WCN-09-1935

WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED
WESTERN HIGHWAYS BUILDER

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VOLUME X, No. 9

SEPTEMBER, 1935

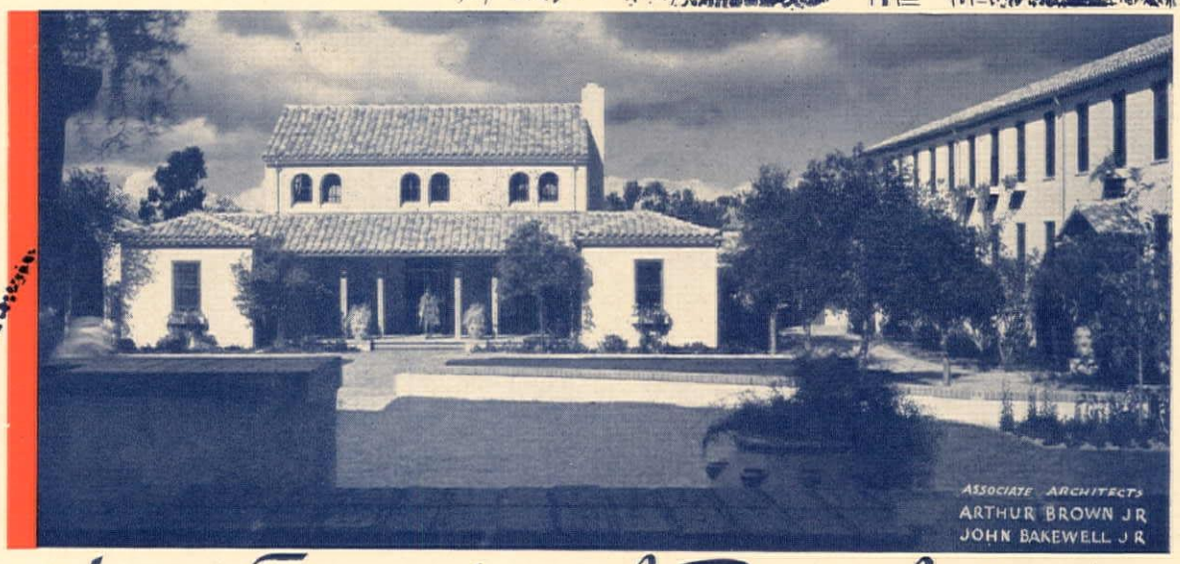
25 CENTS A COPY
$2.00 PER YEAR

IN THIS ISSUE

Just a Step to Work

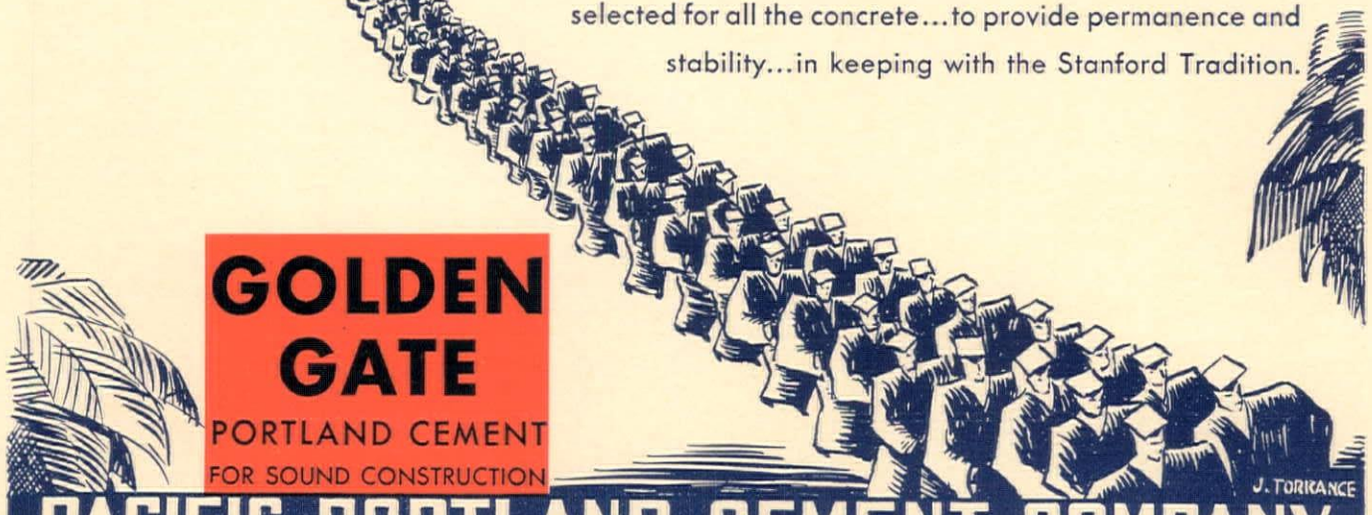
Ladders are too slow for divers of the Pacific Bridge Co. on the Hetch Hetchy Bay Crossing work and they drop in on their work like this. (See page 250.)

In keeping with



the Stanford Tradition

Value in commercial buildings is "written off" each year as obsolescence takes its toll. • University buildings on the contrary become priceless as age and tradition give them personality and make them a permanent part of the campus. • In Lagunita Court, therefore, an unusual responsibility rests on the building materials used in its construction. Pacific Portland Cement Company, friend and neighbor of Stanford, takes great pride in the fact that its product GOLDEN GATE PORTLAND CEMENT was selected for all the concrete...to provide permanence and stability...in keeping with the Stanford Tradition.



GOLDEN GATE
PORTLAND CEMENT
FOR SOUND CONSTRUCTION

PACIFIC PORTLAND CEMENT COMPANY
SAN FRANCISCO

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

WE BEG YOUR PARDON

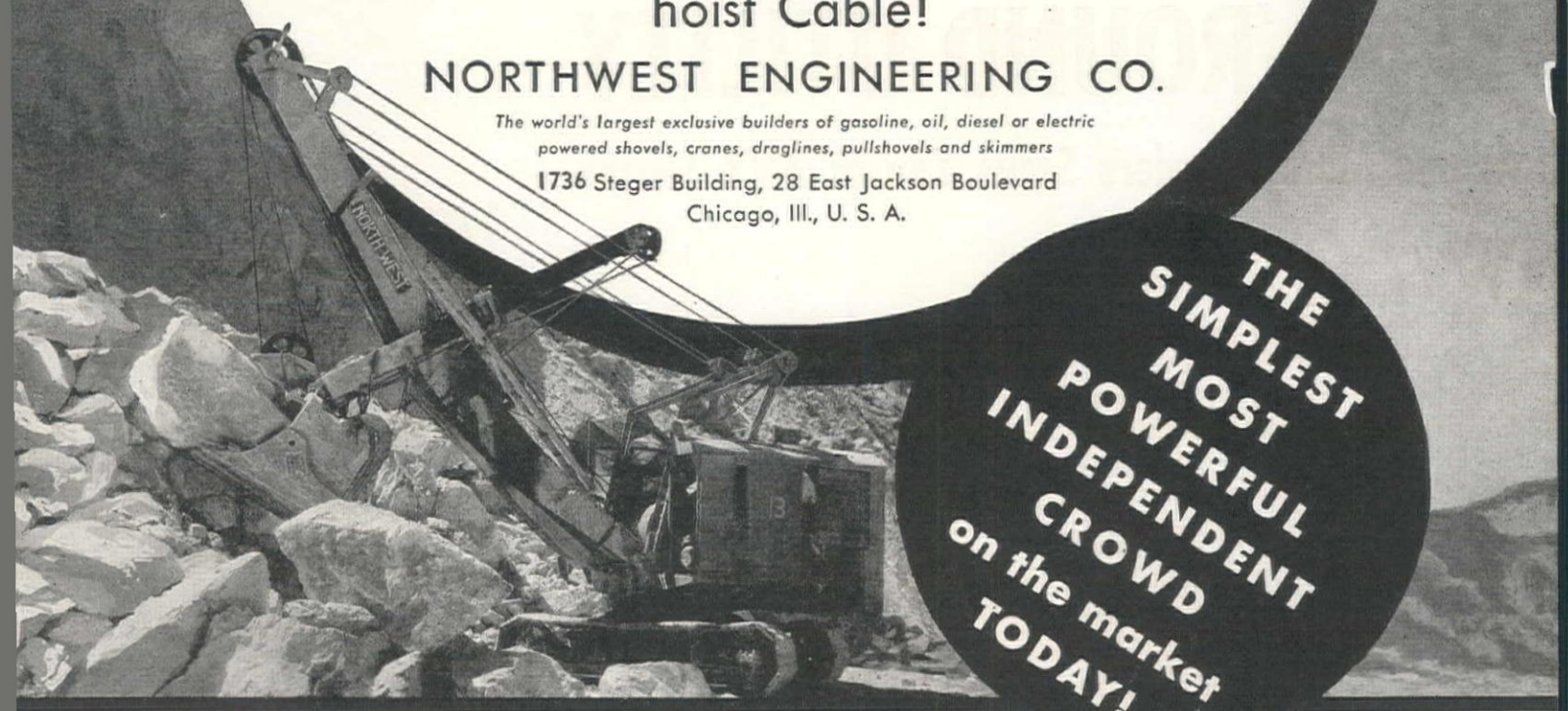
WE THOUGHT WE HAD TOLD YOU

There are no expensive chains, racks and pinions to replace or adjust for the Northwest Independent Crowd. The Crowd Cable is a part of your old hoist Cable!

NORTHWEST ENGINEERING CO.

The world's largest exclusive builders of gasoline, oil, diesel or electric powered shovels, cranes, draglines, pullshovels and skimmers

1736 Steger Building, 28 East Jackson Boulevard
Chicago, Ill., U. S. A.



THE SIMPLEST MOST POWERFUL INDEPENDENT CROWD on the market TODAY!

SHOVELS, CRANES
DRAGLINES
PULLSHOVELS
SKIMMERS

NORTHWEST

GASOLINE, OIL
DIESEL OR
ELECTRIC
POWERED

BUILT IN A RANGE OF 10 SIZES—1/2 YD. CAPACITY AND LARGER

NORTHWEST ENGINEERING COMPANY—255 Tenth St., San Francisco, Calif.; 3707 Santa Fe Ave., Los Angeles, Calif. REPRESENTATIVES —Pacific Hoist & Derrick Co., 3200 Block, 4th Ave. S., Seattle; Arnold Machinery Co., Inc., 149 W. 2nd St., S., Salt Lake City; The Mine & Smelter Supply Co., 1422 17th St., Denver, Colo.; Neil B. McGinnis Co., 1401 S. Central Ave., Phoenix, Ariz.

YEAR-'ROUND UTILITY

Adams Motor Graders Serve You in ANY Season

WHATEVER the time of year, Adams Motor Graders are ready to serve you efficiently and economically.

They have traction and power to "go through" on soft footing in spring . . . they have rigidity and stamina to scarify hard summer roads . . . they have power and capacity to handle road-mix properly . . . and, equipped with Adams Snow Plow, they help keep roads open in winter.

No matter how tough the job may be, an Adams Motor Grader can "take it". The frame is a strong, solidly-welded *unit,* designed for utmost strength and rigidity. Machine-finished throughout, with adjustability for wear, an Adams grader will serve you long and well.

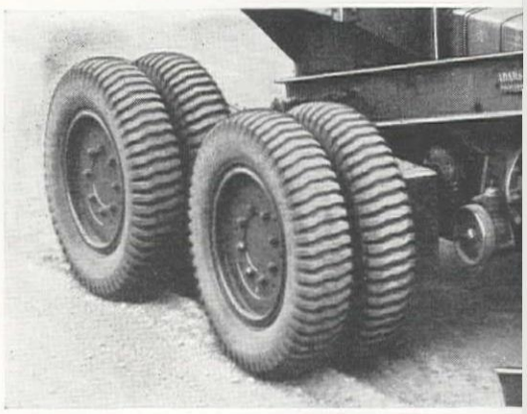
Write for new motor grader catalog which more completely describes these machines. Inquire also about Adams Elevating Graders, Leaning Wheel Graders, Multiple-Blade Maintainers, Retread Pavers, Rotary Scrapers, Dump Trailers, etc.

ROAD ADAMS MACHINERY

J. D. ADAMS COMPANY
230 Utah St., San Francisco
1202 Mateo St., Los Angeles
14 E. Main Ave., Spokane, Wash.

ADAMS MOTOR GRADERS

● Adams Snow Plow, readily attached to any Adams Motor Grader—old or new—handles 10 to 12 inches of snow easily.



● Adams Tandem Drive, with 4 or 8 drive wheels, provides positive traction when the load is heavy, or the "going" soft or uncertain.

Western Distributors

Lund Machinery Co. . . . . Salt Lake City
Neil B. McGinnis Company . . Phoenix, Ariz.
E. E. McKelvey . . . . . Denver
Elton T. Fair Company . . . . . Denver
McChesney-Rand Equip. Co. . Santa Fe, N. M.
A. C. Haag & Co. . . . . Portland, Ore.

"Partial Estimates"

● Random items taken from the WPA lists of approved projects:

Grading, raking and picking rocks from airport
Keeping records for a state fair commission
Organizing agricultural clubs
Canning fruits and vegetables
Making and remodeling garments
Assistance in city curatorial work
Excavation of ancient Indian ruins

These projects are certainly going to be a big help to the construction and capital goods industries.

● The endurance record in dam construction has long ago been established beyond all contesting by the San Gabriel Dam No. 1, so this note merely records the fact that the work has again been resumed. This Houdini-like structure has already escaped from a concrete design and also slipped out of a rock-fill design; it is to be hoped that the present combination earth-and-rock fill design will hold until it can be built.

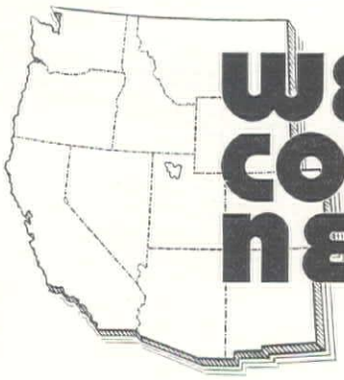
● Arizona, practically assured of federal funds for construction of the first unit of the Gila River irrigation project, has finally scored a decisive point in the Colorado River game. As a result there is a good possibility that the Arizona "Navy" may be retired and the "Battle of Parker Dam" canceled.

● After the months of delay in Washington since the appropriating of the $4,000,000,000 for the work-relief program, the sudden order requiring applications were to be completed and filed with only about two weeks notice was rather a shock.

● High officials of the Bureau of Reclamation visited California recently and discussed the initiating of work on the State Water Plan for which $20,000,000 has been allotted. Friant Dam is rather definitely scheduled as the initial unit in the construction program. From all appearances, it looks as if the visit was planned to be synchronized with the announcement of the release of funds so that definite steps could be taken to start the work, but one of those peculiar hitches in the Administration procedure leaves the matter temporarily unsettled.

SUBSCRIPTION RATES

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



WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER

J. I. BALLARD, Editor

Contents for September, 1935

WESTERN CONSTRUCTION PUBLICATIONS, Inc.

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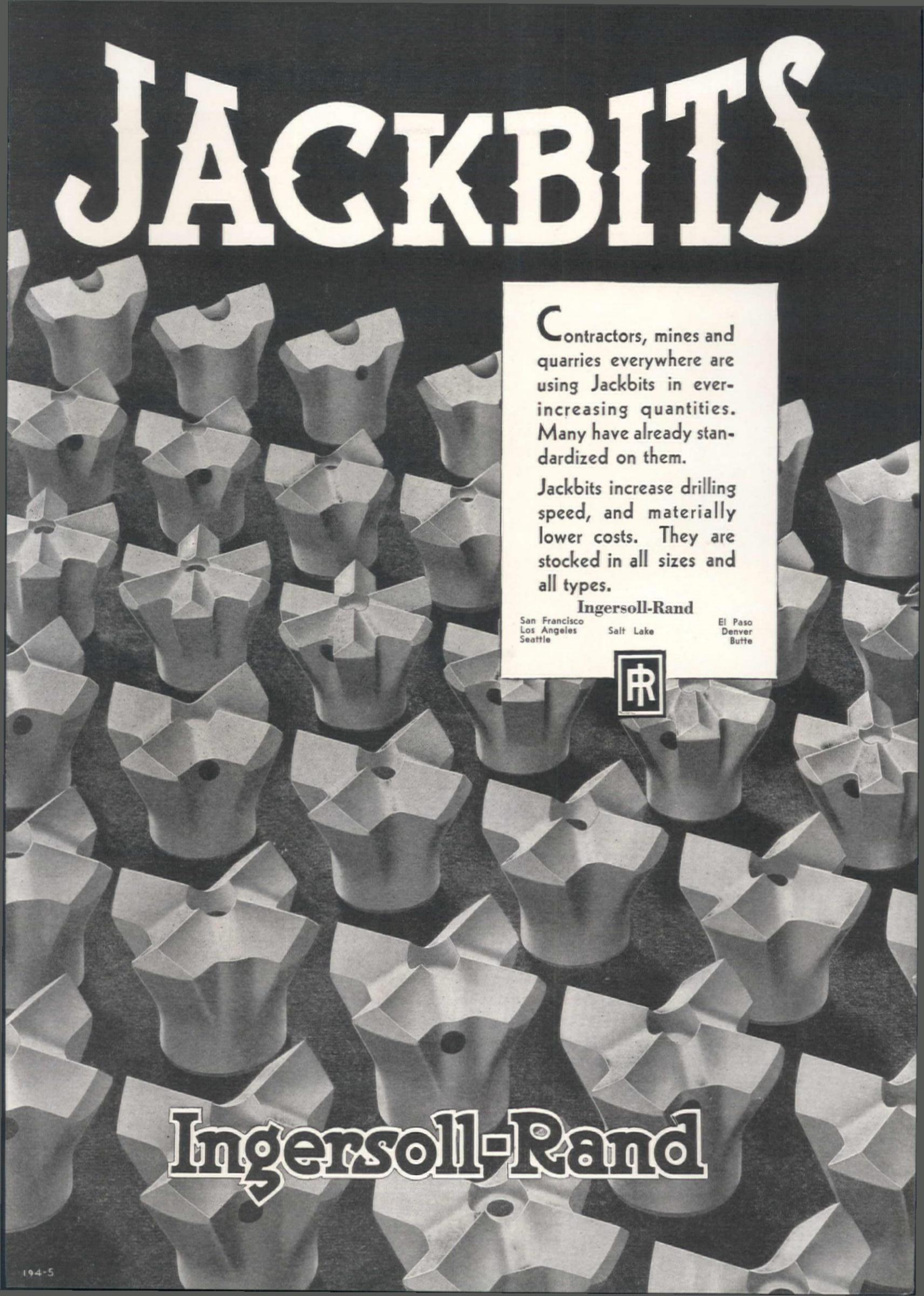

JACKBITS
Contractors, mines and quarries everywhere are using Jackbits in ever-increasing quantities. Many have already standardized on them.
Jackbits increase drilling speed, and materially lower costs. They are stocked in all sizes and all types.
Ingersoll-Rand
San Francisco
Los Angeles
Seattle
Salt Lake
El Paso
Denver
Butte
Ingersoll-Rand
194-5

Announcing the new 85-B 2½-yard convertible excavator...

NEW fast operating speeds, new quick convertibility with high efficiency as either shovel or dragline, new ease of operation, new ease of shipment . . . these are but a few of the money-making features which bring about the sustained high output of this startling machine. Identical in design to the famous 120-B convertible shovel and dragline, that has made such a name for itself in mine, quarry and heavy construction work, this new 2½-yard machine warrants your careful investigation. Write for the 85-B bulletin.

924

BUCYRUS-ERIE

SAN FRANCISCO: BUCYRUS-ERIE CO., 989 Folsom St.; PORTLAND: CLYDE EQUIPMENT CO., 17th and Thurmam Sts.
LOS ANGELES: CROOK COMPANY, 2900 Santa Fe Ave.; SEATTLE: CLYDE EQUIPMENT CO., 3410 First Ave., South

When writing to BUCYRUS-ERIE CO., *please mention Western Construction News.*

The Best Asphalt Plants Built are MADSEN PLANTS

because of

Quicker Erection
Higher Production
Lower Maintenance
Fewer Gears, Shafting and Bearings
More Portability
Lower Power Loss
Less Driving Chain

and that's the Reason

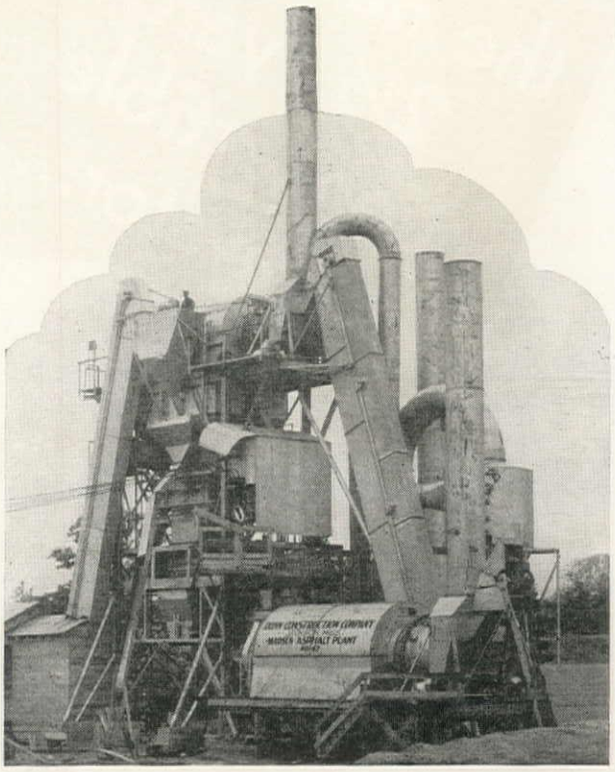
UNITED CONCRETE PIPE CORP.
Torrance, Calif.

J. L. McLAUGHLIN
Montana

DUNN CONSTRUCTION
Alabama

MEGARRY BROS.
Minnesota

HAMILTON & GLEASON
Colorado



Madsen 4000 lb. capacity plant sold to Dunn Const. Co., Birmingham, Alabama This plant shown equipped for asphalt paving construction on one of the largest paving jobs ever let in Alabama. Due to extreme moisture conditions in the aggregate, it was necessary to use two 60" diameter by 24' long dryers. Madsen plants are built to meet any condition.

...and

More than Sixty other Contractors now own MADSEN ASPHALT PLANTS

▼

Established 1910

MADSEN IRON WORKS

Los Angeles California

WESTERN REPRESENTATIVES

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Cramer Machinery Co., Portland, Oregon
William N. Ziegler Co., Inc., Minneapolis, Minn.
Arnold Mch. Co., Salt Lake City, Utah
L. A. Snow Co., Seattle, Wash.
Brown, Frazier & Co., Vancouver, B. C.
Elton T. Fair Co., Denver, Colo.

IMA OVERSHADOWS THE COUNTRY'S HISTORY-MAKING PROJECTS . . .

FROM Cape Cod to the Golden Gate, from the Great Lakes to the Gulf, LIMA overshadows the country's history making projects. Chosen for these jobs because of their all-modern qualities, LIMAS do their part—day and nite—turning out yardage that spells profit for their users. Bulletins will be sent on request.

LIMA LOCOMOTIVE WORKS, INCORPORATED
SHOVEL and CRANE DIVISION
LIMA, OHIO, U. S. A.

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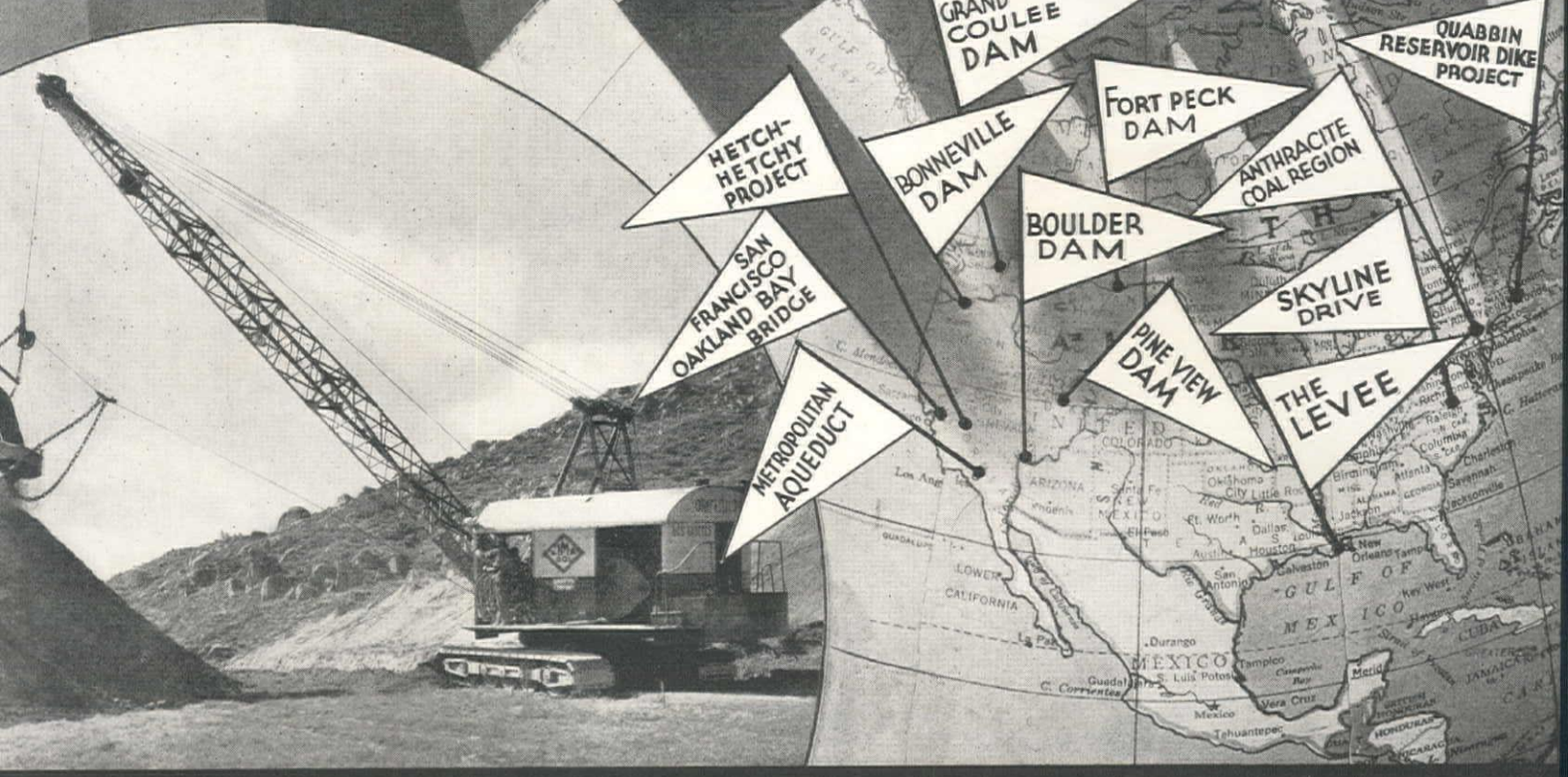
LIMA



LIMAS ARE BUILT IN ¾ YARD CAPACITY AND LARGER

OBTAIN THESE SAVINGS IN PLACING CONCRETE

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

FLEXIBILITY - SPEED - RELIABILITY - LOW COST

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

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

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

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

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

...by *far*, the *Lowest* Rate for Coverage of the West.....

This is a strong statement, but you can prove it by a simple comparison. We base our case on three points . . . .

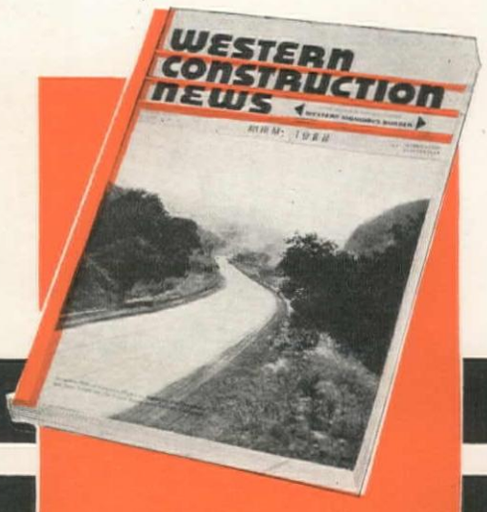
1. QUANTITY. No other civil engineering publication begins to have the circulation of Western Construction News in the West. We now refer to actual circulation . . . and not the mythical figures you sometimes see. Western Construction News has more than twice the circulation of any other Western engineering publication.

2. QUALITY. Compare the editorial pages of Western Construction News with those of any other western publication. It will be apparent at once that Western Construction News is written for operating men whose influences and decision affect buying of equipment and materials. They are the men who count; and they read Western Construction News because what they want cannot be found in any other publication.

3. SPREAD. Compare the dollar volume of engineering works in each of the 11 western states with the circulation of Western Construction News in those same states. You will find that we are not a Washington or Arizona, or Colorado, or California publication alone. Instead, you will find we are all of them combined . . . an ALL western coverage that means your simplest, surest way of doing a promotional job most economically.

But don't take our word for it . . . Make these comparisons yourself. We welcome investigation. If you want figures from us, just write . . . better yet, come to our office and get what you want yourself. We'll open up all our circulation records to you. We can, for our figures are real!

The circulation of Western Construction News is more than **8,100** copies each month.



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THE CIRCULATION OF

any other PUBLICATION

Market!

It BLANKETS TODAY'S Richest CONSTRUCTION MARKET • •

"We are sold on the TIMKEN ROCK BITS 100%

says the STANDARD SILICA CO.

STANDARD SILICA COMPANY
400 WEST MADISON STREET
CHICAGO

A. C. GOODNOW, PRESIDENT
J. S. TENDICK, SEC'Y & TREAS.

PLANTS
OTTAWA, ILLINOIS

April 19, 1935.

Rock Bit Division,
Timken Roller Bearing Co.,
Canton, Ohio.

Dear Sirs:

We have been using the Timken Rock Bit in our quarries located at Ottawa, Illinois, for the past nine months and we would like for you to know the results we are having.

We drill to a depth of sixteen feet in silica sand rock which gives us a real problem in drilling. With the old type of forged steels our best drill footage per steel was 200 feet, whereas we are getting 420 feet with our Timken Bit. Each bit costs us approximately one quarter of the cost of resharpening one steel so the saving to us by using the Timken Bit is obvious. Your bit also gives us a much cleaner hole than we were able to get with the old type of drill steel.

Their convenience is not to be overlooked. It is much easier to change bits on the steels than to carry the steels out of the quarry to be sharpened and back again.

We are sold on the Timken Rock Bits 100% and our genuine enthusiasm for your product prompts us to write you this letter, and tell you that we would not be without it.

Yours very truly,

Standard Silica Company.

By F. D. Chadwick

F. D. Chadwick, Supt.

THERE are few tougher jobs for rock bits than drilling silica rock, and probably no more severe test of the ability of a bit to hold its gauge and cutting edge. The experience of the Standard Silica Company, as expressed in this letter should therefore be of especial interest to everyone confronted with a major rock drilling problem. It will pay you to read it carefully.

