municipalities through general information, special tests, and research investigation wherever the work does not encroach upon the Health Department or the field of the consulting engineer. It can, for example, offer the service of experts on accounting and business procedure to water departments which are on an unsound financial basis. Special tests on meters, valves, fire hydrants, gauges, etc., can be conducted in the college laboratories or in the field, provided they do not require serious interruption of regular duties of the available personnel. Assistance may also include a complete analytical examination, by tests and experiments, of a water supply to help determine its past history and present condition. In such an analysis, various departments—industrial chemistry, bacteriology, biology, geology, and sanitary engineering—are available. The best service can be through research, either by senior seminar subjects on rates of filtration, use of different kinds and amounts of coagulants in different raw waters, effect of disinfectants upon different bacteria, watershed surveys, etc.; or through elaborate experimental work by the technical staff of the college. The last type of study might include such subjects as pipe corrosion and electrolysis, water filtration, color removal, etc.

Editor's Note—For other references to the third annual meeting of the Pacific Northwest Section, American Water Works Association, see the November 25th, 1929, issue, p. 620, and the following 1930 issues: February 10th, p. 88; March 25th, p. 48; April 10th, p. 196; and May 10th, p. 244.

Reminiscences of the Pioneer Engineers of California*

By OTTO VON GELDERN†
Consulting Engineer, San Francisco

Part VII

Henry Root was another of the pioneer railway engineers of California. He was self-made and self-trained in every respect, of an astute mentality, quick to discern, and capable of carrying out problems in railway work which would have baffled many a man of high theoretical training with less practical experience.

He was born in Vermont in 1845, and left his native home for California in 1864 (when in his 19th year), where his professional life began at once; at first in

HENRY ROOT

making land surveys for the official surveyor of Sacramento county as a deputy. Two years later he was employed by the Central Pacific Railway Co. to set lines and grades for the great epoch-making railway over mountains and plains, which task he performed with speed and painstaking accuracy. He possessed the faculty of becoming useful, and those who had once engaged him took good care not to lose him.

In the course of time his position became firmly established with the big railway promoters of that period of active development of our state; he had made himself a prominent factor in the solution of the problems of daring railway location which made our far-off country well known throughout the civilized world.

Henry Root remained in the employ of the prominent railway promoters for many years, acting under such well-known pioneer engineers as the late Colonel George E. Gray, an honorary member of the American Society of Civil Engineers, who died on January 1, 1913, and S. S. Montague, another of the early pathfinders who devoted his life to this great task.

In 1876 Root took up the construction of street cable railways in San Francisco; that is, the surface railway and the tube that contained the cable. The Clay street hill cable railway, from Kearny street to Leavenworth street, had been in operation since 1873. This was considered an early experiment, a construction more or less of timber, made at the least possible expenditure of money, in order to give this new method of traction a practical test. The four men directly interested in this enterprise were Andrew S. Hallidie, Joseph Britton, Henry L. Davis, and James K. Moffitt.

Root improved the first method of constructing the cable tube by using concrete and iron throughout, in accordance with new plans designed by him. In the course of time he built nearly all the cable railways of San Francisco. He enjoyed the full confidence of such men as Leland Stanford and the big financiers of our state, who had faith in his ability and integrity.

His life was one of continuous work well thought out and well performed. He lived to ripe old age, and died in San Francisco recently—an octogenarian.

In the development of cable railway propulsion the name of another pioneer engineer stands out very prominently. It is that of W. W. Hanscom, a mechanical engineer of high ability, who developed methods of handling the cable at the engine station, and designed adequate machinery to pull it through its tube at a certain regulated speed, and to adjust itself, by pulley systems, to vertical and horizontal curves in its run. All of this had to be learned through actual experience, so that improvements in details were constant.

Hanscom was a writer of ability who spread the knowledge of this subject when little was known of its practical and economical results. He read the first paper on cable railway operation before the Technical Society of the Pacific Coast, which was published in June, 1884. The paper read by Hanscom was an important contribution to engineering literature. It may be read with interest and profit today, because it is historic in its description of the early methods of cable railway propulsion. The author described the construction and installation of the following cable railways in San Francisco which were mentioned by the names of the streets, in the order of their development: Clay, Sutter, California, Geary, Union, McAllister, and Market-Valencia-Haight. The paper, difficult to obtain today, contains diagrams and drawings which illustrate the details of construction.

Hanscom was an important man in his time, who is worthy of being listed with the great men who developed our great city on the Pacific.

Hermann Kower, formerly professor and head of the department of drawing, University of California, who died two years ago, deserves to be mentioned in connection with the post-pioneer engineers, because he became known to a great many of our present prominent engineers who were students under him at the time when the old-timers were still active. In

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connection with his department he taught graphostatics, and the methods representing structural designs in plans, sections, and perspective.

He was the son of a pioneer family of California, and obtained his technical training in a polytechnic institute of a high standard in South Germany; and accepted the University appointment here after his return. He held it for many years, at the same time being called in an advisory capacity on many important works in our State.

News has been received recently of an unfortunate accident occurring in New York, from which one of the old-time mechanical engineers of California succumbed. Hans C. Behr, the son of the pioneer man of science in our state, the late Doctor H. H. Behr (at one time the oldest member of the Bohemian Club of San Francisco), was run over by a taxicab on a New York street and suffered severe injuries from which he died March 29. Many older men will remember Hans Behr, who left California about thirty-five years ago to go to South Africa; he was one of a number of California engineers called to this far-off land under lucrative engagements. He became a successful professional man there. Later he went to London, and finally to New York, where he had been engaged in his professional specialties for some years.

Before closing the reminiscences of the Pioneer Engineers of California, there is still one more who should not be left out, because the list would be incomplete without him. He was one who died young in years, but while he lived he accomplished marvelous things, for he helped to build this great empire of the Pacific. During the recent Spring Meeting of the American Society of Civil Engineers held in the city of Sacramento in April, 1930, a monument was dedicated to the memory of the late Theodore Dehone Judah, one of the very earliest pathfinders of our Golden State.

A memorable address was made on this occasion by W. H. Kirkbride, engineer of maintenance of way and structures of the Southern Pacific Co., which should be read by every engineer, and particularly by those who are Californians, and proud of the romantic history and development of their country. It was well said by Mr. Kirkbride that:

"The story of the conception, promotion and construction of this railroad eastward out of Sacramento is a soul-stirring California romance, second only to the discovery of gold, and Judah represents the moving genius of the whole story."

Only a few references to this remarkable man can be made here, which are taken directly from the story which was told in an inimitable way by Mr. Kirkbride.

In 1854 Judah came to California, at the age of twenty-eight years, to become the chief engineer of a railway built from Sacramento to Folsom. Later on he became the prime mover in working out the location of the western link of the transcontinental Pacific railway. He appeared to be obsessed with the idea, to which he devoted the best part of his short life, that this connecting link was perfectly feasible, but he also realized that financial support was impossible until he was able to demonstrate a practical solution of the problem. After having obtained the confidence of such men as Stanford, Huntington, Hopkins, and Crocker, the 'Big Four', great Empire builders of the Far West, funds were made available for making examinations and surveys. In 1861 the Central Pacific Railroad of California was formed, and in 1862 Judah submitted his final report, having fully investigated not less than five passes over the Sierra Nevada. He secured the passage of the Pacific Railroad Bill, signed by President Lincoln July 1, 1862.

On a trip to the Atlantic shore in the interests of the company, made by way of Panama, he took the Panama fever and died shortly after that in New York, on November 2, 1863, in his thirty-seventh year.

The completion of the great transcontinental railway is an accomplished fact; it was an epoch-making one at the time, with which our people are fully conversant, but the name of Judah had been almost forgotten. It became a duty of our California engineers, and particularly our railway engineers, to remind the State and the country at large of this great character, of this indomitable spirit, by erecting a monument to his memory, in the city of Sacramento, composed of the unhewn granite from the High Sierra, inscribed with the name—Theodore Dehone Judah—and with references to his extraordinary achievements. It becomes our duty to see that such names are not forgotten, because they become an incentive for our youth to emulate characteristics which in the human race should remain imperishable. They show that an indomitable spirit cannot be conquered, but that, if its cause be just, it must and will conquer in the end.

Dedication of Monument to Theodore Dehone Judah at Sacramento, California, April 25, 1930

Sam S. Montague, assistant engineer under Judah, was appointed acting chief engineer on October 8, 1864, and then was chief engineer until his death on September 24, 1883; having served 21 years with the Central Pacific Railroad, much of the time in charge of the construction planned by Judah.

In the list of engineers which I have chosen many more names might have been inserted, but in my choice I took those whom I knew personally and who were typical representatives of the post pioneer period. We have now many eminent engineers who are still active, men well along in years, whose names are well known, like that of my old friend C. E. Grunsky, the president of the California Academy of Sciences, and a

past president of the American Society of Civil Engineers, but I consider him, like myself, a member of a later generation, as it were; that is to say, when the pioneer engineers were active we were still boys or youths who were to come into our own later on. For such reasons I have omitted to mention any of the more recent names, irrespective of the prominence which they have justly attained.

Again, that does not mean that the colleagues of my own age are not old men. Indeed, they are and they know it; but it is pleasant to note that they are still able to perform their duty. It must not be forgotten that old age has its pleasures as well as youth. In order to be able to make any statement about it one must have reached old age; that is, no younger or middle-aged man can talk about 'old age' and how one should retain his youth, because he knows nothing about it. Life to an old man presents an entirely different aspect than it does to a younger man. Being old, I know what I am talking about. From my own experience I may be able to tell you something which is probably entirely new to you younger men.

Let me tell you this: The sentiment associated with the past is so strongly implanted in the human breast that it admits of no comparison with any subsequent time. Whatever happened then, in the care-free days of our youth, was beautiful and full of charm. If there

C. E. GRUNSKY*

were trials and tribulations then—and there must have been such—they have been forgotten; only the best of life remains in our memory to make up that beautiful picture of what has been and what will never be again. O, what a benign arrangement this is!

There are visions of the past and visions of the future. The former belong to the old and the latter to the young. Visions of the future are not chimerical; nor are those of the past, as I shall attempt to show you. Judging from my own experience, the life of a human being may be segregated into three distinct periods or phases.

The first period. The time of unbounded youth and unbounded care-free life, that blissful period of ideal thoughts and conceptions when the air castles are built. They contain the presentiments of the future; these strange cloud edifices created by the imagination of the human mind fill us with hope and ambition. They are so beautiful, so real, so tangible, although so far away—but their very distance adds to their inexpressible charm.

The second period. That of reality and activity, when we are brought face to face with the prosaic necessities of life. It is the struggle of ambition for success; for wordly goods, for money; the strife for a position in life, for preferment and power. We are ready and willing to fight the battle. No more air castles—they are built of air; they do not exist; they are dreams; such is our reasoning at this period of life. Human life is too serious to admit of dreaming. Men are made of sterner stuff; they dream not. Let youth dream and build its air castles. It is the privilege of youth. On with the battle.

The third period. That of contemplation. The time of retrospection. What has been the object of this life? What, after all, is its meaning? Whence? Why? Whither? Now that our life is an open book from the beginning to the approach of its end, what is it that has given it content? What has been its greatest reality? Contemplate it for a moment. Has it been the strife for power, for recognition, for wealth? O, No! No! Not that. We realize it now. What then was it? Let me tell you: It was the air castle! It and it only has been the real attribute of life which has given it its charm and has made it worth living? The castle was not built of air; it was spun of that subtle thread of which the human soul itself was woven by the Great Creator of All!

[FINIS]

Editor's Note—The publishers of **Western Construction News** will appreciate receiving comments from subscribers as to their interest in, and the value of, this series of articles on the 'Pioneer Engineers of California', as re-publication in bulletin form is being considered.

*Member, American Society of Civil Engineers; father of C. E. Grunsky, Jr., and Eugene L. Grunsky, members, American Society of Civil Engineers.

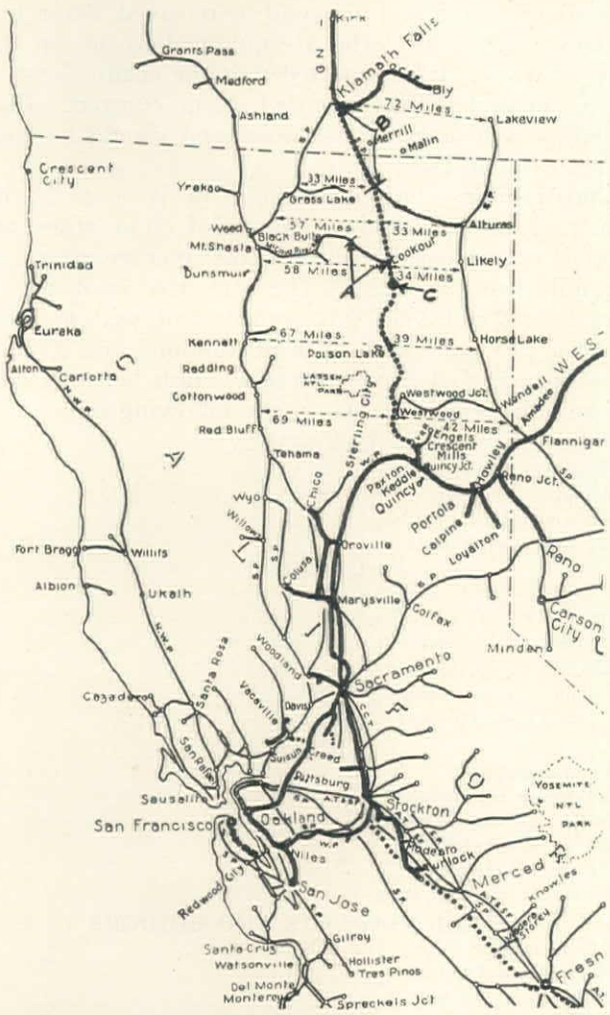
LAKE UNION BRIDGE, SEATTLE

Three errors appeared in the staff article on the engineering features of the Lake Union bridge, Seattle, in the May 10th, 1930, issue, p. 226-228. They are corrected as follows: (1) The anchor arms of the main cantilever span are 350 and 300 ft. on the north and south ends, respectively, instead of 225 and 200 ft. as stated. (2) Under present plans the total number of contracts on this project will be five instead of three. These will be divided into: piers for main structure (let to Pacific Bridge Co., Portland, Oregon, in December, 1929); remaining piers and reinforced concrete approaches (bids opened June 3 for 16,300 cu. yd. excavation; 18,100 lin. ft. reinforced concrete piling; 1350 lin. ft. 6-in. drain and sewer pipe; 11,140 cu. yd. concrete; 1,800,000 lb. reinforcing steel; and 130,800 lb. structural steel; contract awarded L. Coluccio & Co., Seattle, at $335,808); steel superstructure and concrete deck (bids opened June 24 with U.S. Steel Products Co. low at $1,247,888 on 6,900,000 lb. carbon and 8,100,000 lb. silicon structural steel, 480,000 lb. castings, 3800 cu.yd. concrete, 1,000,000 lb. reinforcing steel, and 4220 lin.ft. metal railing); lighting system; and plaza development at north approach. (3) Through economies in design and use of the least expensive type of steel, each 1-ton saving in weight of superstructure will save over $200 in cost of substructure and superstructure.

Great Northern-Western Pacific Connecting Line Authorized

Joint 200-Mile Railroad Between Klamath Falls, Oregon, and Keddie, California, to Cost $15,000,000—Bids on Western Pacific Portion About July 20, with Work to Start This Summer and Be Completed Early in 1932—Great Northern Portion Dates Not Settled

The Interstate Commerce Commission, in a unanimous decision on June 9, conditionally authorized the Great Northern Railway Co. to construct and operate a railroad line in Klamath county, Oregon, and Siskiyou, Modoc, and Lassen counties, California; authorized the Western Pacific Railroad Co. to construct and operate a railroad line in Plumas and Lassen counties, California, and to operate under trackage



Great Northern-Western Pacific 200-Mile Connecting Link Between Klamath Falls and Keddie, Showing: A—Logging Branch; B—24-Mile Section Paralleling Southern Pacific; C—Joint Yard Near Bieber

rights over a portion of the Great Northern line in Lassen and Modoc counties; and authorized the two companies to jointly construct and/or acquire and jointly operate a line in Modoc and Siskiyou counties, California. The three applications, taken together, are for a connecting link 199.54 miles long between existing lines of the Great Northern at Klamath Falls, Oregon, and the Western Pacific at Keddie, California; with a branch extending 36 miles west from Lookout to a connection with the McCloud River Railroad near Hambone, California.

Division of Work—Of the connecting link, 2.27 miles will be a joint yard near Bieber, California; 111.87 miles will be Western Pacific trackage from Keddie to the joint yard; and 85.40 miles will be Great Northern trackage from a point on its line 2.70 miles southerly from Klamath Falls to the joint yard. The distance between existing termini (Keddie and Klamath Falls) will be 202.24 miles. In addition, there will be 22 miles of Western Pacific sidings and spurs, 4.93 miles of Great Northern sidings and spurs, and 6.63 miles of joint yard tracks near Bieber. The Western Pacific will have trackage rights over the Great Northern northerly from Bieber about 10 miles to the turnout switch of the branch line connecting with the McCloud River Railroad.

Applications for this connecting link were first filed February 14, 1929; field parties were sent out in March, 1929; and a hearing was held November 13, 1929. The Interstate Commerce Commission permit was issued June 20, 1930, culminating a bitter fight in which the applications were supported by 66 intervenors and opposed by 15 intervenors.

New Line Needed—San Francisco and Portland are now directly connected by rail by only one carrier, the Southern Pacific, and the sole part of California benefited by rail competition to and from Oregon and Washington points is a small area around Los Angeles served by the Union Pacific. Construction of the Klamath Falls-Keddie connection will extend the competitive area to include all California points served by the Western Pacific and Santa Fe. The Great Northern will provide through passenger service by the 'Empire Builder' operating between Chicago, St. Paul, Spokane, and San Francisco.

The practicable capacity of the Southern Pacific 'Shasta Route' will probably be reached by 1937, notwithstanding diversion of traffic by the Alturas cutoff. Thereafter it would be necessary to provide a complete second route between Klamath Falls and the Sacramento valley, 200 miles, at a cost of about $13,000,000, or to double-track the Southern Pacific between Gerber and Eugene at a cost of about $40,000,000. The new line will not only give more transportation, but will furnish an essential route should the existing line be blocked. Its distance from the coast will be an additional protection against coast or air raids in time of national emergency.

The principal importance of the proposed line is as

a bridge or connecting link between systems. The line will aid in development of a great timber area and considerable agricultural area in northern California.

The new line lies generally 50 to 60 miles east of the Sacramento valley line of the Southern Pacific from Tehama to Black Butte, and about 40 miles west of the Nevada-California-Oregon line of the Southern Pacific between Wendel and Alturas. For 50 miles south of Klamath Falls, the proposed line and the Southern Pacific average 2 miles and nowhere exceed 6 miles apart and it has been proposed by the Commission that joint use be made of 24 miles of the Southern Pacific in this territory. Thereafter the lines diverge, the average distance to other common carrier railroads being 11.7 miles, and to other railroads including logging lines 7 miles.

Physical Features—On the Great Northern line north of Bieber, the curvature will generally not exceed 3 deg., with maximum grades of 0.8% compensated. In the mountainous country to the south, the Western Pacific will have maximum curves of 10 deg. and compensated maximum grades of 1.8% southbound and 2.2% northbound. The northbound maximum of 2.2% is a helper grade 9.5 miles long, between Greenville and Wolf Creek Summit; otherwise the maximum in this direction is 1.5% compensated.

The north half of the territory through which the Great Northern will pass consists of relatively level land, including 15 miles in the reclaimed Tule lake bed of the Klamath Valley Reclamation District. The south half of the Great Northern line is in gentle rolling country. For 8 to 10 miles southward from the Tule lake bed, the line lies in lava beds, with no timber, and thence to Bieber in pumice flats or timber or farming lands. The Western Pacific line traverses a rolling and mountainous country, largely in timber, with considerable portions in tillable valleys. Klamath Falls is at elev. 4100 ft. and Bieber, in Big Valley, is at about the same elevation, while Fall river valley, 10 to 20 miles to the west, is 700 ft. lower. The northwest extension of the Sierra Nevada range is crossed near Westwood Junction east of Mount Lassen at elev. 5700 ft. Thence to the south the line passes through Westwood, elev. 5100 ft., and Indian Valley, elev. 3500 ft., to Keddie, elev. 3200 ft. Keddie, on the main line of the Western Pacific in Feather river canyon, is about 155 miles south and 41 miles east of Klamath Falls, or 160 miles distant on an air line. The area accessible to the new connection is said to be 12,800 sq.mi.

From Mount Shasta City on the Southern Pacific, the McCloud River Railroad extends 50 miles east to Hambone, with an 11-mile branch to Pondosa and a logging spur 24 miles long from Hambone to White Horse. This spur is being extended 12 miles through timber to Lookout, where it will connect with the Great Northern Line, using a limiting eastbound grade of 2.8% and westbound grade of 2.0%, both uncompensated. Purchase and operation of this road from Lookout to Hambone by the two main-line companies is provided for after completion of the Klamath Falls-Keddie extension.

Financing—The estimated cost of building and equipping the lines, as submitted to the Commission, is as follows:

Line	Roadbed	Equipment	Sub-Totals
W.P. (Keddie-Bieber)	$9,824,669	$241,507	$10,066,176
G.N. (Klamath Falls-Bieber)	3,294,620	276,000	3,570,620
Joint McCloud Branch (Lookout-Hambone)			500,000
G.N. Rehabilitation (Bend-Chemult)			800,000
Total			$14,936,796

The Great Northern expects to finance construction by current funds and the Western Pacific by the issue of 5% debenture bonds or notes not exceeding $5,000,000, with the remainder from cash assets as available and issue and sale of 5% first-mortgage bonds, with necessary equipment to be financed from treasury funds, etc.

WESTERN PACIFIC PROJECT

Specifications will be ready for the Western Pacific line about July 5 and bids will be received about July 20 from contractors who are qualified to bid on this type of work. It is expected that the entire Western Pacific project will be awarded in one contract. Construction will start this summer and should be completed early in 1932.