Complete Stocks Maintained In Principal Distributing Centers

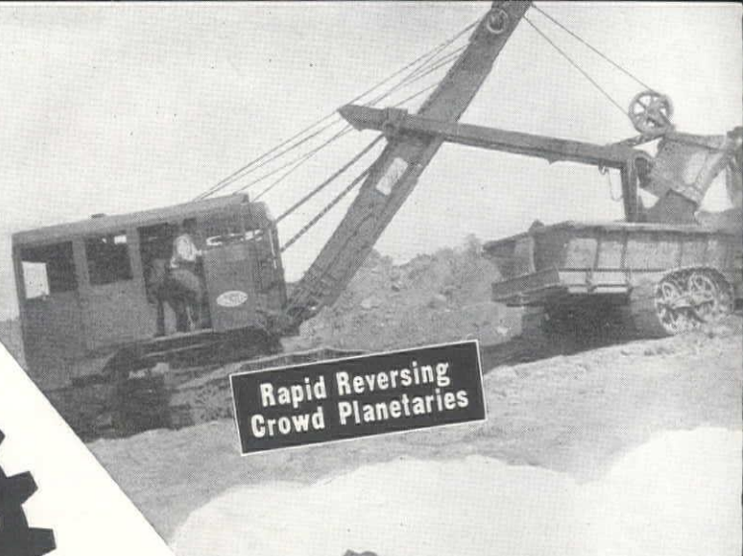
THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

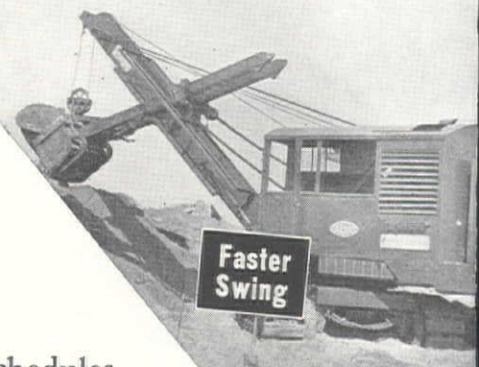
TIMKEN BITS

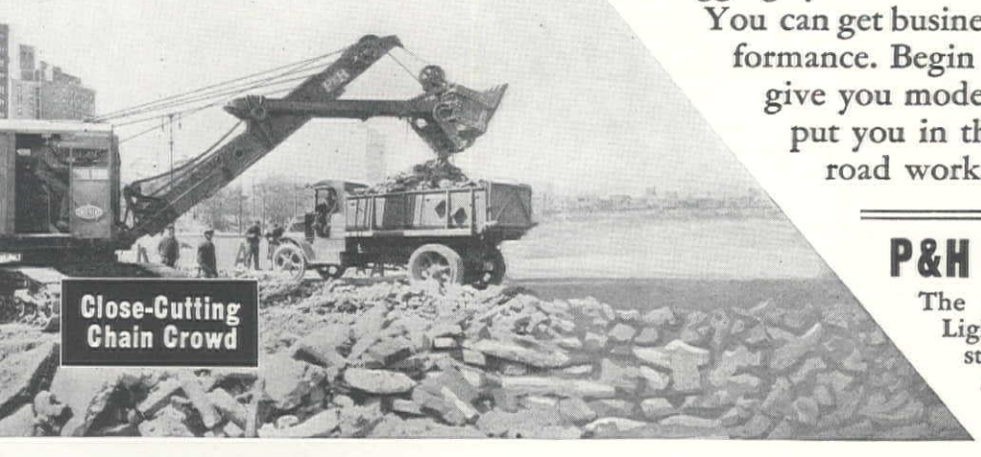
When writing to TIMKEN ROLLER BEARING CO., *please mention Western Construction News.*

P&H

HIGH GEAR PRODUCTION FOR LOW COST ROADS







Road contracts this year call for heavy work, fast schedules, and low cost production . . . That's why you'll want to choose an excavator which is *geared to the job* of road building. That's P&H. *HERE'S WHY:* . . . The durable P&H chain crowd enables you to dig at top speeds within 1 inch of grade. That means less work on the clean up. P&H "Sure Feel" power clutches absorb shocks that punish other excavators. That's why they can keep whacking away day after day with less time out for layup. P&H rapid reversing crowd planetaries give you faster crowd-out-crowd-in . . . they're easier to operate. And the super smooth swing clutches give you more accurate spotting with less time between bites. Remember, the swing represents 60% of the digging cycle. That means a heap more yards per day! . . . You can get business and make money with P&H performance. Begin by investigating these features that give you modern, high speed production. They'll put you in the low bid brackets on any kind of road work. Write for bulletins.

P&H BANTAM WEIGHT (MODEL 100 3/8-YD.)

The new, small shovel that does big things! Lighter, faster, huskier — with all-welded construction. Powered by the smooth Ford V-8 motor. Fully convertible at the lowest cost ever. If you haven't a copy of Bulletin No. 100, write for it today.

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P&H EXCAVATORS FOR ROAD BUILDING

MODEL 100 3/8 YD. — MODEL 400 3/4 YD. — MODEL 600 1 YD. — MODEL 650 1¼ YD.

AND UP TO 4 CU. YARDS

GAS ENGINE SIMPLICITY .. DIESEL ECONOMY

On the All American canal this "WK-O", on the job every minute, operates at a fuel cost of only 15c per hour. Despite the dirt, sand, and dust, repairs are negligible—the oil engine operates smoothly and economically under all conditions, due to its simplicity of construction and low compression pressures.

ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

EPAIRS

. . . MEANS MORE PROFIT PER YARD . . MORE YARDS PER DAY!

ON any job,—bulldozing, scraping, grading or hauling —under any condition,—sand, gravel, muck, or gumbo —in any weather,—hot, cold, rain or snow, A-C Oil Tractors are on the job, 60 minutes to the hour, piling up profits. Why? Because they're built that way.

The fundamental principle of the A-C Oil Engine is "low compression" with resulting lighter parts, smoother operation, less wear, fewer repairs and lower maintenance throughout the entire tractor. The simplicity of design, excellent workmanship and quality materials are positive assurance of long life and constant service.

That is why A-C Oil Tractors are first choice among experienced dirt movers—that is why A-C Oil Tractors are setting the pace on the country's biggest jobs—that is why *you* too should get the facts on A-C Oil Engine economy.

ASK THESE ALLIS-CHALMERS DEALERS

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Browning Motor Company,
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Byers Bros.,
Gilroy, California.

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Clyde Equipment Company,
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L. M. Collins,
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Crook Company,
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Farmers Hardware & Imp. Co.,
San Luis Obispo, California.

W. F. Gage & Sons,
Chico, California.

Harvester Supply Company
Walla Walla, Washington.

Hayes Motor Company,
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El Centro, California.

Fred M. Viles,
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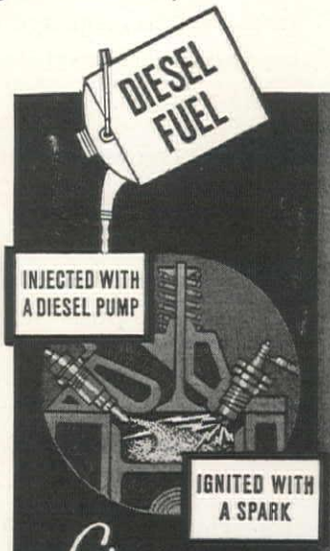
Williams Tractor Company,
Twin Falls, Idaho.

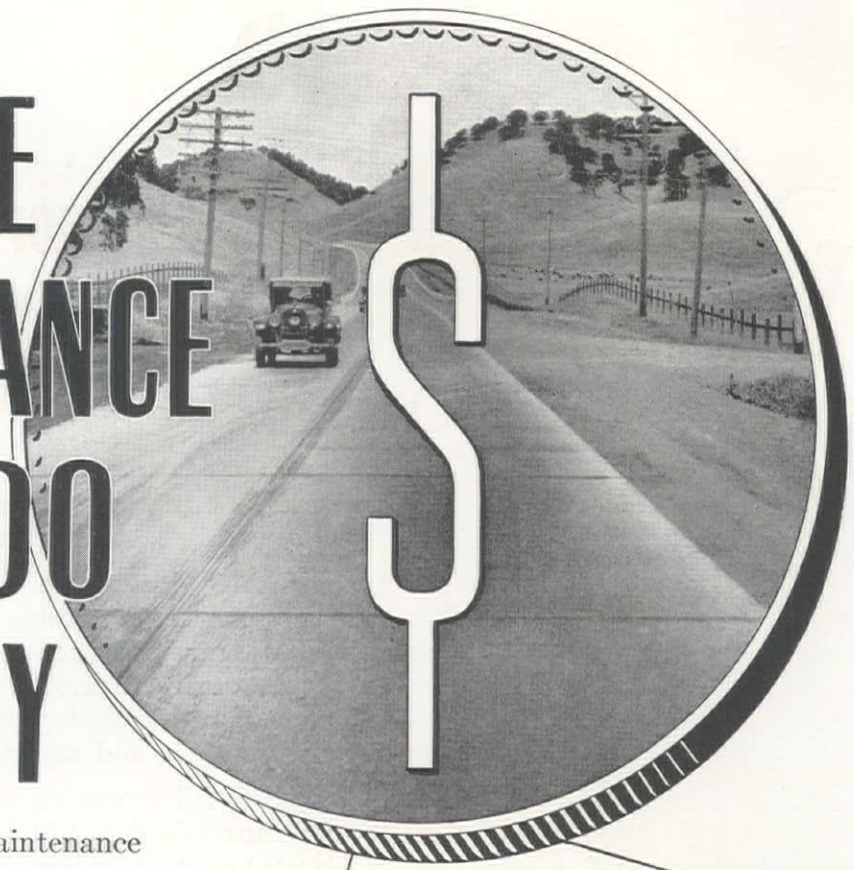
FACTORY BRANCHES: 2533 Peralta St., Oakalnd, Calif.; 1305 S. E. Union Ave., Portland, Ore.; 602 First Ave., Pocatello, Ida.; 25th and Fourth Ave., Billings, Mont.



Gives you:
EASIER STARTING
SMOOTHER OPERATION
LESS VIBRATION
FEWER REPAIRS

OIL TRACTORS

MAKE THE MAINTENANCE DOLLAR DO FULL DUTY



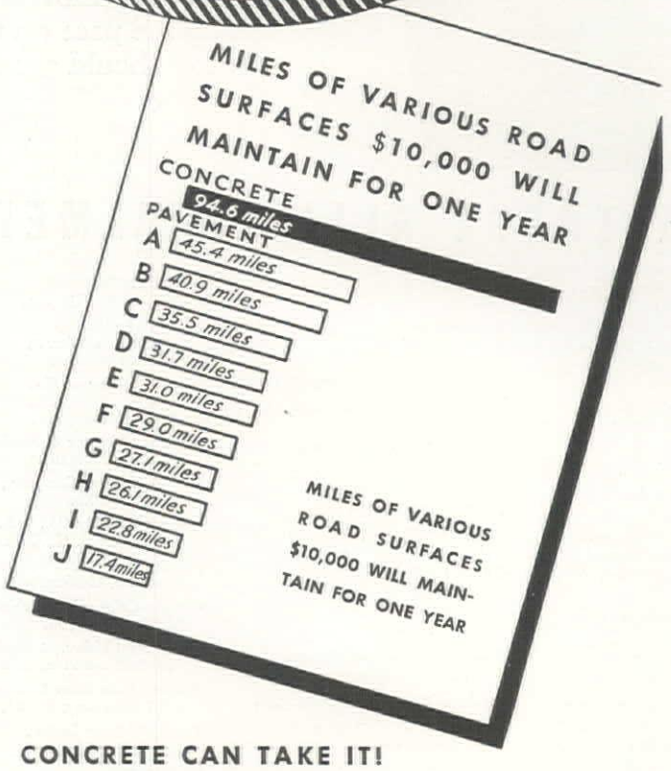
To get the most out of surface maintenance funds *pavements must be of concrete.*

This statement is proved by actual cost figures from the eighteen states which publish comparable records.

Maintenance costs, of course, should be judged from the whole life of the pavement and not by a single year or any other short period. Therefore, all comparisons should extend over as many years as possible.

The Portland Cement Association has compiled a summary of available records which covers all types of pavements over periods as high as 14 years and averaging 7 consecutive years prior to January 1, 1935. The cost averages obtained are given further authority by the fact that they cover 100,000 miles—nearly a third of the improved state highway mileage in the United States.

Concrete was found to average $105 per mile per year for surface maintenance—$114 to $469 less than any other type of pavement.



PORTLAND CEMENT ASSOCIATION
Dept. 109, 564 Market St., San Francisco, California
816 West Fifth St., Los Angeles, California

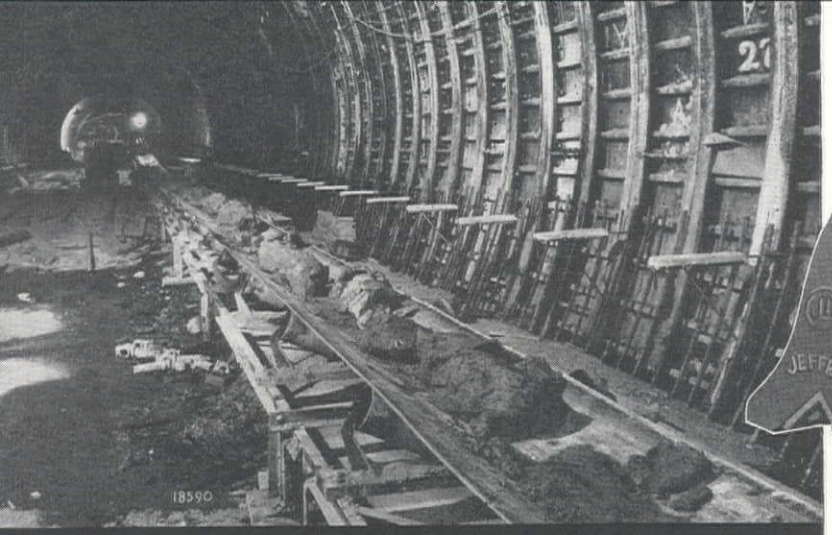
CONCRETE CAN TAKE IT!

Low maintenance costs for concrete are all the more significant because the average daily traffic on concrete is in excess of 1000 vehicles. Some of the other types enumerated in the summary have relatively little traffic, but heavy maintenance expense.

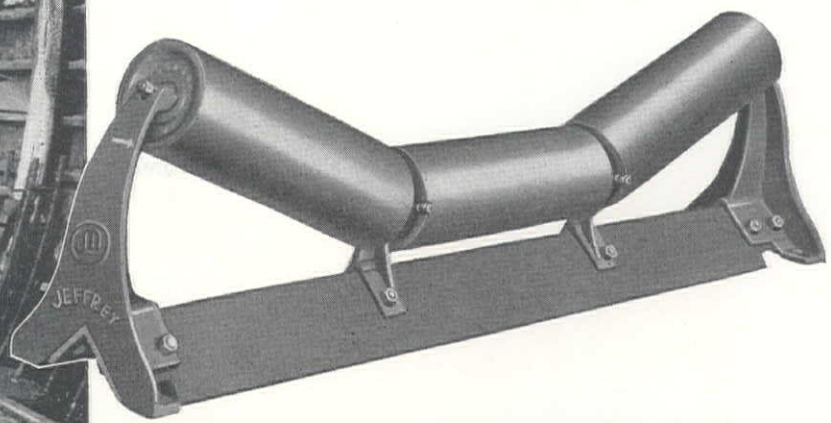
CONCRETE HAS PUBLIC ACCEPTANCE

Motorists judge all roads by the standards of safety, economy and comfort set by concrete. They know that concrete lowers their gas, tire and car repair expense—that it is smooth but non-skid—clearly visible at night—safe at modern speeds.

Write for the report entitled "Road Maintenance Costs as told by Available State Highway Records."



Boston Traffic Tunnel—Conveyor Line, 1 mile long



Jeffrey Reliance Belt Idler—the swift, successful completion of the Traffic Tunnel under Boston Harbor depended on Jeffrey Idlers. At the Fort Peck Dam Jeffrey Idlers are being used on the conveyor lines at the diversion tunnels and in the aggregate plant. At Grand Coulee, Jeffrey Idlers (Reliance and Hercules) are used on the world's largest conveying systems.

From Coast to Coast

JEFFREY BELT IDLERS

Fort Peck Dam—Conveyor Lines at the Diversion Tunnels and Aggregate Plant

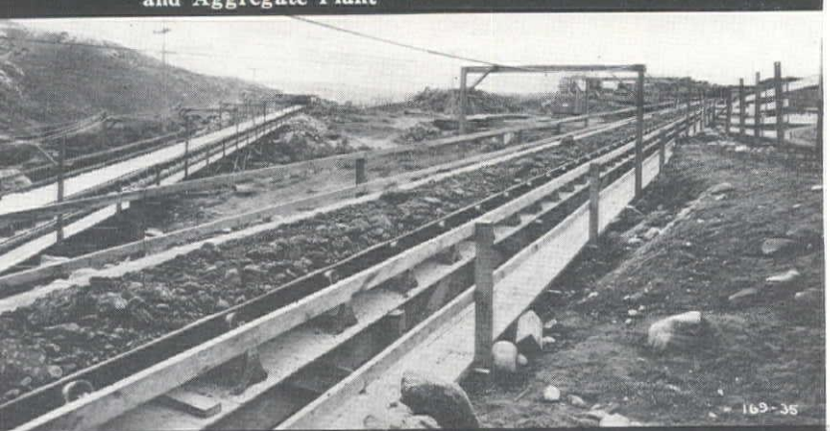
From the Atlantic to the Pacific . . on small jobs, or on big jobs where tons and tons of material must be moved . . rapidly, efficiently and economically . . conveying systems using Jeffrey Reliance and Hercules Belt Idlers . . are carrying the load.

Jeffrey Engineers solved a difficult problem in handling muck in the Boston Traffic Tunnel . . worked out a system of belt conveyors to operate through air locks . . a significant advance in soft-ground tunneling.

At Fort Peck Dam, Montana . . Jeffrey Belt Conveyors again came into prominence . . loading rock into cars in the headings, continuously without car shifting delays . . carrying excavated material from the four diversion tunnels . . handling material in the aggregate and cement plants.

All the giant conveyors at Grand Coulee Dam, Washington, are Jeffrey. An enormous undertaking . . Grand Coulee Dam . . but Jeffrey was equal to the task . . was selected for capability and reliability . . to work out the worlds largest conveying system . . to handle some 12,000,000 cu. yd. of material from the dam excavation at the rate of 2500 bank yards per hour.

If your problem is conveying . . Jeffrey can solve it. Large or small jobs . . no matter what size . . Jeffrey has had ample experience to assure the successful completion of your particular project.

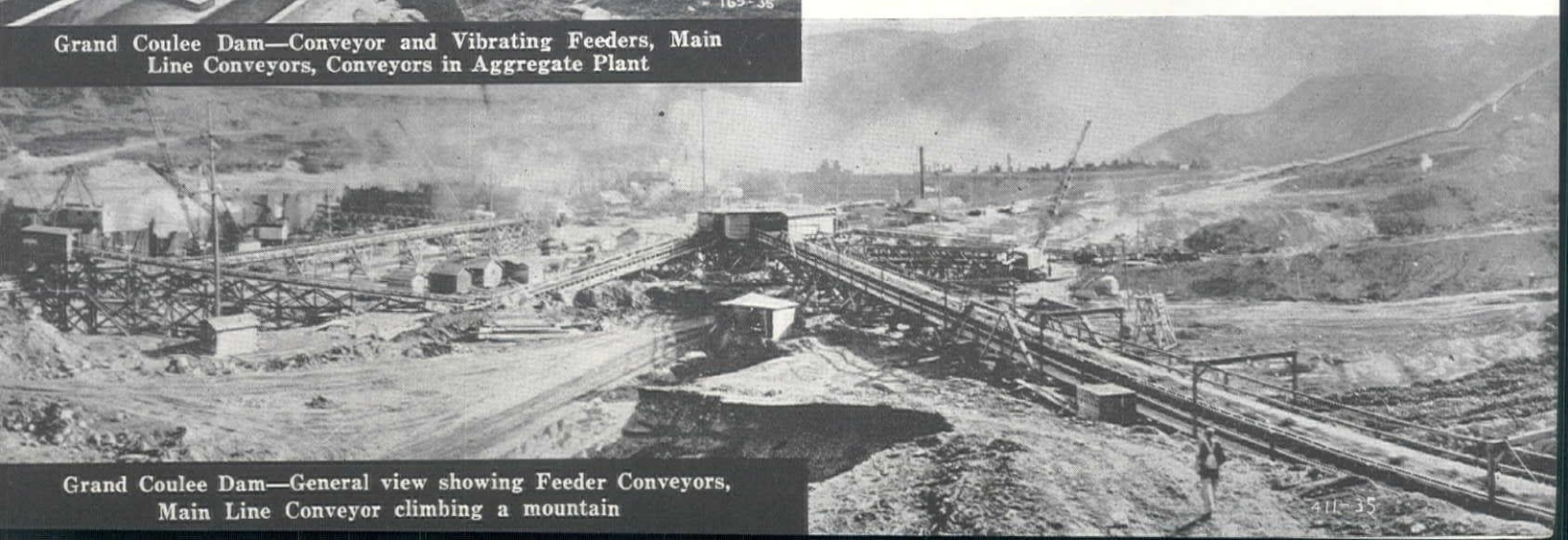


Grand Coulee Dam—Conveyor and Vibrating Feeders, Main Line Conveyors, Conveyors in Aggregate Plant

The Jeffrey Mfg. Co.

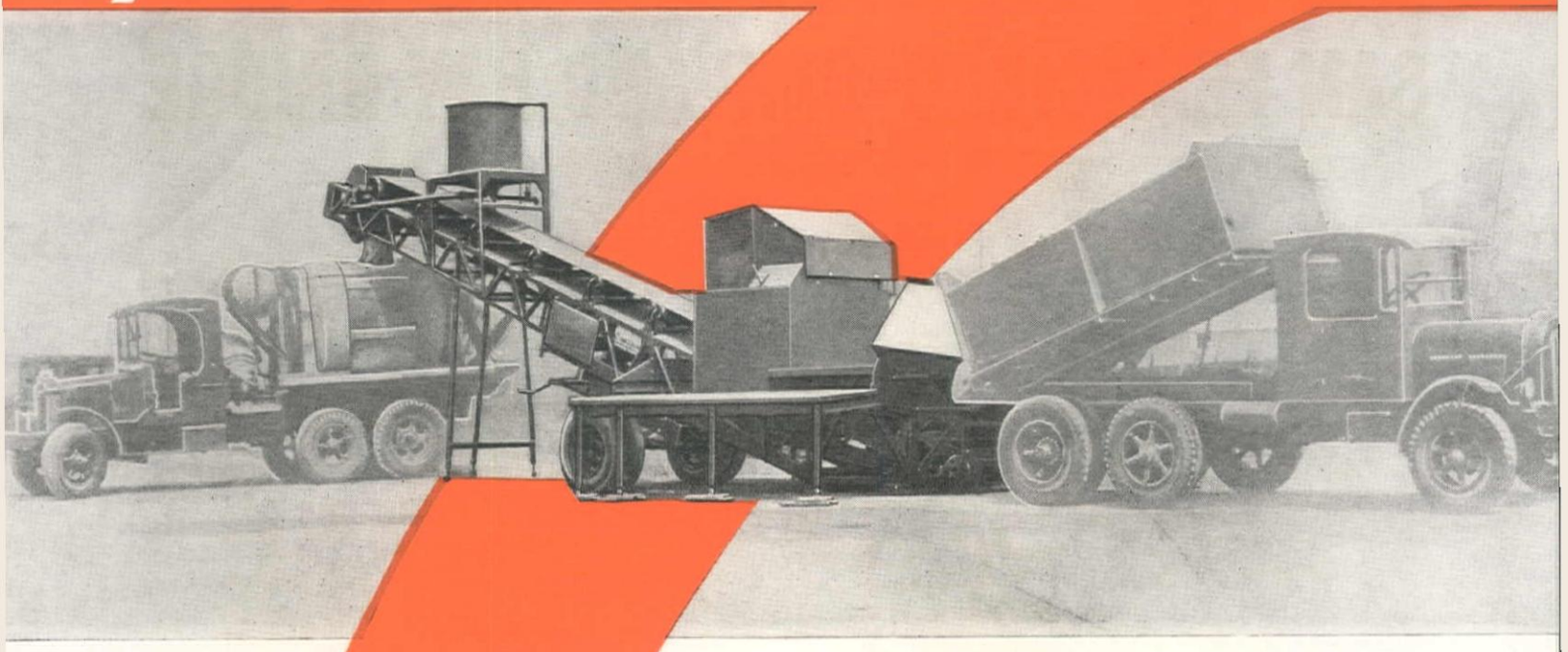
951-99 North Fourth Street, Columbus, Ohio

Branch Offices in Principal Cities

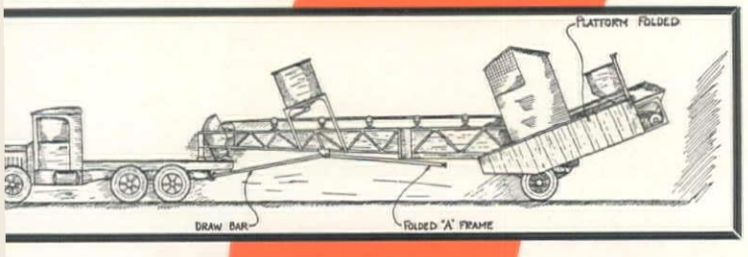


Grand Coulee Dam—General view showing Feeder Conveyors, Main Line Conveyor climbing a mountain

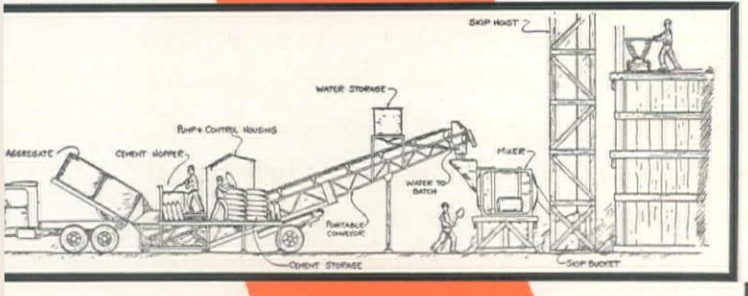
Saves Truck Time.. less Equipment Needed



Moves to the Job at Truck Speed



Easily Assembled at Working Base



...*Make* this simple comparison

Which is cheaper to operate—"ready-mix" trucks or ordinary dump trucks? The answer is obvious. As a fair basis, compare them as to (1) Initial cost, (2) price per hour to operate, and (3) difference in speed on the road.

The S-A Portable Batch Conveyor eliminates elaborate, costly equipment. It moves to the job (at truck speed); is set up almost instantly, and there it remains until the job is completed—whether it's a few days or many months. Thus, as the illustration shows, batched aggregates can be hauled in ordinary dump trucks from the gravel supply right to the job. It's dumped directly into the conveyor hopper—up the belt—and into the mixer truck. In this way, the mixer truck serves only as a mixer—just long enough to prepare the batch of concrete.

This set-up will take care of a job with one or two mixer trucks that ordinarily, with a long haul, requires 15 to 20 mixer trucks. But, savings do not stop here; for this unit serves stationary mixers in the same efficient manner. No large truck ramp is needed to gain height—no pit for skip bucket or frame to get below mixer discharge. In fact, the entire operation is as simple as that used with the mixer truck.

Even the water supply is at hand for the aggregate. A sight-guage tank is part of the equipment, and supplied with a meter when desired. Hinged platforms when swung into place will hold a truck and trailer load of cement for feeding into the hopper. Aggregate, cement and water are discharged in accurately measured quantities to the mixer.

Study these savings. See where they fit into your jobs. Then, for additional information or quotations write:

STEPHENS-ADAMSON MFG. CO., 2227 E. 37th St., Los Angeles, Calif.

San Francisco, Calif.
524 Wells Fargo Bldg.,
85 Second St.;
KEarney 7181

Portland, Oregon
P. O. Box 293,
Union Steel & Rail Bldg.;
Atwater 7425

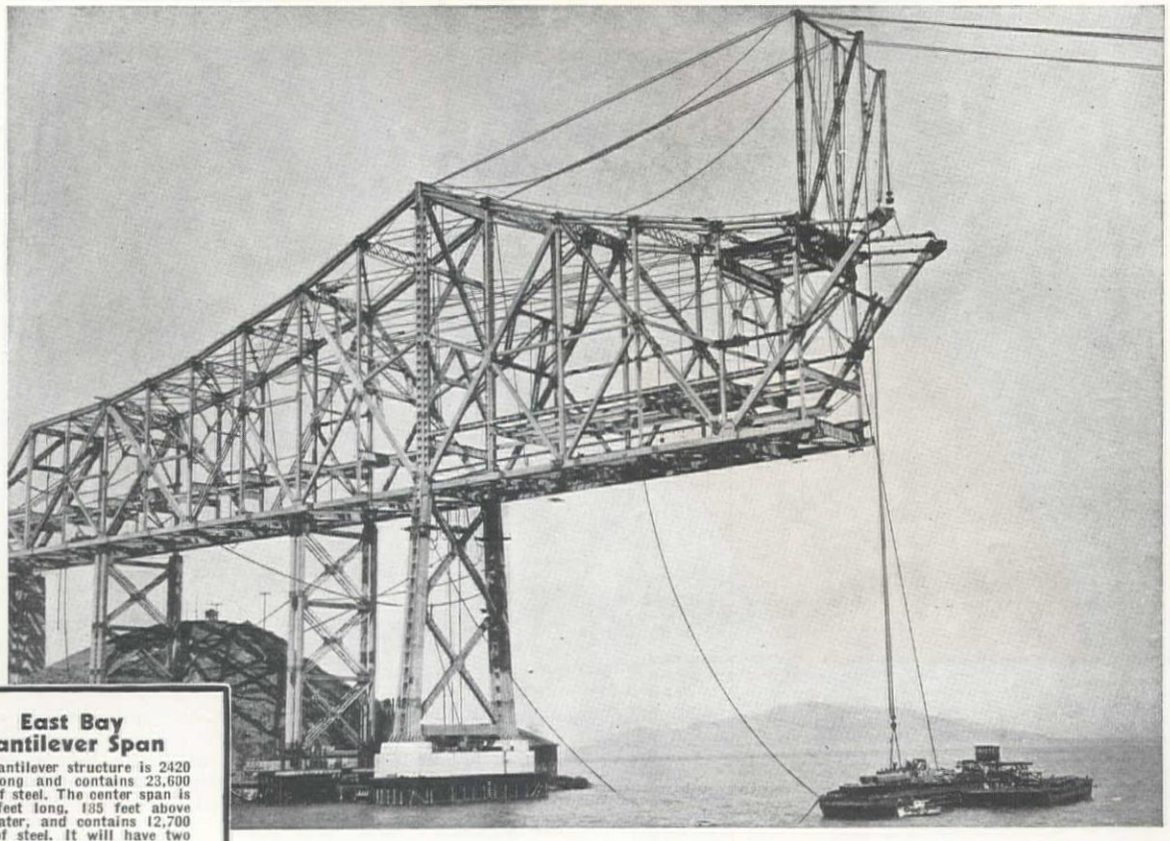
Salt Lake City, Utah
201 Dooley Block;
Wasatch 1890

S-A CONVEYING EQUIPMENT

Building the Cantilever Span

of the

SAN FRANCISCO-OAKLAND BAY BRIDGE



East Bay Cantilever Span

The cantilever structure is 2420 feet long and contains 23,600 tons of steel. The center span is 1400 feet long, 185 feet above the water, and contains 12,700 tons of steel. It will have two decks—to carry both motor and suburban train traffic. While it is the third longest, it is the world's heaviest cantilever span per linear foot. The guy derricks have 118 foot masts, 100 foot booms and lifting capacities of 50 tons.