Construction—The 111.87 miles of Western Pacific construction has a total tangent of 68.14 miles and total curvature of 12,761 deg., the average curvature per mile being 114 deg. The total rise is 3198.17 ft. northbound and 2301.08 ft. southbound, with an average rise per mile of 28.59 ft. northbound and 20.57 ft. southbound. Other construction details between Keddie and Bieber are shown in the following table:

CLEARING

392 acres heavy
394 acres medium
476 acres light
217 acres sagebrush

GRADING

1,264,354 cu.yd. solid rock excavation
788,148 cu.yd. loose rock excavation
779,903 cu.yd. common excavation
256,626 cu.yd. loose rock borrow
560,291 cu.yd. common borrow
3,655,771 sta.yd. overhaul

TUNNELS

12 in number
6500 ft. total length
542 ft. average length
950 ft. longest
300 ft. shortest
17 by 22-ft. clear cross-section

STEEL VIADUCTS AND BRIDGES

14 in number
5345 ft. total length
382 ft. average length
1565 ft. longest
40 ft. shortest
5100 tons structural steel required
18,533 cu.yd. 1:2:4 concrete piers and abutments

TIMBER TRESTLES (PILE AND FRAME)

10 in number
1350 ft. total length
135 ft. average length
435 ft. longest
15 ft. shortest
275,000 f.b.m. douglas fir required
3300 lin.ft. piling required
1733 cu.yd. concrete footings

LINE PROTECTION

560 cu.yd. rubble masonry retaining wall
1231 cu.yd. loose rip-rap
17,720 sq.ft. concrete tie cribbing (face measure)
2 overhead grade crossings
12,330 cu.yd. solid rock excavation for road; channel changes; and drainage ditches
8320 cu.yd. loose rock excavation for road; channel changes; and drainage ditches
11,675 cu.yd. common excavation for road; channel changes; and drainage ditches
8400 cu.yd. borrow for road; channel changes; and drainage ditches
1343 panels snow fencing

TIES

412,971 douglas fir cross ties
511 f.b.m. bridge ties
87 sets switch ties

RAIL

85-lb. throughout
17,845 tons

BALLAST

354,000 cu.yd. gravel or volcanic cinders

STATIONS

To be established at Crescent Mills, Greenville, and Westwood, and at other points where required

SIDINGS AND SPURS

22 miles, also 6.63 miles in joint Bieber yard
5 to 10 miles spacing between

INTERMEDIATE FACILITIES

Eighteen section headquarters
Six 60,000-gal. wooden water stations
Two 75,000-gal. steel oil service tanks
Five stockyards

Western Pacific Personnel—J. W. Williams, chief engineer, and T. L. Phillips, principal assistant engineer, of The Western Pacific Railroad Co., with offices at San Francisco, will have general direction of that company's project. R. A. Hollenbeck, construction engineer, will be in direct charge of construction between Keddie and Bieber and will have seven residencies with a total field force of about 100 men. Two survey parties are now in the field, headquarters being at Greenville and Little Valley (Bognuda's Ranch). Additional engineering forces will be added as the work progresses.

GREAT NORTHERN PROJECT

Construction—The dates specifications will be ready and bids asked on the Great Northern project are not known at this time.

The total length of the Great Northern portion is 87.67 miles (including the joint Bieber yard), of which 81.52 miles is tangent. Maximum grades in both directions are 0.80% compensated. The total rise northbound is 582 ft. and southbound 602 ft. The total curvature is 460° 33′ and the average curvature per mile 5° 15′; the maximum curvature being 4 deg. Other construction details between the joint yard near Bieber and a connection with existing Great Northern tracks near Klamath Falls are as follows:

CLEARING

114 acres heavy
426 acres light and sagebrush

GRADING

186,312 cu.yd. solid rock (lava) excavation
47,038 cu.yd. loose rock excavation
57,010 cu.yd. common excavation
7000 cu.yd. lava rock borrow
106,249 cu.yd. loose rock borrow
157,690 cu.yd. hardpan borrow
870,346 cu.yd. common borrow
729,000 sta.yd. overhaul

Tunnels

None

STEEL VIADUCTS AND BRIDGES

5 in number
219 ft. total length
On pile piers

TIMBER TRESTLES

3200 ft. total length
540,000 f.b.m. required
45,000 lin.ft. piling required
No concrete footings

LINE PROTECTION

No retaining walls
No grade crossings
No road and channel changes and drainage ditches
100 miles right-of-way fencing
No snow fencing

TIES

286,000 untreated cross ties
Dimensions 7 by 9 in. by 8 ft. 6 in.
41 sets switch ties

RAIL

90-lb. new throughout
14,000 tons

BALLAST

266,000 cu.yd. volcanic cinders

STATIONS

None existing

BIEBER YARDS

10-stall round house
Machine shop
Boiler house
Sand house
Oil station with 10,000-bbl. oil storage tank and 65,000-gal. oil service tank
100,000-gal. water station
Yard office
Icing facilities
Stock yards

SIDINGS AND SPURS

Five sidings, each 4000 ft.
14 miles average spacing between

INTERMEDIATE FACILITIES

No. of section headquarters not settled.
Four 50,000-gal. water stations
No intermediate oil stations

Great Northern Personnel—J. R. W. Davis is chief engineer and Frederick Mears is assistant chief engineer of the Great Northern Railway Co. Two survey parties are now in the field, with headquarters at Lookout.

NATURAL GAS LINE EXTENSIONS

The P. G. & E. Co. has applied to the California Railroad Commission for permission to extend its natural gas transmission line as follows: 3.11 miles of 16-in., 37 miles of 12-in., and 1.52 miles of 8-in. pipe from a point on the Standard-Pacific line near the Carquinez bridge to Petaluma and a connection with the Sausalito-San Rafael-Santa Rosa system; a connection between the Carquinez-Petaluma line and the existing Vallejo-Napa line; 26.64 miles of 6-in. main between Napa and St. Helena; 5.70 miles of 4-in. main between St. Helena and Calistoga; 6.99 miles of 6-in. and 4.81 miles of 4-in. mains from Schellville to Glen Ellen; and 17.10 miles of 6-in. main from Santa Rosa to Healdsburg.

PERSONAL MENTION

Hugh L. Cooper, holder of power rights for the $17,000,000 Z-Canyon project on the Pend Oreille river near Metaline Falls, Washington, inspected the site of this proposed development on June 24.

J. O. Wanzer, an engineer with the California State Highway Commission. district VI, at Fresno, spoke before the Fresno Engineers Club on June 11, his subject being 'Engineering Experiences Abroad'. Wanzer spent several years on railroad and other work in China, Alaska, Brazil, and Siberia.

J. R. Iakish, engineer of the Bureau of Reclamation at Denver, Colorado, has been designated to make investigations for the proposed Alcova-Casper and Saratoga project, with temporary headquarters at Saratoga, Wyoming. This investigation is being made in cooperation with the state of Wyoming.

Chad F. Calhoun, formerly engineer on the San Gabriel dam for Fisher, Ross, MacDonald & Kahn, has been made chief engineer and general manager of the firm's Los Angeles office. Fisher, Ross, MacDonald & Kahn are now constructing the Fourth st. viaduct for the city of Los Angeles, contract price $1,246,000.

Ernest C. Willard, consulting engineer, Portland, remains as secretary-treasurer of the Pacific Northwest Section, American Water Works Association, as R. F. McLean, who was elected at the third annual meeting, has declined to serve in that office. Other officers of the section are as listed on p. 244 of the May 10th, 1930, issue.

Hollis R. Thompson, secretary-manager of the Berkeley Chamber of Commerce for the past 3½ years, has been named city manager, succeeding John N. Edy, resigned. Thompson took office June 15 at an annual salary of $7000. He was elected by a 5 to 4 vote of the city council. A number of engineer-city managers applied for the position.

Lochiel M. King, of Alameda, California, has been appointed traffic manager for the port of San Francisco. From 1911 to 1922 he was a member of the chief engineer's staff, Board of State Harbor Commissioners, and in 1923 was commercial development agent for the port. King assisted in promoting the Alameda estuary subway (Posey tube), and served as construction engineer.

William L. Sibert, major general, U. S. A. (retired), Charles P. Berkey, Daniel W. Mead, Warren J. Mead and Robert Ridgway, comprising the Colorado River Board, have approved the recommendation of R. F. Walter, chief engineer of the Bureau of Reclamation, that the height of Boulder dam be increased 25 ft. or to elev. 1232 ft. (maximum height above bedrock, 735 ft.), providing a reservoir capacity of 30,500,000 ac-ft.

Charles H. Lee, consulting engineer, San Francisco, has established the Pacific Hydrologic Laboratory in connection with his engineering practice. The purpose of this laboratory is to obtain accurate data for the solution of engineering problems involving the occurrence and movement of subsurface water in sedimentary deposits and soils. The laboratory is also prepared to make field tests of underflow, etc., and to undertake special subsurface water investigations and research.

Frederick Charles Herrmann, consulting engineer, San Francisco, has consented to be a nominee for Director of District 13, American Society of Civil Engineers, and will probably be elected. Although this office is an honor and carries considerable prestige, it entails a big sacrifice of time and considerable personal expense, and few engineers are in a position to accept. The members of the San Francisco Section should feel fortunate in securing such a worthy successor to Frederick Hall Fowler.

Herbert Deakyne, brigadier general, Corps of Engineers, assistant chief engineer, U. S. Army, has accepted a voluntary reduction to the rank of colonel in order that he may continue to serve on the rivers and harbors improvement program instead of accepting retirement with the higher rank. Deakyne was prominently mentioned for chief of army engineers to succeed Edward Jadwin, major general (retired), but would have reached the retirement age before completion of his tour of duty.

Ray L. Derby, who designed the filtration plant for the Chenery development of the California Water Service Co. (see June 10th issue), has been employed by Stevens & Koon, consulting engineers, Portland, Oregon, to design units for a gravity type filtration plant of 12,000,000 g.p.d. probable ultimate capacity for the Washington Gas & Electric Co. at Longview, Washington. As sanitary engineer for Salisbury, Bradshaw & Taylor, Los Angeles, Derby was on the design of the Beverly Hills, California, 5,000,000-g.p.d. water softening and filtration plant (see October 25th, 1927, issue).

H. M. Westergaard, professor of theoretical and applied mechanics, University of Illinois, employed by the Bureau of Reclamation for the past year on special mathematical studies in the design of the Boulder dam, has been assigned to a study of cracks in dams, including theoretical analyses and field investigations. The study, recommended by the Boulder dam Consulting Board (L. C. Hill, D. C. Henny, A. J. Wiley, W. F. Durand and F. L. Ransome) has been started as one phase in a comprehensive investigation of volumetric changes in concrete under conditions applicable to dam construction.

James H. Polhemus, chief engineer and general manager of the port of Portland, Portland, Oregon, has been named from American Engineering Council as one member of a committee on airport drainage and surfacing. This committee, with a membership of 13, is composed of representatives of American Engineering Council, the American Road Builders Association, and the aeronautics branch of the U. S. Department of Commerce. Polhemus is the only western member on the committee. Harry H. Blee, director of aeronautic development, U. S. Department of Commerce, is the committee chairman.

TWO USEFUL NOMOGRAPHS

Two nomographic design diagrams have been prepared by John R. Jahn, civil engineer, San Francisco. One diagram solves reinforced-concrete beam and slab problems, while the other gives a simple, clear, but unique solution of Kutter's hydraulic formula.

With these nomographs especially, problems can be solved by use of a straight-edge and pencil-point, and are unique in their simplicity and accuracy. No formulas are required, and ample directions, with examples, are printed on the diagrams; the decimal-point is found always in the right place. The foundation formulas upon which the diagrams are based are reliable, and the diagrams have been advantageously used to simplify preliminary designs and estimates. Jahn's diagrams are obtainable on heavy paper or cloth and are offered for sale in the 'Opportunity Pages' of this issue.

ASSOCIATIONS

Oakland Engineers' Club—At a regular weekly luncheon on June 20, James E. Waddell, attorney and former lieutenant in the engineering department of the U. S. Navy, described 'the workings of Congress'. At the preceding meeting H. I. Benjamin, assistant engineer of bridges, Southern Pacific Co., spoke on the 'Suisun Bay Bridge,' for which he has charge of construction and field work.

AMERICAN WATER WORKS ASSOCIATION

On June 18, Arthur E. Gorman, chairman of the A. W. W. A. membership committee, reported that 440 (88%) of the quota of 500 new members for 1930 had been obtained. The standing of the four local sections in the far west as of that date follows:

Local Section	Membership Added	Quota	% of Quota
California	25	25	100
Montana	3	6	50
Pacific Northwest	16	15	107
Rocky Mountain	8	20	40

Special membership drives will be organized this fall in connection with annual meetings of the various local sections.

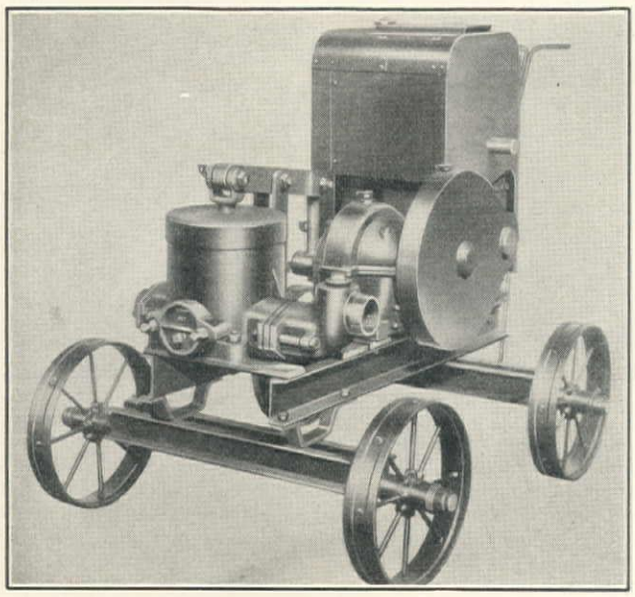
New Equipment and Trade Notes

AMERICAN PIPE MANUAL

The 8th edition, American Pipe Manual, containing 186 pages (pocket size) of standard specifications and pipe information, is ready for distribution to all users of cast-iron pipe and fittings. The book is divided into 10 sections, as follows: (1) history; (2) bell and spigot pipe and fittings for water service; (3) pipe for gas service; (4) mono-cast centrifugal pipe; (5) flanged pipe and fittings, A.W.W.A. standard; (6) flanged pipe and fittings, American standard; (7) special joints for cast-iron pipe; (8) cement-lined pipe; (9) Acipo cast-iron columns; (10) miscellaneous tables and general information for water and gas works superintendents and contractors. Copies of the manual may be obtained from the American Cast Iron Pipe Co., Birmingham, Alabama.

NOVO ROLLER RING PLUNGER PUMP

The Novo Engine Co., Lansing, Michigan, has produced a roller ring plunger pump for contractors, public utilities, and others having dewatering problems. This unit departs from the diaphragm, packed plunger, centrifugal, and other types of pump, as it has no diaphragms, no packing, and no oil seal.



Novo Roller Ring Plunger Pump

A liquid-tight water seal is maintained by two rubber rings on the plunger. These rings roll with the action of the piston as they are pressed against the cylinder wall; the rolling action reduces friction and lessens wear, so that one set of rings may be used for a full season. The plunger operates at 120 strokes per min. and thus permits the water to carry much suspended foreign matter. A straight line flow exists from the suction inlet to the discharge, and the rapidity of stroke creates a more uniform flow of water than is possible with a slower acting pump.

The pump weighs 960 lb. It has a capacity of 3500 to 5000 g.p.h. and develops a 100-ft. head. For high-speed hauling, the pump may be mounted on a coil spring rubber-tired trailer, whereas the standard mounting is a 4-wheel truck.

HERCULES MOTORS ENLARGES PLANT

To meet the growing demand for its heavy-duty 4 and 6-cylinder internal combustion engines, the Hercules Motors Corp., Canton, Ohio, twice enlarged its manufacturing facilities during 1929, the total addition being 75,000 sq.ft. of roofed-over floor space. Greatly increased sales raised the 1929 net earnings to more than twice those of 1928. The Hercules

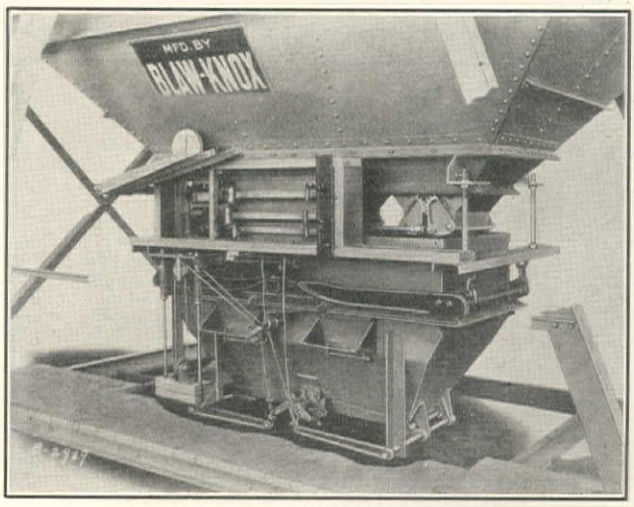
Hercules Motors Corp. Factory. (Upper) Testing and Shipping Departments. (Lower) Engine Assembly Room

output for the first quarter of 1930 has shown a substantial increase over the like period for 1929 and the present year has considerable promise.

To supervise export sales and handle sales promotion among Hercules distributors, Lon R. Smith was recently appointed assistant director of sales.

BLAW-KNOX TRIPLE WEIGHING BATCHER

The Blaw-Knox Co., Pittsburgh, Penn., manufacturer of steel products, has developed an improved type of triple weigh-



Blaw-Knox Triple Weighing Batcher

ing batcher for three-compartment bins. Each compartment is fitted with a clamshell gate with easy lever arrangement for quick operation and accurate control.

JOHNSON BANTAM WEIGH BATCHER

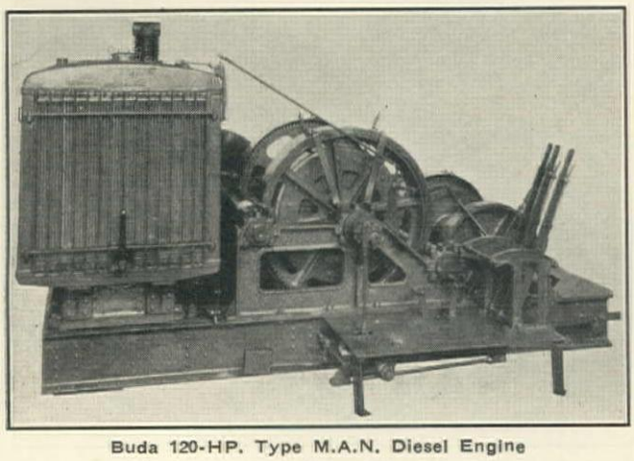
The C. S. Johnson Co., Champaign, Ill., manufacturer of material storage bins, central mixing plants, batch measuring hoppers, and hydrogravic batchers, announces the 'Bantam Weigh Batcher' for wheelbarrow batching of accurately weighed aggregates on building, culvert, small bridge, and

Johnson 'Bantam Weigh Batcher'

curb and gutter construction where the setting up of a complete bin and batch plant is not justified. This unit weighs only 280 lb. and can be moved about the job by one man, as it is equipped with two 15-in. wheels. It has a shoveling height of 42 in. and a capacity of 4 cu. ft., or 400 lb. The discharge is by a simple one-lever sliding gate, loading being done through a round, unobstructed, and freely suspended hopper. A Johnson weighing unit is used, with bronze scale parts. The beam balance indicator can be set for a desired weight and then read from either side; there are no springs. As it is separate from the mixer, the batcher can be kept at the stockpile while the mixer moves along with the job.

BUDA DIESEL ENGINE

For dredging and building levees on rivers dividing King and Pierce counties, Washington, the Inter-County River Improvement, of Tacoma, is using a 120-hp. Buda type M. A. N.



Buda 120-HP. Type M.A.N. Diesel Engine

diesel engine. This equipment is mounted on a steel frame with and driving a double drum two-speed hoist, and operates a heavy-duty 3-yd. dragline bucket. It is used to remove large gravel from the channel of the Stuck river and pulls the gravel to the bank, where it is built up into a levee. As the outfit works along the soft banks of the river and must be moved every 2 or 3 hours, light weight without sacrifice of available power was essential in selecting a power unit. The average haul is 500 ft., the last 100 ft. of which is on a 3 or 4:1 slope. The bucket speed is 325 ft. per min. in high gear. Fuel consumption is 40 gal. per day (at 4c per gal.) and the total cost per day, including fuel and lubricating oils, labor, wire rope, and upkeep, is $24. The dredging unit handles 500 to 600 cu.yd. per day at an average cost of less than 5c.

CATERPILLAR '60' LEANING WHEEL GRADER

The Caterpillar Tractor Co., of San Leandro, Peoria, and Minneapolis, announces a new '60' leaning wheel grader for delivery from July 1. This unit is the heaviest of the 15 Caterpillar graders and maintainers, weighing 11,300 lb. without and 12,860 lb. with scarifier. It has a 12-ft. blade which, with a 42-in. lateral side shift, can make a bank cut of 6½ ft. on a 60-deg. slope. Three-point control maintains correct blade pitch whether cutting or drifting; seven control wheels governing the nine important adjustments of blade pitch and

Caterpillar '60' Leaning Wheel Grader

position, wheel adjustment, and steering. The lifting mechanism is mounted on ball and roller bearings. A compensating spring lift equalizes tension on both ends of the blade and exerts a uniform lifting force at any blade elevation. Tractor draft is applied directly on the blade through the tractor pole and down the drawbars.

The unit can be specially equipped with a 750-lb. backsloper. Additional information is included in the catalog on 'Caterpillar Leaning Wheel Graders', form S.L. 1968, and in a broadside, form S.L. 1929, both available from local dealers or the factory.

HARNISCHFEGER ANNOUNCEMENT

T. W. Burns, who has had wide experience in selling the larger sizes of excavators, has joined the Harnischfeger Sales Corp., with headquarters at the Milwaukee home office of the general sales department.

G. H. WILLIAMS CO. ANNOUNCEMENT

The G. H. Williams Co., of Erie, Pennsylvania, manufacturer of the new Williams 'Champion' dragline and clamshell buckets and Williams 'Arch-Girder' heavy-duty trailers, announces the appointment of Kratz & McClelland, of San Francisco, as agents for northern California. Besides service for Williams products, complete stocks will be carried in the warehouse at all times.

UNIT BID SUMMARY

Note: These unit bids are extracts from our Daily Construction News Service

BRIDGES AND CULVERTS

SACRAMENTO, CALIF.—STATE—TEHAMA AND SHASTA COUNTIES—UNDERGRADE CROSSING AND CONCRETE PAVING AND GRADING

Contract awarded to C. W. Wood, PO. Box 1435, Stockton, who bid $135,058 to California Division of Highways, Sacramento, for undergrade crossing and 0.9 miles roadway grading and concrete paving at Cottonwood Creek, TEHAMA AND SHASTA COUNTIES. Bids from:

(1) C. W. Wood, Stockton (low) $135,058
(2) Ward Engineering Co., San Francisco 136,006
(3) Rocca & Caletti, San Rafael 139,050
(4) Fredrickson & Watson, Oakland 149,565
(5) Jasper-Stacy Co., San Francisco $152,783
(6) Lindgren & Swinerton, Inc., Sacramento 200,943
(7) Dunn & Baker, Klamath Falls 150,134

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
31,800 cu.yd. road. excav.	.25	.33	.38	.30	.51	.49	.60
226,500 sta.yd. overhaul	.01	.009	.015	.01	.01	.015	.01
7,500 cu.yd. struct. excav.	.50	1.50	.75	1.40	1.20	3.00	1.25
11,500 sq.yd. subgrade	.07	.09	.09	.095	.10	.10	.08
1,500 cu.yd. gr. and sand ball	.80	.45	2.00	1.75	.75	2.00	.60
1,850 cu.yd. slag and sand bal	3.00	3.00	4.25	3.85	3.15	3.00	3.70
2,200 cu.yd. "A" conc. (pave.)	11.00	9.00	11.75	11.00	10.50	14.00	12.00
120 cu.yd. "A" conc. (curb)	15.00	15.10	16.00	17.10	17.00	17.00	16.00
2,780 cu.yd. "A" conc. (struc.)	17.50	14.25	13.10	15.60	16.80	24.00	15.00
400 cu.yd. "A" conc. (sl. pave.)	12.50	15.20	14.00	24.00	15.00	15.00	13.50
570 cu.yd. "B" conc. (abut.)	16.00	14.40	13.10	16.75	16.00	21.00	15.00
340,000 lb. reinf. steel	.046	.0475	.046	.05	.05	.045	.05
4,200 lb. sheet copper	.25	.44	.45	.50	.46	.40	.35
200 lb. cast steel	.08	.18	.20	.15	.19	.12	.20
75 ft. pipe handrail	2.00	1.60	2.50	3.00	1.70	1.50	2.00
1 pumping equipment	$1,000	$1,900	$1,850	$1,500	$1,900	$4,000	$2,000
700 ft. 8-in. metal underdr.	1.50	1.70	1.35	1.50	2.00	1.25	1.40
50 ft. 12-in. reinf. conc. cul.	1.50	1.40	1.50	1.50	1.50	1.25	1.50
134 ft. 18-in. corr. pipe	.50	.60	1.00	.60	.65	.50	2.00
212 ft. 24-in. corr. pipe	.50	1.00	1.00	.60	.85	.70	2.75
70 ft. pipe, clean and relay	1.00	1.20	3.00	.85	1.30	.70	1.00
750 yd. scr. gravel	2.00	2.60	2.50	2.00	2.00	2.50	1.25
110 bbl. fuel oil	3.50	4.30	3.00	3.00	10.00	3.50	3.00
1,050 cu.yd. rem. concrete	2.50	1.60	3.50	2.00	2.50	5.50	1.25
41 sta. finish roadway	7.00	6.00	5.00	5.00	6.00	12.50	10.00
21 monuments	3.00	3.00	3.00	3.00	2.50	2.50	3.00
Miscellaneous work	$500	$3,000	$1,000	$850	$1,500	$1,000	$700

SACRAMENTO, CALIF.—STATE—UNDERGRADE CROSSING—PLACER COUNTY

Contract awarded to Lord & Bishop, Native Sons Bdg., Sacramento, $57,816 to California Division of Highways for undergrade crossing near Emigrant Gap, PLACER COUNTY. Bids on:

(1) 14,500 cu.yd. excavation
(2) 35,000 sta.yd. overhaul
(3) 1,290 cu.yd. F concrete
(4) 790 cu.yd. C concrete
(5) 6,700 lb. reinf. steel
(6) 560 tons crusher run base
(7) 235 tons un. gravel or stone surfacing
(8) 39 M gallons watering
(9) Miscellaneous work

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTALS
Lord & Bishop, Sacramento	1.30	.015	18.00	17.00	.05	1.00	1.00	4.00	$ 500	$57,810
Ward Engineering Co., San Francisco	1.00	.01	20.50	19.00	.07	1.00	1.00	3.00	1,200	58,891
T. E. Connolly, San Francisco	1.35	.01	20.00	18.00	.06	1.00	1.00	3.00	500	61,764

SACRAMENTO, CALIF.—STATE—CONCRETE—SISKIYOU COUNTY

Bids received as follows by California Division of Highways, Sacramento:

(A) SISKIYOU COUNTY—Rocca & Caletti, Toll Road, San Rafael, $77,779 low for reinf. concrete bridge over Klamath River, 10 miles north of Yreka. Bids on:

(1) 880 cu.yd. structure excavation
(2) 80 cu.yd. 'A' concrete (tremie)
(3) 1,165 cu.yd. 'A' concrete
(4) 610 cu.yd. 'B' concrete
(5) 34 cu.yd. Class 'E' concrete
(6) 268,000 lb. reinf. steel
(7) Miscellaneous work

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	TOTALS
Rocca & Caletti, San Rafael	10.00	20.00	29.00	29.00	60.00	.048	$1000	$77,779
Pacific Bridge Co., Portland	10.00	29.00	29.00	24.00	60.00	.05	$3000	77,985
Ward Engr. Co., S. F.	10.80	26.00	29.60	30.00	62.00	.051	$445	80,589

(B) SISKIYOU COUNTY—Rocca & Caletti, Toll Road, San Rafael, $97,884 low for bridge over Shasta River about 7½ miles north of Yreka. Bids on:

(1) 1,675 cu.yd. struct. excav.
(2) 475 cu.yd. 'A' concrete (tremie)
(3) 1,235 cu.yd. 'A' concrete
(4) 375 cu.yd. 'B' concrete
(5) 830 cu.yd. 'F' concrete
(6) 48 cu.yd. 'E' concrete
(7) 365,000 lb. reinf. steel
(8) Miscellaneous work

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	TOTALS
Rocca & Caletti, San Rafael	2.00	12.00	27.30	27.30	27.30	60.00	.048	$1822	$ 97,884
Ward Engr. Co., S. F.	4.60	20.40	25.00	22.40	28.40	62.00	.051	$450	102,283
M. B. McGowan, S. F.	3.50	15.00	30.00	16.00	31.00	70.00	.05	$600	103,977
Bodenhamer Const. Co.	4.00	20.00	28.00	24.00	29.75	70.00	.05	$500	106,582
Pacific Bridge Co.	4.00	12.00	32.00	22.00	33.00	60.00	.05	$2500	111,190

SEWER CONSTRUCTION

RENO, NEVADA—CONCRETE SEWERS, PUMPING STATION AND TREATMENT PLANT

Contract awarded to Christensen & Co., 109 Sierra St., Reno, Nevada, who bid $329,940 for constructing sewer improvements, involving trunk sewers, sewage pumping station and treatment plant for the city of Reno, Nevada. Bids received from the following:

(1) Christensen & Co., Reno $329,940
(2) Rocca & Coletti, San Rafael 305,343
(3) W. J. Tobin, Oakland 308,429
(4) J. C. Hickey, Berkeley 334,059
(5) Fredrickson & Watson, Oakland $348,560
(6) H. Gould, Sacramento 353,632
(7) Thos. Haverty Co., Los Angeles 352,704
(8) W. F. Hanrahan & R. A. Wattson 411,634

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
UNIT 1—TRUNK SEWERS								
2,960 ft. 39-in. centr. cast conc. pipe	9.15	7.90	8.68	10.00	8.70	8.40	8.50	9.15
4,300 ft. 33-in. centr. cast conc. pipe	8.35	6.20	8.53	9.00	8.20	8.10	8.85	9.77
983 ft. 30-in. centr. cast conc. pipe	7.25	5.60	6.78	8.00	7.10	7.60	7.00	7.70
276 ft. 24-in. centr. cast conc. pipe	6.80	4.30	5.34	6.00	5.30	6.35	6.25	7.10
7,000 ft. 18-in. T&G conc. pipe	3.75	3.00	3.61	4.00	4.00	4.30	3.45	4.54
10,230 ft. 15-in. T&G conc. pipe	2.50	2.42	2.77	2.25	2.65	3.90	2.95	4.54
180 ft. 12-in. T&G conc. pipe	3.15	1.80	2.22	1.70	2.50	3.00	1.25	2.95
10,900 ft. 10-in. T&G conc. pipe	2.40	1.65	2.01	1.50	2.25	2.75	1.75	3.05
2,480 ft. 8-in. T&G conc. pipe	1.90	1.47	1.53	1.10	1.00	2.45	1.75	3.30
18-in. sewer susp. river crossing	$3,336	$3,189	$3,147	$5,000	$4,600	$5,500	$3,800	$5,500
12-in. sewer susp. river crossing	$2,515	1,777	2,160	4,000	3,500	4,500	3,550	3,730
125 ft. 33-in. conc. jack sewer	20.00	16.30	20.00	24.00	25.00	75.00	23.00	16.00
99 manholes	100.00	100.00	100.00	100.00	100.00	80.00	115.00	96.00
800 cu.ft. concrete	1.00	.80	1.00	1.00	.75	1.10	1.50	.86
3,200 lb. reinforcing steel	.06	.05	.045	.07	.05	.10	.05	.058
180 ft. 18-in. sewer	1.40	1.80	1.75	3.00	3.10	1.60	2.60	2.50
130 ft. 12-in. sewer	1.30	1.15	1.25	1.50	2.50	1.10	1.65	2.00
60 15-in. Y branches	1.00	2.00	1.50	2.00	1.75	4.00	2.00	1.25
160 10-in. Y branches	.90	2.00	1.00	2.00	1.25	2.70	.95	1.00
16 8-in. Y branches	.90	2.00	.75	2.00	1.25	2.00	.70	.60
UNIT 2-PUMPING STATION								
Pumping station complete	$5,500	$5,110	$5,430	$6,500	$7,000	$5,000	$6,500	$10,580
240 ft. 8-in. cast iron disch. main	2.25	2.00	2.00	3.00	3.00	3.00	3.35	2.60
UNIT 3-TREATMENT PLANT								
7,650 cu.yd. grading plant site	.95	.60	.60	1.00	.75	.30	1.00	.78
Treatment plant complete	$135,846	$140,000	$117,786	$128,000	$141,000	$122,000	$140,000	$141,345
900 ft. 36-in. pipe sewer	11.00	7.06	8.00	10.00	8.00	7.90	8.00	9.00
120 ft. 24-in. pipe branches	8.25	25.00	5.34	6.00	4.80	10.00	5.75	5.50
264 ft. conc. in diff. chan.	1.00	.80	1.00	1.00	.75	2.00	1.50	.97
640 cu.yd. gravel roadways	2.75	3.50	3.50	4.00	3.50	4.00	5.00	4.50
75 lin.ft. 18-in. corr. iron culvert	2.00	3.50	2.50	3.00	2.50	3.00	3.25	2.60

Work is to be done under bond issue in amount of $350,000. C. C. Kennedy, Call Bldg., San Francisco, is the Consulting Engineer.

STREET AND ROAD WORK

SACRAMENTO, CALIF.—STATE—GRADING AND BIT. MACADAM PAVING—SANTA CRUZ COUNTY

Contract awarded to O. A. Lindberg, 448 North American St., Stockton, who bid $127,229 to California Division of Highways, Public Works Bldg., Sacramento, for 2.6 miles grading and surfacing with bituminous treated waterbound macadam from Waterman Switch-Back to Saratoga Gap. Bids received from the following concerns for the construction of this project:

(1) O. A. Lindberg, Stockton $127,229
(2) E. C. Coats 130,258
(3) J. P. Holland, Inc., S. F. 139,641
(4) R. H. Travers, Los Angeles 144,043
(5) Ariss-Knapp Co., Oakland 153,484
(6) M. J. Bevanda, Stockton 156,052
(7) Granfield, Farrar & Carlin, S. F. $157,201
(8) C. R. Johnson, Portland 166,729
(9) Geo. Pollock Co., Sacramento 167,964
(10) W. A. Dontanville, Salinas 178,033
(11) Kennedy-Bayles Const. Co. 179,893

Bids received on the following items:

(A) 120 stations clearing and grubbing
(B) 243,000 cu.yd. roadway excavation
(C) 320,000 sta.yd. overhaul
(D) 2,570 cu.yd. structure excavation
(E) 33,300 sq.yd. subgrade preparing
(F) 10,480 tons broken stone (Waterbound macadam base)
(G) 1,750 tons screenings (surface treat)
(H) 140 tons Emulsified asphalt (surface treatment)
(I) 36 cu.yd. "A" conc. (struct.)
(J) 2,600 lb. reinf. steel
(K) 3,266 lin.ft. 18-in. corr. pipe
(L) 342 lin.ft. 24-in. corr. pipe
(M) 140 stations finishing roadway
(N) 65 monuments

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(A)	5.00	50.00	70.00	84.00	50.00	40.00	115.00	85.00	85.00	40.00	50.00
(B)	.35	.35	.40	.38	.40	.45	.40	.43	.46	.48	.4575
(C)	.015	.01	.005	.02	.02	.01	.005	.01	.01	.01	.02
(D)	1.50	1.00	.75	1.00	1.25	1.00	1.00	.80	1.20	1.50	1.50
(E)	.09	.10	.09	.09	.10	.05	.08	.10	.11	.09	.12
(F)	1.75	1.80	1.48	1.75	2.30	2.00	2.40	2.75	2.20	2.90	3.25
(G)	2.00	2.00	2.81	2.42	2.30	3.00	3.50	4.05	2.35	4.90	3.75
(H)	28.00	22.00	23.50	20.00	20.00	22.00	24.00	26.00	24.20	25.00	25.00
(I)	25.00	30.00	26.00	22.00	30.00	30.00	25.00	25.00	30.00	25.00	30.00
(J)	.06	.05	.05	.05	.05	.05	.05	.06	.06	.05	.06
(K)	.60	.70	.50	.65	1.00	.80	.75	.50	.90	.50	.60
(L)	.75	.80	.60	1.00	1.00	1.25	.85	.75	1.20	.50	.75
(M)	5.00	5.00	5.00	5.00	10.00	5.00	5.00	5.00	5.00	7.00	5.00
(N)	3.00	3.00	3.00	3.00	3.00	3.50	4.00	4.00	3.00	4.00	3.00

SACRAMENTO—STATE—FRESNO COUNTY—ASPHALT PAVING

Peninsula Paving Co., Standard Oil Bdg., San Francisco, who bid $257,557 low bid to California Division of Highways, Sacramento, for 6.7 miles grading and asphalt paving from Fowler Switch Canal to Fancher Creek, FRESNO COUNTY, Bids from:

(1) Peninsula Paving Co., S. F. $257,557
(2) Valley Paving & Construction Co., Visalia 280,594
(3) Steele Finley, Santa Ana 284,339
(4) A. Teichert & Sons, Sacramento $296,668
(5) Geo. R. Curtis Pav. Co., L. A. 299,993

	(1)	(2)	(3)	(4)	(5)
157 trees remove	10.00	10.00	25.00	12.50	20.00
6 acres clearing and grubbing	50.00	100.00	50.00	50.00	25.00
38,800 cu.yd. roadway excavation	.22	.33	.30	.30	.25
46,600 sta.yd. overhaul	.01	.02	.01	.02	.015
61,400 cu.yd. imported borrow	.40	.45	.48	.50	.40
1,150 cu.yd. structure excavation	.80	1.25	.75	1.00	1.00
38,100 sq.yd. subgrade for paving	.14	.09	.09	.10	.09
190 cu.yd. 'A' concrete (struct.)	20.00	25.00	25.00	22.00	22.00
20,100 lb. reinf. steel (struct.)	.05	.05	.05	.05	.06
43,840 tons asphalt concrete paving	4.01	4.40	4.50	4.76	5.00
960 tons oil treated gravel or stone surfacing	3.50	2.35	2.85	3.00	2.25
53,800 sq.yd. asphalt paint binder	.01	.015	.01	.015	.015
2,650 bbl. fuel oil	2.25	1.80	1.75	2.00	1.75
30 ft. 12-in. corr. pipe	.40	.50	.50	.50	.50
324 ft. 18-in. corr. pipe	.40	.50	.50	.60	.60
322 ft. part circle corr. pipe	.40	.50	.50	.50	.60
6.8 miles move and reset property fence	$275	$200	$250	$200	$220
1,260 cu.yd. remove concrete	2.00	1.70	2.00	2.00	2.00
7,200 tons crusher run base	2.40	2.60	2.25	2.25	2.50
370 feet timber guard rail	1.50	1.60	1.25	1.00	1.25
399 stations finishing roadway	7.00	6.00	5.00	6.00	5.00
53 monuments	3.00	4.00	2.50	3.00	3.00

PORTLAND, ORE.—GRADING—GOVT.—WASHINGTON

Bids received as follows by the Bureau of Public Roads, Portland, Oregon:

(A) Award of contract recommended to Elich & Co., 3001 21st St. South, Seattle, $144,586 for grading 1 mile Klapatche Ridge-Sunset Park, Ridge Unit, Mt. Rainier National Park, PIERCE COUNTY, Wash. Bids on:

(1) 106,800 cu.yd. road. excavation
(2) 34,200 cu.yd. Class B excavation
(3) 2,680 cu.yd. structure excavation
(4) 141 cu.yd. 'A' concrete
(5) 16,000 lb. reinf. steel
(6) 54 cu.yd. cement rubble masonry
(7) 1,060 cu.yd. retaining walls
(8) 360 lin.ft. 18-in. corr. pipe
(9) 60 lin.ft. 24-in. corr. pipe
(10) 238 cu.yd. masonry guard rail
(11) 1,400 cu.yd. cushion material

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	TOTALS
Elich & Co., Seattle	.67	1.16	1.00	38.00	.07	13.50	12.50	2.45	3.75	20.00	.70	$144,586
Myers & Goulter, Seattle	.65	1.55	1.55	40.00	.10	12.00	10.00	2.50	3.50	15.00	1.00	156,302
Allen & Govan, Olympia	.75	1.40	1.00	30.00	.07	26.00	12.00	2.50	3.00	20.00	.40	159,989
Joplin & Eldon, Portland	.75	1.35	1.50	40.00	.07	15.00	13.00	2.00	3.50	20.00	.75	164,692
A. C. Goerig, Seattle	.72	1.50	2.00	30.00	.06	16.00	15.00	2.00	5.00	15.00	.50	166,607
Sam Orino, Spokane	.70	1.60	2.00	40.00	.12	14.00	14.00	2.50	4.50	18.00	.75	169,515
A. C. Greenwood	.75	1.50	1.50	40.00	.10	20.00	13.00	2.50	5.00	30.00	.80	173,405
Myers Contr. Co.	.90	1.45	3.00	50.00	.07	18.00	12.00	1.90	3.00	20.00	.50	186,996
F. J. McHugh, Seattle	.90	2.15	2.00	40.00	.08	20.00	12.00	2.05	2.85	20.00	.60	207,461

(B) Award of contract recommended to F. J. Haas, Grandview, Wash., $60,046 for 3.8 miles grading Tonasket-San Poil Project, Colville National Forest, OKANOGAN AND FERRY COUNTIES, Wash. Bids on (from 4 lowest bidders):

(1) 17 acres grubbing
(2) 140,000 cu.yd. roadway excavation
(3) 79,500 sta. yd. overhaul
(4) 3.8 miles finishing
(5) 300 cu.yd. 'B' concrete
(6) 34,000 lb. reinf. steel
(7) 82 lin.ft. 12-in. corr. pipe
(8) 520 lin.ft. 18-in. corr. pipe
(9) 40 lin.ft. 24-in. corr. pipe
(10) 40 lin.ft. 36-in. corr. pipe

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	TOTALS
F. J. Haas, Grandview, Wash.	$200	.27	.03	$200	28.00	.09	1.25	1.60	2.75	6.00	$60,046
W. L. Giest, St. Maries, Ida.	$100	.30	.02	$200	28.00	.09	1.28	1.68	2.89	7.00	60,894
Sam Orino, Spokane, Wash.	$100	.32	.03	$100	27.00	.08	1.55	1.90	3.00	4.50	63,688
Clifton, Applegate & Toole, Spokane	$125	.33	.02	$200	25.00	.08	1.25	1.75	3.00	5.60	64,286

SACRAMENTO, CALIF.—STATE—SAN DIEGO COUNTY—CONCRETE PAVING

Sander Pearson, Santa Monica, who bid $338,287, low bid to California Division of Highways for 11.2 miles concrete paving from Viejas Creek to Pine Valley, SAN DIEGO COUNTY. Bids received from:

(1) Sander Pearson, 711 16th St., Santa Monica $338,287
(2) Basich Bros. Construction Co., Los Angeles 338,703
(3) Jahn & Bressi, Los Angeles 340,326
(4) E. Paul Ford, San Diego 340,677
(5) Griffith Co., Los Angeles 340,782
(6) R. E. Hazard Contracting Co., San Diego $363,325
(7) Wells & Bressler, Santa Ana 369,282
(8) Watson & Sutton, San Diego 373,606
(9) A. M. Peck, Los Angeles 387,382

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
14,000 cu.yd. roadway exc.	.43	.30	.20	.60	.45	.35	.50	.40	.87
180,000 sta.yd. overhaul	.005	.01	.005	.01	.01	.01	.02	.01	.015
131,500 sq.yd. subgrade for paving	.1175	.115	.08	.07	.10	.10	.11	.11	.09
27,520 cu.yd. 'A' concrete paving	10.54	10.30	10.80	10.60	10.63	11.50	11.61	11.59	12.00
630,000 lb. reinf. steel	.036	.051	.04	.042	.035	.035	.035	.047	.0425
75 cu.yd. remove conc.	3.00	3.00	2.00	2.00	3.00	3.00	4.00	3.00	1.50
590 stations finishing roadway	5.00	3.00	6.00	5.00	8.00	8.00	4.00	5.00	6.00

SACRAMENTO, CALIF.—STATE—SURFACING—NEVADA AND PLACER COUNTIES

Tieslau Bros., 1315 Allston Way, Berkeley, who bid $122,807, low bid to the California Division of Highways, Sacramento, for 7.2 miles surfacing from Airport to Yuba Pass, PLACER AND NEVADA COUNTIES. Bids received from:

(1) Tieslau Bros., Berkeley $122,807
(2) A. Teichert & Sons, Sacramento 129,363
(3) Chas. Harlowe, Jr. 144,448
(4) T. E. Connolly, San Francisco $147,405
(5) Hein Bros., Basalt Rock Co., Petaluma 151,915

	(1)	(2)	(3)	(4)	(5)
41,100 tons crusher run base	2.04	2.12	2.38	2.37	2.51
16,340 tons untreated crushed gravel or stone surfacing	2.04	2.24	2.38	2.50	2.51
2,815 M gallons watering	2.00	2.00	2.75	3.25	2.75

PORTLAND, ORE.—STATE—GRADING, CONCRETE PAVING AND SURFACING

Bids received as follows by Oregon State Highway Commission, Multnomah County Court House, Portland:

(A) WASHINGTON COUNTY—J. A. Lyons, 1001 Halsey St., Portland, Ore., $112,410 low for 9.3 miles grading and surfacing Multnomah County Line-Middleton Section of the West Side Pacific Highway. Bids on:

(1) Clearing and grubbing
(2) 18,000 cu.yd. excav. north of Sta. 14
(3) 119,000 cu.yd. excav. south of Sta. 14
(4) 51,000 sta.yd. overhaul
(5) 121,000 yd.mi. truck haul
(6) 2,400 lin.ft. 12-in. concrete pipe
(7) 32 ft. 42-in. concrete pipe
(8) 23 cu.yd. 'C' concrete
(9) 8,750 cu.yd. sub-base course broken stone
(10) 6,200 cu.yd. broken stone (base course)
(11) 2,050 cu.yd. broken stone (top course)
(12) 2,500 cu.yd. earth filler