TIGER BRAND Wire Rope

is helping to build this, the world's heaviest cantilever span. Huge guy derricks requiring thousands of feet of Tiger Brand Wire Rope raise and place the immense truss sections from barges over two hundred feet below. In every industry whether it be construction, logging, oil, mining or marine, ropes should be selected according to the job. Tiger Brand Wire Ropes are specially designed for every lifting and pulling requirement, to do the job better and more economically.

When you need wire rope
Specify TIGER BRAND

Tiger Brand Ropes are supplied in Excellay (Preformed) or in Standard construction. With its own wire rope plant —large stocks of wire and wire ropes of all grades—its Engineering staff—its modern testing equipment, all right here on the Pacific Coast, the Columbia Steel Company has built an enviable reputation for prompt and efficient service. Tiger Brand Wire Ropes are also manufactured in the East by the American Steel & Wire Company.

COLUMBIA STEEL COMPANY

Pacific Coast Distributors for
AMERICAN BRIDGE CO.
AMERICAN SHEET & TIN PLATE CO.
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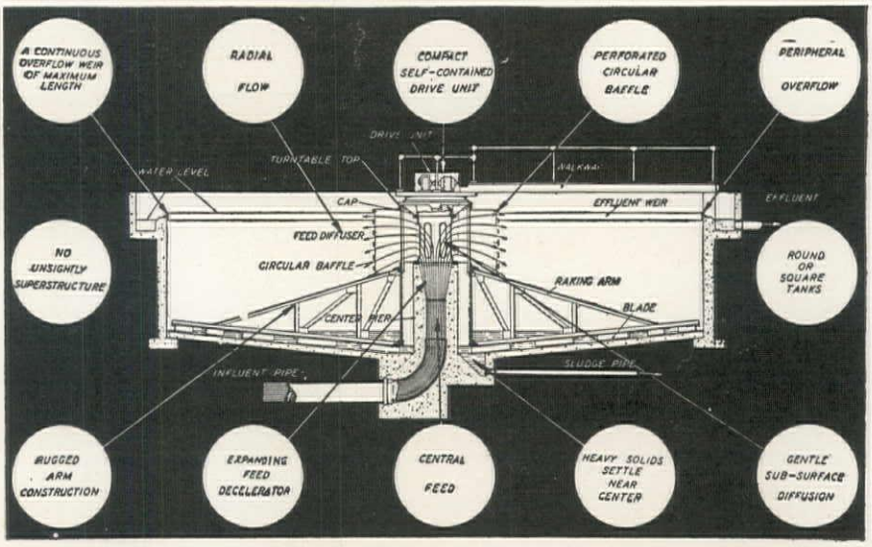
United States Steel Corporation Subsidiaries

Export Distributors: United States Steel Products Company, New York

SEDIMENTATION—*Plus*
THE DORR SIFEED CLARIFIER . . .

There must be—and is—a reason why there are more Dorr Clarifiers in use—more being purchased today—than all other makes combined. Behind such acceptance as this there must lie engineering features that stand up under critical engineering analysis. Here are a few of the ones that our clients like most.



The new Dorr Sifeed Clarifier has many unusual features never before incorporated in continuous sedimentation basins.

FEEDING ● Central, decelerated feed, causing heaviest particles to settle close to discharge hopper.

DISTRIBUTION ● Gentle subsurface diffusion, assuring quiescent radial flow without turbulence or plunging.

OVERFLOWING ● A continuous peripheral weir, three times the tank diameter, providing a gradually-decelerated flow reaching the minimum at point of overflow.

TANK SHAPE ● Round with center drive or square with drive at the periphery—whichever you prefer.

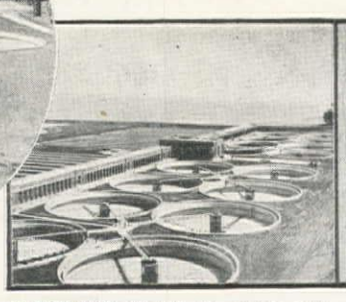
APPEARANCE ● Compact, attractive and symmetrical, devoid of unsightly superstructure and other top-hamper.

DORRCO

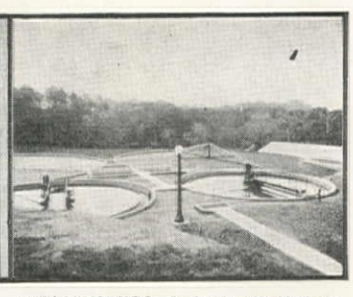
The net result of these exclusive Dorr features is either a greater capacity per unit of tank size, or, conversely, a greater removal of suspended solids at former rates of flow.

CHICAGO—15—97 ft. square Dorr Sifeeds; 32—126 ft. round ones on order—both activated sludge.

BIRMINGHAM — 2 — 40 ft. round Dorr Sifeeds—chemical precipitation.



CLEVELAND—16—112 ft. round Dorr Sifeeds—activated sludge.



WILLIAMSBURG—2—35 ft. round Dorr Sifeeds—separate sludge digestion.

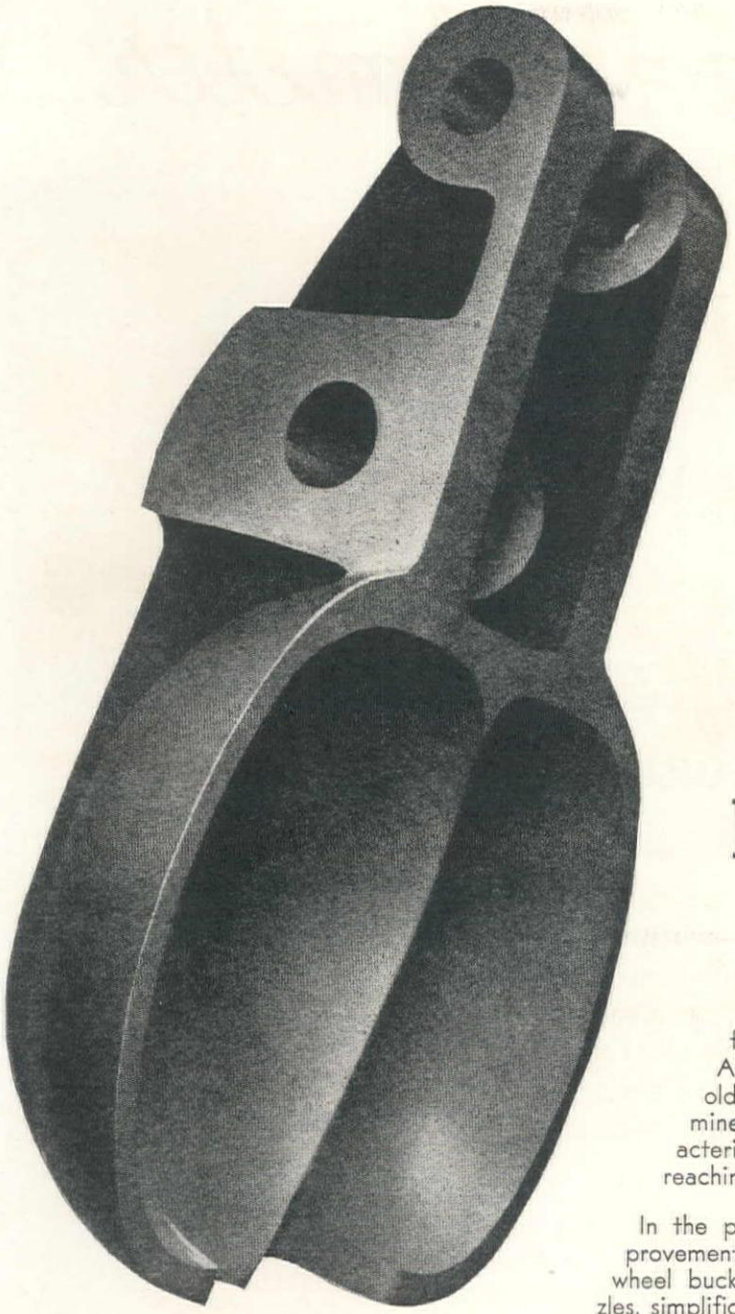
The Dorr Sifeed Clarifier is definitely a unit that merits your favorable consideration—as also do the seven other Dorr units

THE DORR COMPANY INC.

CHICAGO TORONTO • **ENGINEERS • 247 Park Ave., New York** • DENVER LOS ANGELES

DORR TECHNICAL SERVICES AND EQUIPMENT ARE AVAILABLE FROM THE FOLLOWING COMPANIES:

HOLLAND: Dorr-Oliver N. V. The Hague
FRANCE: Soc. Dorr-Oliver, Paris
ENGLAND: Dorr-Oliver Company Ltd., London
AUSTRALIA: Crossle & Duffy Pty. Ltd., Melbourne
SOUTH AFRICA: Edward L. Bateman Pty. Ltd., Johannesburg
GERMANY: Dorr Gesellschaft, m. b. H. Berlin
JAPAN: Andrews & George Co. Inc., Tokio



A Consistent Effort for . . . .

Higher Efficiency Reduced Maintenance Lower Operating Cost

HYDRO plants yield a return in proportion to their mechanical efficiency, cost of maintenance and cost of operation, whether reservoirs are filled or whether stream flow must be maintained. Any Hydraulic power installation—particularly the older units—can well justify an analysis to determine the possibilities of improving operating characteristics. The slightest change may produce far-reaching economies.

In the progress of the hydraulic art marked improvement has been affected in design of water wheel buckets, construction of straight flow nozzles, simplification of operating mechanism and development of automatic devices. Substitution of these parts has already produced remarkable results in many obsolete plants at slight cost, increasing unit capacities, and decreasing unit operating expense and outage time.

Pelton engineers will gladly assist in any plant analysis, offering their long and intimate experience without obligation.

THE PELTON WATER WHEEL COMPANY
HYDRAULIC ENGINEERS

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

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

PELTON

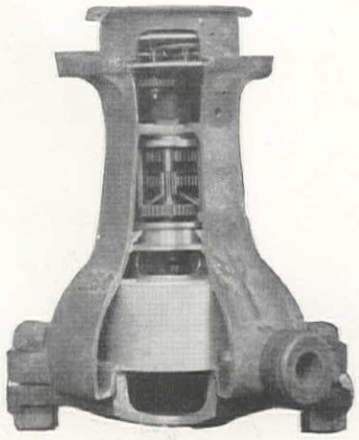
In writing to THE PELTON WATER WHEEL CO., *please mention Western Construction News.*

So he took an old meter....

(A TRIDENT Water Meter)

FITTED IN NEW PARTS

(See Illustration Casing 1899—parts modern)



and it worked perfectly

(THAT'S TRIDENT INTERCHANGEABILITY)

Lack of Meter Depreciation Astounds Water Rate Probers

Depreciation, bugaboo of industry, is not part of a water meter expert's worries.

There is no such thing, says Henry Horandt, New York meter expert and graduate of Rensselaer Polytechnic Institute who was summoned by Rochester and Lake Ontario Water Service Corporation to appear before the Public Service Commission Saturday.

The commission, investigating the rates charged by the company, was mystified by the company's statement that water meters did not depreciate.

Almost unheard of, they said.

So up from New York came Horandt who backed up the company in every detail. He took a meter apart under the eyes of the commission and explained its workings. A meter manufactured in 1893, he said is repaired with parts manufactured today.

Not only is there no depreciation, but there is scarcely any change in design. So he took an old meter, fitted in new parts, and it worked perfectly.

Under PSC regulations the company must test its meters every five years. The company more than complies with these rules, officials said.

Rochester "Democrat and Chronicle"

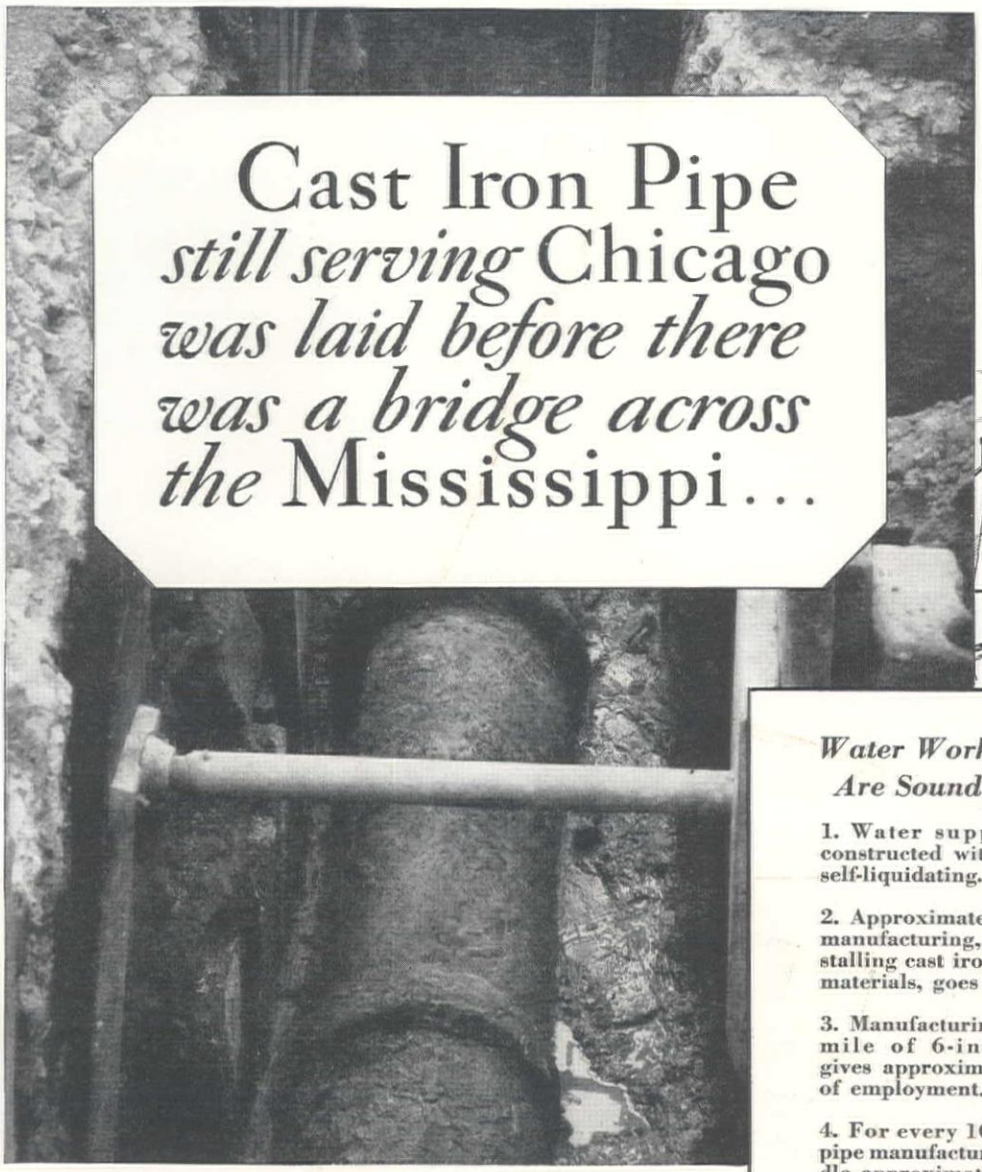
This clipping tells its own story. It refers to TRIDENT WATER METERS. It is *not* astounding—when you have had experience with Trident Meter Quality. The Quality of *Interchangeability,* that eliminates depreciation, is only one of the many qualities of these meters. There is their Quality of design and workmanship and the details of operation that mean long years of sustained accuracy, with maintenance reduced almost to nil.

It pays to buy Quality . . . in water meters that preserve the original value of your invested capital . . . in Trident (and Lambert) Water Meters. Over 6 million of these "Cash Registers of the Water Works Field" made and sold the world over . . . proof of Quality. Data? Write Neptune Meter Co. (Thomson Meter Corp.), 50 W. 50th St. (Rockefeller Center), New York City . . or . . Neptune-National Meters, Ltd., Toronto, Canada.

QUALITY

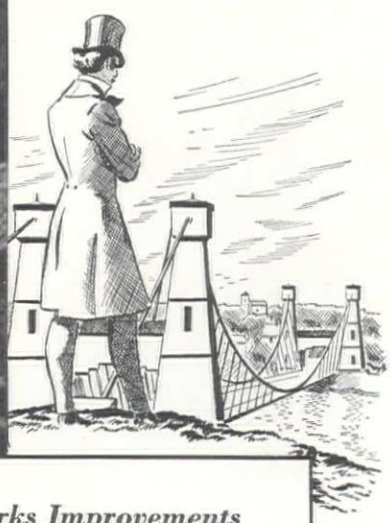
Trident & Lambert Water Meters

QUALITY meters that LACK Depreciation



Cast Iron Pipe *still serving* Chicago *was laid before there was a bridge across the* Mississippi...

The first bridge across the Mississippi River was completed in January 1855 at Minneapolis.



Water Works Improvements Are Sound Relief Projects

1. Water supply improvements constructed with cast iron pipe are self-liquidating.

2. Approximately 75% of the cost of manufacturing, distributing and installing cast iron pipe, including raw materials, goes directly to workmen.

3. Manufacturing and installing one mile of 6-inch cast iron pipe gives approximately 1000 man-days of employment.

4. For every 100 tons of cast iron pipe manufactured, the railroads handle approximately 1000 tons of raw materials.

NO wonder Chicago's more than 3600 miles of water mains are cast iron pipe! Almost all of her original cast iron water line laid in 1851 is still in service. Sections not now in use were abandoned owing to changes incident to a growing metropolis. The pipe shown was recently uncovered and found in good condition after more than 80 years of continuous service.

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

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

Your community has an exceptional opportunity to modernize, enlarge or extend its present water distribution system, or build new supply lines, at costs and financial terms that may never be so favorable again.

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

CAST IRON PIPE

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

TRADEMARK REG.

THE SHOW-DOWN
ON PREFERENCE

On 9 of the biggest construction jobs in the United States,* 92% of the tractors in use are "Caterpillar" Tractors. Depending for profits on uninterrupted performance at rock-bottom cost, contractors make "Caterpillar" their 9 to 1 choice. Their preference is a Show-Down for every power user. Caterpillar Tractor Co., Peoria, Ill., U. S. A.

A recent census on these jobs showed over 350 "Caterpillar" Tractors at work—more than half of them Diesel models:

Grand Coulee Dam • Grafton & Kanawha Dam • Sutherland Reservoir
All-American Canal • Bonneville Dam • Metropolitan Water District
Fort Peck Dam • Sky-Line Boulevard • Muskingum Valley Flood Project

At Grand Coulee Dam (see photograph above), as on every other big construction job, "Caterpillar" Diesel Tractors stand far in the lead—in numbers, and in performance.

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL

WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER

September, 1935 Vol. 10, No. 9

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

The Bureau of Reclamation And the West are Partners

OF ALL THE Federal agencies the Bureau of Reclamation is the most closely allied to the West and particularly the construction industry of the eleven western states. Its work and plans are all directed toward the development and utilization of the region's most vital resource—water—and the carrying out of its designs provides millions of dollars of work for western contractors. The debt of the West to the Bureau, and its famous predecessor the Reclamation Service, is generally accepted too lightly and there should be a more active regional interest in the work of the Bureau by way of indicating to the national government that the work of this organization is appreciated.

In the past three decades the Bureau has been a potent factor in maintaining a balance in western progress by developing the agricultural hinterland. This work, in general, may be characterized as: (1) rescuing water-starved areas where human greed or poor engineering had placed settlers on land where they could not survive, (2) planning and constructing important, large-scale developments when size or interstate problems rendered other agencies inadequate and (3) studying and programming the water development of the future to the end that it will provide the greatest good for the largest number. All of this work has been of immense public benefit and it has been a continuing source of work for western contractors.

In return, western construction interests are in a peculiar position to act as a valuable intermediary between the Bureau and the public in the area west of the Rockies, and not without self-evident return advantages. In one direction they can be of help to the Bureau in passing along the opinions, desires, constructive criticisms and general comments of the people, and in the other direction they can continually sell the value of the Bureau to the West because of first-hand knowledge of its aims and accomplishments. The people must be continually reminded of the need of the West for properly planned reclamation, that the U. S. Bureau of Reclamation may have the active and intelligent support of the area it so effectively serves.

Salt Lake City Takes a Step To Insure its Future

SALT LAKE CITY has taken a step to further its position as the metropolitan center of the intermountain section by voting favorably for a proposal which makes possible the acquiring of an adequate water supply. The election of August 15, authorizing the formation of a metropolitan water district will allow the city to participate in the proposed Deer Creek project planned by the Bureau of Reclamation. Several times in recent years the city has been forced to avert serious water shortage by emergency installations to meet immediate requirements, without time for a studied regard for a comprehensvie program. The present water supply sytem is of patch-work design involving old surface rights, exchange agreements with irrigators causing endless problems, and the use of wells for the peak summer load. Even a casual appraisal indicates that the city cannot be in a position to fulfill its destiny until assured of a water supply commensurate with expected municipal development.

Opponents of the essential step of creating the district set-up for becoming a beneficiary in the Deer Creek project have lacked the vision necessary to see beyond the immediate benefits—a serious error in considering any public works program—and failed to appreciate the fact that municipal growth follows, and does not anticipate, the providing of an adequate water supply. Timidness is not in keeping with the spirit which built this community and it is gratifying to see the city administration and the daily press leading in the effort to insure the future of Salt Lake City. The present initial step must now be carried forward aggressively to the actual building of the project.

•

Highway Fund Diversion Stopped

AROUSED public opinion, ably abetted by concerted action of the construction industry, has stopped the recent plan of the California state administration to expand the use of convict labor on highway work. The suggested program would have doubled the number of convicts in the highway camps and proposed that the additional cost be taken care of by eliminating equipment charges and going to hand labor exclusively. At present, equipment is used in connection with convict labor camps and these units are operated by free labor, according to law. The new plan would have increased the unit costs of the work to a staggering figure and placed free men out of work. Such a program must be considered a diversion, or at least a dilution of state highway funds, and on this point California opinion has expressed itself too often to be misunderstood. The program was particularly infeasible because many of the camps operate on work involving heavy rock excavation and the resorting to hand labor would have almost stopped progress on these projects. Now that the plan has been abandoned, there remains the value of the lesson to the general public and the construction industry of all western states to be constantly on the alert for concealed or indirect efforts to disipate hgihway funds.

•

Now Don't Laugh

OUR contruction brethern in the East are pointing with considerable pride to a project which they describe with appropriate superlatives. The undertaking is the Muskingum Valley conservancy work in Ohio, which includes the building of fourteen earth-fill dams. The quantities involved make interesting regional comparisons, and may prove somewhat formidable to Western contractors—engaged in the field of basement excavating. Skipping over the figures for the individual structures, imposing as they are, we find the total excavation involved in *all fourteen dams* is 10,000,000 cu. yd. which is only 55% of the yardage being moved at the Grand Coulee job and only 26% of the 38,000,000 cu. yd. earth moving contract on the All-American Canal. Further, the figure for the earth fill involved in the fourteen dams is 9,000,000 cu. yd. as compared to the 7,000,000 cu. yd. in the single Cajalco Dam contract which is only one unit of the Colorado River Aqueduct project. Remarks appear a bit superfluous.

GET AN EXTRA PROFIT *from Oil Mix Jobs*

. . . Base your estimate on AUSTIN-WESTERN MOTOR GRADER PERFORMANCE

● On oil mix estimates the particular qualifications of the Austin-Western "77" are a positive factor in winning contracts — and in carrying through the work to yield the expected profit.

The leading factor which will give an advantage in estimating, is the economical balance between speed and low fuel consumption. With a six-speed transmission permitting selection of the one most economical speed from 1.5 to 13 m.p.h. regardless of grade and type of material the general average of fuel consumption for this motor grader is 2½ gallons per hour. Other points of working efficiency are hydraulic controls, Austin-Western dual (4 wheel) drive traction, resistance to side slip by the leaning front wheels, and firm blade free from chatter.

The particularly valuable feature of the "77" to contractors is that it performs equally well on many other types of work—shouldering, grading, maintaining, scarifying, etc. It is a piece of equipment the road contractor can keep busy the year 'round on jobs of many classes.

The Austin-Western line as a whole offers those who specialize in bituminous surfacing a complete line-up of equipment—the Bituminous Distributor, a choice of materials handling units, and the famous Austin-Western Roll-A-Plane.

Check the coupon to indicate the machines on which you would like full details.

The Austin-Western Road Machinery Co.
Home Office: Aurora, Ill. Cable Address: AWCO, Aurora
Branches in Principal Cities

ROAD GRADERS · MOTOR GRADERS · ELEVATING GRADERS · DRAGS

ROAD ROLLERS

Austin-Western

BITUMINOUS DISTRIBUTORS · ROAD-MIX MACHINES · CULVERTS
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DUMP CARS

CRUSHING AND WASHING PLANTS · SWEEPERS AND SPRINKLERS · SHOVELS · CRANES · ETC · SNOW PLOWS

The Austin-Western Road Machinery Co.
L, Aurora, Ill.
Please send ☐ new Road Machinery Catalog; ☐ "77" Motor Grader details; ☐ Bituminous Distributor; ☐ Roll-A-Plane bulletin.

Name.....

Address.....

City..... State.....476

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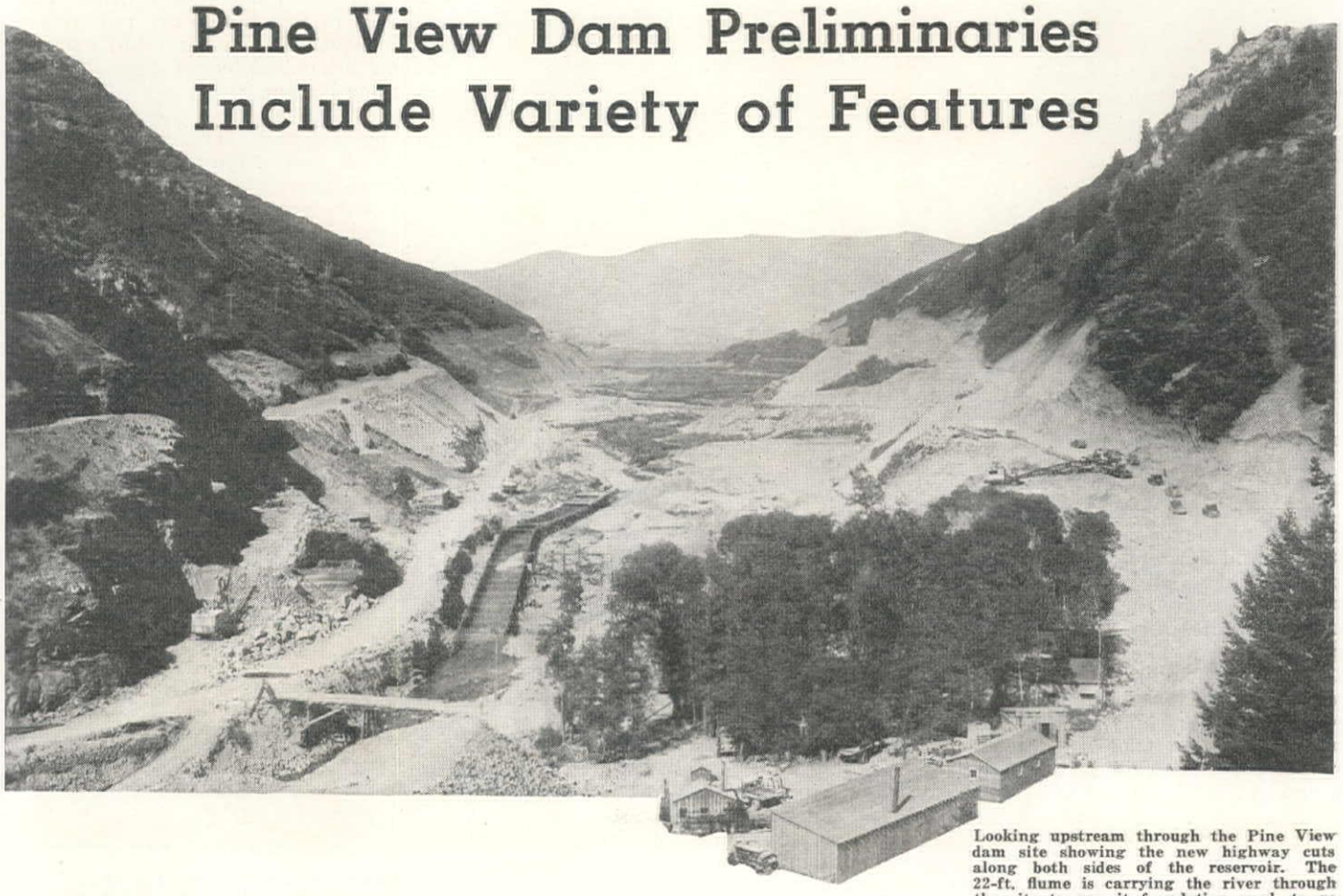
WESTERN CONSTRUCTION NEWS

SEPTEMBER, 1935

Pine View Dam Preliminaries Include Variety of Features



Looking upstream through the Pine View dam site showing the new highway cuts along both sides of the reservoir. The 22-ft. flume is carrying the river through the site to permit foundation work to go forward prior to completion of the diversion tunnel being driven under the left abutment. The shovel at the left is working in the spillway cut. The two highway branches will connect with a road across the crest of the dam.