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	TOTALS
J. A. Lyons, Portland, Ore.	$1000	.50	.30	.02	.15	1.00	8.50	20.00	2.50	2.50	2.50	.30	$112,410
Oregon Contr. Co., Portland	750	.40	.33	.02	.18	.80	6.00	25.00	2.25	2.35	2.40	.40	114,082
Joplin & Eldon, Portland	1500	.30	.25	.015	.20	1.10	8.50	25.00	2.80	2.80	2.80	.40	115,292
A. C. Greenwood, Portland	2500	.30	.30	.02	.19	.95	10.00	25.00	2.60	2.70	2.70	.30	118,267
Clifton, Applegate & Toole	1500	.37	.39	.03	.13	1.25	9.00	35.00	2.50	2.55	2.55	.30	121,292
F. Christensen, Portland	1000	.33	.28	.03	.16	1.75	8.50	25.00	3.25	3.25	3.50	.28	124,255
Kern & Kibbe, Portland	2000	.35	.30	.03	.25	1.25	7.00	25.00	3.05	3.20	3.30	.25	134,835
Union Contr. Co., Portland	1000	.40	.35	.04	.20	2.00	10.00	30.00	3.00	3.10	3.20	.40	136,645
Washburn & Hall, Portland	2000	.60	.33	.03	.20	1.25	9.00	21.00	3.15	3.15	3.15	.35	137,403
United Contr. Co., Portland	3000	.52	.40	.04	.19	1.10	10.50	21.00	2.85	2.95	3.05	.30	139,874
Myers Contr. Co., Portland	2000	.85	.32	.02	.18	1.35	6.00	35.00	3.75	3.75	3.75	.35	148,442

(B) CLACKAMAS COUNTY—Jacobson-Jensen Co., 407 Stanton St., Portland, $182,840 low for 6.8 miles concrete paving Multnomah County Line-Sandy Section of Mt. Hood Highway. Bids on:

(1) 42,000 cu.yd. excavat.
(2) 115 cu.yd. 'A' conc. (culv.)
(3) 10,000 lb. rein. steel (culv.)
(4) 81,000 sq.yd. prep. subgrade
(5) 81,000 sq.yd. concrete paving
(6) 12,200 lin.ft. expansion joint
(7) 24,400 lin.ft. contraction joint
(8) 23,500 lb. reinf. steel
(9) 7,300 dowels
(10) 3,000 cu.yd. rock should. (subb.)
(11) 2,250 yd. rock should. (base)
(12) 750 cu.yd. rock should. (top)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	TOTALS
Jacobson-Jensen Co.	.40	15.00	.06	.10	1.62	.20	.02	.07	.26	2.30	2.30	2.30	$182,840
Oregon Contr. Co., Portland	.40	20.00	.04	.05	1.88	.15	.04	.04	.20	2.35	2.35	2.35	197,996
I. L. Young, Portland	.30	30.00	.05	.06	1.91	.12	.03	.05	.20	2.50	2.50	2.50	199,646
West Contr. Co.	.35	20.00	.06	.05	1.90	.18	.05	.06	.30	2.60	2.60	2.60	201,518
Midstate Contr. Co., Yakima, Wash.	.40	25.00	.05	.10	2.06	.12	.02	.05	.20	2.50	2.50	2.50	218,162
LaPointe Con. Co., Portland	.40	22.00	.06	.07	2.33	.18	.05	.05	.22	3.60	3.60	4.00	245,605

(C) WHEELER COUNTY—Contract awarded to Milne & Dussault, 1853 E. Broadway, Portland, Ore., $125,672 for 18 miles broken stone surfacing of Mitchell-Willow Creek Section of Ochoco Highway. Bids on:

(1) 32,400 cu.yd. sub-base material surfacing
(2) 15,300 cu.yd. base materials surfacing
(3) 5,850 cu.yd. top materials surfacing
(4) 4,500 cu.yd. screenings surfacing
(5) 7,200 cu.yd. 1½-1-in. material (stockpiles)
(6) 5,400 cu.yd. 1-½-in. materials (stockpiles)
(7) 6,300 cu.yd. ½-¼-in. materials (stockpiles)
(8) 8,000 cu.yd. selected borrow
(9) 8,000 cu.yd. filler
(10) 16,000 yd.mi. filler haul

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	TOTALS
Milne & Dussault, Portland	1.55	1.60	1.75	1.75	1.20	1.25	1.30	.50	.30	.18	$125,672
N. Lien, Warrendale, Ore.	1.61	1.61	1.61	1.61	1.30	1.30	1.30	.40	.30	.20	126,830
Wren & Greenough, Portland	1.70	1.70	1.70	1.70	1.20	1.20	1.20	.40	.25	.18	129,445
Joslin & McAllister, Spokane	1.74	1.74	1.74	1.74	1.17	1.17	1.17	.50	.25	.18	132,000
A. C. Greenwood, Portland	1.70	1.70	1.90	1.90	1.37	1.37	1.37	.35	.25	.20	135,584
Washburn & Hall, Portland	1.75	1.75	1.75	1.75	1.60	1.60	1.60	.50	.40	.20	142,227
Fred H. Redmon, Yakima, Wn.	1.76	1.81	1.81	1.81	1.80	1.80	1.80	.40	.40	.20	147,070
Newport Construction Co., Portland	2.10	2.10	2.10	2.10	1.58	1.58	1.58	.40	.30	.18	160,247
Carl Nyberg, Spokane	2.05	2.05	2.05	2.05	1.93	1.93	1.93	.40	.40	.18	164,759

SAN FRANCISCO, CALIF.—GOVERNMENT—GRADING—TAHOE NATIONAL FOREST, NEVADA

Award recommended to Isbell Construction Co., Carson City, Nevada, and Box 584, Fresno, Calif., who bid $58,271 to Bureau of Public Roads, 461 Market St., San Francisco, for grading 2.58 miles of Section C, Route 3, Glenbrook National Forest Highway, TAHOE NATIONAL FOREST, located in DOUGLAS COUNTY, Nevada. Bids received from:

(1) Isbell Const. Co. $58,271
(2) T. E. Connelly, San Francisco 62,105
(3) Finnell Co., Inc., Sacramento $70,048
(4) Engineer's estimate 49,969

	(1)	(2)	(3)	(4)
62,361 cu.yd. roadway excavation	.79	.84	.95	.66
230 cu.yd. structure excavation	2.00	1.50	2.00	2.00
12,338 sta.yd. overhaul	.04	.02	.03	.05
2.58 miles finish. earth graded road	$250	$250	$300	$300
35 cu.yd. Class 'B' concrete	33.00	36.00	30.00	30.00
20 cu.yd. Class 'C' concrete	33.00	36.00	30.00	30.00
3,500 lb. reinforcing steel	.07	.07	.10	.08
680 lin.ft. 18-in. corr. metal pipe	2.00	1.50	3.00	1.85
392 lin.ft. 24-in. corr. metal pipe	2.50	2.00	3.65	2.75
78 lin.ft. 30-in. corr. metal pipe	3.00	3.00	4.25	3.75
Maintenance of existing road	$1000	$1000	$1000	$1000
Hauling and piling logs	$1500	$3000	$2000	$1000
64 right of way monuments	3.50	4.00	3.50	3.50

OGDEN, UTAH—GOVERNMENT—GRADING AND SURFACING—WASATCH COUNTY

Award of contract recommended to S. H. Newell & Co., 1254 Reed College Place, Portland, Ore., who bid $102.943 for 10 miles grading and surfacing, Heber-Fruitland Road, Sections A1 and B2, in Uinta National Forest, WASATCH COUNTY, Utah. Bids received on:

(1) 120,400 cu.yd. roadway excavation
(2) 41,000 sta.yd. overhaul
(3) 10.84 mi. finish earth graded road
(4) 17,500 cu.yd. cr. rock or grav. surf.
(5) 11,000 cu.yd. suppl. rock or gravel
(6) 58 cu.yd. Class 'B' concrete
(7) 112 cu.yd. Class 'C' concrete
(8) 1,890 lin.ft. 18-in. corr. pipe
(9) 60 lin.ft. 24-in. corr. pipe
(10) 150 lin.ft. 36-in. corr. pipe
(11) Maintenance of detours

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	TOTALS
S. H. Newell Co., Portland	.51	.02	$200	1.60	1.60	20.00	18.00	1.50	2.40	4.80	$1,000	$102,943
W. W. Clyde & Co., Springville, Utah, and Thorn & Whiting	.43	.04	150	2.15	2.05	26.00	25.00	1.85	2.85	5.25	1.000	105.735
Gibbons & Reed	.45	.045	200	2.10	2.10	35.00	35.00	2.20	3.50	6.00	1,000	110.664
Dodge Bros., Fallon, Nev.	.58	.03	250	1.90	1.90	30.00	27.50	2.00	3.00	5.00	1,000	121.277
Utah Const. Co., Ogden, Utah	.60	.04	270	1.88	1.88	28.00	27.00	1.65	2.75	5.40	1,000	122,709
B. D. Palfreyman, Provo, Utah	.50	.04	150	2.75	2.50	31.00	31.00	1.80	2.80	3.50	1.000	126.008
W. H. Puckett, Boise, Ida.	.56	.04	450	2.30	2.20	30.00	27.50	2.25	3.50	6.50	1,000	129.227
Wheelwright Const. Co., Ogden, Utah	.75	.05	100	1.50	1.50	40.00	40.00	1.75	2.70	5.20	1,000	134.853
Reynolds-Ely Const. Co., Springville, Utah	.75	.03	500	2.00	2.00	30.00	28.00	2.50	3.50	6.00	1,000	147,054
Engineer's estimate	.60	.05	200	2.00	1.90	33.00	31.00	2.00	3.00	5.50	1,000	125.912

LOS ANGELES, CALIF.—EIGHTH ST.

Griffith Co., Los Angeles Railway Bdg., L. A., $571,591 low bid to Board of Public Works for improving 8th St. from Figueroa St. to Windsor Blvd. Bids received from:

(1) Griffith Co., Los Angeles $571,591
(2) Geo. R. Curtis Paving Co., L. A. 595,019
(3) Lewis Const. Co., L. A. 595,048
(4) Geo. H. Oswald, Los Angeles 604,140
(5) Will F. Peck Co., Los Angeles $612,040
(6) P. J. Akmadzich, Los Angeles 637,185
(7) Los Angeles Paving Co., L. A. 649,591
(8) General Engineering Corp. 600,685

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Grading, lump sum	$72,900	$70,000	$70,000	$78,500	$72,000	$72,000	$86,000	$85,000
11,993 tons asph. base	4.00	3.45	3.55	3.62	3.75	4.00	4.25	3.50
14,642 tons asph. surface	4.00	3.50	3.60	3.80	3.95	4.10	4.50	3.65
544,901 sq.ft. 8-in. conc. base	.14	.179	.165	.16	.18	.212	.18	.162
31,100 ft. curb bar	.17	.20	.23	.2225	.22	.25	.25	.22
348,740 ft. cement sidewalk	.11	.1125	.105	.10	.1025	.106	.12	.11
38,861 ft. heavy conc. curb	.42	.42	.43	.45	.42	.45	.45	.40
Storm drain system	$47,500	$46,000	$45,000	$46,500	$50,000	$47,800	$44,000	$47,000
Sanitary sewers	$45,000	$46,000	$47,000	$47,000	$50,000	$47,000	$42,000	$50,000
Water system complete	$5,900	$6,500	$6,500	$6,000	$6,200	$6,400	$6,000	
Lighting system	$105,000	$111,000	$120,700	$119,000	$114,100	$121,160	$129,000	$122,500

SACRAMENTO, CALIF.—STATE—CONCRETE PAVING—SAN MATEO COUNTY

Basich Bros. Construction Co., 3788 S. Vermont St., Los Angeles, who bid $402,982 low bid to California Division of Highways for 5.2 miles paving in SAN MATEO COUNTY, between South San Francisco and Burlingame. Bids from:

(1) Basich Bros. Const. Co., L. A. $402,982
(2) Hanrahan Co., San Francisco 411,254
(3) T. M. Morgan Paving Co., Stockton 413,314
(4) N. M. Ball, Berkeley 423,507
(5) J. F. Knapp, Oakland 435,169
(6) Fredrickson & Watson & Fredrickson Bros., Oakland $427,854
(7) Jahn & Bressi, Los Angeles 437,963
(8) Eaton & Smith, San Francisco 443,487
(9) C. W. Wood, Stockton 475,338

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
85,000 cu.yd. imported borrow	.50	.63	.70	.65	.80	.69	.65	.60	.90
300 cu.yd. struct. excav.	1.50	1.50	3.00	3.00	1.50	1.00	4.00	2.00	1.00
123,100 sq.yd. subgrade	.10	.09	.08	.09	.09	.065	.10	.10	.08
32,050 cu.yd. 'A' concrete	8.10	8.26	7.80	8.25	8.40	8.45	8.80	8.75	8.80
1,025 tons asphalt	4.40	5.50	6.00	5.00	6.00	5.50	5.50	5.00	6.00
14,500 tons crush. run base	2.35	1.50	2.10	1.80	1.75	1.80	1.85	2.00	2.00
200 cu.yd. 'A' conc. struct.	18.00	20.00	20.00	20.00	20.00	14.00	20.00	20.00	20.00
876,000 lb. reinforcing steel	.035	.04	.04	.045	.04	.045	.04	.045	.055
2,100 bbl. fuel oil	2.15	1.50	1.75	1.80	2.00	2.00	1.75	2.75	2.00
300 tons screenings	2.50	2.00	3.25	2.50	2.50	2.50	1.50	3.00	2.50
2,250 ft. unt. doug. fir piles	.26	.45	.40	.30	.24	.27	.25	.30	.50
50 each driving piles	20.00	30.00	12.00	23.00	20.00	7.00	27.00	30.00	10.00
2.5 M ft. BM No. 1 doug. fir	60.00	40.00	$100	80.00	60.00	50.00	85.00	80.00	80.00
3,000 tons light rip-rap	2.50	2.00	2.50	3.50	2.50	2.75	2.75	3.50	3.50
660 remove and reset posts	.75	1.50	2.00	1.00	.50	.90	.50	1.00	1.00
277 stat. finish roadway	1.00	6.00	8.00	4.00	5.00	4.50	3.00	5.00	5.00

SACRAMENTO, CALIF.—STATE—GRADING AND SURFACING—SAN BERNARDINO COUNTY

George Herz & Co., 456 E Street, San Bernardino, who bid $507,402, low bid to California Division of Highways, for 28.7 miles grading and surfacing in SAN BERNARDINO COUNTY, between 6 miles east of Amboy and 1½ miles east of Essex. Bids from:

(1) Geo. Herz Co., San Bernardino..$507,402
(2) New Mexico Const. Co.....$579,519
(3) J. G. Donovan & Sons.....$669,790

	(1)	(2)	(3)
376,100 cu.yd. roadway embankment	.30	.35	.39
500,000 sta.yd. overhaul	.01	.01	.01
285,000 cu.yd. ditch and channel excav.	.11	.15	.185
18,000 cu.yd. pit run gravel sub-base	.55	.60	1.00
11,000 cu.yd. structure excavation	.70	1.00	1.00
81,100 tons oil treated crushed gravel or stone surfacing	1.55	2.10	2.47
1,820 cu.yd. crushed gravel or stone screenings (seal coat)	2.25	2.50	1.94
2,120 bbl. fuel oil (seal coat)	2.35	2.80	3.19
76 ft. 18-in. corr. metal pipe	.40	.60	.50
294 ft. 24-in. corr. metal pipe	.50	.60	.60
2,224 ft. 36-in. corr. metal pipe	.60	.70	1.00
248 ft. 48-in. corr. metal pipe	.80	1.00	1.25
9,000 M gal. water (subgrade)	2.70	1.80	2.98
840 bbl. fuel oil (detours)	3.25	2.80	2.92
39,975 ft. creo. doug. fir piles	.85	.90	.884
1,599 dried creo. doug fir piles	14.00	16.00	13.65
380 M. ft. BM untr. douglas fir	71.00	60.00	73.66
524 M redwood den. select struct.	90.00	90.00	95.85
355 M redwood select struct.	94.00	90.00	94.18
800 lin.ft. drilling well	9.00	8.00	10.00
1,517 stats. finishing roadway	3.00	3.70	10.00
590 monuments	2.50	2.50	3.00

SAN FRANCISCO, CALIF.—GOVT.—GRADING AND SURFACING—NEVADA COUNTY, CALIF., AND DOUGLAS COUNTY, NEVADA

Award recommended to Isbell Construction Co., Box 602, Carson City, Nevada, who bid $95,512 for 2.58 miles grading and 14.8 miles surfacing of the Topaz National Forest Highway in MONO COUNTY, California, and DOUGLAS COUNTY, Nevada, all in the Mono National Forest, work for the Bureau of Public Roads. Bids from:

(1) Isbell Construction Co. ..... $ 95,512
(2) Chas. Harlowe, Jr., Oakland 112,456
(3) E. B. Bishop, Sacramento $112,513
(4) Engineer's estimate 98,291

	(1)	(2)	(3)	(4)
24,400 cu.yd. roadway excav.	.49	.30	.55	.40
600 cu.yd. struct. excav.	1.50	1.50	3.00	2.00
9,000 sta.yd. overhaul	.04	.05	.02	.04
12.22 miles fine grading	$260	$300	$250	$200
27,700 cu.yd. cr. rock surfacing	1.97	2.58	2.25	2.10
8,700 cu.yd. cr. gravel surf.	1.03	1.27	1.75	1.25
1,200 cu.yd. supplemental cr. rock	1.84	2.58	2.25	2 00
Provide and maintain water plant	$2000	$500	$1000	$1000
1,800 M gal. watering	1.50	2.50	2.00	2.00
350 cu.yd. suppl. cr. gravel	1.03	1.27	1.75	1.25
75 cu.yd. Class 'B' concrete	30.00	35.00	32.00	35.00
50 cu.yd. Class 'C' concrete	30.00	35.00	32.00	30.00
7,000 lb. reinf. steel	.06	.07	.08	.07
654 lin.ft. 18-in. corr. pipe	2.25	2.00	2.25	1.60
206 lin.ft. 24-in. corr. pipe	3.00	2.75	3.00	2.45
158 lin.ft. 30-in. corr. pipe	3.50	3.75	4.00	3.25
120 lin.ft. remov. culverts	1.00	1.00	.50	.75
2 25 miles move and reset fences	$200	$300	$200	$150
268 right of way monuments	3.50	3.50	3.00	3.50

SAN FRANCISCO, CALIF.—GRADING—TAHOE NATIONAL FOREST—GOVERNMENT—NEVADA

Award recommended to Isbell Construction Co., Carson City, Nevada, and Box 584, Fresno, Calif., who bid $44,876 to Bureau of Public Roads, 461 Market St., San Francisco, for grading 2.36 miles of Section B, Route 1, Lake Tahoe National Forest Highway, TAHOE NATIONAL FOREST, located in WASHOE COUNTY, Nevada. Bids received from:

(1) Isbell Const. Co. $44,876
(2) T. E. Connelly, San Francisco 54,630
(3) Finnell Co., Inc., Sacramento $65,464
(4) Engineer's estimate 52,572

	(1)	(2)	(3)	(4)
18.34 acres clearing	$200	$200	$400	$270
56,949 cu.yd. roadway excavation	.56	.74	.84	.65
408 cu.yd. structure excavation	1.50	1.50	1.50	2.00
18,533 sta.yd. overhaul	.04	.01	.03	.04
2.36 miles finish. earth graded road	$250	$250	$416	$300
115 cu.yd. 'B' concrete	30.00	34.00	30.00	38.00
6 cu.yd. 'C' concrete	30.00	34.00	25.00	35.00
9,500 lb. reinforcing steel	.06	.07	.07	.08
788 lin.ft. 18-in. corr. metal pipe	2.00	1.50	2.75	1.75
154 lin.ft. 24-in. corr. metal pipe	2.75	1.90	3.25	2.60
Maintenance of existing road	$1000	$1000	$1000	$1000
50 right of way monuments	3.00	3.00	3.50	3.50

GRAND CANYON, ARIZ.—GOVT.—OILING—COCONINO COUNTY

Lord & Bishop, Native Sons Bdg., Sacramento, who bid $113,949, low bid to Park Supt., Grand Canyon, Ariz., for 18.45 miles plant mixed oil treated rock surfacing, Grand Canyon-Desert View Sect., Grand Canyon National Park, Ariz., for Bureau of Public Roads, work in COCONINO COUNTY. Bids on:

(1) 18.46 miles preparing roadway
(2) 1,000 tons crushed rock for subgrade
(3) 35,133 tons oil treat. crushed rock surf.
(4) 1,858 tons suppl. oil-treat. crushed rock

	(1)	(2)	(3)	(4)	TOTALS
Lord & Bishop, Sacramento, Calif.	350.00	2.25	2.85	2.75	$113,949
General Const. Corp., Los Angeles	200.00	2.00	4.30	3.57	163,396
Pearson & Dickerson, Riverside	360.00	3.20	5.07	4.80	196,888
Engineer's estimate	200.00	2.35	2.85	2.75	111,280

IRRIGATION AND RECLAMATION

VALE, ORE.—GOVT.—CONCRETE OR STEEL SIPHONS

Bids received as follows by Bureau of Reclamation, Vale, Oregon, for construction of Bully Creek Fairman Coulee siphons with a connection section of concrete lined canal, on the Vale Main Canal, Vale Project, Oregon. The construction of these siphons and the concrete canal lining involves two alternative plans. One for constructing the major portion of the siphons of 101-in. diameter riveted plate steel pipe, and the other for 96-in. diam. pre-cast concrete pipes, both with appurtenant works:

PLATE STEEL SIPHONS—SCHEDULE NO. 2

(1) Furnishing, erecting and painting riveted plate steel pipes with the pipes fabricated in the shop, in about 20-ft. lengths, shipment of materials and tools and equipment from the factory shipping point to the RR destination to be made on Government bills of lading.

(2) Fabricated material, tools and equipment—freight or shipment of materials and tools and equipment from the factory to Hope, Oregon, to be made on commercial bills of lading:

	(1)	(2)
Puget Sound Mchy Depot	$267,040	$322,480
Commercial Boiler Works	$277,666	$337,558

SCHEDULE NO. 2 (ALTERNATIVE)

(1) Furnish, erect and paint riveted plate steel pipes with plates, sheared, rolled and punched in the shop, and shipped knocked down, with all fabrication performed in the field, shipment to be made from the factory shipping point to RR dest. on Government bills of lading.