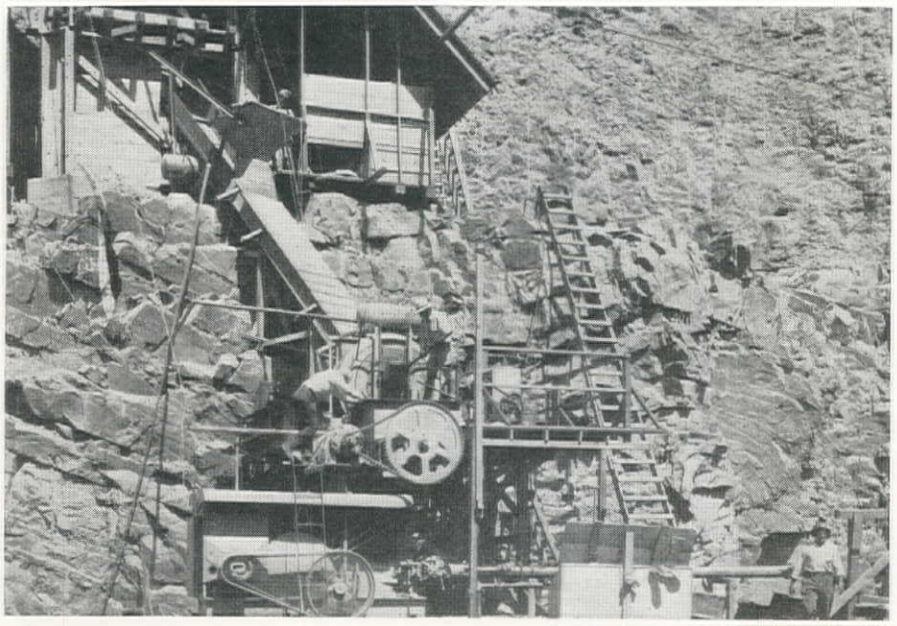
Pipe line, tunnel and sheet-pile cutoff operations are preliminaries to placing 265,000 cu. yd. of earth and gravel fill—Project to be completed in 1936

THE extensive preparatory work required on the Pine View dam project, before earth fill operations can be started, is now well advanced. These preliminaries which have been under way for the past few months, include: (1) the new collector-pipe system for the Ogden municipal water supply, (2) 9.5 mi. of highway relocation which has been graded ready for surfacing, (3) driving of the diversion and outlet tunnel with lining under way, (4) highway tunnel driving well advanced, and (5) driving of steel sheet piling for the dam cutoff. Following the completion of these preliminary operations, the development of the borrow pits will be started, the river will be turned into the combination diversion and outlet tunnel, and the 265,000 cu. yd. of earth and gravel fill will be started.

Strict control will be exercised over filling operations with careful control of moisture content and compaction. This work will mark the first time that the Bureau of Reclamation has instituted these recent innovations in earth fill dam construction for one of its structures. These filling operations should be started during this fall but will be closed down during the winter because freezing will interfere with moisture control and completion of the construction program is scheduled for the 1936 working season.

The Pine View dam, located on the Ogden River about 8 mi. north of Ogden, Utah, is being built by the Bureau of Reclamation to serve several purposes. The storage of 41,000 ac. ft., provided by this dam will insure an adequate water supply for the irrigation of about 15,000 acres of land now served by the uncontrolled flow of the Ogden River and will be also used for 4,500 acres of new lands in the same vicinity. Further, the water supply will be used for power development at a plant of the Utah Power and Light Co. which has been established for many years. Ten thousand acre feet of the reservoir storage is reserved for the city of Ogden to meet possible future requirements.

The project is unusually complicated, considering the size of the dam, because of the various features required which were not directly connected with the regular dam construction program. In the first place, the reservoir floods the artesian well park of the Ogden municipal supply and makes it necessary to connect all of these flowing wells with a steel pipe system and lead the discharge out through the reservoir to the conduit line below the dam. In the second place, a state highway route through



Concrete for lining the diversion-outlet tunnel is prepared in this gravity feed plant, mixed in a Leach mixer and placed by the Rex Pumpcrete unit. This unit will be used for a maximum horizontal distance of 550 ft.

the valley had to be rebuilt, with branches on either side of the reservoir. This work involves about 9.5 mi. of highway construction. Lastly, the additional water supply necessitates rebuilding of the conduit line down the canyon to the beginning of the ditch system and this work includes the construction of 5.3 mi. of 75-in. wood stave pipe. These are the principal features of the project, in addition to the regular dam work. The general features of the project including plans for the dam were reviewed briefly in *Western Construction News*, May, 1934. Progress which has been made to date on the preparatory work is reviewed in the following.

Well Connecting System

The system of pipes which connects the artesian wells include about 15,000 ft. of line ranging in size from 4-in. pipe at individual wells to an outlet line 38 in. in diameter. The individual lines from the wells form three principal branches, each 20 in. in diameter and these, in turn, flow through a collecting tank to the outlet main.

Existing operations at this source of water supply include the use of an air lift pumping system to increase the flow of the wells. The new plan provides for tapping these wells at an elevation of about 10 ft. below the present point of discharge and this 10-ft. differential is designed to provide the same amount of flow which now results from the air lift pumping. The air lift pumping plant, of course, will be discontinued when the reservoir is flooded. Construction of this extensive pipe line system did not involve any particularly unusual features of construction although the work was made difficult because of the water level at ground surface which made extensive pumping necessary to keep the trenches unwatered while the pipes were being laid.

The pipes, as shipped from the manufacturer, for all straight run sections, were in 30-ft. lengths, with provision for a bolted flanged joint at the end of every third joint. The intermediate joints had belled ends and were welded inside and outside in the field into 90-ft. belled lengths. An expansion sleeve coupling was provided every 450 ft.

Trenches were excavated through the mud with a dragline and for the larger sizes of pipe this trench was held by timber lagging and struts while it was pumped out to complete laying and connecting the pipe sections. Each well is also connected with an air vent line which runs to a 3-in. main air vent and from this point to an elevation above the reservoir level. This whole program was designed to permit the uninterrupted use of this artesian supply by the city of Ogden after the well area has been flooded. The main 38-in. outlet pipe, about 9,240 ft. long, extends through the reservoir site to the portal of the diversion tunnel and continues under the floor of this tunnel to connect with the existing conduit line which extends about 5.3 mi. to the city of Ogden. These existing conduit lines will be supplemented and replaced by a new line, bids for which have been called for by the city. This new conduit line will add about $400,000 to the cost of the work involved in the general Pine View development program.

Highway Work

The location of the Ogden to Huntsville state highway through the canyon and damsite necessitated a new highway diverging from the old route about ½ mi. below the damsite, crossing the Ogden River and rising to the elevation of the top of the dam. At this point, the new route branches with one line continuing along the south side of the reservoir to Huntsville and the other branch crossing the dam and continuing on the north side of the reservoir to Eden. The location of this second branch, after it crosses the spillway requires a tunnel about 300 ft. long. This tunnel has a section providing two 10-ft. highway lines and is 10 ft. 6 in. high at the curb lines. It is being driven through alternate layers of limstone and quartzite rock with a truck jumbo mounting four drills. Two settings of this jumbo are required to drill about 25 holes for a 10-ft. round. Muck is handled by a Conway No. 60 machine loading into trucks. Between 22 and 24 hours are required for completing a round. There has been no particular rush about completing this highway tunnel work and the operations have not been pushed. The tunnel will be lined with timber sets at 5-ft. spacing which will be lagged over the arch.

The tunnel to provide diversion during the construction period and to carry the permanent outlet pipes is about 600 ft. long and extends through rock under the north abuttment of the dam. At the upstream end (trash racks provided in the final installation) this tunnel is of horseshoe shape 10 ft. 6 in. in diameter. It is lined with 14 in. of concrete. About 270 ft. downstream this tunnel enlarges into a gate chamber which connects with the surface through a short shaft. Below this gate chamber, the tunnel will carry one 60-in. and one 72-in. steel pipe.

During the snow of last December, the first section of the 38-in. Ogden water supply line is shown lined up over the trench ready for lowering. This line extends through the reservoir site to the dam.

About 200 ft. further downstream the smaller pipe turns out through a branch tunnel to discharge into the stilling basin of the spillway. This pipe will carry the regular flow of the stream into the channel to maintain the requirements for existing rights along the river. The tunnel continues in smaller diameter with the 72-in. pipe, a distance of about 200 ft. to the downstream portal. At this point the wood stave pipe conduit begins as the upstream end of the power and irrigation supply system. Throughout the

entire length of the tunnel the 38-in. steel pipe line of the Ogden supply, from the artesian wells, is buried in concrete under the floor of the tunnel.

The driving of this tunnel did not involve any unusual construction procedure. Drills were mounted on bars and rounds of about 8 ft. were pulled. The time required for completion of each round was about 18 hr. Excavation was done with a Conway mucker loading into trucks. The rock was hauled out of the upper portal and wasted.

The concrete lining for the tunnel, involving about 2,000 cu. yd., is being placed with a Pumpcrete unit. This unit is installed on the abutment directly above the shaft leading into the gate chamber. The steep slope of the abutment permits gravity operations through this concreting layout.

Aggregate for the concrete is delivered by truck from the local electric railway terminal. This supply comes from a commercial plant near Brigham City. The trucks discharge into bunkers set above the batching plant which was designed by the contractor for weighing the various classes of material. The batcher discharges into a Leach 21-S mixer which, in turn, discharges directly into the Rex Pumpcrete unit. The concrete pump discharge line leads down the shaft and is then carried along the tunnel to the point of pour. This concreting set up is designed to take care of the entire tunnel lining operations and will require a horizontal pumping distance of about 550 ft. as a maximum and a maximum vertical drop of 35 ft.

Dam Foundation Work

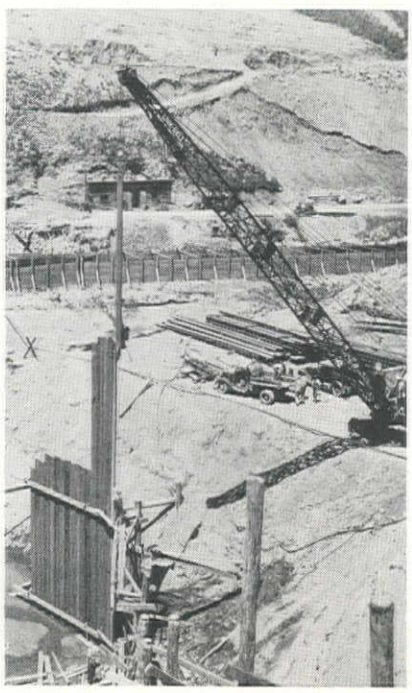
Preliminary to the completion of the diversion tunnel, the contractor built a flume to carry the flow of the river, thereby permitting foundation operations to start in the river channel. This flume is 22 ft. wide and 8 ft. deep and was designed for a capacity of about 3,000 sec. ft. The peak flood it has carried during the spring runoff was 1,200 sec. ft. During August this flume was handling the 80-sec. ft. flow of the river and 4-sec. ft. pumped out of the sump at the cutoff trench.

Excavation for the dam involved about 60,000 cu. yd. and this was removed by truck to waste dumps. The stripping removed the river deposit over the entire dam foundation area and continued down an additional depth of about 30 ft. in the control core section which will be filled with the selected impervious material. At the bottom of this trench the steel sheet piling cutoff is being driven to bed rock.

As soon as the river had been turned into the flume and the cutoff section excavated to required depth, the contractor began driving sheet piling. Pile driving is done with a Northwest crane supporting a McKiernan-Terry hammer. Recently, the size of hammer has been increased from a No. 7 to a No. 9-B because of penetration depths which have reached about 100 ft. The piles are driven in 40, 45 and 50-ft. lengths and are then spliced by arc welding to provide for a maximum penetration of about 100 ft. and a top length which will extend 15 ft. into the earth fill. This pile driving work is now actively under way and it involves about 27,500 lin. ft. of 37.5-lb. piling.

An interesting feature of this sheet pile cutoff is the fact that where it extends up onto the south abutment, a drift will be driven along the contact of the piling and bed rock to permit grouting the bed rock and back filling the stope with concrete. The result of this operation should provide interesting information as to the condition of the piles when driven against rock.

Threading a length of sheet piling in the work of driving a cutoff to rock. These lengths are handled by the Link-Belt crane, spliced by arc welding and driven to maximum penetration of about 100 ft. by a McKiernan-Terry hammer.



At the gate-chamber junction between the outlet-diversion tunnel and the operating shaft. The pipe for the Ogden municipal supply is shown ready to be encased in the concrete of the floor. The delivery pipe from the Pumpcrete unit can be seen coming down the shaft.

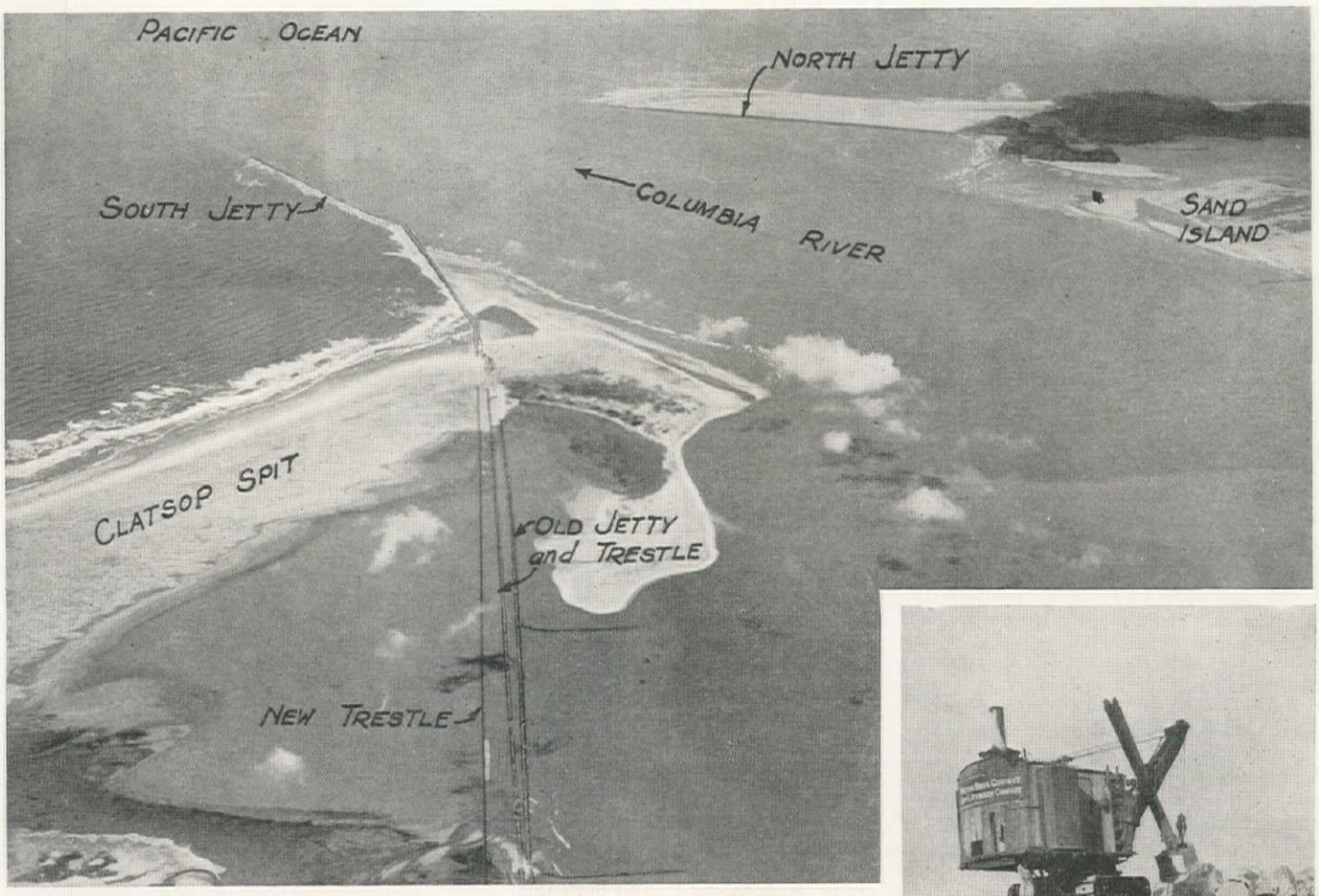
Plans for Fill

Design for the dam calls for the usual impervious section of selected material backed on both sides by a section of more pervious clay and sand. The upstream face is completed by a 3-ft. layer of riprap and the downstream slope is covered by an extensive rock fill section.

Plans for the earth filling operations have not been completed in detail, in so far as the contractor's work is concerned. The material will be obtained from borrow pits located about ½ to 1 mi. upstream in the reservoir site. This material will be moved by truck to the dam and moistened and rolled in 8 in. layers. The placing of this fill will be carried out under strict supervision as to control of moisture content and compaction. A field laboratory for making these earth fill tests has been established by the Bureau at the site.

Organization

The Pine View project is being built by the Bureau of Reclamation under the general direction of Elwood Mead, Commissioner, and the headquarters staff in the Denver office. J. R. Iakish is construction engineer, H. V. Hubbell, field engineer, and G. C. Imrie, office engineer. Contract for construction of the dam and appurtenant works is held by Utah Construction Co. and Morrison-Knudsen Co. under a bid of $677,898. The same contracting combination secured the contract for the highway relocation, which was a separate job. A subcontract was awarded to Wheelwright Construction Co. for part of this highway work. H. B. Way is superintendent for the general contractor and Morris Brown is engineer.



Rebuilding a Long Jetty For the Columbia River

Fig. 3—Moving along the 20-car train this Bucyrus-Erie shovel unloads the rock.

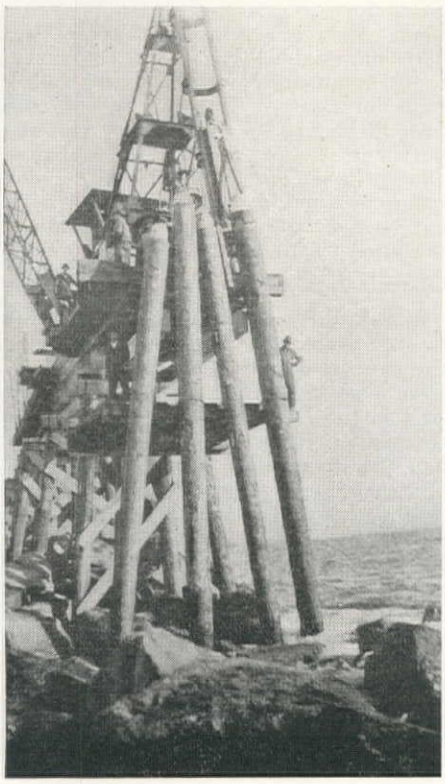


Fig. 2—Pile driving operations on the trestle. Note the arrangement of leads to secure proper batter and the staging for the cut-off crew slung below the driver. The derrick handles the piles direct from car to leads.

Two million tons of rock dumped to recondition the 3¾-mi. jetty — Trestle construction, quarry operations and the work at the site reviewed—Output in July totaled 109,000 tons.

EXTENDING out 3.75 mi. beyond Clatsop Spit into the Pacific Ocean, and a total distance of about 7 miles from the original root at Fort Stevens, the south jetty at the mouth of the Columbia River will, upon its completion this winter, establish a record for length and amount of rock involved for this type of construction. The project is being built by the War Department under supervision of the U. S. Engineer's Office in Portland and consists primarily of placing a new rock top on an existing enrockment which was started in 1884 and completed in 1913.

The old jetty has been gradually lowered to low water level elevation by wave action and spread to a top width of about 200 ft. At times the sea at this point becomes extremely rough and has a normal tide variation of 7.5 ft. and a maximum difference of 10 ft. The apparent cause of the leveling of the old jetty was the heavy wave action and the relatively small size rock used in the older work.

The mouth of the Columbia River, located 12 mi. below Astoria, Ore., and 117 mi. below Portland, is formed by Cape Disappointment and Sand Island on the Washington shore and Clatsop

Fig. 1—Mouth of the Columbia River showing the South Jetty extending 3¼ miles out into the Pacific Ocean. The relation of Clatsop Spit to the jetty position is clearly indicated.

Spit, a long narrow neck of sand, located approximately normal to the river, on the Oregon side. An undetermined, but relative heavy, load of sand and fine material is carried by the river, and the south jetty now being reconstructed and a jetty on the north or Washington side are required to control, as far as possible, this constantly shifting sand as well as to protect navigation at the extreme outlet of the river. The north jetty, which was completed in 1917, extends southwest from a location near McKenzie head on Cape Disappointment a distance of nearly 2½ mi. A 2-mi. channel opening is provided between the offshore ends of the opposite jetties.

From studies made by the U. S. Engineer's Office during the past few years on direction and velocities of tidal currents and from frequent surveys of sand movement, it has been determined that the material in the river is carried out beyond the end of the jetties, where part is deposited in a crescent shape, and more is transported by wave and current action to nearby beaches. Since the north jetty was completed in 1917 in open water, a bar of sand has been deposited (Fig. 1) on the north or ocean side extending the full length of the enrockment and from the shore end of the jetty to North head, a distance of 6500 ft. This sand deposit protects the north jetty from the sea.

Clatsop Spit raised by unique method

Clatsop Spit extends north from the mainland south of Fort Stevens a distance of 4 mi. and has an average width of 2000 ft. This spit formed across the original jetty (completed in 1895), which extended only to the angle point (Fig. 1) 4¼ mi. from Fort Stevens. It gradually built up to elevations above high tide level and entirely covered a considerable section of the old jetty, thus affording a protection from wave action. In recent years this spit has been wearing away.

In an effort to increase the protectiveness of Clatsop Spit a unique method of raising the elevation of exposed sand was undertaken during the past year. This method consists of collecting and controlling the movement of wind blown beach sand by means of picket fences placed so that the material is deposited in a ridge along the spit.

The sand fences consist of 1 x 3-in. by 4-ft. pickets placed at 6-in. centers in three parallel rows 100 ft. apart with lateral fences located at intervals varying from 50 to 100 ft. These pickets are driven into the sand 1 ft. and are subsequently pulled up to higher elevations, at intervals, as the sand drifts in around the obstructing fence. During the year this beach erosion work has been under way about 300,000 cu. yd. of material has been built up on

Fig. 4—Trimming the side slopes with a 50-ton Browning crane using a sling to adjust the large rocks.

the spit at the extremely low cost of $0.01 per cu. yd. The spit has been built up from El. 14 to a crest El. 21 over an area 350 ft. wide and 7,000 ft. long extending south from the south jetty. The raising of the spit prevents the heavy winter seas from breaking across into the lagoon behind the spit.

Jetty reconstruction

The present reconstruction work was started four years ago and involves placing 2,200,000 tons of rock at a total cost of $4,188,880. This work has been done under three separate contracts:

Contractor	Amount	Tons of Rock
Columbia Contract Co.	$1,200,000	700,000
Winston Bros. Co. and Guy F. Atkinson Co.	1,111,945	900,000
Winston Bros. Co. and Guy F. Atkinson Co.	1,876,935	900,000
Total	$4,188,880	2,200,000

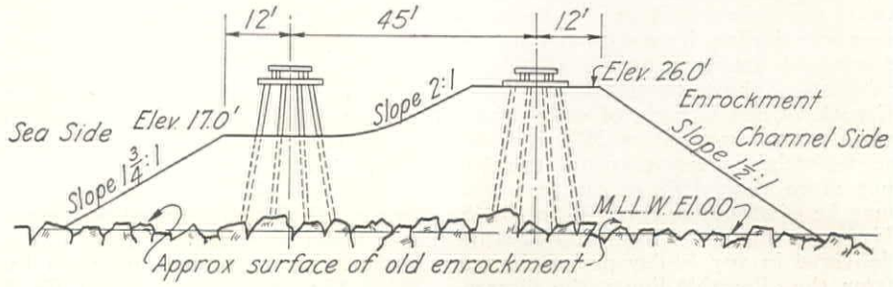
Rock for the original jetty was transported in railroad cars across the lagoon separating Ft. Stevens and the head of Clatsop Spit on a timber trestle which subsequently deteriorated beyond possible reuse. The contract of Columbia Contract Co. included construction of a new single track pile trestle parallel to the old one. This structure, located in shallow water, has a length of 12,800 ft. and is built of cedar piles and creosoted caps and stringers. Ties are of untreated timber.

The new plans provide for two types of enrockment, one having a cross section with a top width of 24 ft. and employing a single track trestle in its construction, the other being 70 ft. from shoulder to shoulder with two embedded railroad trestles at 45-ft. centers. Both sections have a top elevation of 26 ft. The jetty work completed during 1932 by Columbia Contract Co. included a single track section which extended from the shore of Clatsop Spit (bent No. 800) to the "knuckle" (bent No. 1315) or turning point of the jetty, a distance of 8,250 ft. Construction methods used in trestle construction and rock placement were very similar to those used on the present work.

The double track jetty extends from the "knuckle" to the proposed end of the work (bent No. 1191), a total distance of 9,540 ft., all of which has been built by Winston Bros. Co., and Guy F. Atkinson Co. The portion completed between September, 1933, and October, 1934, extends from the "knuckle", a distance of 4,740 ft., and the balance of the work under present contract is scheduled to be completed by the end of the year.

The adopted design of the heavier type of jetty (Fig. 5) provides for two standard gage tramway lines supported on timber pile trestles, and three specified classes of rock. The top of the enrockment along the channel side trestle is stepped down on a 2:1 slope from El. 26 to the area under the trestle on the sea side at El. 17. The bottom width of the new enrockment varies from 140 to 145 ft. with side slopes of 1 3-4:1 on the exposed ocean side and 1 1-2:1 on the channel side. The top surface of the stone of the old jetty is in general nearly level, ranging in height from El. 2 at the start

Fig. 5—Section through the jetty showing features of the double trestle and elevations of the enrockment.



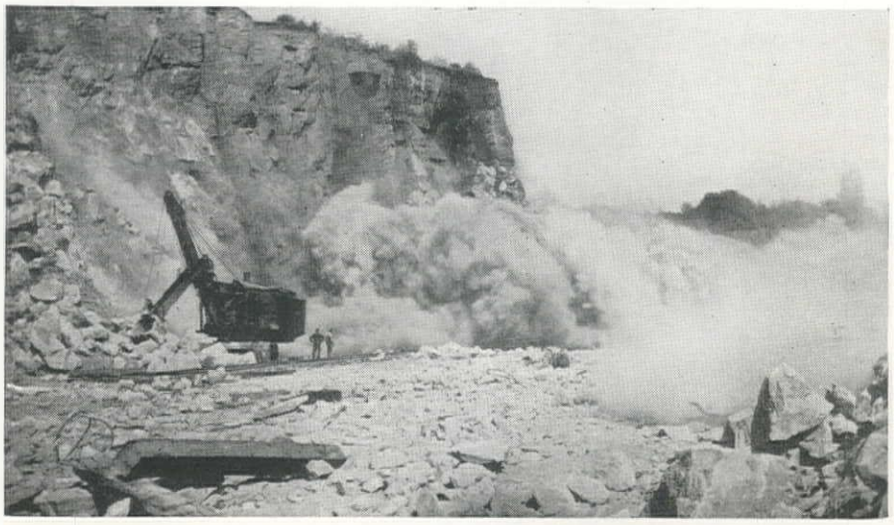


Fig. 6—Blasting is done with such precision that little time is lost in resuming loading. Note the nearness of men and machine to this blast which brought down 10,000 cu.yd. of rock.

of the work to El. 10 at the extreme end of the new work. The depth of water along the south side of the jetty is about 40 ft. at mean lower low water.

Each trestle consists of 4-pile bents spaced at 16-ft. centers with four 9 x 18-in. stringers, each 32 ft. long laid with broken joints, and 12 x 16-in. caps, the exposed ends of which are protected by 6 by 16-in. blocks against injury from falling rocks being unloaded from cars. Piles are driven to a batter of 2:12 and 1:12 and are braced by four 3-12-in. diagonal braces. The two inner piles are fastened to the caps by 5/16 x 2-in. steel anchor straps which extend around the cap and are spiked to both sides of the pile. The outer piles are fastened to the caps by 5/8-in. cable which also holds the protecting block in place. The driving ends of the green untreated Douglas fir piles are provided with a plate shoe fitted over the sharpened end. This shoe, about 8 in. long, is of 1/8-in. metal and is formed and welded to fit the dressed end. It is fastened to the pile with spikes.

Stone for the jetty is furnished from the commercial quarry of Columbia Contract Co. at Fishers Landing, Washington, about 12. mi. above Portland on the Columbia River, and 120 miles from the site of the work. This rock weighs about 167 lb. per cu. ft. and is of a dense, tough quality. Three classes of rock are specified according to weight of pieces. Class A rock, of which there must be not less than 45%, includes all larger stones weighing not less than 6 tons per piece and must average 10 tons, with an allowable maximum of 25 tons. On the last contract this class of rock averaged 12½ tons per piece. Class B includes stones weighing from 1 to 6 tons per piece and amounts to the remaining percentage above the total for A and C rock. Class C rock, of which there must not be more than 20%, includes stones weighing less than one ton, but not more than 15% of any car load may be of stone weighing 25 to 100 lb. If the percentage of any class of stone delivered in any 10-day period departs from the allowable limits, the discrepancy is corrected in the succeeding 10 day period, so that the cumulative totals of different classes are nearly always in compliance with the contract specifications.

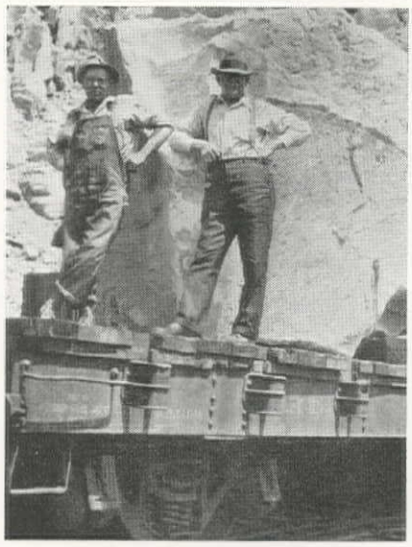
Due to the excessive loads being hauled in a westerly direction over the yard and trestle tracks, anti-rail creepers of the Bulldog type are required to hold the rails in place on the ties. The U-shaped heavy straps are located so as to bear against every third tie and are fastened to the rails by means of a hook bolt which passes through the two upright legs of the anti-creeper and under the rail to the outside edge of the bottom flange. A full time maintenance crew is necessary for the 9 mi. of yard and trestle tracks at the jetty site. Cross-over tracks between the two trestles on the jetty are located at convenient distances.

Pile driving rig

Piles, having an average length of 36 ft., are floated down the Columbia River and landed near the framing yard which is located adjacent to the tramway on Clatsop Spit. Here the piles are dressed and the metal shoes fitted to the pointed driving ends. A 25-ton Browning railroad crane is used for handling piles, lumber, rails, etc., in loading the materials car which is pulled out to the driver each morning. This car has a capacity of 20 piles, and all the other material required to drive five bents, or 80 ft. of trestle, a daily average.

In driving the 1,192 bents required in the last two contracts, a unique driving rig (Fig. 2) was developed to facilitate the work. A 6,800-lb. McKiernan-Terry No. 9B2 steam hammer in steel leads is supported on a steel tower which is mounted on the front end of a 20-ton Ohio locomotive crane with a specially constructed underframe. The crane, located between the driver and the materials car, has a full circle swing and picks up piles by a cable sling and places them directly into the driver leads. The leads are pivoted near the top of the driver frame and workmen on the driver platform shift position of the leads by merely pushing the light frame to the required angle for the batter and passing a bolt through matching holes through angles on the frames of the leads and the driver frame. Cut-off of the piles and erection of bracing is done by a crew working on a platform hung from the front of the driver frame. The deck structure is placed by the crane after the rig has moved back from the pile bents driven ahead of the completed trestle.

Fig. 8—Quarry operations are in charge of R. A. Lathrop, general superintendent (right) and Carl Johnson, assistant superintendent (left). Note the size of the rock.



Specifications require that the piles shall be driven as far as practicable in the old rock, not to exceed 10 ft. The average penetration amounts to about 2 ft., to the point of refusal. No requirement regarding the number of blows the hammer shall strike is included in the specifications. As soon as is practicable after the piles have been driven and trestle completed, Class C rock is dumped around the piles to provide additional support for the bents which are not braced longitudinally.

Unloading rock from cars

Upon arrival at the Fort Stevens yard track, the rock trains are weighed by government inspectors and are hauled in 20-car trains by a 60-ton Shay locomotive over the jetty tramway and spotted for dumping. The rock trains are coupled to an empty flat car, the last one of the previous train, which carries a Bucyrus-Erie ¾-yd. type B shovel used for unloading the rock from the cars. This shovel, provided with a bottomless bucket, has crawler treads about 1 ft. less than the width of the flatcar decks. Skillful operation of the shovel is essential in the rooting operation in which the rock is shoved over the side of the car.

Fig. 7—Loading rocks in the quarry with a Bucyrus-Erie shovel and a sling. The average carload of rock weighs 56 tons.

In cases where difficulty is encountered in getting the dipper teeth under a large flat-surfaced rock, a cable sling, hung over the bucket teeth is used in tipping the rock from the car. To support the shovel in passing from one car to the next, a small platform, designed to fit the space between the cars, is picked up by a sling and placed directly in the opening ahead of the shovel. After the rock has been dumped from the cars to the approximate finished section, slope finishing is completed with a 25-ton Browning crane equipped with a sling (Fig 4). On the final finished slope no Class C rock is permitted to be exposed above the larger rock.

Before construction could proceed this spring on the present contract, considerable repair work was necessary on the jetty tramway following a storm—one of the worst ever experienced on the North Pacific coast—which occurred at the completion of the previous contract on October 21, 1934. During the storm a maximum wind velocity of 107 miles per hr. was recorded at North head on the Washington side. Nearly all of the rails and ties on the south track west of the knuckle were wrecked for a distance of 4,500 ft. and a portion of the north track along this stretch and the entire deck structure of the single track tramway for a distance of 500 ft. east of the knuckle were taken out. About 70 tons of rails were salvaged and used in the present work. The enrockment was not damaged.

The contractors, who had completed their contract work only a few days previously and were preparing to move their equipment off the jetty tramway when the storm struck, lost a 50-ton Browning crane which was blown and washed off the north track onto the north slope near the knuckle and submerged in the high running sea. The crane was never salvaged.

Progress on present work

An exceptionally good record was made in July both at the quarry and at the site, 109,000 tons were dumped into the jetty in 26 working days. Up to August 15, slightly more than 450,000 tons of rock along 4,000 ft. of jetty had been placed under the present contract involving 900,000 tons. The last pile bents will be driven by September 15, and the entire contract will be completed about January.

The staff of Winston Bros. Co. and Guy F. Atkinson Co. includes: W. H. Gardiner, general manager; E. Standish, resident superintendent; and Joe Nunn, engineer.

Quarry operations

Rock for the jetty is taken from one of the oldest and largest quarries in the west. It was first opened up in 1885 by Perry Hinkle and supplied rock for several enrockment jobs along the Columbia River. In 1901 the quarry was acquired by Hale and Kern, who later formed the Columbia Contract Co. which operated the quarry continuously from 1901 to 1917 when it was closed down until jetty reconstruction work was started in 1931. More than 12,000,000 tons of rock have been produced from this quarry.

Previous to the recent development in 1931 when a new system of tracks was installed to facilitate rail shipment instead of water, rock was handled in the quarry with large derricks and transported in balanced cable cars over tramway trestles to loading docks on the Columbia River, located a few hundred feet below. Due to more rigid specification requirements for present enrockments, the quarry waste has increased from 18 to 33%. This material is segregated for riprap and other types of work and is stockpiled on a dump.

A total of 4,500 lin. ft. of quarry face with an average height of 85 ft. has been opened up, of which 2,000 ft. is being worked at present. This face is served by a track system which connects with a scales at the west end of the quarry and the S. P. & S. main line tracks along the river. A derrick at the scale house handles rock to and from a small stock pile in making weight adjustments in loaded cars. The average carload of rock weighs 56 tons.

Six crawler-mounted steam shovels, including four 50-B, one 95-B and one 100-B Bucyrus-Erie machines and a 35-ton Brownhoist crane are used for loading jetty rock on flat cars (Fig. 7) and waste material into 30-yd. dump cars. For the larger rocks slings, fastened to the dipper teeth or around the boom back of the bucket, are used to hoist the pieces from pit to car decks.

The rock is naturally broken up in vertical and horizontal seams which makes blasting relatively simple. The relation between the size of the broken rock and height of the quarry face is ideal and the blasted material forms a nearly uniform slope from the top of the quarry to the loading track along the toe. Rarely are tracks disturbed by rocks after a blast (Fig. 6).

The length of face permits driving 2½ x 4½-ft. tunnels for blasting without interfering with the loading operations. These coyote holes are driven in from the face a distance equal to one-half the height of the quarry and cross cuts are driven from 18 to 30 ft. on each side. Pockets at the ends of the cross cut tunnels are loaded with from 6,000 to 30,000 lb. of Trojan granular powder which amounts to a consumption of from 1¼ to 2 lb. per cu. yd. of broken rock. Air is furnished by a stationery 700-cu. ft. Sullivan compressor and is piped throughout the quarry.

A crew of 240 men is employed in the quarry in three 6-hr. shifts and production averages 75 cars per day amounting to about 4,200 tons. Glenn E. Kibbe, of the contracting firm of Kern and Kibbe is manager of the quarry and R. A. Lathrop is resident superintendent with Carl Johnson as assistant. N. S. Holcomb and John Kurtz are quarry foremen.

Engineer's staff

The work is being done under the direction of Major Milo P. Fox, district engineer, and R. E. Hickson, senior engineer. Col. T. M. Robins is division engineer for the North Pacific Division. The U. S. Engineers resident staff at Fort Stevens includes: F. C. Bidwell, supervising engineer; O. J. Hawkins, assistant; and inspectors N. K. Emery, G. Moore, William Norris, Richard Lennon, G. McCrum, and Carrol Cushman.

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Because the Taylor Park storage dam in western Colorado is being constructed for about $700,000 less than the $2,000,000 granted for the project by the PWA, about $500,000 of this money has been reallocated to the Uncompahgre reclamation project, of which the dam is a part, and will be used to drain swamp and seepage areas.

Laying 100-Ton Sections A San Francisco Bay

Unusual design for underwatter pipe used on the second bay crossing of the Hetch Hetchy system — Welded steel pipe sections encased in 6 in. of concrete handled in 120 ft. lengths.

FABRICATION and handling of 120-ft. lengths of 54-in. welded steel pipe, covered with 6 inches of concrete and weighing 100 tons when ready for laying, are the notable features of construction on the two submarine lines being built by San Francisco to complete a second crossing of San Francisco Bay for the Hetch Hetchy development. This work is part of the $12,000,000 program of water works improvements being carried out by the city, under PWA financing, which was reviewed in the last issue of *Western Construction News*. With completion of the present work, the capacity of the Hetch Hetchy lines across the lower end of San Francisco Bay will permit delivery of 114 m.g.d. by gravity into Crystal Springs Reservoir.

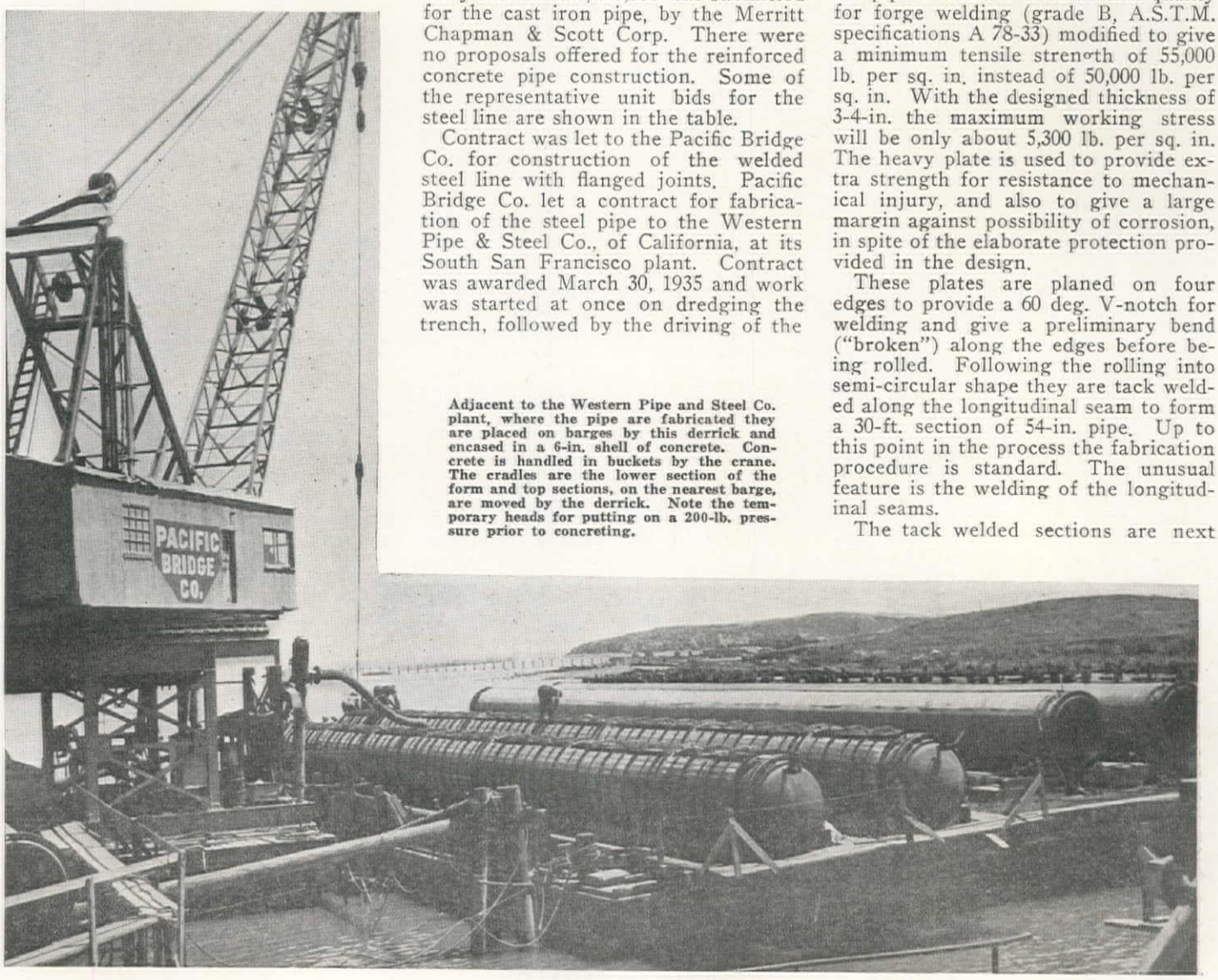
A general description of this project and the land features of this 21.25 mi. pipe line were described in the March, 1935 issue of *Western Construction News*. That article reviewed the design of the line and the type of construction employed on all except the submarine section. The present article will be confined to the fabrication and laying of this submarine pipe.

The crossing being laid under the bay consists of two lines of 54-in. steel welded pipe, about 2,800 ft. long under the navigable channel at Dumbarton Strait and a single line of similar pipe 436 ft. long across Newark Slough. These lines are being laid parallel to the existing 42-in. diameter flexible-joint cast iron pipe.

Bids for this construction were called on three different types of pipe: (1) steel welded pipe with flanged joints supported on submerged trestles; (2) cast iron pipe of flexible joint type 2 1-2 in. thick in 12-ft. lengths; and (3) steel cylinder, reinforced concrete pipe with flexible joints laid in 12-ft. lengths.

Six bids were received for the welded steel pipe (flanged and concrete jacketed) type of construction, ranging from the low figure of $698,226 by the Pacific Bridge Co. to $987,324 of the Case Construction Co., Alhambra, Calif. Only one bid of $928,535 was submitted for the cast iron pipe, by the Merritt Chapman & Scott Corp. There were no proposals offered for the reinforced concrete pipe construction. Some of the representative unit bids for the steel line are shown in the table.

Contract was let to the Pacific Bridge Co. for construction of the welded steel line with flanged joints. Pacific Bridge Co. let a contract for fabrication of the steel pipe to the Western Pipe & Steel Co., of California, at its South San Francisco plant. Contract was awarded March 30, 1935 and work was started at once on dredging the trench, followed by the driving of the pile trestle. In the meantime the pipe fabrication was started and the first section of submerged pipe was laid July 29.



Adjacent to the Western Pipe and Steel Co. plant, where the pipe are fabricated they are placed on barges by this derrick and encased in a 6-in. shell of concrete. Concrete is handled in buckets by the crane. The cradles are the lower section of the form and top sections, on the nearest barge, are moved by the derrick. Note the temporary heads for putting on a 200-lb. pressure prior to concreting.

Fabrication Procedure

Steel plates for the pipe sections are 3-4 in. thick, 30 ft. long, and wide enough to permit two pieces to form the 54-in. pipe. The plate out of which the pipe is made is of structural quality for forge welding (grade B, A.S.T.M. specifications A 78-33) modified to give a minimum tensile strength of 55,000 lb. per sq. in. instead of 50,000 lb. per sq. in. With the designed thickness of 3-4-in. the maximum working stress will be only about 5,300 lb. per sq. in. The heavy plate is used to provide extra strength for resistance to mechanical injury, and also to give a large margin against possibility of corrosion, in spite of the elaborate protection provided in the design.

These plates are planed on four edges to provide a 60 deg. V-notch for welding and give a preliminary bend ("broken") along the edges before being rolled. Following the rolling into semi-circular shape they are tack welded along the longitudinal seam to form a 30-ft. section of 54-in. pipe. Up to this point in the process the fabrication procedure is standard. The unusual feature is the welding of the longitudinal seams.

The tack welded sections are next

# of Pipe for Crossing

placed under the automatic welding machines which travel the length of the seam as the pipe is held stationary. As a result of about five years of intensive research work the Western Pipe & Steel Co. is using its own improved method of automatic electric welding on these pipe sections. The method has been used by this company on lighter pipe previously, but this is the first time it has been use on ¾ in. steel plate for a large order.

The particular feature of the method consists of using a special flux combined with a bare welding wire and a procedure which fills the notch with one pass of the welding machine.

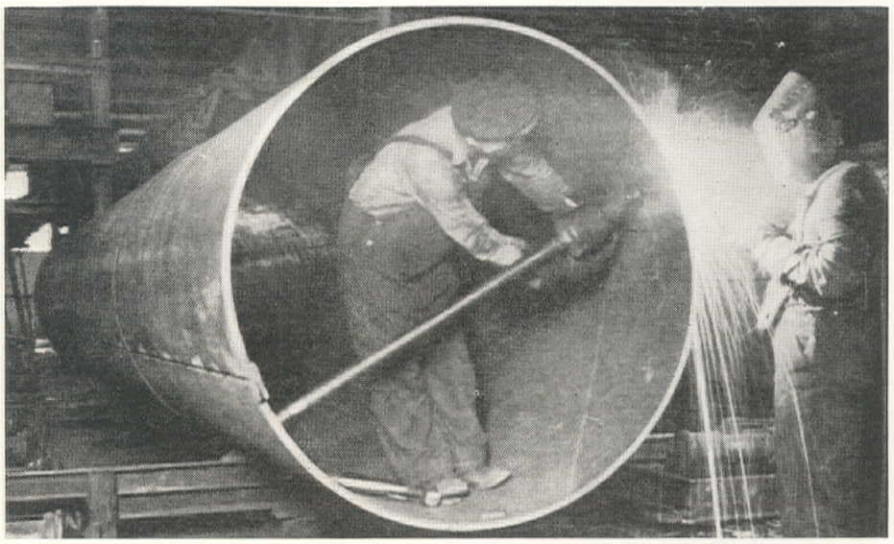
Before the welding machine is started, the V-notch is completely filled with the powdered flux, and a surplus ridge added along the line of the joint. The welding machine is then started and operates at an extremely high amperage, moving at the rate of about 9 in. per min. At this rate the welding metal is deposited to completely penetrate the notch and provide the customary bead on the inside and outside. The flux material completely quenches any flame or sparks and the only evidence of welding is a slight smoke and glow as the rod passes along through the powdered flux material.

The flux which remains on the top of the weld is completely fused and acts as an annealing poultice. It is not lifted off until sometime after the passing of the welding machine. Also, the unfused flux, still in the powdered form, is removed by vacuum to be used over again.

Metallurgical tests indicate a high grade type of weld with complete penetration and relatively low stresses set up in the adjacent metal. The pipes are not stress relieved and the regular tests of the weld and the hydrostatic tests on the pipe sections have indicated satisfactory strength.

After the two longitudinal seams have been machine welded from the outside, the inside of the notch is chipped out and a hand bead is applied with one pass. The pipe sections are then moved to the testing machine where a 500-lb. per sq. in. hydrostatic test is applied. The pipe is hammered at 1-ft. intervals just above and below the joints while under test, in accordance with definite requirements in the specifications.

Sand blasting, both inside and out, follows the shop testing and the pipes are then ready for coating. On the inside a 3-32-in. layer of coal tar enamel is applied centrifugally and on the outside a similar coat of enamel is applied as the pipe is slowly revolved. These individual 30-ft. sections are then ready for combining into a 120-ft. length which is the laying unit.



Tack welding the 30-ft. lengths of 54-in. diameter pipe prior to placing them in the machines for automatic welding. Note the thickness of the steel which is ¾ in.

Four of the 30-ft. sections are placed together on a rigidly supported frame so that the alignment is perfect and no variation is apparent at the circumferential joints. These three joints are then tack welded and heavy flanges, at both ends of the 120-ft. section, are also welded into position.

This 120-ft. length of pipe, weighing about 26 tons, is then placed on rollers and revolved slowly while the round seams are hand welded. This operation requires about 7 passes before the seams are completed. At the same time the flanges are permanently fastened with two fillet welds.

These pipe sections are then ready for encasing in concrete and are turned over at this stage by the Western Pipe & Steel Co. to the Pacific Bridge Co. for further handling.

Concrete Encasement

The pipes are moved by flat car to the adjacent dock where they are lifted and placed on barges. The barge fleet consists of four units and each of these holds two of the 120-ft. sections. On each barge have been constructed permanent timber cradles which act as the lower form for the concrete covering.

The pipes are placed in these cradles with cast iron spacers to provide the 6-in. thickness of concrete and then the remaining forms are placed in 12-ft. sections. After the forms are in place the two sections of pipe on the barge are ready to be concreted.

Concrete in which the pipes are encased has a 1:2:4 mix with eight sacks of cement to the cubic yard. The aggregate has a 1-¼-in. maximum size and the slump is about 5-½-in. Specifications require strength of 4,000 lb. at 28 days and the cement being used is the high silica product of the Santa Cruz Cement Co.

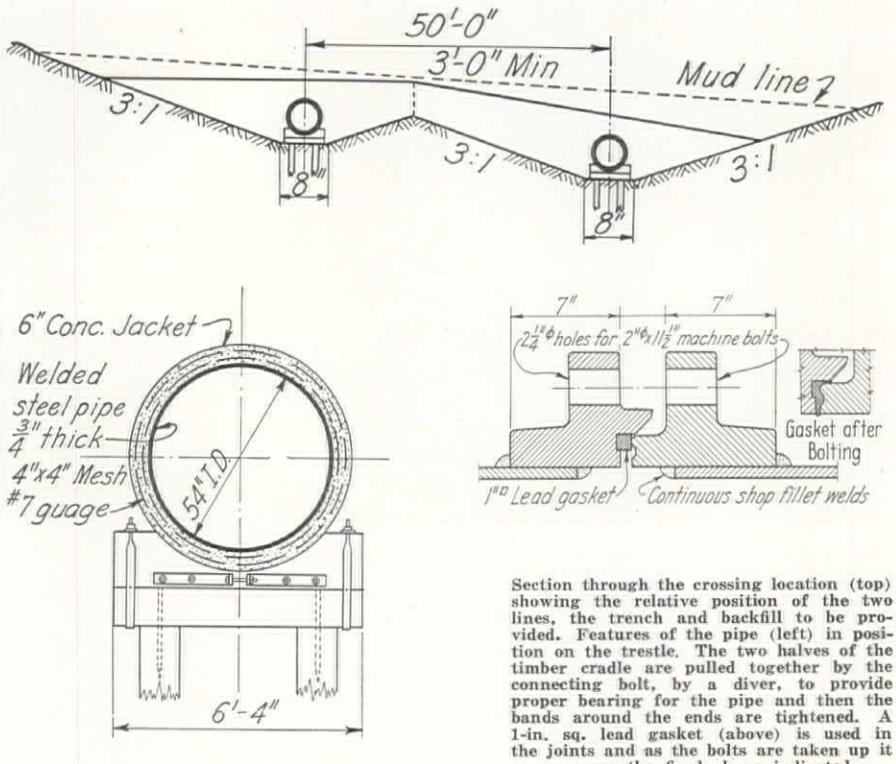
This concrete is delivered in mixer trucks to barge side and buckets, handled by the crane, deposit the concrete into the forms through a slot left along the top. The concrete is vibrated into position as it is placed.

Wire mesh reinforcement (No. 0 gage .3065-in. dia. on 6-in. centers both ways), is used in the concrete, intended primarily to reinforce against secondary stresses and not designed to assist the steel pipe in overcoming the internal pressure.

Prior to placing concrete, test heads are placed on both ends of the pipe and a 200-lb. pressure applied. The purpose of this pressure during concreting is to insure a circular section

Some of the Principal Items in the Bids

	Pacific Bridge Co.	Merritt Chapman & Scott	Healy, Tibbetts Const. Co.
100,000 cu. yd. exc. at Dumbarton Strait....	$ 1.00	$ .33	$ .50
800 lin. ft. furn. untr. piles.....	.30	.50	.25
52,800 lin. ft. furn. treated piles.....	.60	.60	.48
880 ea. driving piles.....	20.00	45.00	50.00
10 M. ft. BM furn & inst. untr. timber.	60.00	250.00	65.00
70 M. ft. BM furn & inst. tr. timber..	110.00	550.00	200.00
1,425 cu. yd. A tremie concrete.....	40.00	40.00	20.00
5,600 lin. ft. furn & lay 54-in. steel pipe, concrete jacketed	65.00	73.00	91.50



Section through the crossing location (top) showing the relative position of the two lines, the trench and backfill to be provided. Features of the pipe (left) in position on the trestle. The two halves of the timber cradle are pulled together by the connecting bolt, by a diver, to provide proper bearing for the pipe and then the bands around the ends are tightened. A 1-in. sq. lead gasket (above) is used in the joints and as the bolts are taken up it assumes the final shape indicated.

of the pipe and stress it sufficiently to insure against internal pressure on the concrete coat during working stress.

The concreting of the two sections forming one barge load occupies about 5 hr. and requires 70 cu. yd. of concrete. The concrete is then cured for 7 days with water under a burlap covering and the 200 lb. pressure is maintained for the first 72 hr. of this period.

Following curing a further test is made on the one out of every 10 pipe sections with a pressure of 265 lb. applied for 10 min., dropped to zero, raised to 265 lb. again, and again dropped to zero with a final raising to 265 lb. and the concrete inspected for cracks. To date no difficulty has been found in the concrete after this rigorous test.

Ready to be towed to the site, these pipes weigh slightly over 100 tons each or a load of 200 tons on each barge. The concrete around each pipe weighs 71 tons and the remainder, or 29 tons, is the weight of the steel pipe and the two flanges, with the enamel coating. The present program calls for completion of four pipes per week on a 5-day basis.

The barges are towed to the site by tug, the 25 mi. trip requiring about 3 hr.

Preparations at the site

The first operations along the line of the new pipe consists of dredging, with floating equipment, trenches to provide a minimum of 3 ft. of back cover over the two lines which are 50 ft. apart. These trenches are being excavated with two floating clamshell units and the work involves more than 100,000 cu. yd. of dredging.

In this double trench, two-pile bents are driven at 20-ft. intervals to support the pipe. These bents are capped with timber sills and blocks curved to fit the pipe. Provision is made for these blocks to be drawn together with bolts, by diver, when the pipe is laid, to insure a proper bearing.

All timber used in this sub-structure work is dense select structural Douglas fir (16-lb. full cell creosote treatment) and all the hardware is galvanized. Piles are driven from floating equipment and are required to be driven to a minimum bearing of 35,000 lb. Immediately after the cutoff the heads of the piles are covered with a piece of creosote saturated felt, tacked onto the pile.

Cutoff elevations are established by an interesting procedure. The level of the survey party is set up on the nearby railroad bridge of the Southern Pacific Co., and the target is operated by a man suspended in a platform (see illustration) over the barge from which the divers are working. Vertical measurements from this target to the pile heads give the elevation of cut off.

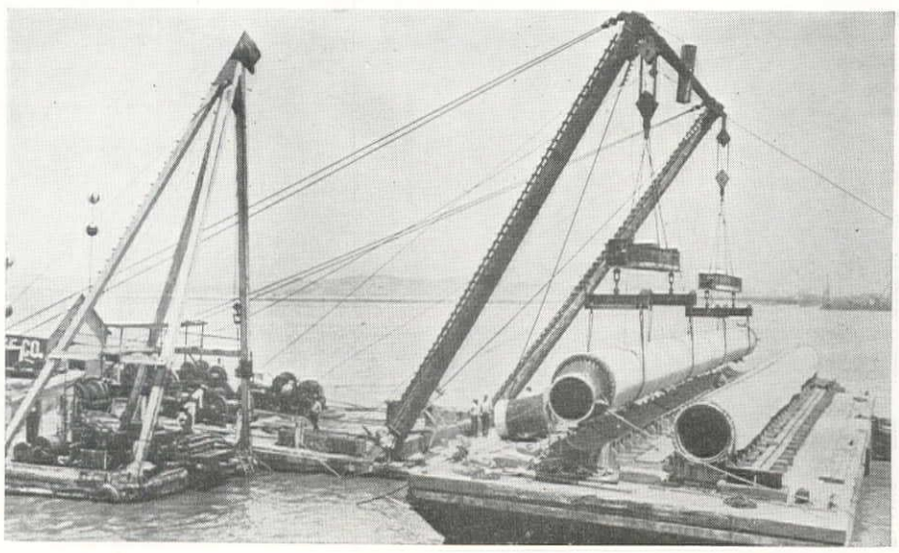
Every 120-ft. a 4-pile bent is provided to support the tremie block of concrete which is subsequently poured around the pipe joints. With these preparations complete the procedure is ready for the placing of the pipe sections.

The pipes are picked up by a floating derrick barge (see illustration) using four slings around each section and lowered onto the cradles and moved into final position under direction of divers.

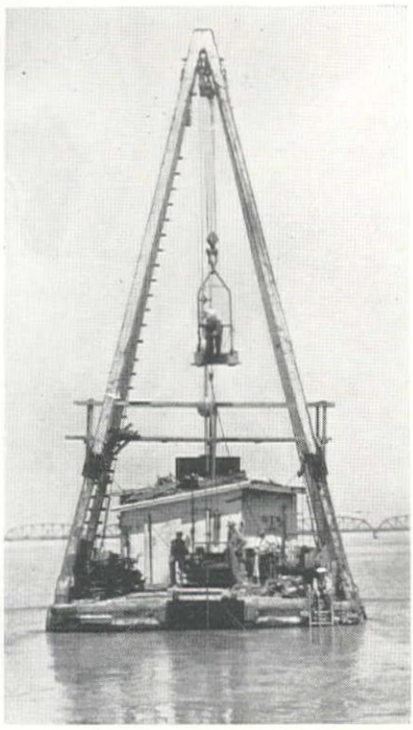
After placing, the divers place the forty 2-in. diameter bolts through the flanges. These bolts are of special alloy steel and test specimens showing a strength of 100,000 lb. per sq. in. to the elastic limit and 125,000 lb. per sq. in. for ultimate tensile strength. Special steel is used for these bolts because the conditions under which they are tightened does not permit a careful adjustment of stress on different bolts. The bolts are tightened with ratchet wrenches which are pulled by a line to the derrick barge, with the diver only required to return the handle to position and move the ratchet to the next nut.

Prior to placing the sections together, a 1-in. sq. lead gasket is inserted in a groove cut in the flanges. As the bolts are tightened up this gasket changes shape from a square form to that shown in the accompanying illustration.

The completion of the pipe line construction involves the placing of tremie concrete in the form of a 6.5 x 10-ft. block to encase these pipe joints. The final operation consists of dredging



A derrick barge with double boom is used to handle the 100-ton pipe sections. The barge with the pipe is placed in position, the four slings are placed and the section raised. Then the barge is removed and the pipe is lowered onto the cradles. Note the list of both pieces of floating equipment.



From target held by the man on the suspended platform, set by level on the nearby railroad bridge, measurements are made down to diver at the pile heads to establish elevation of cut-off.

back fill to cover the pipes with a minimum thickness of 3-ft. There are angles in the pipe line which require certain special sections of the pipe, but the general procedure, except for fabrication, is the same as described.

Organization

The general improvement program of the San Francisco Water Department is being carried out under the direction of N. A. Eckart, general manager and chief engineer; T. W. Espy, engineer of water production; and I. E. Flaa, hydraulic engineer. The design of the pipe line was carried out by this organization. Construction of this work is being supervised by the Hetch Hetchy department of the city, L. T. McAfee, utilities engineer; L. W. Stocker, chief civil engineer; L. A. McAtee, construction engineer.

The Western Pipe & Steel Co. is fabricating the steel pipe sections at the South San Francisco shops under the direction of T. R. Rooney, shop superintendent.

Pacific Bridge Co. operations are under the general direction of Phil Hart, vice-president, with Jack Graham, superintendent.

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A fund of $250,000 has been allotted by the federal government to carry on a study of possible irrigation and power projects on the Colorado River system in the Upper Basin states. Surveys thus far have been confined to Arizona, Nevada and New Mexico under a separate $215,000 grant from the PWA, but this new allocation will be for a study to be concentrated principally in Colorado, Utah and Wyoming.

Grand Coulee Excavating Program Modified to Meet Changed Design

THE RECENT change made in the design of the Grand Coulee dam, the common excavation for the foundations will be increased by about 2,000,000 cu. yd., of which a considerable portion and a large volume of this additional yardage is on the east side abutment. The new design provides, instead of a complete dam about 300 ft. high, for the base of the ultimate 540-ft. high dam to El. 990. Construction operations will be little effected by the change and the foundation and added tailrace excavation fits into the contractor's program of operation. However, the added yardage of excavation on the east side has been met by a revision in the conveyor system.

After completing the west side conveyor system late last fall (*Western Construction News*, March and June, 1934) a 48-in. conveyor system was partially installed on the east bank, but abandoned soon after and subsequently salvaged. During the winter, and until flood waters filled the east pit behind the earth cofferdam, excavation was carried forward on a small scale by trucks. With the exception of material included in the east side tailrace, provided for in the government change order in design, excavation by trucks is no longer feasible on the east side. Soon after high water began to subside in late June, a dike was built between the river and the east pit and pumps were installed for unwatering in preparation for construction of the conveyor system.

With the west side excavation nearing completion, the main line of the west side conveyor system will be used to dispose of the remaining east side material. To connect the east side conveyors with the west side, a timber trestle with 12 x 16-in. caps and 10 x 20-in. stringers was built across the river. The driving of this trestle, begun in mid-July when the river was still near flood stage, was one of the most difficult assignments the contractor has had to contend with on this project. Near the shore, regular five-pile, 18-ft. bents spaced at 38 ft. were driven. Near mid-stream, where deeper and swifter water was reached, it became necessary to drive pile clusters. Due to the extremely swift current, many of the piles for these clusters were broken and had to be redriven. These clusters were spaced at 80 ft., capped with double 10 x 20-in. timbers, and spanned with two 21-in. I-beams.