(2) Fabricated material, tools and equipment—freight of shipment from the factory shipping point to Hope, Oregon, to be made on commercial bills of lading:

	(1)	(2)
Western Pipe & Steel Co., S. F.	$228,000	
Pittsburgh-Des Moines Steel Co.		
(f.o.b. Des Moines)	237,600	
(f.o.b. Pittsburgh)	229,600	$267,500
(f.o.b. St. Paul)	240,000	
Puget Sound Mchy. Depot	276,500	302,500
W. H. Puckett Co.	325,000	
Burnham Mfg. Co., Salt Lake City		
(f.o.b. Chicago, Ill.)	$248,240	$289,240
(f.o.b. Kansas City)	265,240	
Commercial Boiler Works	295,895	322,780
Chicago Bridge and Iron Works	296.000	336,600
Willamette Iron & Steel Works	314,900	339,900

SCHEDULE NO. 1

(1) 25,000 cu.yd. excavation, canal Class 1
(2) 24,000 cu.yd. compacting embankment
(3) 6,600 cu.yd. excavation, pipe tr. Class 1
(4) 6,300 cu.yd. excavation, struct. Class 1
(5) 3,000 cu.yd. excavation, struct. Class 2
(6) 8,600 cu.yd. backfill about structures
(7) 348 cu.yd. concrete (transitions)
(8) 526 cu.yd. concrete (canal lining)
(9) 1,340 cu.yd. concrete (piers, anchors, etc.)
(10) 170,000 lb. place reinf. steel.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	TOTALS
Puget Sound Mchy. Depot, Seattle, Wash.	.20	.40	.20	.30	.35	.20	18.50	11.00	11.00	.03	$53,696
W. H. Puckett Co.	.20	.40	.20	.30	.40	.20	19.00	11.00	12.00	.03	55,401
J. F. Shea Co.	.30	.40	.40	.75	1.00	.30	25.00	22.00	12.00	.03	72,812
A. Ritchie & Co.	.38	.24	.38	.73	1.25	.40	21.00	14.00	17.50	.03	74,156
Pittsburgh-Des Moines Steel Co.	.40	.25	.60	1.00	1.75	.40	22.00	17.00	17.00	.02	80,983

PRECAST CONCRETE SIPHONS—SCHEDULE NO. 5

(1) 25,000 cu.yd. exc. trench for conc. pipe, Class 1
(2) 10,000 cu.yd. exc. tr. for conc. pipe, Class 2
(3) 2,200 cu.yd. gravel found. and back for pipe
(4) 29,000 cu.yd. backfill about pipe
(5) Lump sum 96-in. pre-cast conc. pipe
(6) 75 cu.yd. concrete other than in pipe
(7) 4,000 lb. placing reinf. bars (exc. of pipe)
(8) 2,400 lb. install and paint valves, etc.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	TOTALS
Elliott. Stroud Bros. & Seabrook, Ravensdale, Wash.	.35	.65	1.50	.15	$188,240	20.00	.015	.10	$213,015
Lock-Joint Pipe Co.	.30	.50	2.00	.30	222,400	20.00	.03	.10	249,960

CONSTRUCTION NEWS SUMMARY

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

TABULATION OF AWARDS

Awards for the month of June, 1930, for Engineering Construction projects in the Far Western States total $30,170,000, as follows:

Paving	$ 4,167,000
Grading, highways	7,250,000
Bridges	3,500,000
Sewer construction	1,400,000
Water supply systems	500,000
Irrigation and reclamation	1,400,000
Power development	1,000,000
River and harbor work	500,000
Lighting systems	453,000
Railroad construction	10,000,000
	$30,170,000

LARGE WESTERN PROJECTS

(See Construction News, this issue, for details.)

WORK CONTEMPLATED

Bridge over upper arm of Coos Bay for State of Oregon; $300,000.

Sewer mains and treatment plant for City of Phoenix, Ariz.; $817,000.

Water mains, reservoirs, pumps for City of Phoenix, Ariz.; $1,300,000.

Railroad, 111 miles from Keddie to Bieber, Calif., for Western Pacific RR., San Francisco; $9,824,669.

Railroad, 85 miles from Klamath Falls, Ore., to Bieber, Calif., for Great Northern Railway, Seattle; $3,924,620.

Yard improvements for Union Pacific RR. at Cheyenne, Wyoming; $1,000,000.

BIDS BEING RECEIVED

Grading 7 miles Mariposa Grove Sect., MARIPOSA COUNTY, for U. S. Bureau of Public Roads, 320,000 cu.yd. excavation; bids to July 24.

BIDS RECEIVED

Steel superstructure for Lake Union Bridge for State of Washington, U.S. Steel Products Co., Seattle; $1,247,888 low.

Asphalt and concrete paving 8th St. for City of Los Angeles, Griffith Co., Los Angeles; $571,591.

Concrete paving Manchester Ave. for Los Angeles County, Griffith Co., Los Angeles; $499,441 low.

Concrete paving from South San Francisco to Burlingame, San Mateo County, for California Division of Highways, Basich Bros. Const. Co., Los Angeles; $402,982 low.

Grading and surfacing in San Bernardino Co. for California Division of Highways, Geo. Herz & Co., San Bernardino; $507,402 low.

CONTRACTS AWARDED

Sewers and treatment plant for City of Reno, Nevada, to Christensen & Co., Reno, Nev.; $329,940.

Bridge from Sausalito to Belvedere, Calif., for T. A. Tomasini, San Francisco, to Jasper-Stacy Co., San Francisco; $650,000.

Concrete paving from Viejas Creek to Pine Valley, SAN DIEGO COUNTY, for California Division of Highways, to Sander Pearson, Santa Monica; $338,287 low.

Aptos Jr. High School for City and County of San Francisco to MacDonald & Kahn, San Francisco; $531,500.

STREET and ROAD WORK

WORK CONTEMPLATED

KING CITY, CALIF.—Plans by Engr., H. F. Cozzens, Court House, Salinas, for improving Bassett St., 7th St., Mildred Ave., etc., paving with 5-in. concrete. 6-28

MARYSVILLE, CALIF.—Plans by City Engr., protests July 14 for improving 12th, E and B Sts., grading, paving with 2½-in. asphalt base with 1½-in. Warrenite Bit. surface. 7-1

OAKDALE, CALIF.—Plans by Geo. Macomber, City Engr., for grading and paving with 2-in. oil treated crushed rock or stone 7½ miles of city streets. $27,000. Bids after July 7. 6-20

SAN DIEGO, CALIF.—Plans by City Engr., H. W. Jorgensen, for (1) Improving 9th St., involving 25,175 sq.ft. 6-in. concrete paving, 667 ft. 6-in. and 20 ft. 4-in. cast iron pipe, 1 hydrant; and (2) Improving La Jolla Mesa Drive and other streets, involving 374,773 sq.ft. 6-in. asphaltic paving, 60,039 cu.yd. excavation, 7602 ft. 8-in., 5242 ft. 6-in. and 756 ft. 4-in. cast iron pipe, reinf. concrete and concrete sewers, 15 hydrants. Bids after July 14. 6-21

SAN JOSE, CALIF.—Plans by City Engr. for tennis courts at playground at Delmas Ave. and Home St. 7-1

SAN RAFAEL, CALIF.—Plans by City Engr., H. K. Brainerd, protests July 14, for Palm Ave. Improvement, involving 110,000 sq.ft. 5-in. concrete paving with 4-in. stone sub-base, vitr. sewers, corr. culverts, etc. 6-24

TOOELE, UTAH—Plans by City Engr. for improvement of Main and other streets to cost $43,000.

BIDS BEING RECEIVED

ARCADIA, CALIF.—Bids to 8 p.m., July 16, by City for improving Huntington Drive, etc., asphalt paving, corr. culverts, conc. headwalls and 4 miles of culverts. 7-1

COMPTON, CALIF.—Bids to 8 p.m., July 15, by City for improving streets in Kemp St. project, 5-in. concrete paving, water mains and hydrants. $75,000. 6-23

COMPTON, CALIF.—Bids to 8 p.m., July 15, by City for improving Kemp St., etc., involving: 346,824 sq.ft. grading, 301,144 ft. 5-in. concrete pavement, 6216 ft. 6-in. cast iron main pipe, 9310 ft. 4-in. cast iron main pipe, 4809 ft. 1-in. copper water services, 36 manholes to be lowered. $75,000.

MILL VALLEY, CALIF.—Bids to 8 30 p.m., July 15, by City for improving Corte Madera Ave., Summit Ave., etc., involving 16,800 cu.yd. excavation, 39,250 sq.ft. concrete and 209,920 sq.ft. asphalt paving, vitrified sewers, cor. culverts, concrete works, etc. $96,907. 7-2

SACRAMENTO, CALIF.—Bids to 2 p.m., July 23, by California Division of Highways for (1) SAN LUIS OBISPO COUNTY—3 miles grading and concrete paving from San Luis Obispo to foot of Cuesta grade, involving 75,700 cu.yd. roadway excavation, 7200 cu.yd. concrete paving, 189,000 lb. reinf. steel, corr. pipes, etc.; and (2) MARIN COUNTY—1.3 miles from Belvedere Crossing to Tiburon, involving 82,000 cu.yd. roadway excavation, 1800 tons broken stone, 5600 tons crusher run base, 1060 tons asphalt, corr. pipe, etc. 6-25

SACRAMENTO, CALIF.—Bids to 2 p.m., July 30, by California Division of Highways for: MENDOCINO COUNTY—2 miles from McDonald to Wendling, involving 75,550 cu.yd. roadway excavation, 5000 cu.yd. gravel or stone surfacing, 1025 cu.yd. concrete structures, 104,600 lb. reinf. steel, 26,000 lb. structural metal, 73 M ft. BM redwood timber; SAN BERNARDINO COUNTY—9.5 miles from southwest of Dunn to Cronise Valley, involving 89,000 cu.yd. roadway embankment, 81,000 cu.yd. ditch and channel excavation, 51,000 cu.yd. pit run gravel subbase, 25,500 tons oil treated gravel or stone surfacing, 13,915 ft. furnish treated piles, 94 M ft. BM Douglas fir, 245 M ft. BM redwood timber; RIVERSIDE COUNTY—16.2 miles from Desert Center to 9½ miles west of Hopkins Wells, involving 104,500 cu.yd. embankment, 218,400 cu.yd. ditch and channel excavation, 15,100 cu.yd. pit run gravel subbase, 4500 cu.yd. structure excavation, 45,000 tons oil treated gravel or stone surface, 17,400 ft. treated piling, 130 M Douglas fir, 320 M redwood; PLACER COUNTY—1.7 miles grading and concrete paving through Lincoln, involving 500 cu.yd. roadway excavation, 15,200 cu.yd. imported borrow, 4150 cu.yd. concrete paving, 122,500 lb. reinf. steel; and TRINITY COUNTY—0.4 miles from west boundary to Burnt Ranch, involving 30,800 cu.yd. roadway excavation, 55 cu.yd. rubble masonry. 7-2

SAN DIEGO, CALIF.—Bids to 10 a.m., July 14, by City for improving 46th and Norwood Sts., involving 50,470 sq.ft. 6-in. asphalt paving, 477 ft. 4-in. and 934 ft. 6-in. cast iron pipe, 2 hydrants, concrete sewers, etc. 6-28

SAN FRANCISCO, CALIF.—Bids to 2 p.m., July 22, by U. S. Bureau of Public Roads, 461 Market St., San Francisco, for oil processing the Idyllwild National Forest Highway, Route 72, in San Bernardino National Forest, RIVERSIDE COUNTY, California, a distance of 15.5 miles, work involving: 15.5 miles preparing roadway, 365,000 gallons asphaltic oil furnished and applied, 15.5 miles road mixing and compacting oil treated surface. 6-28

SAN FRANCISCO, CALIF.—Bids to 2 p.m., July 24, by U.S. Bureau of Public Roads, 461 Market St., S. F., for (1) MARIPOSA COUNTY—7 miles Mariposa Grove Sect., Wawona Route, Sierra National Forest, involving 55 acres clearing, 320,000 cu.yd. roadway excavation, 121 cu.yd. cement rubble masonry; and (2) 2.6 miles Sect. B, Fish Camp-Fourmile, Oakhurst Nat. Highway, Sierra National Forest, MARIPOSA COUNTY, involving 17 acres clearing, 85,240 cu.yd. roadway excavation, etc. 7-2

BOISE, IDAHO—Bids to 2 p.m., July 10, by Commission of Public Works for (1) 15 miles from Lenore to Orofino, NEZ PERCE AND CLEARWATER COUNTIES, involving 265,200 cu.yd. rock excavation, 107,000 cu.yd. common excavation, 7000 cu.yd. gravel surfacing, 882 cu.yd. concrete; (2) 8 miles from Roberts to Hamer, JEFFERSON COUNTY, involving 70,000 cu.yd. excavation, concrete structures, corr. culverts; (3) 11 miles from Idaho Falls to Ririe, BONNEVILLE COUNTY, involving 93,000 cu.yd. roadway excavation, 20,200 cu.yd. gravel surface, 535 cu.yd. concrete; (4) 1.4 miles Rainey Creek Extension, BONNEVILLE COUNTY, involving 42,000 cu.yd. roadway excavation, etc.

BOISE, IDAHO—Bids to 2 p.m., July 10, by State for 5.5 miles grading from Parker Pass to Rocky Point, BENEWAH COUNTY, involving 89,500 cu.yd. rock excavation, 102,500 cu.yd. common excavation, clearing, grubbing, corr. culverts, piling, etc. 6-26

MISSOULA, MONT.—Bids to 10 a.m., July 10, by U. S. Bureau of Public Roads, W. H. Lynch, Dist. Engr., P.O. Box 1386, Missoula, Mont., for (1) 9 miles surfacing Columbia Falls-Glacier Park Highway, Flathead National Highway, FLATHEAD COUNTY, Mont., involving 24,050 cu.yd. excavation and 17,700 cu.yd. gravel surfacing; and (2) 1.8 miles grading Clark Fork Highway, Cabinet National Forest, SANDERS COUNTY, Mont., work involving 59,000 cu.yd. roadway excavation, concrete structures, etc.

PORTLAND, ORE.—Bids to July 10, by U. S. Bureau of Public Roads, for (1) 4 miles Salmon River project, Siuslaw National Forest, LINCOLN COUNTY, Oregon, involving 76,400 cu.yd. roadway excavation, etc.; and (2) 4.8 miles grading and surfacing Wind River project, Columbia National Forest, SKAMANIA COUNTY, Wash., involving 42,950 cu.yd. roadway excavation, 4000 cu.yd. gravel base, 5000 cu.yd. gravel surface, etc.

OGDEN, UTAH—Bids to 10 a.m., July 17, by Bureau of Public Roads, Kiesel Bdg., Ogden, Utah, for (1) 5.7 miles Enaville-Murray, Linfor Section, Couer d'Alene National Forest, SHOSHONE COUNTY, Idaho, involving 82,700 cu.yd. roadway excavation, culverts; (2) 5.5 miles Clarks Fork Highway, Pend Oreille National Forest, BONNER COUNTY, involving 119,175 cu.yd. roadway excavation, corr. culverts; and (3) 3.7 miles North and South Highway, St. Joe National Forest, LATAH COUNTY, Idaho, involving 68,720 cu.yd. excavation, culverts, etc. 6-30

OLYMPIA, WASH.—Bids to July 22, by Washington State Highway Comm., for (1) 3.6 miles surfacing North Bank Highway from Wing Creek to Prindle, SKAMANIA COUNTY; and (2) Resurfacing and stockpiling 18,000 cu.yd. crushed stone from Skyomish to Summit, KING AND CHELAN COUNTIES.

SEATTLE, WASH.—Bids to 10 a.m., July 21, by King County Commissioners for 2.2 miles concrete paving M. E. Neal Lateral Highway.

BIDS RECEIVED

CHANDLER, ARIZ.—O. F. Fisher, Phoenix, $64,078 for concrete paving Dist. 4 for City.

GRAND CANYON, ARIZ.—Lord & Bishop, Native Sons Bdg., Sacramento, $113,949 low for 18 miles plant mixed oil treated rock surfacing, Grand Canyon-Desert View Sect., Grand Canyon National Park, Ariz., for Bureau of Public Roads. (See Unit Bid Summary.) 6-27

PHOENIX, ARIZ.—Tenney & Black, Clifton, Ariz., who bid $34,460, submitted the low bid to the Arizona State Highway Commission for the grading and surfacing of 4 miles of the Holbrook-Winslow Highway from 4 miles east of Winslow westerly. 6-26

LOS ANGELES, CALIF.—Griffith Co., Los Angeles Railway Bdg., L. A., $571,591 low for improving 8th St. from Figueroa St. to Windsor Blvd., grading, asphalt paving, concrete base, storm drain, sanitary sewer and water system. 6-27

LOS ANGELES, CALIF.—Griffith Co., L. A. Railway Bdg., L. A., $499,441 low for improving Manchester Ave. from Inglewood to Playa Del Rey, etc., involving grading, concrete paving, reinf. concrete pipe, Cast iron pipe, vitrified sewers for County. 6-26

SACRAMENTO, CALIF.—Tieslau Bros., 1315 Allston Way, Berkeley, $122,807 for 7.2 miles surfacing from Airport to Yuba Pass, PLACER AND NEVADA COUNTIES, for California Division of Highways. 6-25

SACRAMENTO, CALIF.—Low bids as follows by California Division of Highways—SHASTA COUNTY—A. Teichert & Sons, 1846-37th St., Sacramento, $27,798 for 35 miles bit. macadam from La Moine to north boundary; HUMBOLDT COUNTY—Englehart Pav. & Const. Co., Eureka, $22,043 for 0.6 mi. concrete paving near Eureka; SAN MATEO COUNTY—Basich Bros. Const. Co., 3788 S. Vermont St., L. A., $402,982 low for 5.2 miles concrete paving from South San Francisco to Burlingame; and SAN BERNARDINO COUNTY—Geo. Herz & Co., 456 E St., San Bernardino, $507,402 low for 28.7 miles grading and surfacing from east of Amboy to east of Essex. (See Unit Bid Summary.) 7-2

YUBA CITY, CALIF.—Low bids as follows by Joint Highway Dist. 12 for 9.9 miles paving from Robbins to Yuba City:

REIN. CONC. PAVING—Basich Bros. Const. Co., 3788 S. Vermont St., L. A. (low) $259,871

PLAIN CONC. PAVING—Basich Bros. Const. Co., 3788 S. Vermont St., L. A. (low) $236,522

PLAIN ASPH. PAVING—J. E. Johnston, Weber Ave. and E St., Stockton (low) $212,262

7-2

DENVER, COLO.—Low bids as follows by State: (1) Lumsden-Hall Const. Co., Grand Junction, Colo., $30,330 for 5.5 miles oil process E. of Avondale, PUEBLO COUNTY; and (2) F. C. Dreher, Denver, Colo., $99,187 low for 1.2 miles concrete paving north of Ft. Collins, LARIMER COUNTY.

PORTLAND, ORE.—Low bids as follows by State: (1) UNION COUNTY—Union Construction Co., Portland, who bid $41,218, low bid for 7.96 miles grade and widening LaGrande-Hot Lake Section of Old Oregon Trail; (2) WASCO COUNTY—Barnet & Mitchell, Kent, Ore., who bid $37,555, low bid for 7.4 mi. grading Wapintia-Maupin Junction Section of the Wapinitia Highway; (3) LINCOLN COUNTY—C. L. Camp, Medford, Ore., who bid $138,645, low bid for 10.1 mi. broken stone surfacing Pioneer Mountain-Eddyville Section of the Corvallis-Newport Highway; (4) CLACKAMAS COUNTY—Jacobson Jensen Co., 407 Stanton St., Portland, Ore., who bid $182,840, low bid for 6.80 miles concrete paving Multnomah County Line-Sandy Section of the Mt. Hood Highway; (5) WASHINGTON COUNTY—J. A. Lyons, 1001 Halsey St., Portland, Ore., who bid $112,410, low bid for 9.3 miles grading and surfacing Multnomah County Line-Middleton Section of the West Side Pacific Highway. (See Unit Bid Summary.) 6-30

SALT LAKE CITY, UTAH—Low bids as follows by State: (1) Gibbons & Reed, Continental Bank Bdg., Salt Lake City, $53,712, low for gravel surfacing 5 miles from Wasatch to Utah-Wyoming line; and (2) Utah Const. Co., Ogden, Utah, $82,172, low for 7.5 miles grading and surfacing from Nephi to Sanpete County Line, JUAB COUNTY.

SEATTLE, WASH.—A. Scarselle, 947-26th Ave. So., Seattle, $13,593, low for 35th Ave. and $9357, low for 11th Ave., paving for City.