On this trestle has been erected a regular 60-in. conveyor, identical with those on the west side, except for its length of 615 ft. which is the longest conveyor yet built by MWAK Co. A terminal or transfer point in mid-river is a feature of this crossing. The conveyor. At present, two feeder units and three feeder conveyors are being used in the east pit and as the excavation level is lowered, new feeders will veyor crossing the river ties in with a terminal located on top of the west side cofferdam and from there the conveyor extends westerly 400 ft. where it joins the west side main line conbe installed.

Present plans do not provide for a sheet steel pile cofferdam on the east side, and undoubtedly excavation will be much wetter than it has been on the west side. Already considerable water is leaking through the natural dike that separates the river from the east pit. It is anticipated that the east side excavation will be completed late this fall.

During the summer considerable difficulty has been experienced with the disposal dump in Rattlesnake canyon, located 500 ft. above and a mile east of the west side excavation. Due to the depth of the fill of 250 ft. and the wet condition of the material being dumped, the huge fill has a tendency to shift and mushroom. After dumping nearly 9,000,000 cu. yd. of material the original dump was abandoned late in July because it no longer was considered safe. At that time, the irregular face of the fill had an average slope of 5:1. When the fill was first started, the material stood on a 1½:1 slope.

In abandoning the old fill, the stacker was moved back 1300 ft. and a new fill started between the far edge of the old fill and the river. Material in the second fill acted exactly as the first dump and after dumping for three weeks, the toe of the new fill reached the river. Due to War Department regulations, dumping of dirt in the river is prohibited. In the meantime, considerable material has been disposed of by plowing it off the belt into a big hollow near the upper end of the main line belt. The MWAK Co. will probably have to find another dumping ground for the conveyor system before the excavation work has been completed.

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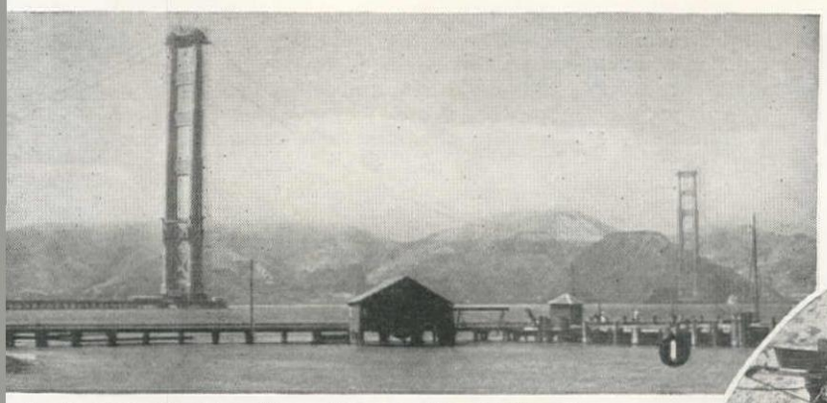
Water Required for Tunnel Work

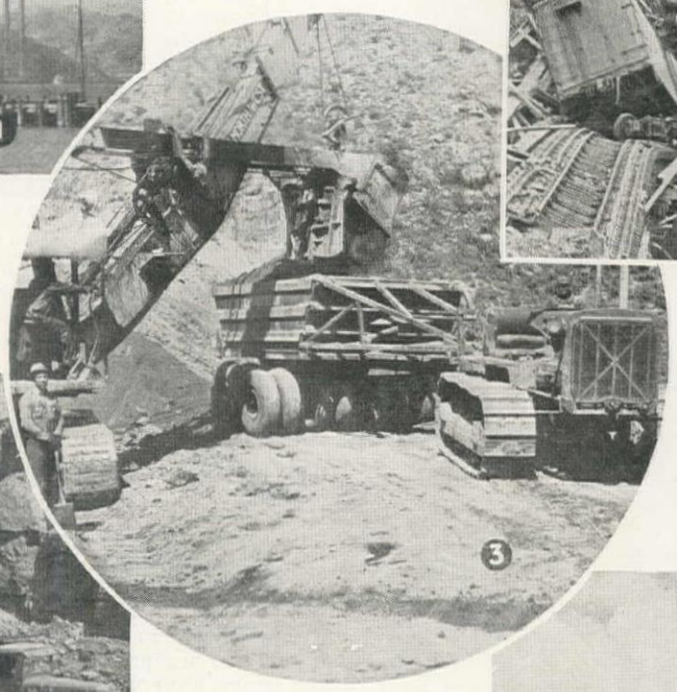
It requires 849 gallons of water to drive every foot of aqueduct tunnel on the Colorado River Aqueduct, according to a report released from the office of F. E. Weymouth, general manager of the Metropolitan Water District. This water includes the requirements for camp purposes (cooking and sanitation), cooling systems and mixing and carrying concrete, in addition to miscellaneous uses. The amount of water used for camp and construction purposes was 140 gal. per man per day.

On the Western Construction Front



1—Lost in the fog, the cables to support the catwalks now span the 4,200-ft. distance between the towers of the Golden Gate Bridge.

2—This 110-ft. high trestle on a branch of the Southern Pacific, near Cockran, Ore., collapsed Aug. 6 under the weight of a freight train, while undergoing repair. It was rebuilt in 10 days.



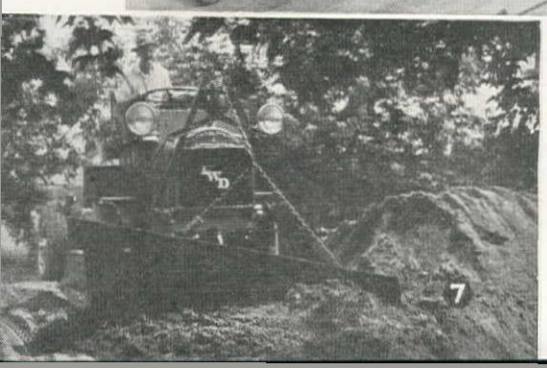
3—At Grand Coulee Dam this Northwest shovel is putting big bites of overburden into the LeTourneau buggy.

4—In a 370-000-yd. cut on the Bonneville Dam project, these two Lima shovels are at work on the contract of Orino, Birkemier & Saramel Co. Sam Orino is standing behind the first shovel.

5—On the California coast highway this Caterpillar patrol is at work on maintenance operations.

6—Placing sections of a dredge line for hydraulic fill operations on the Fort Peck Dam project.

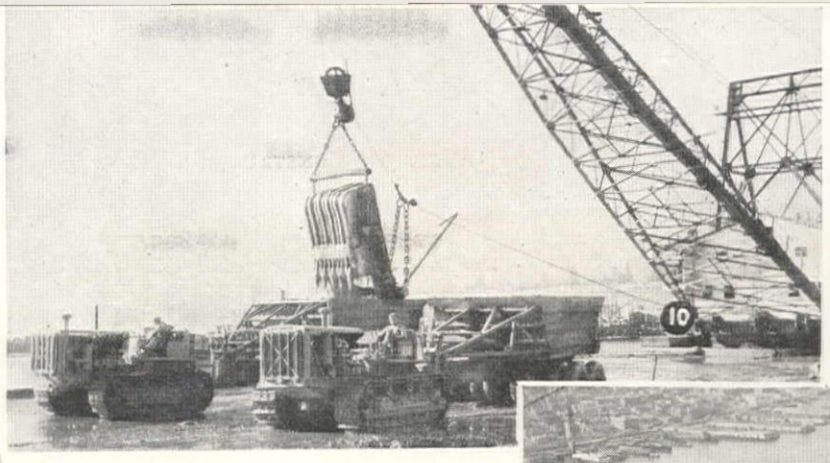
8—The Idaho Bureau of Roads recently started this Lorain 30 shovel on borrow pit work and, according to report, it was moving 600 yds. in an 8-hr. day.



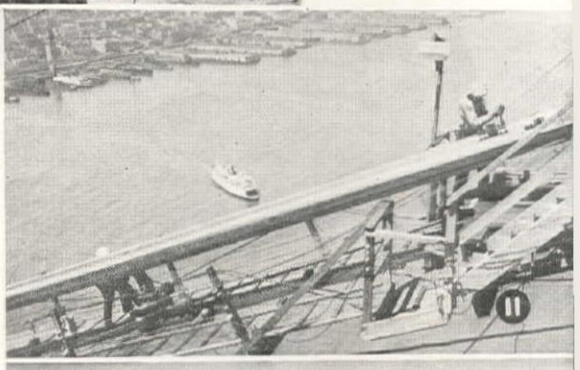
7—Equipped with a snow-plow blade, this Model B, FWD truck is being used to back fill a water main trench, taking 6-ft. cuts.

9—On the storm-swept trestle which has to be built as the first part of the Columbia River South Jetty reconstruction work. (See Page 246.)

10—Wet conditions do not stop excavation work on the Bonneville project.

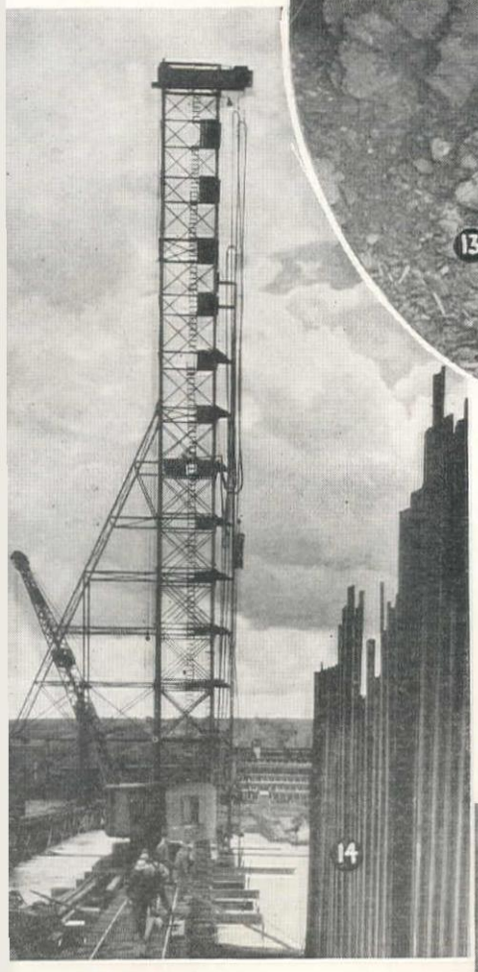


11—Adjusting wires for strand No. 7 on the suspension span of the San Francisco-Oakland Bay Bridge.



12—Advancing over the East Channel crossing the east arm of the 1,400-ft. cantilever is shown built out several panels from the tower at the edge of Yerba Buena Island.

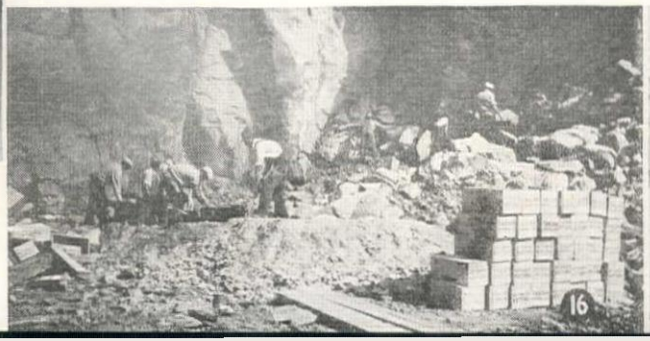
13—Excavation starts at the portal of the tunnel which will carry traffic on the San Francisco-Oakland bridge through Yerba Buena Island. Note the concrete lining has been placed in advance of excavation.



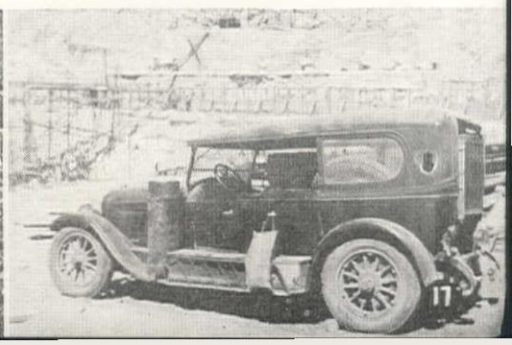
14—Reaching up into the sky this steel tower is used in driving the steel sheet piling to form the cutoff for the Fort Peck Dam.

15—On a subcontract where L. C. Karstedt was moving dirt for a California highway job near San Juan Bautista.

16—Loading Trojan granular powder into coyote holes at the quarry which is producing rock for the south jetty work at the mouth of the Columbia River.



17—On the Pine View Dam project near Ogden, Utah, the Utah-Morrison & Knudsen Co. have rebuilt a passenger car to carry a complete engine driven arc welding outfit, to be moved rapidly around the job.



Drags Lay Sheet Asphalt On Utah State Highway

Innovation in surfacing procedure results from experience gained in spreading rock asphalt—Method first used on multi-lane boulevard in Salt Lake City—Outfit and operations described.

By LEVI MUIR
Materials Engineer
Utah State Road Commission

DRAGS ARE being used with marked success to lay sheet asphalt street surfacing on arterial boulevard projects in Salt Lake City, under the supervision of the Utah State Road Commission. By this method, the hot bituminous mixture is dumped from trucks ahead of the drags and these drags perform the dual operation of spreading and leveling, ahead of rolling. The procedure is simple, capable of handling large plant capacity, can be easily adapted to multiple-lane paving and has resulted in smoothness equaling other methods of laying this material. This development of the Utah Road Commission is a direct outgrowth of several years of study and experiment in the handling and laying of natural rock asphalt.

The first use of drags in laying sheet asphalt was on a 72,000-sq. yd. section of 60-ft. surfacing on 2nd West Street on the highway leading out of Salt Lake City toward Ogden. As a result of the success of this initial project and its rather bold departure from standard practice in laying sheet asphalt, the commission is now allowing another contractor to use the same general method in a second resurfacing job involving about 87,000 sq. yd. of 56½-ft. sheet asphalt on North Washington Ave. in Ogden. On both of these jobs the drags have eliminated hand raking operations and the use of surfacing machines.

Complete equipment used to spread sheet asphalt on recent Utah highway work, consisting of only a truck-drawn, timber drag, followed by rolling. Note the width of street being resurfaced.

Historic Background

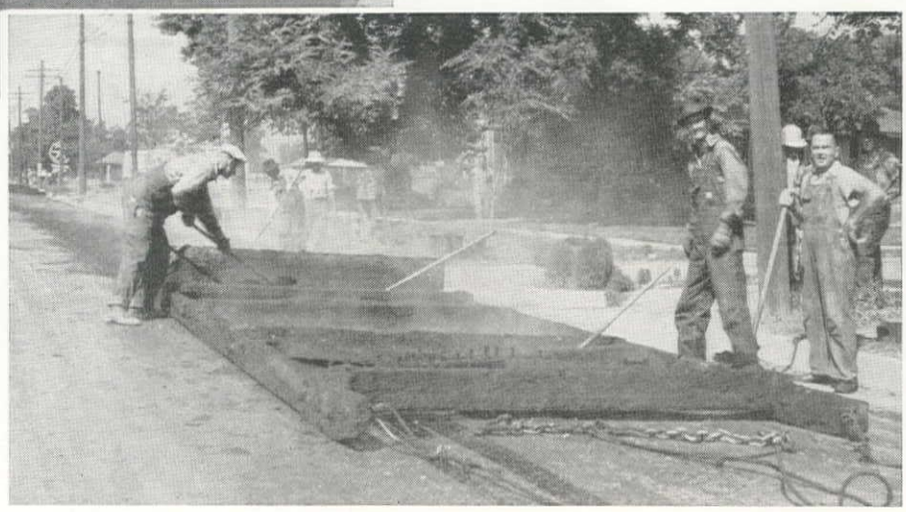
For many years, beginning with initial applications before 1890, the extensive, natural rock asphalt deposits of Utah have been used for road surfacing in the state. The native qualities of this material were early appreciated, both as to its resistance to wear and its ability to remain smooth and not corrugate. However, for many years there was no technical study made of the subject to parallel the practical development of this material and it was laid without particular attempt to adapt it to requirements for highway work.

Recently, the highway commission has studied the material with more care and particular advances have been made in the matter of maintaining uniformity of quality and in methods of laying. The recent large scale use of rock asphalt on highway surfacing in the Uintah Basin provided the subject of an article which appeared in *Western Construction News*, July, 1935. This article described the procedure used in securing proper control of the material.

The experimental work in connection with improved methods of laying rock asphalt resulted, initially, from the need for employing a high percentage of labor on local highway work. In 1934 some work was done by use of timber drag to spread rock asphalt behind trucks, both for the purpose of using a greater number of unemployed men on this particular project, and attempting to secure a smoother surfacing. From this beginning, the experiments with various types of drags has been continued until the results obtained by this method of laying rock asphalt have been demonstrated to complete satisfaction.

Type of Drag

Thus far there has been no standardized design of drag used in this type of work and each project has resulted in a modified design based on the drag used on the last job, changed to include improvements suggested by the difficulties encountered. The more recent types of drags consist of timber frames about 10 ft. wide and 22 ft. long. These timber frames of 3 x 10-in. members are mounted on timber shoes along the side pieces, designed to raise the strike-off pieces to the required height above the base course. The strike-off members, four in number, are set at right angles to the highway and it is the usual practice to



Details of the drag: 10 ft. wide by 22 ft. long, of 3x10-in. timbers with teeth on the front strike-off. Cables are used to attach the drag to the truck during unloading and spreading.

Surfacing Projects

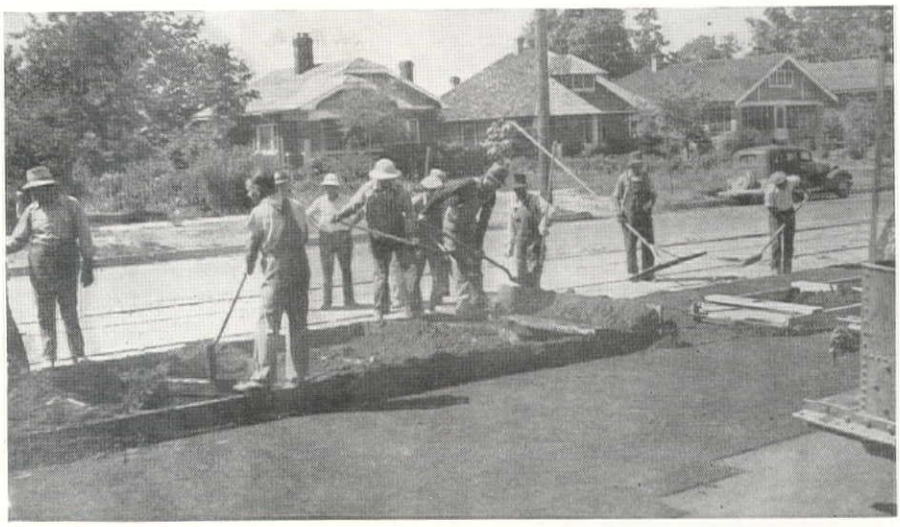
have the front timber equipped with teeth to help distribute and break up the material. The other strike-off timbers are equipped with steel faces to insure an even surface to the finished material.

In placing rock asphalt these drags are usually pulled by a separate tractor using long cables to eliminate interference with the operations of the trucks dumping material ahead of the drags. However, the practice recently developed on the sheet asphalt work, and for binder courses, has been to have the truck itself pull the drag. This plan requires the use of a large truck having sufficient power to pull the drag which must be moved forward at a slow, uniform rate of speed. The question of traction for the truck pulling the drag is a special problem if the surface has been treated with a tack coat.

Description of operation

The truck loaded with the sheet asphalt mix is backed up to the drag and the cable hooked to the back of the truck. The end gate is then partly opened and the body hoisted into dumping position. The mixture is dumped on the subgrade and the drag is pulled through this loose pile as the truck moves ahead. The cable attachment has a length of about 20 ft. to insure against any tendency of raising the front of the drag.

At least four men with shovels ride the drag. This weight keeps the sliding shoes of the drag in contact with the subgrade at all times to insure uniformity of thickness and surface smoothness. The men move the material to keep it evenly distributed across the strike-off members.



A crew of four men rides the drag for weight and to shovel the material evenly across the strike-off members.

On the recent Ogden work three drags were used and three trucks could be unloaded at the same time. Some difficulty was first encountered in securing a smooth line of contact between the different spreads. However, this was overcome by the use of a second drag 4 ft. wide and 16 ft. long, somewhat lighter than the others, which is dragged over the surface of the spread material and covers the area on both sides of the line between the 10-ft. spreads. The use of this auxiliary drag to smooth over the longitudinal joints has proved very satisfactory.

As a result of this newest addition to the system the method is being expanded to consist of a tandem set of drags completely covering the width of highway, with a second set of lighter drags lapping over the joints formed by the regular spreading drags. This improved system is being worked out and is expected to soon be in actual operation.

Texture and smoothness of surface have proved most satisfactory.

Behind the main spreading drag a light auxiliary drag is pulled on an offset hitch to cover the longitudinal joint and smooth up this line ahead of the rolling.

In the use of this method for the rock asphalt surfacing, a finishing drag is usually used. This is somewhat lighter than the spreading drags and has at least three diagonal strike-off members arranged to provide a planing action to the finished surface. These diagonal members cause the excess material to be moved back and forth across the 10-ft. section and to fill in the irregularities in the surfacing, with the smaller sizes of material, to produce a smooth and even surface.

This finishing drag, for the rock asphalt surfacing, usually requires several repetitions and each is followed by rolling. When properly carried to completion this process is continued until no material is moved by the drag.

The mixtures used for the sheet asphalt surfacing, laid by these drags, as already described, carries high percentages of fines produced by grinding rock for inclusion in the mixture. The asphalt content ranges between 9¼ and 10%. The stability of the material (Hubbard & Fields) averages about 3,800 lb.

Organization

The work of the Utah State Road Commission is under the general supervision of K. C. Wright, chief engineer. The author has been in direct charge of investigating the properties and uses of natural rock asphalt for the past several years which work has resulted in the recent innovation for sheet asphalt spreading by drags.

The contractors on the two sheet asphalt projects were Gibbons & Reed on the second West job in Salt Lake City and the Wheelwright Construction Co. for the North Washington Avenue work in Ogden.

Slides in West Abutment Area Are Problem at Grand Coulee Dam

CONTROL of sliding overburden in and near the west side excavation area is one of the major problems in connection with construction of the $63,000,000 Grand Coulee dam across the Columbia River in central Washington. The problem has been met temporarily several times already, but still continues.

The first slide of importance occurred during the original contract of David H. Ryan, when the spoil bank of overburden from the preliminary excavation began to slip on January 28, 1934. This dump is located about 1,500 ft. above the axis of the dam on the west side of the river. Huge cracks appeared in the dump and the natural ground. In the river, east of the dump, an island was formed by the river bottom being pushed up by the weight of the spoil bank. Investigations revealed that the slide moved on smooth, greasy seams in the clay underlying the area.

The movement of this slide was gradual and did not involve any additional excavation. It did, however, have considerable bearing on other phases of the construction program, including a suspension highway bridge which had been contemplated, but was abandoned. Movement of the dump also influenced the location of the main line of the conveyor system of Mason-Walsh-Atkinson-Kier Co., general contractors. Since the initial movement of this slide, it has continued to slip gradually.

On March 27, 1934, a slide involving about 1,500,000 cu. yd. of material occurred northwest of the west abutment. Cracks and a gradual settlement around the area had been noticed during the preceding 10 days. Excavation to the original slopes was continued, which tended to remove the normal toe of the slide. With the removal of the supporting element the slide broke loose; the entire mass moved about 125 ft. in a few minutes. Five shovels, working on two levels at the toe when the slide occurred, were moved back in time to escape being buried and one shovel was raised 20 ft. on a pinnacle of earth.

Due to the slide, it was necessary to revise the location of the highway and railroad into the damsite. This involved sloping the material above the slide, and cutting further into a rock ledge just above the abutment of the dam. The changed alignment made necessary some exceptionally sharp curves in the railroad. Soon after completion of this work, a re-occurrence of the original slide made it necessary to again change the highway and railroad alignment, and to reslope the slide material. Following the second slide consideration was given the possibility of putting a bridge across the slide area to carry the railroad and highway, but this was abandoned for a plan to control the slide by draining the subsoil.

Drill samples and other studies indicated that the material moved on a well lubricated plane. It was thought that by proper drainage the water forming the lubricant on the slide planes in the clay would be removed, thus preventing further movement of the overburden. A series of drainage wells were drilled through the slide and into the bedrock. These wells were connected by a system of tunnels, driven through the bedrock. During construction of the drainage system, minor slides continued to occur. A small amount of water was collected by the drainage system and no further movement of the slide occurred, but whether the drainage was entirely responsible has not been definitely determined.

On Jan. 28, 1935, a slide of about 500,000 cu. yd., with the same characteristics as the others, occurred in the forebay area. Movement was very sudden and, as before, was caused by water lubricated seams of clay close to bedrock. It necessitated changing excavation plans in the forebay area and involved considerable re-sloping. From time to time, continued movement of this slide occurred, making necessary further minor slope changes. No attempt was made to drain this slide.

About July 1, 1935, cracks were observed through a large area, immediately above the middle of the west tailrace slope. A slight settlement was indicate by two large upheavals in the newly oiled road leading into the damsite. Although no estimates could be made as to the quantity of material involved, it probably amounts to several million cubic yards. Measurements show that the slide has moved about 6 in. horizontally and the same

Looking across the west abutment slide area which has a height of 600 ft. above the toe of excavation and a face width of 600 ft. The upper face is being sloped at 1½:1. There have been several smaller slides since this picture was taken, necessitating changes in the road alignment.

distance vertically. As a means of preventing further movement, a large sump was dug on the tailrace slope, to bedrock. This sump has been relatively productive of water, and since its completion, very little movement of the slide has been observed. No particular damage has been done by this slide but its potential possibilities are of consequence. The first movement came about the time the last of the excavation at the toe of the tailrace slope was being completed. It is thought that removal of the natural resistance of the toe, combined with the water-soaked seams, of clay on bedrock, caused the movement.

Present indications are that slides may also present problems in the excavation on the east side of the river. About Aug. 1, 1935, a slide of several thousand yards, occurred on a newly finished slope, just north of the east abutment. This movement has been followed by several smaller slides on its edges. Considerable resloping has been necessary.

Resume Work On San Gabriel Dam

AS a result of favorable court decision, approving the existing contract for the construction of San Gabriel Dam No. 1 legal under the revised design, construction operations on this record breaking structure will be resumed, immediately. The dam is being built by the Los Angeles County Flood Control District and the contract is held by the West Slope Construction Co.

For several months the construction operations have been shut down while the design of the structure has been studied and revised, following a change in the engineering administration of the district. During this time, the district engineers, consultants, and the state department responsible for the design and construction of dams have been at work on the problem. Particular features of the problem were: (1) Proven inability to secure material to build a strictly rock fill dam from quarries mentioned in the specifications, (2) an existing contract which the district desired to maintain for obvious business reasons and (3) a limited fund of money available to keep a flood control structure at this site.

Under the direction of C. H. Howell, chief engineer of the district, the revised plans have been completed and have been approved by the state. In general, the modified plans provide for a dam with 3:1 slide slopes constructed of a fill composed of several zones including an impervious section of clayey-sand rolled fill which is supported both up and down stream by zones of coarser rock material. The details of the new design and the plans for the construction program will be published in a subsequent issue.

Standard Oil Company of Calif. Photograph.

Catwalk Cables Now Span the Golden Gate

During August the 25 cables to support the catwalks for the Golden Gate bridge cable-spinning operations were strung between the towers on this 4,200-ft. span. These cables were towed across the Gate, one at a time, and then hoisted to the tops of the 746-ft. towers, and they are now ready for the beginning of building the actual footbridges which will serve as working space for the spinning of the 36-in. main cables. The picture shows the top of one of the towers as one of the 1½-in. catwalk cables has been raised and is being anchored to a temporary girder.

New System for Highway Permits

CONTRACTORS requiring emergency permits to move overweight power shovels, equipment and trucks along California state highways will no longer be required to apply to Sacramento headquarters. C. H. Purcell, state highway engineer, issued an order July 24 which gives district engineers the authority to issue all single-transportation permits within their district. In turn, they are permitted to delegate this authority to maintenance superintendents, when advisable. This new rule eliminates the delay and inconvenience which has existed in the past from the requirement that these special permits had to be obtained directly from headquarters in Sacramento.

The statement made by Mr. Purcell to the district engineers in setting forth this new order follows:

"It must be borne in mind . . . that the 1933 Vehicle Act authorizes permits to operate otherwise illegal vehicles and/or loads in emergencies, and was not intended to provide a means for evading the law by indiscriminate issuance of permits. A growing tendency by manufacturers and others to assemble vehicles with illegal features should be discouraged wherever the occasion arises, and contract carriers must not obtain the impression that general hauling of overloads will be tolerated under permit when other means of transportation are available. District engineers will be held strictly accountable for the proper administration of this authority, and employees designated to handle this work should be impressed with their limitations and responsibilities in order that a uniform policy is maintained."

Loadings for Timber Beams . . . Solved by Chart

A quick solution or check for determining safe concentrated loads for unfinshed or dressed timbers used as beams.