CONTRACTS AWARDED

COLUSA, CALIF.—To W. H. Larson, 941 Santa Ynez St., Sacramento, who bid $39,942 for 4.4 miles asphalt paving from Mills Orchard westerly along the route of Maxwell-Sites Road to town of Sites, for County. 6-25

EUREKA, CALIF.—To Englehart Paving & Const. Co., Eureka, $11,417 for 0.5 miles grading DEL NORTE COUNTY, head of Richardson Creek, bids opened by Dist. Engr., California Division of Highways. 6-27

FORT MASON, CALIF.—To A. J. Raisch, 46 Kearny St., San Francisco, who bid approximately $6000 for the construction of waterbound macadam roads leading to the Chapel at the Presidio, San Francisco. 6-28

LONG BEACH, CALIF.—To Griffith Co., 502 L.A. Railway Bdg., Los Angeles, who bid $47,024 for improving 67th Street, between Long Beach Boulevard and east line of Lot 27, Block G, Tract No. 6305. Work involves: 26,890 ft. curb, 142,918 sq.ft. walk, 16,148 ft. 8-in. vitrified pipe, 7520 ft. 6-in. cast iron water mains. 6-23

LOS ANGELES, CALIF.—Awards as follows by California Division of Highways: (1) To G. M. Duntley, 722 S. San Pedro St., Los Angeles, $3448 for 13.8 miles oiling shoulders in KERN AND LOS ANGELES COUNTIES. (2) To G. M. Duntley, 722 S. San Pedro St., Los Angeles, $2560 for 7.8 miles oiling shoulders from Oxnard to Callegaus Wash Bridge, VENTURA COUNTY. 6-27

NAPA, CALIF.—To Highway Builders, Ltd., 640 Redhill Ave., San Anselmo, $33,114 for 12 mi. bit. macadam surfacing for County. 7-1

PASADENA, CALIF.—To J. E. Haddock, 357 N. Chester St., Pasadena, who bid $72,450 for the improvement of Walnut St. from Orange Grove Ave. to Fair Oaks Ave., work for City. Work consists of concrete paving, grading, lighting system, sewer system, asphalt paving, etc. 6-26

REDDING, CALIF.—To Basalt Rock Co., Napa, who bid $3.10 per bbl., total bid $6547, for 21 miles heavy fuel oil as dust layer in SISKIYOU COUNTY from Shasta River to Walker, work for District Engineer, California Division of Highways. 6-25

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways: SAN DIEGO COUNTY—To Sander Pearson, Santa Monica, $338,287 for 11.2 miles concrete paving from Viejas Creek to Pine Valley; FRESNO COUNTY—To Peninsula Paving Co., Standard Oil Bdg., S. F., $257,557 for 6.7 miles grading and asphalt paving from Fowler Switch Canal to Fancher Creek. (See Unit Bid Summary.) 7-1

SACRAMENTO, CALIF.—To Geo. McDaniel, 814-13th St., Marysville, $5434 for 1.5 miles timber guard rail from west of Boca to Iceland, NEVADA COUNTY, work for the California Division of Highways, Sacramento. 7-1

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways: SAN JOAQUIN COUNTY—To Larsen Bros., Box 274, Galt, who bid $38,726 for 3.3 miles grading and widening with concrete and crusher run base from Houston School to Forest Lake. SAN JOAQUIN COUNTY—Contract awarded to Larsen Bros., Box 274, Galt, who bid $42,828 for 1.7 miles grading and gravel or stone surfacing from French Camp to Stockton. 6-25

SACRAMENTO, CALIF.—To O. A. Lindberg, 448 No. American St., Stockton, who bid $127,229 for 2.6 miles grading and surfacing with bituminous treated waterbound macadam from Waterman Switchback to Saratoga Gap, SANTA CRUZ COUNTY, work for the California Division of Highways. (See Unit Bid Summary, June 25 issue.) 6-25

SAN FRANCISCO, CALIF.—Award recommended to Isbell Const. Co., Box 602, Carson City, Nev., $95,512 for 2.58 mi. grading and 14.8 miles surfacing Topaz National Forest Highway, MONO COUNTY, Calif., and DOUGLAS COUNTY, Nev., for Bureau of Public Roads. (See Unit Bid Summary.) 7-1

SAN FRANCISCO, CALIF.—Awards of contracts recommended as follows by U. S. Bureau of Public Roads: (1) To Isbell Const. Co., Carson City, Nev., $44,876 for 2.3 miles grading, Sect. B, Route 1, Lake Tahoe National Forest Highway, Tahoe National Forest, WASHOE COUNTY, Nev.; and (2) To Isbell Const. Co., Carson City, Nev., $58,271 for 2.5 miles grading Sect. C. Route 3, Glenbrook National Forest Highway, Tahoe National Forest, DOUGLAS COUNTY, Nev. (See Unit Bid Summary.) 6-26

SAN JOSE, CALIF.—Awards as follows by County: (1) To San Jose Paving Co., San Carlos and Dupont Sts., San Jose, $11,500 for improving San Felipe Road. (2) To San Jose Paving Co., San Jose, $7396 for improving Martin, Flint and Kohler Sts. (3) To A. J. Raisch, Burrell Bdg., San Jose, $2049 for improving streets in Campbell. 6-24

SAN RAFAEL, CALIF.—To S. M. McGaw, Vallejo, $47,561 for improving Taylor, First and C Sts., grading, concrete paving with stone sub-base, vitr. sewers, corr. culverts, etc., for City. 6-24

SANTA CLARA, CALIF.—To Union Paving Co., Call Bdg., S. F., $31,309 for improving Union Ave., Bellomy St., etc., for City, asphalt paving, vitr. sewers, etc. 6-24

SANTA ROSA, CALIF.—To Geo. French, Jr., Box 675, Stockton, $8265 for 10 miles asph. oiling Healdsburg-Napa Road for County. 6-27

DENVER, COLO.—To Collier-Latimer, Inc., 1 E. Bayaud St., Denver, Colo., $74,364, low for grading and gravel surfacing streets in Dist. 151 for City.

DENVER, COLO.—Awards of contracts recommended as follows by U. S. Bureau of Public Roads: (1) To Hamilton-Gleason Const. Co., Tramway Bdg., Denver, Colo., $37,593 for 10 miles surfacing Tennessee Pass Road, Holy Cross National Forest, EAGLE COUNTY, Colo.; (2) To Taggart Const. Co., Cody, Wyo., $64,761 for 1 mile surfacing and steel bridge on Cody-Yellowstone Highway, Shoshone National Forest, PARK COUNTY, Wyo.; and (3) To L. E. Smith & Co., Denver, Colo., $29,391 for 7 miles surfacing Dayton-Kane Road, Bighorn National Forest, SHERIDAN COUNTY, Wyo.

BOISE, IDAHO—To Olaf Nelson, Logan, Utah, $126,279 for 12 miles grading and gravel surfacing from McCammon to Virginia, BANNOCK COUNTY, for State.

CRAIGMONT, IDA.—To Max. J. Kuney & Co., Spokane, Wash., $50,000 for grading Peck Road for County and for graveling of the North Highway.

PORTLAND, ORE.—Awards as follows by State: WHEELER COUNTY—To Milne & Dussault, 1853 E. Broadway, Portland, Ore., who bid $125,672 for 18 miles broken stone surfacing of Mitchell-Willow Creek Section of the Ochoco Highway; LANE COUNTY—To L. D. Packard, Blachly, Ore., who bid $33,495 for furnishing 13,200 cu.yd. broken stone for Triangle Lake-Low Pass Summit Section of the Siuslaw Highway; COOS COUNTY—To Joplin & Eldon, Couch Bdg., Portland, Ore., who bid $32,170 for 1.29 miles grading Haynes Slough, Larson Slough and Russell Point Section of the Roosevelt Coast Highway. 6-30

PORTLAND, ORE.—Awards recommended as follows by Bureau of Public Roads: (1) PIERCE COUNTY, Wash.—Award of contract recommended to Elich & Co., 3001-21st St. South, Seattle, $144,586 for grading Klapatche Ridge-Sunset Park, Ridge Unit, Mt. Rainier National Park; (2) OKANOGAN AND FERRY COUNTIES, Wash.—Award of contract recommended to F. J. Haas, Grandview, Wash., who bid $60,046 for 3.8 miles grading Tonasket-San Poil grading Project, 19-G1, Colville National Forest. 6-30

OGDEN, UTAH—Award recommended to S. H. Newell Co., 1254 Reed College Place, Portland, Ore., $102,943 for 10 miles grading and surfacing Heber-Fruitland Road, Uinta National Forest, WASATCH COUNTY, Utah, for Bureau of Public Roads. (See Unit Bid Summary.) 6-26

OGDEN, UTAH—Awards of contract recommended as follows by U. S. Bureau of Public Roads: (1) To Utah Const. Co., Ogden, Utah, $38,970 for 2 miles grading Salina-Emery Road, Fishlake National Forest, SEVIER COUNTY, Utah; (2) To Olof Nelson, Logan, Utah, $18,092 for surfacing 5 miles of Teton Highway, Targhee National Forest, TETON COUNTY, Idaho; and (3) To Utah Const. Co., Ogden, Utah, $49,927 for 10 miles grading Ketchum-Clayton Road, Sawtooth National Forest, CUSTER AND BLAINE COUNTIES, Idaho.

SALT LAKE CITY, UTAH—To J. M. Sumsion, Springville, Utah, $18,395 for 15 miles surfacing Salt Lake County Line-Wasatch County Line Highway, SUMMIT COUNTY, for State.

TOOELE, UTAH—To Gibbons & Reed, Continental Bank Bdg., Salt Lake City, $15,171 for grading, curbs, gutters, etc., in Dist. 1 for City.

OLYMPIA, WASH.—To Goetz & Brennan, Seaboard Bdg., Seattle, $48,577 for 1.4 miles concrete paving in city of Raymond, PACIFIC COUNTY, for State.

RITZVILLE, WASH.—To Bert Johnson and W. Morach, Ritzville, Wash., $7637 for grading Tokio Road for County.

SEATTLE, WASH.—Awards as follows by County: (1) To Erickson Paving Co., Seattle, $95,997 for concrete paving 4.4 miles of Woodinville-Duval Highway; (2) Fiorito Bros., Seattle, $14,060 for 1 mile concrete paving of 20th Ave. northeast; and (3) To Fiorito Bros., Seattle, $13,841 for 1 mile concrete paving 6th Ave. northwest.

GREEN RIVER, WYO.—To Woodward Cont. Co., Rock Springs, Wyo., $49,963 for improving streets in Dist. 1 for City.

BRIDGES and CULVERTS

WORK CONTEMPLATED

SALEM, ORE.—Plans being prepared by State Highway Commission for constructing bridge over Isthmus Slough on upper arm of Coos Bay, Coos County, $300,000.

BIDS BEING RECEIVED

LOS GATOS, CALIF.—Bids to 8 p.m., July 21, by City for culvert on New York Ave.

SACRAMENTO, CALIF.—Bids to 2 p.m., July 30, by California Division of Highways for bridge over Nojoqui Creek, 7½ miles from Zaca, SANTA BARBARA COUNTY, involving 625 cu.yd. concrete, 120,000 lb. reinf. steel. 7-2

VENTURA, CALIF.—Bids to 11 a.m., July 15, by County for Bridge on Los Angeles Ave., near Strathearn, involving 72 timber piles, 340 cu.yd. concrete and 37,000 lb. reinf. steel. 6-27

PORTLAND, ORE.—Bids to 10 a.m., July 16, by U. S. Bureau of Public Roads for bridge over Frying Pan Creek on White River Road, Mt. Rainier National Park, PIERCE COUNTY, Washington, involving 885 cu.yd. concrete, 95,000 lb. reinforcing and 227,800 lb. structural steel.

OLYMPIA, WASH.—Bids to July 22, by State Highway Dept., for 100-ft. timber pile trestle over Nason Creek, CHELAN COUNTY.

BIDS RECEIVED

LOS ANGELES, CALIF.—General Engineering Corp., 740 South Broadway, Los Angeles, $204,320 low bid to Board of Public Works, City Hall, Los Angeles, for constructing Washington St. bridge over Los Angeles River, between Soto St. and Harriet St. 6-27

SACRAMENTO, CALIF.—Low bids as follows by California Division of Highways for reinf. concrete bridges: SISKIYOU COUNTY—Rocca & Caletti, Toll Road, San Rafael, $77,779 low for bridge over Klamath River, near Yreka, and $97,884 for bridge over Shasta River, near Yreka; and COLUSA COUNTY—R. B. McKenzie, Red Bluff, $19,966 low for bridge over Bear Creek. (See Unit Bid Summary.) 7-2

OLYMPIA, WASH.—U. S. Steel Products Co., 1054 4th South, Seattle, Wash., who bid $1,247,888 low bid to the Washington State Highway Commission for steel superstructure for the Lake Union Bridge at Aurora St. in the City of Seattle. 6-25

SEATTLE, WASH.—General Const. Co., Colman Bdg., Seattle, $28,125 low bid to City for steel towers on W. Michigan St. over Duwamish Waterway.

CONTRACTS AWARDED

BELVEDERE, CALIF.—To Jasper-Stacy Co., 216 Pine St., San Francisco, at about $650,000 for constructing toll bridge over Richardson Bay from Sausalito to Belvedere, Marin County, for T. A. Tomasini, 209 Post St., San Francisco. Work consists of steel span over tracks, 7800 ft. creosoted pile trestle with concrete floors, road work at Belvedere end, and construction of a small steel bascule span in the center of the bridge. E. L. Cope, Hunter-Dulin Bdg., S. F., is Engnieer. 6-27

NAPA, CALIF.—Awards as follows by County: (1) To Harry Thorsen, St. Helena, $6291 for drainage structures in Berryessa Valley; and (2) To E. W. Peterson, 371 Vienna St., S. F., $8367 for steel bridge over Napa River at Barro Station. 7-1

OREGON CITY, CALIF.—To Northwest Equipment Co., American Bank Bdg., Portland, $20,997 for steel and concrete bridge over Mollalla River near Canby.

SACRAMENTO, CALIF.—Awards as follows by State: (1) PLACER COUNTY—To Lord & Bishop, Native Sons Bdg., Sacramento, $57,816 for reinf. concrete undergrade crossing near Emigrant Gap. (2) TEHAMA AND SHASTA COUNTIES—To C. W. Wood, P.O. Box 1435, Stockton, $135,058 for reinf. concrete undergrade crossing and 0.9 miles grading and concrete paving at Cottonwood Creek. (See Unit Bid Summary, June 25th issue.) 6-25

SACRAMENTO, CALIF.—To Fredrickson & Watson Const. Co., 354 Hobart St., Oakland, $18,127 for 3 reinf. conc. bridges near Williams, COLUSA COUNTY, for California Division of Highways. 7-1

SACRAMENTO, CALIF.—To Bodenhamer Const. Co., 4886 Mansfield Ave., San Diego, $55,851 for steel, concrete and timber overhead crossing over S.P. RR. tracks at Yuba Pass, NEVADA COUNTY, for California Division of Highways. 6-24

SAN LUIS OBISPO, CALIF.—To I. L. Ryder, San Carlos and Dupont Sts., San Jose, $11,495 for reinf. concrete bridge on Ida St. for City. 7-2

SANTA ROSA, CALIF.—(1) To A. Soda & Sons, $1031 for reinf. conc. culvert on Washington St.; (2) To R. Press Smith, Santa Rosa, who bid $1408 for reinf. conc. culvert on Skaggs Springs Road; (3) To W. L. Proctor, Santa Rosa, who bid $5988 for reinf. concrete culvert on Adobe to Eureka School Road. 6-27

LA GRANDE, ORE.—To Illinois Steel Bridge Co., Hutton Bdg., Spokane, Washington, who bid $3949 for furnishing fabricated structural steel, f.o.b. cars at Alicel, Oregon, work for UNION COUNTY. 6-23

PORTLAND, ORE.—To Edward Krieg, Hood River, Ore., $5402 for bridge over Drift Creek on Silverton-Willard Market Road for State.

PORTLAND, ORE.—Award recommended to W. T. Butler, Central Bdg., Seattle, $36,580 for concrete bridges on Round Pass and Klapatche Ridge Sections, West Side Highway, Mt. Rainier National Park, PIERCE COUNTY, Wash.

ST. HELENS, ORE.—Awards as follows by County: (1) To Kuckenberg & Wittman, Portland, Ore., $12,785 for 140 ft. reinf. conc. bridge over Rock Creek; and (2) To O. H. Pierce, Portland, $4481 for reinf. conc. bridge, 53 ft. long over Milton Creek.

SALT LAKE CITY, UTAH—To F. S. Whiting, Springville, Utah, $12,866 for bridge over Chalk Creek, SUMMIT COUNTY, for State.

OLYMPIA, WASH.—Awards as follows by State: (1) To Union Bridge Co., Portland, $12,558 for bridge and retaining wall between Wing Creek and Cape Horn, SKAMANIA COUNTY; and (2) To Lindstrom & Feigenson, Smith Bdg., Seattle, $23,460 for reinf. concrete bridge at Bunker Hill, COWLITZ COUNTY.

SEWER CONSTRUCTION

WORK CONTEMPLATED

PHOENIX, ARIZ.—Bonds have been voted by the City of Phoenix, Ariz., in amount of $817,000 for the construction of sewer mains and a sewage disposal plant. 6-28

SAN FRANCISCO, CALIF.—Plans by City Engr., office, bids soon for Alemany Storm Drain as follows: (1) Section 'E' from Bayshore Highway to Toland St., work involving: 915 ft.—two compartment, 8 ft. 6-in. by 11 ft. Monolithic conc. sewer, 350 ft. 2 ft. 6-in. by 3 ft. 9-in. reinf. conc. sewer, 77,000 lin.ft. piling. $165,000. (2) Section 'D' from Toland St. to Oakdale Ave., work involving: 1200 ft. 8 ft. by 14 ft. wood box sewer, 200 ft. 3 ft. by 4 ft. 6-in. wood box sewer, 7000 lin.ft. piling. $50,000. 6-23

SURETY BOND AND CASUALTY INSURANCE DIRECTORY

BIDS BEING RECEIVED

STOCKTON, CALIF.—Bids to 5 p.m., July 21, by City for vitr. sewer in Burkett Villas, $2046. 7-2

KLAMATH FALLS, ORE.—Bids up to 8 p.m., July 14, by City for 15th Sewer Unit involving: 13,200 lin. ft. 6-in. vitr. or concrete sewer, 3100 lin.ft. 8-in. vitr. or concrete sewer, 950 lin.ft. 10-in. vitr. or concrete sewer, manholes, and 7100 cu.yd. excavation and backfill. 6-26

BIDS RECEIVED

MODESTO, CALIF.—Bids received as follows by City: (1) Water Works Supply Co., 501 Howard St., San Francisco, $4560 low for furnishing one sewage clarifier mechanism, Dorr or Hardinge or equal. Dorr Company, Los Angeles, bid $6014. (2) Water Works Supply Co., 501 Howard St., San Francisco, $485 low for furnishing one duplex sewage sludge pump, of either diaphram or plunger type constant displacement sludge pump of approved type. Municipal & Industrial Supply Co. bid $486. 6-27

CONTRACTS AWARDED

BERKELEY, CALIF.—To Paradise & Gualter, 823A Capp St., San Francisco, $5979 for vitrified sewers on Keith Ave., Bret Harte Road and Cragmont Ave. for City. 7-1

CARPINTERIA, CALIF.—To Chas. H. Johnston, 94 No. Orange Drive, Hollywood, Calif., who bid $8750 for installing outfall about 3000 ft. in length. work for Carpinteria Sanitary District. 6-27

LOS ANGELES, CALIF.—Awards as follows by County Sanitation Dist. No. 8: (1) To Carpenter Bros., Inc., 457 N. Cannon Drive, Beverly Hills, $13,995 for sewage pumping station. (2) To Byron Jackson Pump Mfg. Co., Berkeley, who bid $1543 for furnishing and installing pumping plant. 6-25

LOS ANGELES, CALIF.—Awards as follows by City for portions of North Outfall Sewer: (1) SECTION 34 A—To Dalmatin & Nikcevich, 841 W. 62nd St., Los Angeles, who bid $203,634, using semi-elliptical concrete pipe; (2) SECTION 34 B—To M. Simunovich, 3305 W. 66th St., Los Angeles, who bid $171,800, using semi-elliptical concrete pipe. 6-30

RENO, NEV.—To Christensen & Co., 109 Sierra St., Reno, Nev., $329,940 for centr. cast concrete trunk sewers, sewage pumping station and treatment plant for City. (See Unit Bid Summary.) 6-25

WATER SUPPLY SYSTEMS

WORK CONTEMPLATED

PHOENIX, ARIZ.—Bonds voted $2,364,000 by City for: (1) Construction of a flow line from the sand trap to reservoir, 48-in. diam. $1,300,000; (2) Construction of a flow line from the reservoir to 16th St., and Thomas Road, 48-in. diam. $500,000; (3) Construction of a 42-in. pipe-line from 12th St. and McDowell Road to 16th St. and Thomas Road. $146,000; (4) Construction of a 24-in. pipe-line from 16th St. and Thomas Road to 7th Ave. $140,000. (5) Construction of belt line distribution system. $138,000; (6) Installation of five well pumping plants at Verde River. $25,000; (7) Construction of sump station at Verde River. $24,000. (8) Bank protection at Verde. $110,000; (9) Construction of 10,000,000-gallon reservoir. $92,000; (10) Purchase of well field. $8000; (11) Water mains in city. $78,000. 6-28

HELENA, MONT.—Bond election July 7 by City to vote $200,000 for constructing water system.

BIDS BEING RECEIVED

BEVERLY HILLS, CALIF.—Bids to 8 p.m., July 15, by City for water meters. 6-30

SACRAMENTO, CALIF.—Bids to 2 p.m., July 22, by Geo. B. McDougall, State Architect, Public Works Bdg., 11th and P Sts., Sacramento, for concrete dam for the Preston School of Industry, near Ione, Calif. The dam will measure 192 ft. at the crest and 25 ft. at the highest point and involves 600 cu.yd. of reinf. concrete. 6-25

SAN FRANCISCO, CALIF.—Bids to 3 p.m., July 14, by Board of Supervisors, City Hall, San Francisco, for furnishing 200 fire hydrants complete and 100 extra hydrant bodies for fire department. 6-27

PROSSER, WASH.—Bids to 7:30 p.m., July 15, by City for furnishing and installing deep well turbine pump. 6-23

WALLA WALLA, WASH.—Bids to July 9 by City for 10,000 ft. 20-in. 10 gauge steel pipe. 6-23

BIDS RECEIVED

OAKLAND, CALIF.—Byron-Jackson Pump Mfg. Co., Berkeley, $8420 low for pumping equipment for Lafayette Pumping Plant Second Unit, East Bay Municipal Utility Dist. 6-26

OLYMPIA, WASH.—Pacific Water Works Supply Co., Seattle, who bid $38,626, low bid to the City of Olympia, for furnishing and delivering cast iron pipe. Martin Hardware Co., who bid $39,741, next lowest bidder. 6-20

CONTRACTS AWARDED

FORT MASON, CALIF.—To United Iron Works, Oakland, $970 for turbine pumping plant at Fort Barry.

FULLERTON, CALIF.—Awards as follows by City: (1) To U. S. Cast Iron Pipe Co., Wright & Callender Bdg., Los Angeles, who bid $29,168 for furnishing cast iron pipe and fittings. (2) To Chapman Valve Co., Los Angeles, who bid $1615 for valves and valve boxes. 6-21

WEISER, IDAHO—Awards as follows by City: (1) To Reader & Lowe, Weiser, Ida., $47,152 for cast iron intake line and structures; (2) To McFarland Engr. Co., Kansas City, Mo., for filter equipment; and (3) To DeLaval Steam Turbine Co., Seattle, $3565 for pumps. Burns-McDonnell-Smith Engr. Co., Los Angeles, are Engrs.

GREAT FALLS, MONT.—Awards as follows by City: (1) Contract awarded to James B. Clow & Sons, $67,214 for furnishing various sizes of cast iron pipe; (2) Contract awarded to Pacific States Cast Iron Pipe Co., Provo, Utah, $4901 for furnishing 4500 ft. 8-in. cast iron pipe and 150 ft. 6-in. cast iron pipe; (3) Contract awarded to Rensselaer Valve Co., $726 for valves. 7-1

MOUNTAINAIR, N. M.—To Orman Const. Co., Pueblo, Colo., $31,100 for tank, wells and water mains for City.

IRRIGATION and RECLAMATION

BIDS RECEIVED

DENVER, COLO.—Bedford Fdy. & Machinery Company, Bedford, Ind., $3850, low bid to Bureau of Reclamation, Wilda Bdg., Denver, Colorado, for furnishing and delivering one pillar jib crane, capacity of 8 ton, together with hand-operated hoist and trolley and 2000 lb. auxiliary electric hoist and controller. 6-23

VALE, ORE.—Low bids as follows by Bureau of Reclamation for Bully Creek Fairman Coulee siphons: PLATE STEEL SIPHONS—Puget Sound Machinery Depot, Seattle, $267,040, and Western Pipe & Steel Co., S. F., $228,000 (alternative) low for pipe work; and Puget Sound Machinery Depot, Seattle, Wash., $53,696 low for excavation; PRECAST CONCRETE SIPHONS (ALTERNATIVE TO STEEL SIPHONS)—Elliott Stroud Bros. & Seabrook, Ravensdale, Wash., $213,015 low for concrete siphon; and W. H. Puckett Co., Boise, Ida., $29,689 low for structure excavation and concrete lined canal. (See Unit Bid Summary.) 6-23

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To Pelton Water Wheel Co., San Francisco, $14,908 low for one 72-in.x60-in. needle valve for Big Tujunga Dam No. 1 for Los Angeles Co. Flood Control Dist. 6-30

WASHINGTON, D. C.—To J. C. Maguire, Butte, Mont., $84,260 for overflow control works, dikes, canals, and structures at Bear River Migratory Bird Refuge, BOX ELDER COUNTY, Utah, for U.S. Department of Agriculture. 6-30

POWER DEVELOPMENT

BIDS RECEIVED

PASADENA, CALIF.—Low bids as follows by City for equipment for Municipal Light and Power Department: (1) Two 15,000 sq.ft. boilers, including boilers proper, steel supporting members, superheater, water columns, valves: Consolidated Steel Corp., 1200 N. Main St., Los Angeles (low bidder), $123,151. (2) Two suitable air preheaters, including enclosing casing. Sutor Co., 2008 E. Slauson Ave., Los Angeles (low bidder), $29,460. (3) Two sets of tubes, headers, connections, recirculators, etc., for side, rear, and front furnace walls. Foster-Wheeler Co., Los Angeles (low bidder), $29,475. (4) Two suitable automatic de-superheaters as specified, but not installed. C. C. Moore, Central Bdg., Los Angeles (low), $4185. 6-21

EUGENE, ORE.—Low bids as follows by Eugene Water Board of equipment for steam power plant (1) Plumbing & Heating Sales Corp., Portland, Ore., $52,998 low for one 1150 hp. bent tube type water boiler; (2) General Electric Co., $96,500 low for one 6000 kw. turbo-generator set; and (3) Allis-Chalmers Mfg. Co., $21,900 low for one surface condenser. 7-3

TACOMA, WASH.—O. F. Larson, Tacoma, $41,822 low for constructing steel frame for municipal power plant No. 2 for City.

RIVER and HARBOR WORK

WORK CONTEMPLATED

REDONDO BEACH, CALIF.—Bond election July 29 by City to vote $30,000 for addition to municipal pier. 6-30

BIDS BEING RECEIVED

SACRAMENTO, CALIF.—Bids to 3 p.m., Aug. 26, by U. S. Engineers Office, California Fruit Bdg., Sacramento, for clamshell dredging on San Joaquin River for Stockton Deep Water Channel. Work involves: PART 1—From Mormon Channel to Turners Cut and cutoff across McDonald Track, work involving: 1,827,000 cu.yd. clamshell dredging. PART 2—From Turners Cut to west side of Spud Island, work involving: 325,400 cu.yd. clamshell dredging. PART 3—From McDonald Tract to near Camp 8, Venice Island, work involving: 464,000 cu.yd. clamshell dredging. 6-27

SACRAMENTO, CALIF.—Bids up to 3 p.m., Aug. 26, by U. S. Engineers Office, California Fruit Bdg., Sacramento, for constructing levees or embankments by dragline excavators along San Joaquin River in connection with Stockton Deep Water Channel. Work involves: PART 1 (Section A) From Mormon Channel to Burns Cutoff, work involving: 478,800 cu.yd. dragline excavation. PART 2 (Section B) From Burns Cutoff to Turners Cut, work involving: 268,700 cu.yd. dragline excavation. PART 3 as follows: Section C—From Hog Island to Headreach Island, work involving: 50,000 cu.yd. dragline excavation. Section C—From Venice Island to Mandeville Island, work involving: 66,100 cu.yd. dragline excavation. 6-27

OPPORTUNITY PAGE

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SAN FRANCISCO, CALIF.—Bids to 3 p.m., July 24, by U. S. Engineers Office, Custom House, S. F., for 1,107,000 cu.yd. dredging in Oakland Harbor. 6-24

BIDS RECEIVED

LOS ANGELES, CALIF.—Bids received as follows by the Los Angeles Harbor Department, City Hall, Los Angeles, for dredging:
(1) 185,000 cu.yd. in Fish Harbor.
(2) 115,000 cu.yd. dredging in entrance channel.
(3) 300,000 cu.yd. entire project (items 1 and 2 combined).

	(1)	(2)	(3)
Standard Dredging Co., Central Bdg., L. A.	.35	.60	.2388
Western Dredging Co.	.38	.65	.257
S. F. Bridge Company	....	....	.257
Hydraulic Dredging Co.	....	....	.2533

6-20

CONTRACTS AWARDED

HUNTINGTON BEACH, CALIF.—Awards as follows by City: (1) To Merritt, Chapman & Scott, PO. Box 698, San Pedro, who bid $49,065 for gunite repairs to 1400 ft. pier; (2) To Merritt, Chapman & Scott Corp., PO. Box 698, San Pedro, who bid $61,927 for 500 ft. extension to pier, using centrifugal spun concrete piling and concrete girders and beams for deck. 6-30

OAKLAND, CALIF.—To Schuler & McDonald, 1723 Webster St., Oakland, $104,715 for extension to Outer Terminal Wharf at foot of 14th St. for Oakland Port Comm. 7-1

SAN FRANCISCO, CALIF.—To M. B. McGowan, Call Bdg., San Francisco, who bid $30,357 to Park Commissioners for reinf. concrete wharf and approach at Fort Mason, San Francisco, about 300-ft. northwest of the present Fort Mason Wharf No. 4. Wharf is to be 150x40 ft. pre-cast reinf. concrete pipe with reinf. concrete deck. 6-24

MACHINERY and SUPPLIES

WORK CONTEMPLATED

HEMET, CALIF.—Bond election July 24 by the City of Hemet, Riverside County, as follows: (1) $6000 for the purchase of tractor, grader, truck and street sweeper for the Street Department. (2) $12,000 for purchase of new fire truck, enlargement of fire house, etc. 6-20

BIDS BEING RECEIVED

SAN FRANCISCO, CALIF.—Bids to 3 p.m., July 14, by Board of Supervisors, City Hall, S. F., for furnishing wrought steel and cast iron pipe. 7-2

BIDS RECEIVED

NAPA, CALIF.—American Cast Iron Pipe Co., $1834 low for furnishing cast iron pipe to City. 7-2

CONTRACTS AWARDED

OAKLAND, CALIF.—To U. S. Steel Products Co., Rialto Bdg., S. F., $3100 for track materials for 14th St. Wharf for Oakland Port Comm. 7-1

RAILROAD CONSTRUCTION

WORK CONTEMPLATED

SAN FRANCISCO, CALIF.—Plans by Engr. Dept., Western Pacific Bdg., San Francisco, and bids will be called for about July 5 to be opened about July 25 for the construction of 111 miles of railroad from Keddie, Plumas County, to Bieber, Lassen County (the Western Pacific RR. portion of joint line from Keddie to Klamath Falls), Western Pacific portion of the work involves: CLEARING—392 acres heavy, 476 acres light, 394 acres medium, 217 acres sagebrush. GRADING—1,264,354 cu.yd. solid rock excavation, 788,148 cu.yd. loose rock excavation, 779,903 cu.yd. common excavation, 256,626 cu.yd. loose rock borrow, 560,291 cu.yd. common borrow, 3,655,771 sta.yd. overhaul. TUNNELS—11 in number, total length 6500 ft., 17 ft. wide by 22 ft. high in the clear (standard cross section). STEEL VIADUCTS AND BRIDGES—involving 5100 tons structural steel. TIMBER TRESTLES—involving 275,000 ft. BM Douglas fir, 3300 lin.ft. piling, and 1733 cu.yd. concrete footings. LINE PROTECTION—560 cu.yd. rubble masonry retaining wall, 1231 cu.yd. loose riprap, 17,720 sq.ft. conc. tie cribbing, 2 overhead grade crossings, 12,330 cu.yd. solid rock, channel changes, etc.; 8320 cu.yd. loose rock, channel change, etc.; 11,675 cu.yd. common, channel change, etc.; 8400 cu.yd. borrow for above, 1343 panels snow fencing. TIES—416,971 Douglas fir cross ties. RAIL (85 lb.)—17,845 tons. BALLAST—354,000 cu.yd. gravel or volcanic cinders. SIDINGS—22 mile and 6.63 miles in joint yard. Also 18 sect. headquarters, six 60,000 gal. wooden water stations, two 75,000 gal. steel oil service tanks, 5 stockyards. J. W. Williams is Chief Engineer of Western Pacific RR. Cost of above $9,824,669. Work will probably all be let in one contract. 6-30

SEATTLE, WASH.—Plans by Engr. Dept., Great Northern Railway Co., Seattle, Wash., for the construction of 85 miles of railroad from near Klamath Falls, Ore., to a joint yard at Bieber, Lassen County (The Great Northern portion of a joint line from Keddie to Klamath Falls). The Great Northern portion of the work involves: CLEARING—114 acres heavy, 426 acres light. GRADING—186,312 cu.yd. solid rock excavation (lava), 47,038 cu.yd. loose rock excavation, 57,010 cu.yd. common excavation, 7000 cu.yd. lava rock borrow, 106,249 cu.yd. loose rock borrow, 870,346 cu.yd. common borrow, 157,690 cu.yd. hard-pan borrow, 729,000 sta.yd. overhaul. STEEL VIADUCTS AND BRIDGES—One 60-ft. deck plate girder, one 38-ft. girder beam, and three 40-ft. girder bridges. TIMBER PILE TRESTLES—3200 lin.ft. involving: 540,000 ft. BM lumber, 45,000 lin.ft. piling. FENCING—100 miles of right of way fencing. TIES—286,000 cross ties. RAIL (90-lb.)—14,000 tons. BALLAST—266,000 cu.yd. cinder ballast. YARDS—Round house, machine shop, boiler, oil station, at Bieber. Also one 10,000 bbl. oil storage tank and one 65,000 gallon capacity oil service tank and 100,000 gallon water station, and four 50,000 gallon water stations. $3,924,620. J. R. W. Davis is Chief Engineer of the Great Northern Railway Company, and Col. F. Mears, Seattle, is Assistant Chief Engineer. 6-30

CHEYENNE, WYO.—Plans by Engr. Dept. of Union Pacific Railroad Company for enlarging present yard, improvements to cost $1,000,000.

LIGHTING SYSTEMS

BIDS RECEIVED

SACRAMENTO, CALIF.—E. E. Burgess, 430 Natoma St., S. F., $11,660 low bid to City for 48 electroliers on H St., etc. 6-21

SAN JOSE, CALIF.—City Impr. Co., 2055 Center St., Berkeley, $12,794 low for electroliers on Third St. for City. 7-1

SWIMMING POOLS

CONTRACTS AWARDED

TUCSON, ARIZ.—To Herbert F. Brown, 1233 W. Alameda St., Tucson, Ariz., $21,700 for South Side swimming pool for City. 6-23

BUILDING CONSTRUCTION

CONTRACTS AWARDED

LONG BEACH, CALIF.—To Lynch Const. Co., 730 Merril Ave., Los Angeles, Calif., who bid $92,598 for a transit shed at Berth No. 50, Long Beach Harbor. The building will be 82x510 feet, steel frame, concrete foundation, and corrugated iron sides, work for City. 6-23

OAKLAND, CALIF.—To E. T. Leiter & Sons, 811-37th St., Oakland, $56,837 to County for two-story stucco and reinforced concrete club and lodge building at Emeryville. 6-24

OAKLAND, CALIF.—To Chas. W. Heyer, 682 Mills Bdg., San Francisco, Calif., for the department store to be located at 20th and Broadway. Weeks & Day, Financial Center Bdg., San Francisco, Calif., are the Architects. $250,000. 6-27

SAN ANDREAS, CALIF.—To Frank P. Guyon, 1211 E. Main St., Stockton, $16,797 for brick addition to Hotel Treat. 7-1

SAN FRANCISCO, CALIF.—Awards as follows by City for reinf. concrete and stone Aptos Jr. High School on Aptos Ave. and Upland Drive: GENERAL—To MacDonald & Kahn, Financial Center Bdg., S. F., $531,500; PLUMBING—Scott Co., 243 Minna St., S. F., $34,988; ELECTRICAL—R. Flatland, 1899 Mission St., S. F., $37,332; and MECHANICAL—Scott Co., 243 Minna St., S. F., $53,867. 7-3

SAN JOSE, CALIF.—Awards as follows by Board of Education for Gardner School (10 classrooms) to be located at Martin and Williams Sts., San Jose, Calif., to be frame and stucco construction. GENERAL CONTRACT—To the Minton Co., Front St., Mountain View, Calif., $38,938. HEATING—To A. J. Peters, 455 E. Washington St., San Jose, $5900. 6-27

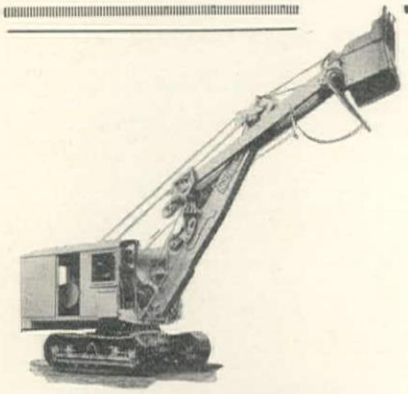
SAN JOSE, CALIF.—Awards as follows by Board of Education for stucco and reinforced concrete Roosevelt Junior High School: GENERAL CONTRACT—To E. Nommensen, 28 No. First St., San Jose, $116,171. PLUMBING—To Hately & Hately, 1710 10th St., Sacramento, $19,546. HEATING—To A. J. Peters, 455 E. Washington St., San Jose, $31,663. ELECTRIC WIRING—To Webb & Fleming, 368 E. Julian St., San Jose, $9325. PLASTERING—To J. Provenzano, San Jose, $13,155. PAINTING—To Patterson Bros., 494 36th St., Oakland, $7260. SHEET METAL—To Superior Metal Products Co., Market St., Oakland, $4258. ROOFING—To Bush Roofing Co., St. Clair Bdg., San Jose, $3227. TILE—To Rigney Tile Co., 3012 Harrison St., Oakland, Calif., $2320. SPECIAL CABINET WORK—To Braas & Kuhn, San Francisco, $12,950. 6-27

SAN JOSE, CALIF.—Awards as follows by Franklin Grammar School District for frame and stucco school: GENERAL—To Paul N. Anderson, 1210 Lincoln St., San Jose, $35,862; and HEATING—To W. Serpa, 497 N. 13th St., San Jose, $3875. 6-30

YOUNTVILLE, CALIF.—To Gaubert Bros., 4735 Brookdale Ave., Oakland, $15,750 for reinf. conc. guard house at Veterans Home, Yountville, Napa County, for State Architects' Office, Public Works Bdg., Sacramento. 6-28

OPPORTUNITY PAGE

CONTINUED



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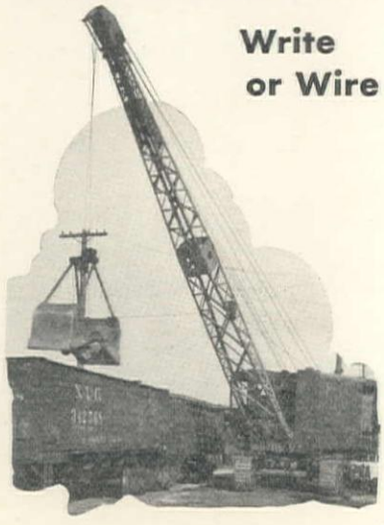

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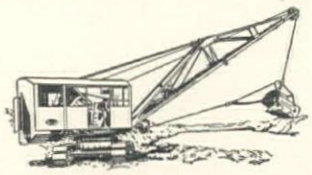

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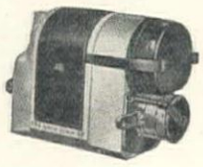

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Ingersoll-Rand Co.
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Leitch & Co.
National Brake & Electric Co.
Rix Company, Inc., The
Schramm, Inc.
Sullivan Machinery Co.
West Coast Tractor Co.

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Seaside Oil Co.
Shell Oil Co.
Standard Oil Co.
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Asphalt, Emulsified
American Bitumuls Co.

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Cleveland Tractor Co., The
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Speeder Machinery Corp.
Thew Shovel Co., The
Universal Crane Co., The
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Pacific Coast Steel Corp.

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Bacon Co., Edward R.
Diamond Iron Works, Inc.
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Associated Indemnity Corp.
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Consolidated Indemnity & Insurance Co.
Detroit Fidelity & Surety Co.
Fidelity & Casualty Co. of N. Y., The
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Dorr Co., The
Wallace & Tiernan Co.

Clay Products
Gladding, McBean & Co.
Pacific Clay Products Co.

Concrete Buckets
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Young Machy. Co., A. L.

Concrete Curing
Concrete Curing Co.
McEverlast, Inc.

Concrete Forms
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Concrete Pipe
American Concrete Pipe Co.

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Harron, Rickard & McCone Co.
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Cranes, Electric, Gasoline Locomotive
American Hoist & Derrick Co.
Austin Machy. Corp.
Bacon Co., Edward R.
Bucyrus-Erie Co.
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Hackley Equipment Co., P. B.
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Universal Crane Co., The
W-K-M Company, Inc.

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Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Thew Shovel Co., The

Crushers
Austin Western Road Machy. Co., The
Bacon Co., Edward R.
Diamond Iron Works, Inc.
Garfield & Co.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Smith Engineering Works
W-K-M Company, Inc.
Young Machy. Co., A. L.

Culverts, Concrete
Portland Cement Association

Culverts, Metal
California Corrugated Culvert Co.
U. S. Cast Iron Pipe & Fdy. Co
Western Pipe & Steel Co.

Culverts, Part Circle
California Corrugated Culvert Co.
Western Pipe & Steel Co.

Culverts, Vitrified
Gladding, McBean & Co.
Pacific Clay Products

Curing, Concrete
Concrete Curing Co.
McEverlast, Inc.

Cutting Apparatus
Oxweld Acetylene Co.
Victor Welding Equipment Co.

Dams
Ambursen Dam Co., Inc.

Derricks
Bacon Co., Edward R.
Garfield & Co.
Harron, Rickard & McCone Co.

Derricks (Continued)
Industrial Brownhoist Corp.
Jenison Machinery Co.
Young Machy. Co., A. L.

Ditch Machinery
Bacon Co., Edward R.
Bucyrus-Erie Co.
Cleveland Trencher Co.
Garfield & Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Co.
Marion Steam Shovel Co.
National Equipment Corp.
Northwest Engineering Co.
Ohio Power Shovel Co., The
Orton Crane & Shovel Co.
Thew Shovel Co., The

Draglines
Austin Machy. Corp.
Bacon Co., Edward R.
Bucyrus-Erie Co.
Garfield & Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Co.
Marion Steam Shovel Co.
National Equipment Corp.
Northwest Engineering Co.
Ohio Power Shovel Co.
Sauerman Bros., Inc.
Spears-Wells Machy. Co.
Speeder Machinery Corp.
Thew Shovel Co., The
Universal Crane Co., The
Young Machy. Co., A. L.

Drain Tile
Gladding, McBean & Co.
Gladding Bros. Mfg. Co.
Pacific Clay Products

Drills, Rock
Bacon Co., Edward R.
Gardner-Denver Co.
Harron, Rickard & McCone Co.
Ingersoll-Rand Co.
Rix Company, Inc., The
Schramm, Inc.
Sullivan Machinery Co.

Drill Sharpening
Compressor Service & Tool Co.

Dump Cars
Bacon Co., Edward R.
Jenison Machinery Co.
United Commercial Co.

Dump Wagons
Le Tourneau Mfg. Co.
West Coast Tractor Co.

Engineers
Ambursen Dam Co., Inc.
Burns-McDonnell-Smith Engr. Co.
Hunt Co., R. W.
Porter, Geo. J.

Engines, Gasoline and Steam
Bacon Co., Edward R.
Continental Motors Corp.
Harron, Rickard & McCone Co.
Hercules Motors Corp.
Ingersoll-Rand Co.
International Harvester Co.
Jenison Machinery Co.
Le Roi Co.
Novo Engine Co.
Wisconsin Motor Co.

Excavating Machinery
Austin Western Road Machy. Co., The
Bacon Co., Edward R.
Bodinson Mfg. Co.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Cleveland Tractor Co., The
Excavating Equipment Dealers, Inc.
Garfield & Co.
Haiss Mfg. Co., Geo.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Co.
Marion Steam Shovel Co.
National Equipment Corp.
Northwest Engineering Co.
Ohio Power Shovel Co.

(Continued on page 66)

OPPORTUNITY PAGE

CONTINUED

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

Oiling

San Francisco, California, June 27, 1930

Sealed bids, in single copy only subject to the conditions contained herein, will be received until 2:00 o'clock p.m. on the 22nd day of July, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for oil processing the Idyllwild National Forest Highway, Route 72, in San Bernardino National Forest, Riverside County, California. The length of the project to be oil processed is 15.5 miles and the principal items of work are approximately as follows:

Preparing roadway, 15.5 miles.

Asphaltic oil furnished and applied, 365,000 gallons.

Road mixing and compacting oil treated surface, 15.5 miles.

Right of way monuments in place, 198 each.

Proposals will be received from capable and responsible contractors who must submit with their request for Standard Government Form ot Bid an attested statement, on forms to be supplied by the District Engineer, of their financial resources and construction experience. Standard Government Form of Bid will be supplied only to contractors showing sufficient experience and financial resources to properly construct the work contemplated.

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

Guarantee will be required with each bid as

Performance bond will be required as follows: should be certified and made payable to the Federal Reserve Bank of San Francisco.
follows: In the amount of five (5) per cent of the bid.

In the amount of one hundred (100) per cent of the total contract price. Performance shall begin within ten (10) calendar days after date of receipt of notice to proceed and shall be completed within one hundred (100) calendar days from that date exclusive of any time that may intervene between the effective date of orders of the Government to suspend operations on account of weather conditions and the effective date of orders to resume work and subject to such extensions as may be provided for under the Special Provisions.

Liquidated damages for delay will be the amount stated in the Special Provisions for each calendar day of delay until the work is completed and accepted.

Partial payments will be made as the work progresses for work and material delivered if such work and material meet the approval of the contracting officer.

Article on patents will be made a part of the contract.

Bids must be submitted upon the Standard Government Form of Bid and the successful bidder will be required to execute the Standard Government Form of Contract for Construction.

The right is reserved, as the interest of the Government may require, to reject any and all bids, to waive any informality in bids received, and to accept and to reject any items of any bid, unless such bid is qualified by specific limitation.

Envelopes containing bids must be sealed, marked, and addressed as follows:
Bid for Road Construction. To be opened 2:00 p.m., July 22, 1930.
California 72-A2, B1, C, Idyllwild National Forest Highway, 807 Sheldon Bldg., San Francisco, Calif.

C. H. SWEETSER, District Engineer.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

Grading

San Francisco, California, July 1, 1930

Sealed bids, in single copy only subject to the conditions contained herein, will be received until 2:00 o'clock p.m. on the 24th day of July, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for grading from Sta. 0+00 to Sta. 137+67 with exception from Sta. 25+27 to Sta. 28+47 on Section B, Fish Camp-Fourmile, of route No. 47, Oakhurst National Forest Highway, in Sierra National Forest, Mariposa County, California. The project is 2.648 miles in length and the principal items of work are approximately as follows:

Clearing, 17.3 acres.
Unclassified excavation, 85,240 cu.yd.
Unclassified excavation for structures, 405 cu.yd.
Overhaul, 12,705 sta.yd.
Finish earth graded road, 2.648 miles.
Cement rubble masonry, 34 cu.yd.
Corrugated galvanized metal culvert pipe in place, 1420 lin.ft.
Maintenance of existing road and sections accepted for traffic, extra work, estimate $1500.
Right of way monuments in place, 74 each.