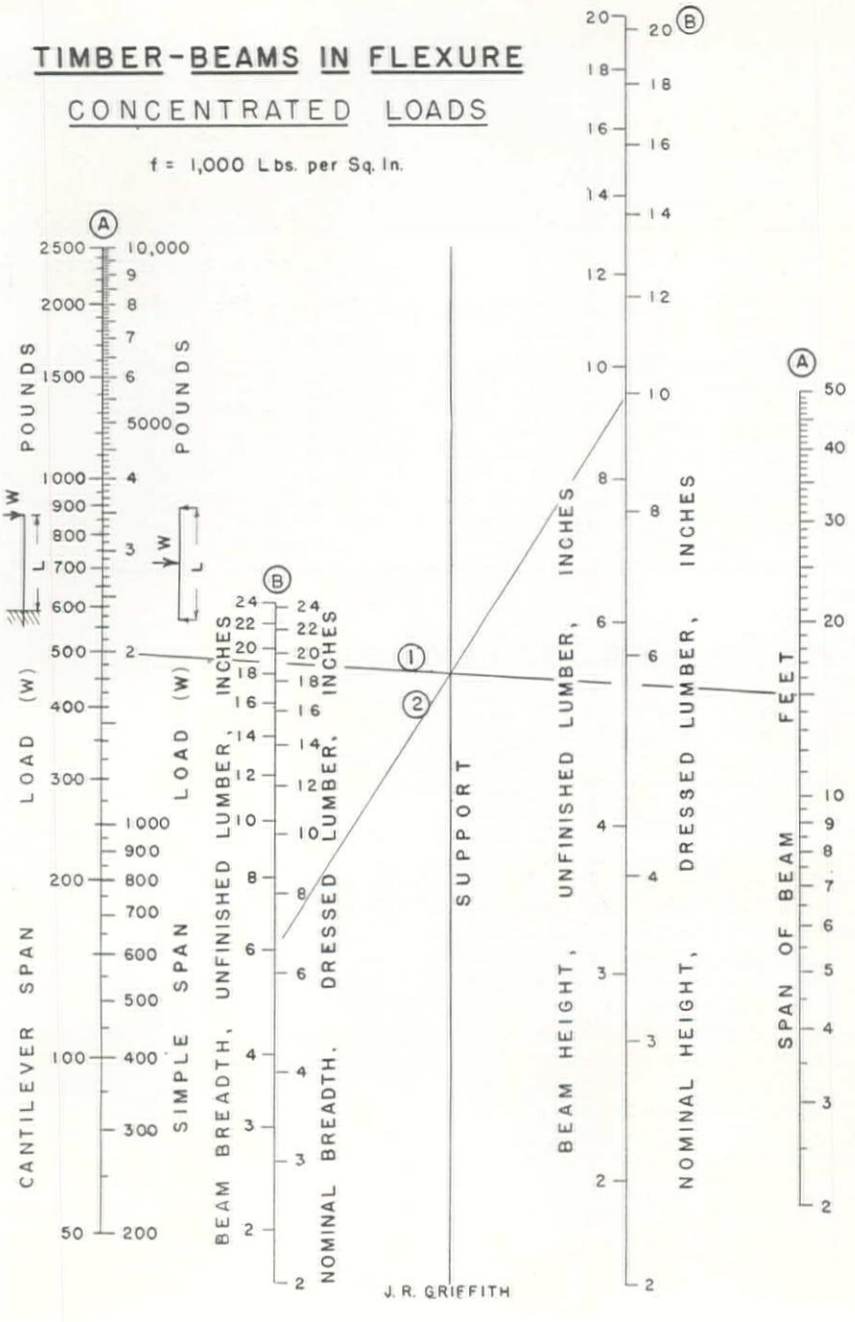
By JAMES R. GRIFFITH

Professor of Structural Engineering
Oregon State College

TIMBER BEAMS are constantly being used on construction projects to temporarily support concentrated loads. The accompanying chart provides a means of quickly determining, or checking, a beam size for any specific load. Dimensions are given for both rough and dressed lumber. The chart is computed on the basis of an extreme fiber stress in bending of 1,000 lb. per sq. in. This conservative value was used due to the uncertainty of timber grades and the variety of species to be found on different projects.

Two straight lines intersecting on the "support" are necessary for a solution. The two outside scales, marked (A) at their top, are used for the limits of one solution line. The two inside scales, marked (B) at their top, define the limits of the second solution line.

The scale giving the loads, has been constructed for two span conditions:



1. A cantilever beam with a concentrated end load;

2. A simple span with the load at the span center. The load should be taken from the scale of the applicable condition.

To illustrate the use of the chart, the following problems will be solved:

Problem (1) (Solution indicated on the chart)

In order to set a motor weighing approximately 2,000 lb., a chain hoist is to be attached to the mid-point of a timber beam supported on the bottom chords of two adjacent roof trusses. The trusses are 15 ft. center to center (span of beam).

Required

What size of timber (unfinished) is necessary?

Solution

Line (1) is drawn between the load —2,000 lb. and the span—15 ft. The intersection of Line (1) and the "Support" is a point of rotation for the solution line to obtain the timber size. Any solution line through this intersection will give beam dimension which will satisfy the conditions of flexural stress. As shown by solution line (2) a 6x10-in. rough timber will satisfy the conditions.

Check Solution

Section modulus, 6×10, $S=\dfrac{b\,h^2}{6}=$

$$\frac{6\times10\times10}{6}=100 \text{ in.}^3$$

Bending Moment, $M=\dfrac{12\,W\,L}{4}=$

$$\frac{12\times2000\times15}{4}=90{,}000 \text{ in. lb.}$$

Extreme fiber stress in flexure, $f=\dfrac{M}{S}=$

$$\frac{90{,}000}{100}=900 \text{ lb. per sq. in.}$$

Allowable, $f=1{,}000$ lb. per sq. in.

Problem (2) (Solution not shown on the chart)

A 6x8-in. dressed timber (8-in. dimension vertical) is to be cantilevered over the cornice of a building to hoist an iron safe weighing 1,000 lb.

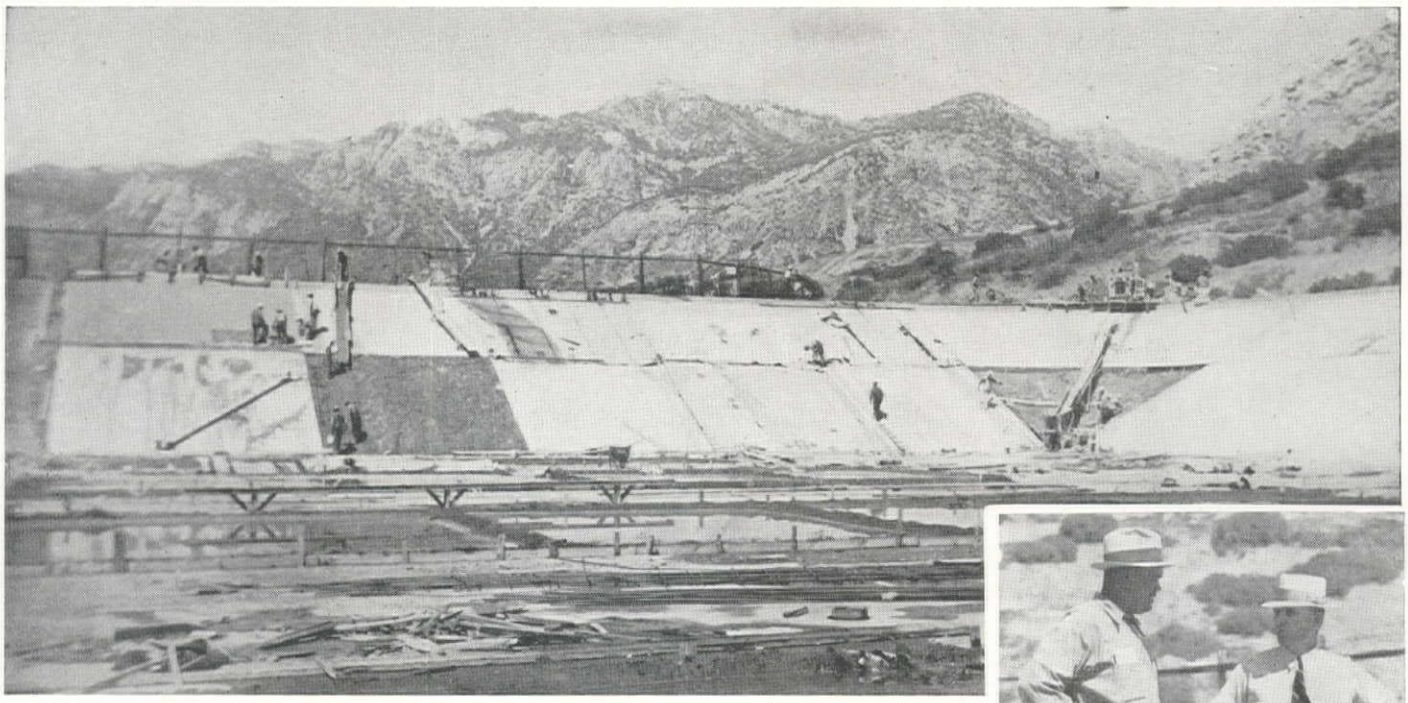
Required

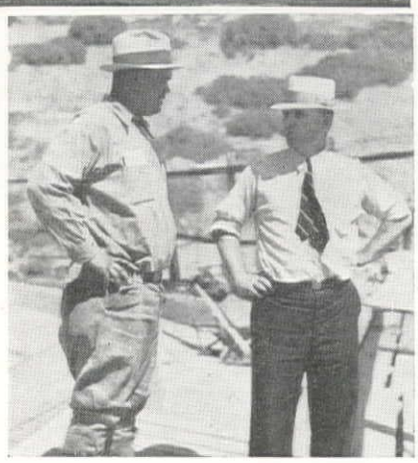
How far out from the cornice support (cantilever span) can the block and tackle be safely placed on the timber?

Solution

A solution line can be drawn between the dressed dimensions, breadth=6-in. height=8-in. Through the intersection of this first solution line and the "Support" a second line can be drawn from the cantilever load of 1,000 lb. On the span scale read, =4.3 ft.

Horizontal shear may be the controlling factor instead of flexural stress when large loads are used on short spans. When in doubt, the shear should be checked.





Reservoir construction has been carried out under the direction of C. L. Coray, city engineer of Ogden (right). Contract operations of W. W. Clyde, Springville, Utah, under the supervision of Harry Clyde (left).

Ogden Adds 38m.g. of Storage To Water Supply System

New Reservoir will provide much needed reserve storage at end of 5-mile Ogden River Conduit. Design features water-tight joints between slabs.

TO INCREASE the terminal storage facilities at the end of the Ogden River conduit, the city of Ogden, Utah, is building a 38 m.g. reservoir as part of a program of improvements to the municipal water supply system. The feature of the reservoir design is the special provision for insuring water-tightness in the reinforced concrete lining. In addition to the reservoir the city is also installing about 6,000 meters in the distribution system, which will completely meter the system, and calling bids for a conduit representing a total expenditure of about $400,000 to replace and supplement present lines from the Ogden River source of supply.

At present the supply lines from the Ogden River artesian basin discharge into two concrete lined reservoirs on the high ground east of the city. These reservoirs (14 mg. and 7 m.g.) hold only about a 30-hr. supply and additional storage has been needed as a precaution against interruption of service on the main conduit. The new reservoir, adding 38 m.g., will insure a 5-day supply at the conduit terminal.

A Jaeger mixer, which was moved frequently as the work progressed, and distribution by buggies along the rim comprised the concreting arrangements. Aggregates from a commercial plant were weighed by the wheelbarrow load into the mixer.

Located adjacent to the existing reservoir the new unit consists of an excavation 265 x 675 ft. in area, providing a 22-ft. depth of water. Excavation involved the removal of about 80,000 cu. yd. of sand, with 16,000 cu. yd. used for a fill at the low corner of the site and the remainder wasted. The material was practically all handled with tractor drawn Le Tourneau equipment. Side slopes are 1:2 and the sandy character of the material did not allow compaction. The surface was screeded to grade and wet down prior to placing concrete. After the finished grading, trenches were excavated by hand for the ribs located under the joints in the lining slab. Slab sizes are 25 x 60 ft. on the floor of the reservoir and 25 x 25 on the side slopes. The ribs, which are 18 in. wide and 6 in. deep are poured first and coated with asphalt on the top.

The copper water stops are then laid on the ribs. These seals are 13 in. wide and have the usual U-shaped bend along the center line to allow for expansion and contraction. Lengths of water stop are brazed together at all joints to form a complete water-tight net work along all the slab joints. The special feature is the type of pressed

Concrete on the slopes was chuted directly into place followed by finishing operations.

piece used at the intersections (see illustration) which provides for movement into both directions.

Steel is then placed for reinforcing the 6-in. slab. This steel consists of ⅜-in. round bars at 8-in. centers in both directions. These bars extend to the U-bend in the water stops, leaving a space of about ½-in. along the joints. As the slabs are poured this ½-in. joint is kept open and is later filled with fine clay in the bottom and then asphalt to the top of the joint. Incidentally, the loose, fine sand made necessary extensive cleaning out of the water stops and final grading immediately before pouring concrete.

Concreting is done with a 2-sack Jaeger mixer, using aggregate with a 1-½-in. maximum size delivered at the site from a commercial plant. The mix calls for 6 sacks of cement to the yard and a slump of 2-2½ in. is maintained. Strength of the concrete runs about 4,000 lbs. at 7 days. The mixer is moved along the rim of the excavation as the pouring advances. The character of the foundation material did not make feasible a paving mixer or trucks moving on the bottom of the reservoir. Concrete for the bottom was handled by buggies from a hopper at the base of the slope and on the side slopes was chuted directly into place (see illustration).

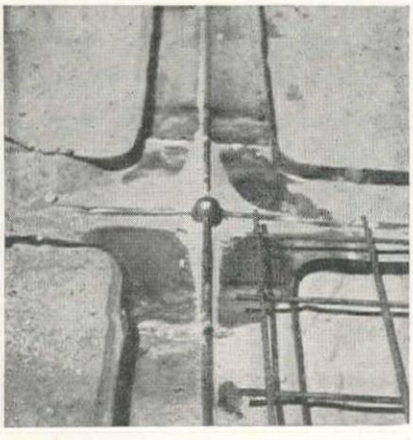
A curing period of 10 days is required. On the bottom this is carried out by ordinary ponding. On the sides the slabs are enclosed in a covering of Sisilkraft paper for the required period. These paper coverings are generally rensed 3 times.

Concrete placing required about 90 days and the contractor worked two 5-hr. shifts to meet the 30-hr. week requirement of the PWA. Construction work is scheduled for completion in September and the reservoir will be put into service, with a temporary connection, in October.

A curb is built into the upper edge of the concrete lining and a 4-ft. sidewalk is laid around the rim. Beyond the sidewalk a 6-ft. strip of grass will be maintained, to keep down dust. A fence around the outside completes the installation. A special feature is the provision to stretch wires across the short dimension of the reservoir at 20-ft. intervals to keep off seagulls.

Construction of the reservoir and the other features of the improvement program, including the conduit work, are under the direct supervision of C. L. Coray, city engineer of Ogden. Contract for the reservoir is held by W. W. Clyde & Co., Springville, Utah, with Harry Clyde in charge of the work.

Copper water stops placed at the slab joints. At intersections, as shown, a special pressed piece provides for two-way movement of the joint. Note the reinforcing steel in place. The fine sand of the area made frequent cleaning of the forms necessary.



Cajalco Dam Design Features And Requirements for Fill

Embankment work for the terminal reservoir on the Colorado River Aqueduct will result in large volume operations under refined specifications for placing earth fill.

CONTRACT for the construction of the Cajalco dam, the terminal structure of the Colorado River Aqueduct, has been let to the Griffith Co., Los Angeles, on the low bid of $4,646,856, and work on this huge rolled earth embankment is expected to start shortly. The work will involve the placing of about 7,500,000 cu. yd. of earth fill and the structure will rank as one of the major features of the gigantic construction program being carried out by the Metropolitan Water District of Southern California. The main dam will have a maximum height of 194 ft. and the 100,000 ac. ft. of storage will feed into the distribution tunnels and aqueducts for delivery to member cities of the district.

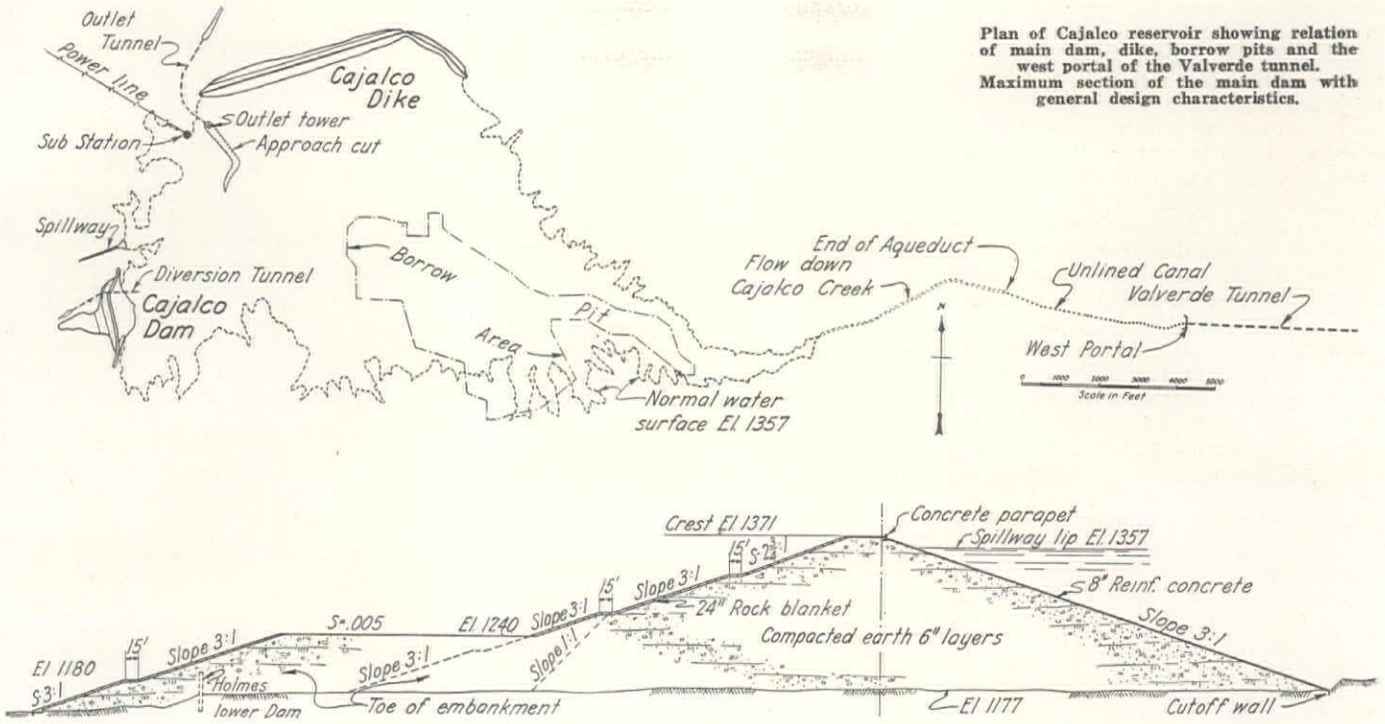
Bids received were:

Griffith Co.	$4,646,856
L. E. Dixon, Bent Bros. & Johnson	4,742,320
Columbia Construction Co.	4,769,986
Macco Const. Co., Emsco Equip. Co., Broderick & Gordon	4,837,977
Walsh Construction Co. and Guy F. Atkinson	4,883,253
W. E. Calahan Const. Co.	5,499,673

These bids do not include the cost of materials, which are to be purchased by the district, and the total cost of the project is estimated at about $6,500,000. Complete unit bids appear on page 38 of this issue.

The site for the dam is about 10 mi. south east of Riverside on Cajalco Creek about 5 mi. west of the portal of the Valverde tunnel. From the portal of this tunnel the aqueduct will continue about one mile in unlined canal to the upper end of the reservoir. About 1 mi. north of the main damsite, a low saddle in the reservoir area necessitates a dike which will have a maximum height of 90 ft. and a length of more than 7,500 ft. A spillway is provided near the main dam and the outlet works are located near the west end of the auxiliary dike. The outlet system consists of a long approach cut to an outlet tower which discharges into a 14-ft. tunnel about 2,550 ft. long.

A power line is available at the site and local roads traverse the reservoir area. The borrow pits for the earth fill, according to the plans, are situated in the reservoir site about 2 mi. from both the main dam and the dike.



Plan of Cajalco reservoir showing relation of main dam, dike, borrow pits and the west portal of the Valverde tunnel. Maximum section of the main dam with general design characteristics.

Design features

In design the structure is a typical compacted earth fill dam with an upstream slope of 3:1 paved with an 8-in. reinforced concrete slab and a downstream slope of 2¾:1 and 3:1. The downstream slope is covered with a rock blanket 24 in. thick. The outstanding feature of the back slope is an extensive toe embankment resulting from the introduction of a berm 325 ft. wide (see drawing) at an elevation of about 63 ft. above the bottom of the fill. The crest width is 50 ft. and a concrete parapet wall is provided on the upstream side of the crest. The base of the dam, in its maximum section, is at El. 1,177, the spillway lip is at El. 1,357 and the crest is at El. 1,371.

The upstream paving, which is reinforced with ¾ in. bars at 11 in. in both directions, extends into a vertical cut-off wall 24 in. thick along the upstream toe. Grout pipes are to be left in this cut-off wall at 5-ft. intervals.

The dike is of similar design with an upstream slope of 2½:1, an 8-in. concrete paving slab and a downstream slope of 2¾:1 for the upper half of the structure and 3:1 near the base. The same general type of cut-off wall and parapet is provided.

Spillway and outlet works

The spillway is a concrete lined channel 16 ft. wide on the bottom and about 500 ft. long. It has a flared inlet and no gates or control devices are provided in the plans. The outlet tower is a reinforced concrete structure resting on a slab of concrete 15 ft. thick and 60 ft. in diameter. The tower is 123 ft. high from lowest foundation to elevation of spillway and 161 ft. to the top. Outlet gates are provided at five levels. Access to the tower will be by means of a suspension bridge of 231-ft. main span. The discharge from the outlet tower enters the outlet tunnel for delivery to the distribution system of the district.

Construction requirements

The water supply system of the district is not available at the damsite and the specifications require the contractor to provide his own water supply facilities. The district agrees to provide the contractor with power for which the contractor will be billed at a rate of $0.015 per kw.hr. for all energy received. Further, the district will furnish the cement, steel valves, piping, and other materials used in the permanent structure.

Handling and placing of the 7,500,000 cu.yd. of compacted earth fill represents the most important phase of the construction program. Preparation for this fill includes clearing all material which, in the opinion of the engineers, are not suitable for the foundations. This stripping of the excavation amounts to 575,000 cu.yd. of earth and 25,000 cu.yd. of rock for the dam, and about 60,000 cu.yd. for the dike. In general, the specifications provide that the contractor will be required to excavate to obtain a foundation material having the same "stability, density, and impermeability, in the opinion of the engineer, as the embankment to be placed upon it."

The borrow pits have been sampled with 24-in. auger holes and samples taken at 5-ft. intervals for the study of the material. The location of these test holes and the resulting information, of course, has been made available to bidders.

Moisture control of fill

In accordance with recent improvements in practice for the construction of compacted earth fills, particular stress is laid upon the point of moisture in the fill material, and its control as the work progresses. The general statement is made that "an average moisture content of approximately 13% of the dry weight of the material will be required at the time of compaction but the right is reserved to vary this percentage as conditions may require."

Borrow pits are to be stripped from two to three months prior to the removal of fill material and during this period the surface of the pit is to be sprinkled with the quantity of water which may be considered necessary by the engineers. This quantity of water is estimated to be about 75% of the total amount required. Uniform application and penetration of this water is considered essential in providing a material which is of uniform characteristics, and cultivation, plowing or other operations may be required to insure this uniformity of penetration. Surface cultivation may also be required to assist in retarding evaporation after this water has been applied and if the results do not indicate uniformity in moisture content the contractor may be required to do the following. Labor and equipment are to be provided for sinking pipes, perforated at the lower end, to required depth at about 50-ft. intervals and securely tamped in place. Air is then to be exhausted from the ground through these pipes as the surface is again sprinkled until the desired penetration of water is secured. However, the contractor is permitted to devise other equally effective means for securing uniform penetration.

Cooperation of the contractor is required in this entire process of securing correct moisture content in the borrow pits. Areas which do not take the water readily are to be noted and

reported and may be required to be loosened by blasting.

The moistening process is to be completed fifteen days prior to the beginning of excavation from the pit and no excavation will be permitted if the moisture is in excess of the required amount. As an exception, this material could be excavated and placed to dry out naturally. The foundation area for the dam and the dike, except the areas of solid rock, are to be plowed to a depth of 6 to 8 in. and moistened and compacted similar to the fill.

Material from the borrow pits is to be transported to the point of placement in conveying units having a weight of not more than 20 tons when loaded, unless it is determined that larger units will not damage the compacted fill. The transportation method will not be permitted to result in excess evaporation. Fill is to be spread to a thickness which will result in compacted layers of about 6 in. The loads of material will be deposited in rows about roughly parallel to the axis of the dam and the selected material near the abutment is to be deposited at the same time so that the entire surface of the fill at any elevation may be compacted by rollers traveling parallel to the axis of the structure.

The moisture content of material will be checked as it arrives at the dam and additional sprinkling to correct deficiencies will be required.

Types of rollers

Rollers used for compacting the fill will be the sheepsfoot type drawn by tractors and they are to be equivalent to the following:

"They shall contain two forward drums and a single rear drum that will cover the intervening space between the forward drums plus an overlap on each side of at least 1 ft. Each of the drums shall be so mounted that its frame is free to pivot about an axis parallel to the direction of travel. Each drum shall be approximately 42 in. in diameter and 60 in. in length, and the weight of the empty drum plus supporting frame and teeth shall be not less than 8,000 lb. To each drum there shall be firmly attached 78 teeth, which shall be arranged in 6 rows longitudinally and 13 rows circumferentially, so spaced that a different tooth pattern will be secured when mounted reversely (end for end). One half of the roller units used shall have the drums mounted reversely from the other half. The teeth shall be 8½ in. in overall length and fitted with hardened steel points, preferably removable, which shall have penetrating areas of 6 sq. in. when new, and these, when they are worn to a penetrating area of 5 sq. in., shall be replaced by new ones or shall be increased in area to 6 sq. in. by approved methods. Each drum shall be equipped with cleaner bars so attached as to remove accumulations of material between the teeth. The drums shall be water-tight and fitted with connections that will permit the addition and retention of water. The gross weight of any one or all of the rollers shall be increased by the addition of water up to the full capacity of the drums whenever required and the contractor shall receive no additional compensation for using rollers with such increased weight. Nothing in these specifications shall be presumed to forbid cooperative effort of the contractor and the engineer to improve the details of the compacting equipment, nor to relieve the contractor of his obligation to compact the fill properly".

Compaction of the fill must equal or exceed the minimum requirement of a resistance of 300 lb. per sq. in. for a plasticity needle and the maximum allowable percolated rate in the compacted material shall be 0.60 ft. per year. These two specifications are to be determined by laboratory tests. As a result, the field requirement provides for the material in the embankment to be compacted "to a plasticity needle reading for a 4-in. penetration of from 600 to 2,500 lb. per sq. in." The plans anticipate that 16 roller trips over each 6 in. layer will be required to obtain the necessary compaction.

Specifications also include the requirement which provides for increasing or decreasing by $0.0025 per cu.yd. of fill for each roller trip required more or less than the 16-trip normal figure.

Tunnels

A 9-ft. diameter diversion tunnel, about 2,000 ft. in length is to be driven through the north abutment of the dam site. This tunnel will be lined with a 9-in. thickness of concrete and is designed to take care of the local run-off from the catchment area during the construction of the dam. Ultimately this tunnel will be plugged with a 20-ft. section of concrete and grouted.

The permanent outlet tunnel, is 2,565 ft. long. It is located near the west end of the auxiliary dike. After driving this tunnel will be lined with 8 in. of concrete (minimum) inside the tunnel supports and a steel cylinder lining is to be provided. Inside of this steel cylinder there will be a 2-in. inner lining of gunite and the final inside diameter is to be 14 ft.

All work on the Colorado River Aqueduct, including the construction of the Cajalco dam, is carried out under the general direction of F. E. Weymouth, general manager and chief engineer, of the Metropolitan Water District. J. L. Burkholder is assistant general manager, Julian Hinds is assistant chief engineer, and James Munn is general superintendent. Richard B. Ward has recently been named resident engineer for Cajalco dam.

Metal Crib Wall Constructed By Relief Labor Crew

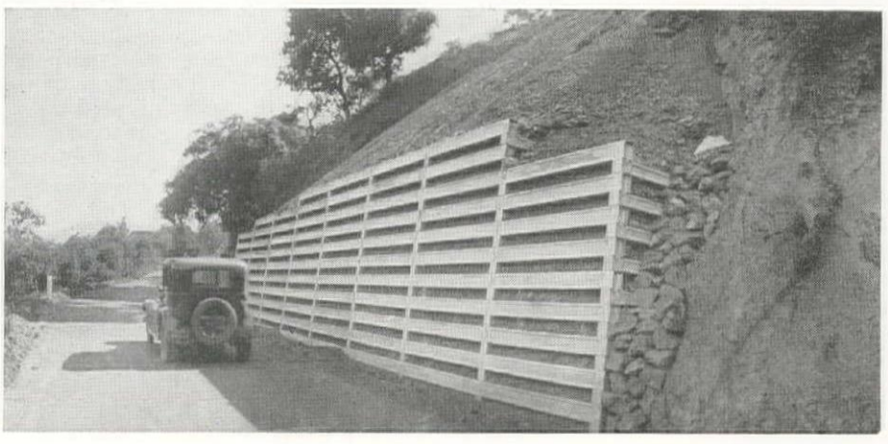
By S. H. PHELAN
Project Engineer
California Relief Administration

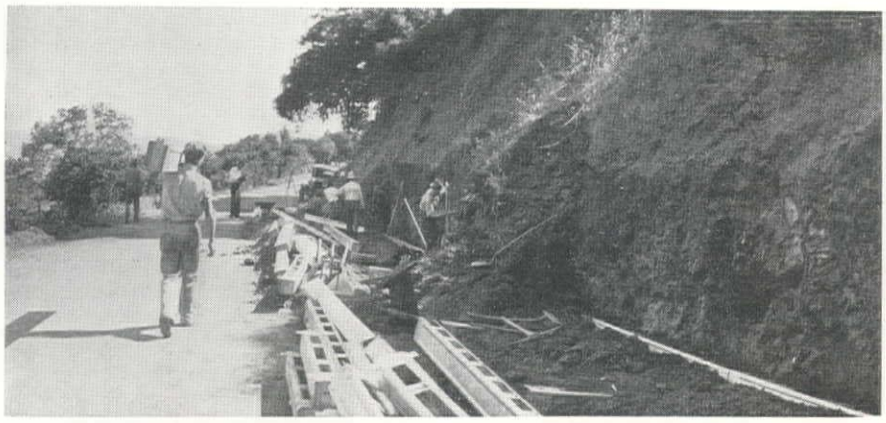
ON AN SERA project in Contra Costa County, California, a metal crib wall was erected by emergency relief labor as part of a highway improvement. The highway known as Snake Road, between the Skyline Boulevard and Redwood Canyon near Moraga, had been steep and narrow and in some sections dangerous for traffic. The route was rebuilt with better grades and alignment and a wider section (two-lane throughout) so that it may now be travelled with comfort and safety.

At one point, where the road makes a long loop, trouble was experienced from slides of the embankment onto the lower roadway. Some means had to be provided to decrease the steepness of the slope and permit widening the upper highway. A wall of metal cribbing was selected. The lightweight construction lent itself to the relief-labor work used on the project.

The height of the completed wall is

Crib wall completed and backfilled with the decomposed rock forming the embankment. This wall is 64 ft. long and 13½ ft. high.



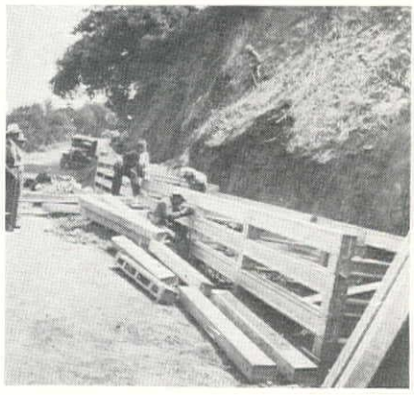


Excavating for the wall by SERA hand labor, bringing in the sections of crib and setting the base course at the rear of the foundation level.

13½ ft. and the length 64 ft. The embankment material is decomposed rock with some boulders. Work was performed by alternating gangs of SERA workers under the charge of a foreman familiar with the material. Approximately 70 man hr. were required for erection, exclusive of backfill. The accompanying illustrations make a description of the construction operations unnecessary.