Proposals will be received from capable and responsible contractors who must submit with their request for Standard Government Form of Bid an attested statement, on forms to be supplied by the District Engineer, of their financial resources and construction experience. Standard Government Form of Bid will be supplied only to contractors showing sufficient experience and financial resources to properly construct the work contemplated.

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 Federal Reserve Bank of San Francisco.

Guarantee will be required with each bid as follows: In the amount of five (5) per cent of the bid.

Performance bond will be required as follows: In the amount of one hundred (100%) per cent of the total contract price. Performance shall begin within ten (10) calendar days after date of receipt of notice to proceed and shall be completed within two hundred twenty-five (225) calendar days from that date, exclusive of any time that may intervene between the effective date of orders of the Government to suspend operations on account of weather conditions and the effective date of orders to resume work and subject to such extensions as may be provided for under the Special Provisions.

Liquidated damages for delay will be the amount stated in the Special Provisions for each calendar day of delay until the work is completed and accepted.

Partial payments will be made as the work progresses for work and material delivered if such work and material meet the approval of the Contracting Officer.

Article on patents will be made a part of the contract.

Bids must be submitted upon the Standard Government Form of Bid and the successful bidder will be required to execute the Standard Government Form of Contract for Construction.

The right is reserved, as the interest of the Government may require, to reject any and all bids, to waive any informality in bids received, and to accept or reject any items of any bid, unless such bid is qualified by specific limitation.

Envelopes containing bids must be sealed, marked, and addressed as follows:
Bid for Road Construction. To be opened 2:00 p.m., July 24, 1930.
Fish Camp-Fourmile Section, Oakhurst National Forest Highway, 807 Sheldon Bldg., 461 Market St., San Francisco, California.

C. H. SWEETSER, District Engineer.

NATIONAL PARK SERVICE

Grading

San Francisco, California, July 1, 1930

Sealed bids, in single copy only, subject to the conditions contained herein, will be received until 2:00 o'clock p.m., on the 24th day of July, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for grading from Sta. 0+00 to Sta. 373+51.35 with exception of Sta. 329+32 to Sta. 335+80 on Mariposa Grove section of Wawona Route in Sierra National Forest, Mariposa County, California (Yosemite National Park project 2-B2, grading). The project is 7.08 miles in length and the principal items of work are approximately as follows:

Clearing, 55.28 acres.
Unclassified excavation, 320,000 cu.yd.
Structural excavation, 1346 cu.yd.
Overhaul, 94.765 sta.yd.
Finishing, 7.08 miles.
Cement rubble masonry, 121 cu.yd.
Corrugated metal pipe in place, 5950 lin.ft.
Hand laid riprap, 195 cu.yd.

OFFICIAL BIDS

Maintenance of detours (extra work estimated $250.00).
Moving existing fences, 0.5 mile.

Proposals will be received from capable and responsible contractors who must submit with their request for Standard Government Form of Bid an attested statement, on forms to be supplied by the District Engineer, of their financial resources and construction experience. Standard Government Form of Bid will be supplied only to contractors showing sufficient experience and financial resources to properly construct the work contemplated.

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 Federal Reserve Bank of San Francisco.

Guarantee will be required with each bid as follows: In the amount of five (5) per cent of the bid.

Performance bond will be required as follows: In the amount of one hundred (100%) per cent of the total contract price. Performance shall begin within ten (10) calendar days after date of receipt of notice to proceed and shall be completed within three hundred twenty-five (325) calendar days from that date exclusive of any time which may intervene between the effective date of orders of the Government to suspend operations on account of weather conditions and the effective date of orders to resume work and subject to such extensions as may be provided for under the Special Provisions.

Liquidated damages for delay will be the amount stated in the Special Provisions for each calendar day of delay until the work is completed and accepted.

Partial payments will be made as the work progresses for work and material delivered if such work and material meet the approval of the Contracting Officer.

Article on patents will be made a part of the contract.

Bids must be submitted upon the Standard Government Form of Bid and the successful bidder will be required to execute the Standard Government Form of Contract for Construction.

The right is reserved, as the interest of the Government may require, to reject any and all bids, to waive any informality in bids received, and to accept or reject any items of any bid, unless such bid is qualified by specific limitation.

Envelopes containing bids must be sealed, marked, and addressed as follows:
Bid for Road Construction. To be opened 2:00 p.m., July 24, 1930.
Mariposa Grove Section, Wawona Route, Yosemite National Park Project 2-B2, Grading, 807 Sheldon Bldg., 461 Market St., San Francisco, California.

C. H. SWEETSER,
District Engineer, Bureau of Public Roads.

THE BUYERS' GUIDE—*Continued from Page 64*

Excavating Mchy.(Continued)
Orton Crane & Shovel Co.
Owen Bucket Co.
Sauerman Bros., Inc.
Speeder Machinery Corp., The
Thew Shovel Co., The
Universal Crane Co., The

Expansion Joints
Industrial & Municipal Supply Co.
U. S. Cast Iron Pipe & Fdy. Co.
Water Works Supply Co.

Explosives
Giant Powder Co., Cons., The
Hercules Powder Co.

Equipment—Rental
Atkinson Construction Co.
Contractors Mchy. Exchange
Hackley Equipment Co., P. B.
Tieslau Bros.

Filters, Water
California Filter Co., Inc.

Fire Hydrants
Greenberg's Sons, M.
Industrial & Municipal Supply Co.
Rensselaer Valve Co.
Water Works Supply Co.

Floating Roofs
Chicago Bridge & Iron Works

Flood Lights
Oxweld Acetylene Co.

Flooring, Industrial
Paraffine Companies, Inc., The

Floors, Mastic
Wailes Dove-Hermiston Corp.

Flumes, Concrete
Portland Cement Association

Flumes, Metal
California Corrugated Culvert Co.
Montague Pipe & Steel Co.

Fluxes
Victor Welding Equipment Co.

Forms, Steel
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Lakewood Engr. Co.

Freight, Water
American-Hawaiian Steamship Co.

Frogs and Switches
Bacon Co., Edward R.
United Commercial Co.

Gas Holders
Chicago Bridge & Iron Works
Western Pipe & Steel Co.

Gates, Cast-Iron
California Corrugated Culvert Co.

Gates, Irrigation
Great Western Meter Co.

Gates, Radial
California Corrugated Culvert Co.

Gates, Sheet Metal
California Corrugated Culvert Co.

Governors, Steam Engine
Gardner-Denver Co.
Young Machy. Co., A. L.

Governors, Turbine
Pelton Water Wheel Co., The

Gravel Plant Equipment
Bacon Co., Edward R.
Bodinson Mfg. Co.
Bucyrus-Erie Co.
Diamond Iron Works, Inc.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Link-Belt Co.
Smith Engineering Works
Young Mach. Co., A. L.

Hammers, Steam Pile
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.

Hoists, Hand and Power
Bacon Co., Edward R.
Gardner-Denver Co.
Garfield & Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Ingersoll-Rand Co.
Jaeger Machine Works, The

Hoists, Hand and Power (Continued)
Jenison Machinery Co.
Link-Belt Co.
Novo Engine Co.
Sullivan Machinery Co.
West Coast Tractor Co.
Young Machy. Co., A. L.

Hoppers, Steel
Bacon Co., Edward R.
Haiss Mfg. Co., Geo.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Lakewood Engr. Co.
Link-Belt Co.

Hose, Steam, Air and Water
Gardner-Denver Co.
Ingersoll-Rand Co.
Leitch & Co.
Rix Company, Inc., The

Hydro-Tite
Industrial & Municipal Supply Co.

Insurance, Casualty
Associated Indemnity Corp.
Commerce Casualty Co.
Consolidated Indemnity & Insurance Co.
Detroit Fidelity & Surety Co.
Fidelity & Casualty Co. of N. Y., The
Fidelity & Deposit Co. of Maryland
Glens Falls Indemnity Co.
Great American Indemnity Co.
Indemnity Insurance Co. of North America
Maryland Casualty Co.
Massachusetts Bonding & Insurance Co.
New Amsterdam Casualty Co.
Rolph, James Jr., Landis & Ellis

Iron, Plates and Sheets
American Rolling Mill Co., The

Jacks, Lifting
Jenison Machinery Co.

Kettles, Tar and Asphalt
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Montague Pipe & Steel Co.
Spears-Wells Machy. Co.
Young Machy. Co., A. L.

Leadite
Water Works Supply Co.

Loaders, Power, Truck and Wagon
Haiss Mfg. Co., Geo.
Industrial Brownhoist Corp.
Jaeger Machine Works, The
Jenison Machinery Co.
Link-Belt Co.
Spears-Wells Machy. Co.
Young Machy. Co., A. L.

Locomotives, Electric, Gas and Steam
Bacon Co., Edward R.
Garfield & Co.
Hackley Equipment Co., P. B.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
United Commercial Co.

Lumber
McCormick Lumber Co.

Metal Lath
Truscon Steel Company

Meters, Irrigation
Great Western Meter Co.

Meters, Venturi
Water Works Supply Co.

Meters, Water
Industrial & Municipal Supply Co.
Neptune Meter Co.

Mixers, Chemical
Dorr Co., The

Mixers, Concrete
Bacon Co.,Edward R.
Foote Company, Inc.
Garfield & Co.
Harron, Rickard & McCone Co.
Jaeger Machine Works, The
Jenison Machinery Co.
Lakewood Engr. Co.
National Equipment Corp.
Young Machy. Co., A. L.

Mixers, Plaster
Harron, Rickard & McCone Co.
Jaeger Machine Works, The
Jenison Machinery Co.
Young Machy. Co., A. L.

Motors, Gasoline
Continental Motors Corp.
Hercules Motors Corp.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Le Roi Co.
Wisconsin Motor Co.

Oxy-Acetylene Apparatus
Oxweld Acetylene Co.

Oxygen in Cylinders
The Linde Air Products Co.

Paints, Acid Resisting
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Paints, Metal Protective
McEverlast, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Paints, Technical
American Bitumuls Co.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Paints, Waterproofing
McEverlast, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Pavers, Concrete
Foote Company, Inc.
Harron, Rickard & McCone Co.
National Equipment Corp.

Paving Breakers
Gardner-Denver Co.
Harron, Rickard & McCone Co.
Ingersoll-Rand Co.
Leitch & Co.
Rix Company, Inc., The
Schramm, Inc.
Sullivan Machinery Co.

Paving, Contractor
Warren Bros. Roads Co.

Paving Plants
Bacon Co., Edward R.
Jaeger Machine Works, The
Jenison Machinery Co.
Standard Boiler & Steel Works

Paving Tools
Bacon Co., Edward R.
Harron, Rickard & McCone Co.

Penstocks
Chicago Bridge & Iron Works
Lacy Manufacturing Co.
Pittsburgh-Des Moines Steel Co.
Water Works Supply Co.
Western Pipe & Steel Co.

Pile Drivers
Bacon Co., Edward R.
Bucyrus-Erie Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Ingersoll-Rand Co.
Jenison Machinery Co.
Northwest Engineering Co.
Orton Crane & Shovel Co.
Thew Shovel Co., The

Piles, Concrete
Raymond Concrete Pile Co.
MacArthur Concrete Pile Corp.

Piling
Pacific Coast Steel Corp.

Pipe, Bell and Spigot
National Cast Iron Pipe Co.

Pipe, Cast-Iron
American Cast Iron Pipe Co.
Claussen & Co., C. G.
Industrial & Municipal Supply Co.
National Cast Iron Pipe Co.
Pacific States Cast Iron Pipe Co.
U. S. Cast Iron Pipe & Fdy. Co.
Water Works Supply Co.

Pipe, Cement Lined
American Cast Iron Pipe Co.
National Cast Iron Pipe Co.
U. S. Cast Iron Pipe & Fdy. Co.

Pipe, Centrifugal
National Cast Iron Pipe Co.

Pipe Clamps and Hangers
Kortick Mfg. Co.

Pipe Coatings
McEverlast, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Pipe, Concrete
American Concrete Pipe Co.
Lock Joint Pipe Co.
Portland Cement Association

Pipe, Culvert
California Corrugated Culvert Co.
Gladding, McBean & Co.
Pacific Clay Products
Western Pipe & Steel Company

Pipe Fittings
American Cast Iron Pipe Co.
Claussen & Co., C. G.
Industrial & Municipal Supply Co.
National Cast Iron Pipe Co.
Pacific Pipe Co.
Pacific States Cast Iron Pipe Co.
U. S. Cast Iron Pipe & Fdy. Co.
Weissbaum & Co., G.

Pipe, Flanged
National Cast Iron Pipe Co.

Pipe Line Machinery
Bacon Co., Edward R.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
W-K-M Company, Inc.

Pipe, Lock-Bar
Western Pipe & Steel Co.

Pipe, Preservative
Columbia Wood & Metal Preservative Co.

Pipe, Pressure Line
Lacy Manufacturing Co.
Lock Joint Pipe Co.
Western Pipe & Steel Co.

Pipe, Riveted Steel
Lacy Mfg. Co.
Montague Pipe & Steel Co.
Pittsburgh-Des Moines Steel Co.
Western Pipe & Steel Co.

Pipe, Sewer
Gladding, McBean & Co.
Pacific Clay Products

Pipe, Standard
Claussen & Co., C. G.
Pacific Pipe Co.
Weissbaum & Co., G.

Pipe, Vitrified
Gladding, McBean & Co.
Gladding Bros. Mfg. Co.
Pacific Clay Products

Pipe, Welded Steel
California Corrugated Culvert Co.
Lacy Manufacturing Co.
Montague Pipe & Steel Co.
Steel Tank & Pipe Co.
Union Tank & Pipe Co.
Western Pipe & Steel Co.

Plows, Road
Bacon Co., Edward R.
Hackley Equipment Co., P. B.
Jenison Machinery Co.
Spears-Wells Machy. Co.

Pneumatic Tools
Gardner-Denver Co.
Ingersoll-Rand Co.
Leitch & Co.
Schramm, Inc.

Powder
Giant Powder Co., Cons., The
Hercules Powder Co.

Power Units
Continental Motors Corp.
Harron, Rickard & McCone Co.
Hercules Motors Corp.
International Harvester Co.
Jenison Machinery Co.
Novo Engine Co.

Preservative, Wood, Metal, etc.
Columbia Wood & Metal Preservative Co.
Paraffine Companies, Inc., The

Pumps, Centrifugal
Byron Jackson Pump Mfg. Co.
Industrial & Municipal Supply Co.
Ingersoll-Rand Co.
Jaeger Machine Works, The
Pelton Water Wheel Co., The
Rix Company, Inc., The
Washington Iron Works
Woodin & Little

(Continued on page 68)

OPPORTUNITY PAGE

CONTINUED

OFFICIAL BIDS

NOTICE TO CONTRACTORS

Grading, Surfacing, Bridge

Sealed proposals will be received at the office of the State Highway Engineer, Public Works Building, Sacramento, California, until 2 o'clock p.m. on July 16, 1930, at which time they will be publicly opened and read, for construction in accordance with the specifications therefor, to which special reference is made, of portions of State Highway, as follows:

Modoc County, between 3 miles and 4.4 miles east of Alturas (II-Mod-28-C), about one and four-tenths (1.4) miles in length, to be graded and surfaced with untreated crushed gravel or stone.

El Dorado County, a reinforced concrete girder bridge across South Fork of American River at Riverton (III-E.D-11-F); composed of one 60-foot span and two 54-foot spans on concrete piers and bents, and grading and surfacing approaches with untreated crushed gravel or stone.

Kern County, between 1-½ miles east of Cottonwood Creek and Democrat Springs (VI-Ker-57-F & G), about thirteen and nine-tenths (13.9) miles in length, to be surfaced with oil treated crushed gravel or stone.

San Joaquin County, between Forest Lake and the northerly boundary (X-S.J-4-D), about one and four-tenths (1.4) miles in length, to be graded and paved with asphalt concrete.

Proposal forms will be issued to only those Contractors who have furnished verified statement of experience and financial condition in accordance with the provisions of Chapter 644, Statutes 1929, and whose statements so furnished are satisfactory to the Department of Public Works. Bids will not be accepted from a Contractor to whom a proposal form has not been issued by the Department of Public Works.

Plans may be seen, and forms of proposal, bonds, contract and specifications may be obtained at the said office, and they may be seen at the offices of the District Engineers at Los Angeles and San Francisco, and at the office of the District Engineer of the district in which the work is situated. The District Engineers' offices are located at Eureka, Redding, Sacramento, San Francisco, San Luis Obispo, Fresno, Los Angeles, San Bernardino and Bishop.

A representative from the district office will be available to accompany prospective bidders for an inspection of the work herein contemplated, and Contractors are urged to investigate the location, character and quantity of work to be done, with a representative of the Division of Highways. It is requested that arrangements for joint field inspection be made as far in advance as possible. Detailed information concerning the proposed work may be obtained from the district office.

No bid will be received unless it is made on a blank form furnished by the State Highway Engineer. The special attention of prospective bidders is called to the "Proposal Requirements and Conditions" annexed to the blank form of proposal, for full directions as to bidding, etc.

The Department of Public Works reserves the right to reject any or all bids or to accept the bid deemed for the best interests of the State.

DEPARTMENT OF PUBLIC WORKS,
DIVISION OF HIGHWAYS.
C. H. PURCELL, State Highway Engineer.

Dated June 18, 1930.

NOTICE TO CONTRACTORS

Grading, Paving, Surfacing and Bridge

Sealed proposals will be received at the office of the State Highway Engineer, Public Works Building, Sacramento, California, until 2 o'clock p.m. on July 30, 1930, at which time they will be publicly opened and read, for construction in accordance with the specifications therefor, to which special reference is made, of portions of State Highway, as follows:

Trinity County, between Westerly Boundary and Burnt Ranch (II-Tri-20-C), portions about four-tenths (0.4) mile in length, to be graded.

Placer County, through Lincoln (III-Pla-3-A), about one and seven-tenths (1.7) miles in length, to be graded and paved with Portland cement concrete.

Mendocino County, between McDonald and Wendling (IV-Men-48-A,B), about two (2.0) miles in length, to be graded and surfaced with untreated crushed gravel or stone and timber bridges to be constructed.

Santa Barbara County, a reinforced concrete girder bridge across Nojoqui Creek, 7½ miles south of Zaca (V-S.B-2-D), composed of four 42'-6" spans on concrete bents and an abutment.

Riverside County, between Desert Center and nine and one-half miles west of Hopkins Well (VIII-Riv-64-B & C), about sixteen and two-tenths (16.2) miles in length, to be graded and surfaced with oil treated crushed gravel or stone.

San Bernardino County, between one and one-half miles southwest of Dunn and Cronise Valley (VIII-SBd-31-J), about nine and five-tenths (9.5) miles in length, to be graded and surfaced with oil treated crushed gravel or stone.

Plans may be seen, and forms of proposal bonds, contract and specifications may be obtained at the said office, and they may be seen at the offices of the District Engineers at Los Angeles and San Francisco, and at the office of the District Engineer of the district in which the work is situated. The District Engineers' offices are located at Eureka, Redding, Sacramento, San Francisco, San Luis Obispo, Fresno, Los Angeles, San Bernardino and Bishop.

A representative from the district office will be available to accompany prospective bidders for an inspection of the work herein contemplated, and Contractors are urged to investigate the location, character and quantity of work to be done, with a representative of the Division of Highways. It is requested that arangements for joint field inspection be made as far in advance as possible. Detailed information concerning the proposed work may be obtained from the district office.

No bid will be received unless it is made on a blank form furnished by the State Highway Engineer. The special attention of prospective bidders is called to the "Proposal Requirements and Conditions" annexed to the blank form of proposal, for full directions as to bidding, etc.

The Department of Public Works reserves the right to reject any or all bids or to accept the bid deemed for the best interests of the State.

DEPARTMENT OF PUBLIC WORKS,
DIVISION OF HIGHWAYS.
C. H. PURCELL, State Highway Engineer.

Dated July 2, 1930.

Grading, Paving and Surfacing

NOTICE TO CONTRACTORS

Sealed proposals will be received at the office of the State Highway Engineer, Public Works Building, Sacramento, Calif., until 2 o'clock p.m. on July 23, 1930, at which time they will be publicly opened and read, for construction in accordance with the specifications therefor, to which special reference is made, of portions of State Highway, as follows:

Marin County, between Belvedere Crossing and Tiburon (IV-Mrn-52-A), about one and three-tenths (1.3) miles in length, to be graded and surfaced with bituminous macadam.

San Luis Obispo County, between San Luis Obispo and the foot of Cuesta grade (V-SLO-2-D), about three (3.0) miles in length, to be graded and paved with Portland cement concrete.

Proposal forms will be issued to only those Contractors who have furnished verified statement of experience and financial condition in accordance with the provisions of Chapter 644, Statutes 1929, and whose statements so furnished are satisfactory to the Department of Public Works. Bids will not be accepted from a Contractor to whom a proposal form has not been issued by the Department of Public Works.

Plans may be seen, and forms of proposal, bonds, contract and specifications may be obtained at the said office, and they may be seen at the offices of the District Engineers at Los Angeles and San Francisco, and at the office of the District Engineer of the district in which the work is situated. The District Engineers' offices are located at Eureka, Redding, Sacramento, San Francisco, San Luis Obispo, Fresno, Los Angeles, San Bernardino and Bishop.

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The Department of Public Works reserves the right to reject any or all bids or to accept the bid deemed for the best interests of the State.

DEPARTMENT OF PUBLIC WORKS,
DIVISION OF HIGHWAYS.
C. H. PURCELL, State Highway Engineer.

Dated June 25, 1930.

HELP WANTED

As listed by the Engineering Societies' Employment Service, 57 Post Street, San Francisco. Applicants will please apply direct to them.

SALES ENGINEER, technical graduate, not over 35 years, with experience estimating and detailing various types of steel structures. Some sales experience also required. General line of shapes, plates, bars, etc. Salary, $200 month plus car allowance and commission on sales over quota. Apply by letter. Location, Northwest. R-3185-S.

SALES ENGINEER, C. E. graduate, 25-28 years old, with some sales record and construction experience, for building materials. Apply by letter with details of experience, etc., and photo. Nominal salary to start. Headquarters, San Francisco. R-3190-S.

ASPHALT ENGINEER, not over 30, college graduate preferred, with practical experience in constructing asphalt pavements. Should be single on account of considerable traveling. Salary, $3600 a year to start. Apply by letter. Location, India. W-775.

CIVIL ENGINEER, experienced and qualified to act as assistant in making studies of a large river basin with a view to the formulation of general plans for the most effective improvement for the purpose of navigation, water power and flood control. Applicant must have experience in the design of high storage or power dams, including estimates of costs, in the general design and estimates of power houses, penstocks and other major structures and also in making studies and estimates of the effect of storage on navigation and increased output of power houses. Salary dependent on qualifications. Apply only by letter. Location, South. W-1017-C.

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Pomona Pump Co.
Woodin & Little

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