Material costs were covered by Contra Costa County and the California Emergency Relief Administration supplied the labor. Supervisor H. L. Cummings planned the development and Warren Harrold, road superintendent, was directly in charge. Harold M. Pearson was the SERA engineering representative on this project.

Assembling the crib wall with work-relief labor, under the direction of a skilled foreman.



Salt Lake City Approves Deer Creek Project at Special Election

BY A MAJORITY of 5215 to 4568 at a special election August 15, Salt Lake City voted approval of the formation of a metropolitan water district which is a preliminary step necessary for participation in the proposed $6,500,000 Deer Creek water development project, to be built by the Bureau of Reclamation. On the same day the towns of Provo and Orem also gave large majorities favoring the formation of a district. Formation of a metropolitan water district comprising Salt Lake City and vicinity is necessary to join the contracting agency—Provo River Water Users Association—which has been set up to negotiate with the Bureau of Reclamation for carrying out this development. The Association is necessary to provide a single agency which can represent all the beneficiaries and deal directly with the Bureau, in accordance with the usual procedure in this type of undertaking. The Association will consist of groups of irrigators, municipalities, and land owners who will secure water through the construction of the project.

Salt Lake City has been faced by recurring water shortages during the past few years and has no definite program for an ultimate water supply. The Deer Creek project is considered the most feasible plan for securing an adequate municipal supply to take care of future growth. The project is too large and involved for the city, or any other single agency, to undertake by itself, both as to territory, complicated water rights and cost. For this reason it was necessary for the city to unite with various other groups of water users, both municipal and irrigation, to carry out the project which the Bureau of Reclamation has laid out and approved for construction. Further, Salt Lake City has a bonded indebtedness which made participation impossible based on strictly municipal financing.

A law passed at the recent session of the legislature made possible the formation of a metropolitan water district to further participate in this undertaking. The plan was actively backed by the present administration and the favorable vote of August 15 will probably be followed by immediate steps to carry forward the plans for the project.

Features of the Project

The Deer Creek project involves several distinct features and in its various ramifications is complicated both as to construction operations and the use of water. The principal units of the program, which may not be built concurrently, are outlined briefly.

The principal unit in the program is the dam to be built on Deer Creek in Provo Canyon about 14 mi. from the city of Provo. This dam of earth fill construction, 195 ft. high above stream bed, will store 170,000 ac. ft. of water and is estimated to cost $2,000,000. The storage in this reservoir, as proposed, would come from the Provo River and from diversions to be made from the Duchesne and Weber Rivers. This water would be delivered to the various users who form the water users association, through the enlarged Provo Canal which includes siphons and connecting units. Salt Lake City would receive its share of this water by delivery through the canal to the Jordan River. The estimated cost of this canal feature of the program is $900,000.

The Duchesne—Provo tunnel, to cost more than $2,000,000, would be driven for a length of 5½ mi. to divert excess flow from the upper Duchesne River into the Provo River to be stored in the Deer Creek reservoir. The estimated supply to come from this source is 25,000 ac. ft. per year.

At a cost of $265,000 the Weber-Provo canal would be enlarged to 1,000 sec. ft. capacity to carry surplus water from the Weber River into the Provo River for storage in the Deer Creek reservoir. About 54,000 ac. ft. of water would come from this source including 18,000 ac. ft. which would be available through agreement with the power company.

One of the unique features of the program is the plan to dike off a section of Utah Lake; this proposal has been discussed for many years. A large area of Utah Lake is relatively shallow and subject to excess evaporation losses during each summer season. The plan would be to build a dike to confine the lake waters to the deeper part of the lake and thus save this evaporation loss which is estimated to be at least 60,000 ac. ft. The plan to reduce the lake area by this dike, with incidental dredging operations is estimated to cost $2,000,000.

The Duchesne-Rock Creek tunnel, estimated to cost $3,000,000 will be driven for a length of 6½ mi. from a point above the intake of the Duchesne-Provo tunnel for the purpose of tapping a series of lakes in the Uintah Basin. This projected feature, a part of the ultimate program, would provide about 30,000 ac. ft. of water which would be allocated to the state of Utah under the development of the Colorado River program.

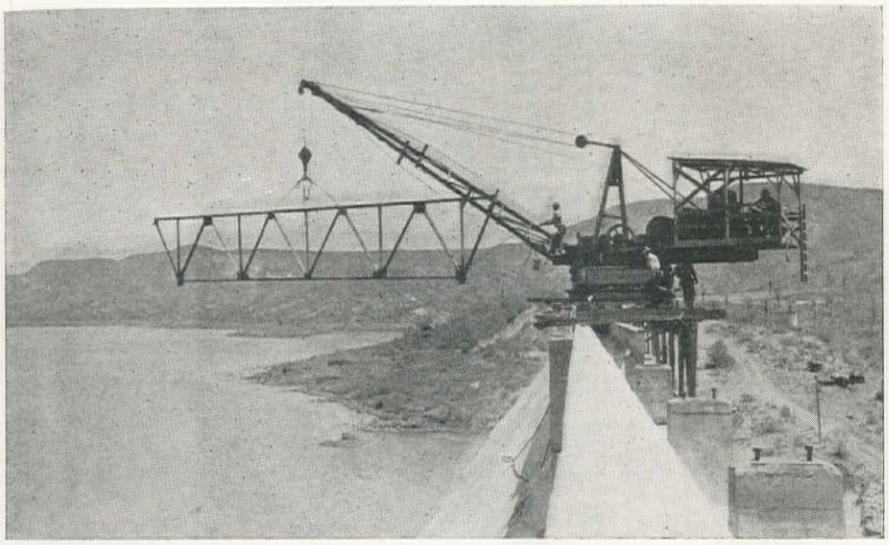
In addition to these distinctly water development features there would be required the reconstruction of a section of Denver and Rio Grande Western railroad track and a state highway with an estimated total cost of more than $1,000,000.

Development Program

According to present plans the carrying out of this entire program would be under the direction of the Bureau of Reclamation with financing under the usual Bureau set up of 40-year repayment without interest charges. Repayment charges would be allocated to those participating in the Provo River Water Users Association in proportion to benefits. The details of this financing program have not been worked out. An additional complication which presents problems that have not been completely worked out at present involves the exchange of existing water rights and agreements by which rights to irrigation supplies can be transferred to municipal uses, and the reverse.

The Provo River Water Users Association has been recently incorporated as a step toward the development program with Mayor Marcus of Salt Lake City, chairman. W. D. Beers, city engineer, Salt Lake City, is a member of the executive committee.

Lake Pleasant Dam Repairs To Strengthen Buttresses



Placing a 60-ft. truss for a new bridge being built along the crest of the dam.

RFC loan permits rehabilitation of large multiple arch dam near Phoenix and reconstruction of many structures on irrigation system.

By J. A. FRAPS
Resident Engineer
Maricopa County Water District

WITH the aid of a $1,350,000 RFC loan made in February, 1935, the Maricopa County Municipal Water Conservation District Number One, with headquarters at Phoenix, Ariz., is rehabilitating the Lake Pleasant dam and repairing and rebuilding other structures on the irrigation system of the district. Work on the multiple arch dam on the Agua Fria River consists of strengthening the buttresses and reconstructing the spillway. Other operations financed by the loan include the replacing of wooden structures on the main canal, lining sections with concrete, and rebuilding the major part of the lateral distribution system.

The district comprises 40,000 ac. of land situated 20 miles northwest of Phoenix, Ariz. Cotton and citrus fruit have been the chief crops to date, but greater diversification is expected in the future. The project secures its water supply chiefly from storage in Lake Pleasant dam, which is on the Agua Fria River. A supplementary supply is obtained from wells on project lands. The storage dam is 40 miles northwest of Phoenix, a short distance above the point where the Agua Fria River leaves the mountainous country and flows out into the valley.

This imposing structure was completed in 1928, *(Western Construction News,* Dec. 10, 1927) and has been continuously in use since then. However, the spillway was cut down early in 1929, decreasing the storage capacity and rendering the water supply for the district inadequate. The reduced level of the spillway was deemed necessary to make the dam structurally safe, and it will not be restored until the repairs to the dam have been completed.

In the preliminary application to the RFC district officials agreed to adopt a plan of repair to Lake Pleasant dam that would be entirely satisfactory to the State Engineer of Arizona, and to a consulting engineer mutually acceptable to the district and to the RFC. Louis C. Hill, consulting engineer, Los Angeles, was selected and all plans have been carried out under his direct supervision. Plans that have been adopted by the district have been approved by the state engineer, who has supervision over all dams in Arizona.

Lake Pleasant dam is a multiple arch structure having a maximum height of 170 ft. above stream bed, and a height of 250 ft. from lowest bed rock to crest of dam. The buttresses are of the hollow H-type and have nominal temperature and shrinkage reinforcing. There are 27 buttresses, and twenty-two of these will be repaired. The method of repair, which has been adopted and approved, consists of the construction of a series of horizontal floors inside the buttresses, and an inclined slab near the upstream face of the buttresses. Floors and slabs will be heavily reinforced with steel relay rails. Rails in the horizontal floors will be pre-stressed by hydraulic jacks with initial stresses of from 8,000 to 12,000 lb. per sq. in. induced into rails

Lake Pleasant dam which is being strengthened to permit full use to former spillway level.

and thus transferred to the buttress walls. In addition, all buttresses in stream bed will be filled solid with concrete to an elevation of 10 ft. above stream bed elevation.

Without going into a technical discussion of the stresses in the buttresses, it may be stated that tensile stresses along the upstream face of each buttress will be relieved by the repairs that are being made. It is evident that steel near the upstream face will serve this purpose, and pre-stressing of rails in the horizontal floors will serve the same purpose. Had the existing buttresses been made longer up and down stream, or had they contained heavy steel reinforcing parallel and adjacent to the sloping upstream face, the resulting structure would have been safe.

The gap in the spillway which is now 200 ft. wide by 30 ft. deep, will be closed by four Taintor gates, each 24 ft. high by 34 ft. wide, and by one Stauwerke sector gate of the automatic type, of the same dimensions.

An ogee section 6 ft. high will form the spillway sill for all of the new gates, thus completely closing the 30-ft. gap. In addition, new operating mechanism for 21 existing Taintor gates, each of which is 16 ft. high by 23 ft. wide, will be installed.

Other reconstruction work

Contracts have also been let for the repair and reconstruction of the irrigation structures owned and operated bv the district. This work involved the replacement, on the main canal, of wooden structures with permanent structures of concrete and steel, the lining of portions of the main canal, the replacement of old lateral structures with new concrete structures and the reconstruction of the major portion of the lateral distribution system.

Except for a flume on the main canal across the Agua Fria River all structures along the main canal have been completed. Seven and one-half miles of the main canal have been lined with gunite. Work is now under way on the flume across the Agua Fria River. Lining of ten miles of main canal will be done in the winter of 1935-36.

W. W. Lane, former state engineer of Arizona, and now chief engineer and general manager for the district, conceived the plan of the loan and the scheme of rehabilitation, and worked for a period of three years to bring to a successful conclusion the refinancing and reconstruction. Simultaneously, with the securing of the RFC loan, a plan which refinanced the bonded indebtedness of the district was successfully concluded. He has been assisted by R. V. Leeson, assistant chief engineer for the district. Contract for the reconstruction of Lake Pleasant dam and spillway is held by the Pleasant-Hasler Construction Co. of Phoenix, Arizona. The work is in charge of D. H. Sanders, superintendent.

Early Dam Builders Hinder Colorado Highway Construction

Beaver dams created this swampy condition which presented a drainage problem on the 8-mi. construction and reconstruction project of the Colorado highway department between Grand Lake and the foot of Milner Pass. C. V. Hallenbeck Construction Co. of Denver is the contractor and the shovel is a Lorain 40 of ¾-yd. capacity.

This work is part of the extensive construction program for the Trail Ridge highway which extends for 42 mi. from Estes Park to Grand Lake. Completion of this route has been assured by a federal allotment to make possible the purchase of rights of way along the shore of Grand Lake.

Broadway Tunnel Cavein Investigated

A CAVEIN on the Broadway Low Level Tunnel project in Oakland, Calif., on Aug. 29, which killed three members of a re-timbering crew, has resulted in opening up a controversy on such broad points as: the adequacy of the engineering design, the responsibility of the contractor in the difficult ground, and the state's responsibility for safety of the workmen. The twin vehicular bores, each 5,800 ft. long are being driven through the hills back of Oakland by the Six Companies of California for Joint Highway District No. 13 of the State of California. On Sept. 1 work was still in progress clearing out the cavein and several investigations were in progress.

J. B. Lippincott, consulting engineer of Los Angeles, had inspected the project to make a report for the district. The U. S. Bureau of Mines announced, through S. H. Ash, that it would cooperate with the State Industrial Accident Commission in an investigation of the accident.

During the week preceding the accident the contractors had written formal letters to the district declaring that the condition of the ground made it unsafe for them to continue the work under the original design, and asked that they be relieved of further responsibility. According to these letters, this opinion was confirmed in a report made to them by T. L. Phillips and Fred H. Tibbetts, consulting engineers of San Francisco, acting as their consultants. Further, the letters stated that the ground, with slight exception, "has been and is entirely different from the character of ground represented to the contractor". Excavation operations have been suspended, according to the letters, pending word from the district as to possible alteration in the design. In the meantime the concrete lining work is being continued in the excavated sections. Additional time for concluding the contract and claims for extra compensation are also requested in these letters.

Following the accident the district made public the contents of these letters and made counter statements that the designs for the tunnel had been approved by the state and had also been tacitly accepted by the federal government as a result of its loan for the financing of the work. Responsibility for the accident was attributed directly to the contractor, in a statement made by one of the board of directors of the district, who pointed out that the work of concrete lining had not been kept up close behind the excavation, as required by the specifications. According to the statement of this official the tunnel lining was about 1,800 ft. behind the headings.

Contract for the tunnels was awarded to the Six Companies of California in June, 1934, on a bid of $3,683,931. The next bid, of Frazier Davis Co. and G. L. Tarlton, was $4,394,613. A description of the project appeared in *Western Construction News* July, 1933, and the complete unit bids for the work were published in the issue of June, 1934.

New Regulations for Registration of Engineers in California

REGULATIONS governing the examination for registration under the California licensing act for civil engineers were modified by action of the board at a meeting on July 29. The new regulations require a 4-day examination period, in place of the previous 3-day examination, and a wider range of subject matter.

According to the old rules, applicants were required to take a one and a half day examination in the fundamentals of engineering, followed immediately by a one and a half day examination on some special branch of civil engineering which could be selected from the eleven divisions listed in the official rules and regulations. At the option of the board the examination in fundamentals could be waived if the applicant was a graduate engineer. The applicant also received an oral interview by the board before the certificate was granted.

Under the new regulations, an applicant will take a two-day examination in the fundamentals of civil engineering, with the same rule which may allow this examination to be waived if the applicant is a graduate of an engineering college. If the applicant passes this examination he is permitted, at the next regular examination time (six months later) to take an examination covering all branches of civil engineering design and construction. This regulation does not permit the applicant to select one particular specialty for the second examination, but requires him to be examined in all phases of the subject. Under the new regulations no thesis is required, nor any letter to the board required, as in the past, as an indication of the applicant's ability to express himself. An oral interview is still required by the board before the certificate is granted.

The new regulations for examination will require an applicant to be a more all-around civil engineer than was true under the former rule. Further, they eliminate the problem which occasionally arose under the old regulations as a result of an applicant passing his specialty examination and failing to pass the preliminary test in fundamentals. Under the new regulation the test on fundamentals will precede by six months the second examination and those not passing the first test will not be permitted to take the second. Under the new plan, with the exception of the first four-hour period in the examination on fundamentals, text and reference books may be used throughout the remainder of the examination.

The new regulations, as outlined, for registration as civil engineer in California will be held late in October, simultaneously in both San Francisco and Los Angeles. The board of registration is composed of Ralph Reed, Henry D. Dewell and Asa G. Proctor.

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Diesel Engineering Course Offered by Correspondence

Announcement has been made by the Extension Division, University of California, Berkeley, Calif., that their correspondence course in Diesel Engineering has been thoroughly revised and is now open for those who wish to enroll. The course presents a general discussion of the elements of the Diesel engine so as to furnish the practical man with fundamental principles which will assist him in the operation and maintenance of the engine. A few of the important points covered are: principles and theory of the diesel engine, types, two and four stroke cycle engines, supercharging, precombustion and auxiliary air chamber engines, turbulence, Hesselman engines, fuels, various principles involved in fuel pumps and fuel injectors, timing, governors, opposed piston engines, diesel-electric rail-cars, materials, high speed engines, torsional vibration, construction features, cooling and lubricating oil systems, starting and reversing systems, auxiliary equipment, operation, maintenance, and repairs. Each assignment is fully illustrated by diagrams and blue-prints.

The required fee for the course is $7.00 for students in California, or $10 for those enrolling from points outside California. For further details one should consult the University of California Extension Division, 301 California Hall, Berkeley, California.

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Transmountain Diversion For Denver Sewage Program

At least one new transmountain diversion of western slope water from either William Fork or the upper Blue River will be necessary in Denver's tentative plans for a sewage disposal plant. George E. Cranmer, manager of parks and improvements for the city, is understood to favor the Williams Fork project, which could deliver 40,000 to 50,000 ac. ft. of water per year through a 3-mi. tunnel into Clear Creek at a cost of between $1,000,000 and $1,600,000. Also included in the proposed project would be dams in Clear Creek and possibly a pipe line from the creek to Marston Lake. The project on the upper Blue River would require a tunnel 1½ mi. long, to cost about $600,000.

Work on the second tunnel of the Twin Lakes project, southwest of Leadville, Colo., is scheduled to start about September 15. This second tunnel, to supplement the collection system of the first one, completed recently at a cost of $1,150,000, will be 6,200 ft. long and cost $800,000. The first tunnel was about 3½ mi. long. The second tunnel, to be located at an altitude of 10,500 ft., will be the highest transmountain diversion bore in the world. Water began flowing through the first tunnel on May 23. Work on the second project will be carried out through the winter months, according to present plans.

Washington Highway Program

A PARTIAL PROGRAM work relief type of highway projects in Washington has been submitted by the state highway department to W. H. Lynch, district engineer, Bureau of Public Roads, Portland, and forwarded with his recommendation to Washington for approval. The program submitted includes nine projects at an estimated total cost of $1,042,700 (34% of the state's apportionment). The direct employment to be provided in this work is estimated at 556,070 man-hours, for an average daily number of 575 men, and a direct payroll of $388,800. Improvement is proposed for 24 miles of highway, the work to consist of 1.7 miles grading, 17 miles grading and surfacing, 3.5 miles re-top paving, and 2.6 miles roadside improvement.

The Washington State Highway Department has accepted the alternate plan proposed under the regulations for the utilization of works program highway funds. Under this plan the state enters into a binding agreement with the Secretary of Agriculture to take from the relief rolls and give employment to its full quota of individuals determined by dividing the allotment to the state for works program highway projects by the allowable expenditure of $1,400 per man year of employment.

The total allotment from works program funds to the State is $3,026,161 for highways, roads and streets. Under the accepted plan all contracts financed with regular federal-aid funds, will carry provisions requiring a certain percentage of the total direct employment on the project to be given to persons from the public relief rolls. The employment of all such individuals to be for a period of one year, or the equivalent thereof in man hours of employment on highway work under the direct supervision of the state highway department.

Program for California Water Works and Sewage Conventions

THE arrangements for the 16th annual convention of the California Section of the American Water Works Association, to be held at San Diego, October 23-26, have been completed and the official program of papers has been announced. The technical papers to be presented at the meeting follow.

"The Colorado River Aqueduct," by Prof. Franklin Thomas, Professor of Civil Engineering, California Institute of Technology.

"The California State Water Plan," by Edward Hyatt, State Engineer.

"The Effect of Recent Court Decisions on Water Rights," by T. B. Cosgrove, Attorney, Los Angeles.

"Back Siphoning and Cross Connections," by G. E. Arnold, Water Purification Engineer, San Francisco Water Department.

"The San Diego Water Supply," by Fred D. Pyle, Hydraulic Engineer, San Diego.

"Design of Distribution Systems to Meet Requirements of Board of Fire Underwriters," by Robert E. Andrews, Chief Engineer of the National Board of Fire Underwriters.

"New Method of Earth Dam Design and Construction," by W. W. Wyckoff and R. R. Proctor, Engineers, Los Angeles Water Department.

"Practical Problems in Water Distribution," by E. W. Breitkreutz, Engineer of the Los Angeles Water Department.

The Purification Division Program

"Treatment of the Colorado River Water," by D. M. Forrester, U. S. Bureau of Reclamation, Boulder City, Nevada.

"Municipal Water Softening," by Eskel Nordell, Permutit Company, New York.

"Purification of City Water Supply of Vallejo," by William Wentworth.

"New Method of Application of Copper Sulphate to Reservoirs," by R. F. Goudey, Sanitary Engineer, Los Angeles City Water Department.

"Plankton Control of Morris Reservoir," by C. W. Sopp, Pasadena Water Department.

"Activated Carbon Plant at Culver City," by C. P. Harnish, American States Water Service Co., Los Angeles.

The headquarters for the convention will be at the Hotel San Diego. Officers of the California Section of the A.W.W.A. are: H. A. Van Norman, chairman; R. F. Brown, vice-chairman and J. E. Phillips, secretary-treasurer. Other members of the executive committee are: J. R. Barker, H. S. Kittredge, J. S. Longwell, J. S. Peters and P. D. Rice.

Announcement has been made for the national meeting of the American Water Works Association which will be held in Los Angeles, June 8 to 12, 1936. This is the national convention of the parent organization to be held in California for the first time since the meeting in San Francisco in 1928. Headquarters for the convention will be at the Biltmore Hotel and 15,000 sq. ft. of exhibit space and 600 rooms have been reserved for this meeting.

●

Sewage Works Association

The eighth annual convention of the California Sewage Works Association will be held Sept. 23 and 24. The sessions on the first day will be at Palo Alto and on the second day there will be a joint session with the engineers and street superintendents of the League of Municipalities which is holding its annual meeting in San Francisco at the same time. The program for the meetin follows:

Monday: Inspection of Palo Alto sewage disposal plant, general assembly and reports of committees at Community Center Building.

"The Palo Alto Sewage Treatment Plant" by H. O. Banks, former plant operator. Luncheon at Community Center Building.

Afternoon: Caravan to San Mateo, Burlingame, San Francisco Jail, and Golden Gate Park sewage disposal plants. Dinner at San Francisco (St. Francis Yacht Club). Address by Harold Pomeroy, mayor of South Gate, and assistant director of relief administration for Los Angeles County.

Tuesday: Joint session with the Engineers and Street Superintendents Section of the League of Municipalities at San Francisco. Papers and discussions: "The San Francisco Sanitation Problem" by John J. Casey, City Engineer of San Francisco. "Sewer Pipe Disintegration at Long Beach and Remedial Measures Contemplated" by J. W. B. Blackman, City Engineer-Director of Public Service, Long Beach. "Importance of Industrial Wastes with Respect to the Domestic Sewage Load at Stockton" by William T. Ingram, San Joaquin County Health Department.

Informal luncheon.

Afternoon: Papers, discussions and business meeting.

Symposium on gas engines operated with digested sludge gas:

"Six Months' Experience with a Two hundred Horsepower Engine" by Carl F. Tennant, chief operator, Los Angeles County Sanitation Districts.

"Eastern Experience with Gas Engines" by Samuel A. Greeley, Greeley & Hansen, Chicago, Illinois.

"Adaption of Gas Engines to Use of Sludge Gas Fuel" by A. K. Hegeman, Sales Engineer, Smith - Booth - Usher Company.

"Ontario's Experience with Gas Engine" by Austin Burt, City Engineer, Ontario.

Discussion by H. O. Banks.

Discussion of sewage plants by operators:

W. V. Skinner, Escondido.
William Berg, San Bernardino.
Fred West, Stockton.
Trustee Ford, Shastina Sanitary District.
J. B. Ledford, Cloverdale.
A. B. Shearer, Marin County Sanitary Dist. No. 1.

$20,000,000 Allocated for California Water Program

ON July 23 the Federal Works Allotment Board made available $20,000,000 to start work on the California state water development program, commonly referred to as the Central Valley Water Project. The work will be under the supervision of the Bureau of Reclamation. The ultimate development is estimated to cost about $170,000,000 and the present financing will be used to begin work on several major features.

Engineers of the Bureau of Reclamation were scheduled to begin work during August on plans, preparatory to starting construction operations. Among the first work to be done will be a review of all of the plans and data which have been accumulated during the past decade by the office of Edward Hyatt, state engineer. These investigations include a complete study of the physical, economic, and financial factors involved in this state wide program of water conservation and development. They include definite engineering plans for dams, conduits, and pumping plants which are designed to accomplish three major objectives:

1—Store flood waters on the upper Sacramento River with accompanying power development,

2—Provide additional flow down the Sacramento River during the summer season with the accompanying aid to navigation and relief of salt water invasion into the rich agricultural region of the delta.

3—Relieve the acute water shortage in the upper San Joaquin Valley by additional storage, conduits, and by the pumping of surplus Sacramento River water into the lower section of the San Joaquin Valley.

Mr. Hyatt returned to Sacramento July 28 after having spent many months in Washington in the interest of securing Federal financing for this program. He intimated that construction work might be underway in the fall. First construction operations probably will be in excavating the site for the Kennett Dam, provided the Bureau approves of this dam as a unit in the final plan.

●

Denver to Vote on Bonds for Additional Water Supply Work

A special election will be held in Denver on September 10 to vote on a bond issue of $2,700,000 to finance the cost for bringing the water, which will flow through the Moffat tunnel, directly into the city. Application has been made to the PWA for a grant of 45% the cost of this work. At the same election the tax payers will vote on $1,000,000 in bonds for material and equipment for use on work relief projects.

Letters to the Editor . . . . .

Improvements in Pedestrian Subway Design

Sir—

Relative to the article in your July issue, which I prepared on the design of pedestrian subways in Los Angeles, I should like to add the following supplementary data.

There has been one recent modification of some importance made in the design, as described in that article. This is on the method of removing storm water from the subways. Owing to the objections by the city water department to the use of eductors actuated by water power through connections to the city water supply mains, the use of such eductors has been abandoned and automatic, electric bilge pumps adopted as standard, except for the few rare cases where drainage by gravity to a gutter can be obtained.

In the future a 1-6 h.p. motor will be used to drive a pump, with control through a float to provide automatic operation. This installation will be placed in a concrete chamber at the side of the subway. This chamber will be 2 ft. by 20 in. in section and will be provided with a 2-ft. square door in the wall of the subway, through which the pump assembly can be installed and serviced. The opening will be closed by a bronze door with a concealed lock. A 1-in. outlet pipe of copper will discharge into the gutter above.

ROBERT H. BACON,

Division of Bridge and Structural Design.

Los Angeles, Calif.
Aug. 21, 1935.

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Additions to the Highway Questionnaire

Sir—

I have examined the catechism of the works relief highway program which appeared in your issue of August, pages 224-225. Comments, suggestions and additions are indicated as follows:

16. Q—The answer is incomplete in the sense that on alternate projects the number of man-hours of work may be stated, provided they do not exceed 33 1-3 per cent of a reasonable estimate of the total man-hours required for the job. On alternate projects the per cent of relief labor, not to exceed 50 per cent, may be required by the specifications, in which case the man-hours will not be used.

29. Q—The answer should be supplemented by the statement that the alternate requirement of 40 per cent of the total cost applicable to direct labor shall no longer include the property cost.

If there occur additional points I shall be glad to advise you.

L. I. HEWES,

Deputy Chief Engineer Bureau of Public Roads.

San Francisco, Calif.
August 20, 1935.

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Received and noted—with thanks

Sir—

Congratulations on the improved appearance of *Western Construction News*. We are particularly impressed with the sharpness and clearness of the press work and your rather wide use of photographs. We like, too, the way you are heading up your shorter news items and the method of running your new equipment section.

May the good work go on.

GEO. C. MCNUTT

Advertising Sales Promotion, R. G. LeTourneau, Inc.

Peoria, Ill.
Aug. 22, 1935.

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Food for the Engineer

The following extract is from an actual letter received recently by a San Francisco engineer and presents a wife's opinion of her husband, who was also an engineer.

". . . . . Occasionally he wanders in in something of a daze and takes a little nourishment here, but he doesn't stay long. There is a far away look in his eye and he is on edge until he gets back to his crew. This crew is a strange, motley looking polygot thing that only comes up for air at rare intervals. They live mostly on large helping of data, served with thick tabulations, and garnished with hard-boiled graphs and a few sour miscalculations on the side. This they consume with the mechanical aid of sharp sliderules of unbelievable keenness, using calculators for forks, or pushers, as the case may be.

"Then they wash it all down with a snappy concoction squeezed out of a lemon they call depreciation, and a final swig of their most powerful drink they call conclusions. This is a very potent beverage and has a terrible wallop, but appears to be tremendously pleasing. For dessert they sit back with their little hammers and diligently whack away at a collection of hard nuts, and judging from the smell of the whole thing there also must be plenty of cheese about.

"This dessert course is particularly bad for . . . . ., for he seems not to be able to digest it until long into the night, with an accompanyment of night-mares, groans and what have you. And such, dear . . . . ., is the kind of an engineer and/or husband your little brother has turned out to be. There are moments when I think he seems to recognize me, so it must be that he is still human. Sorry he will not be here when you arrive so that you can look him over for yourself,—but I'm telling you."

WIFE OF AN ENGINEER

Nevada to License Engineers

REVIVING an engineers licensing law passed in 1919, and dormant since that time, the state of Nevada has appointed a board to carry out provisions of the act and steps have been taken to begin registration. The 1919 law provided for the appointment of a board, and failure to appoint this board until the present time resulted in the law being inactive for 16 years. The law requires the registration of anyone practicing professional engineering which is defined as: "The practice of professional engineering involves the control of forces of nature and the utilization of material and these forces for the benefit of man." Under the usual "grandfather" regulation, practicing engineers, who are competent in the opinion of the board, can be registered prior to October 1 and thereafter an examination will be required for registration in the state of Nevada.

According to the law the board has its principal office in Reno and is empowered to formulate rules for examinations and the granting of certificates. Written examinations for applicants must be held every 6 mos. according to the law. The application fee is not to exceed $15.00 and the annual renewal charge is $2.50.

The law provides that "All persons who have been actively engaged in the profession of engineering for six years, or who have a diploma from some recognized college or university and have had 4 years active practice in engineering and who have in either case been 2 years in charge of important engineers work as principal or assistant, shall not require an examination, if application is made in writing within 6 months after passage of the act."

The act applies to all professional engineers in any branch of the science but does not refer specifically to engineers in public office. The board appointed by the governor consists of five, of whom the civil engineering members are George Malone, former state engineer, chairman; and A. R. Thompson, assistant state PWA engineer, secretary. Other members of the board are in other branches of engineering. The board has organized and is issuing applications of registration. Requests for information should be addressed to the secretary, A. R. Thompson, assistant state PWA Engineer, Reno, Nevada.

Personally Speaking . . . .

R. G. McGlone, former chief for the Long Beach harbor development, has been placed in charge of one of the divisions of the work which the Corps of Engineers is carrying out for the Los Angeles County Flood Control District. Major McGlone's headquarters will be at Pasadena and he will be in charge of the work to be done on the Rubio, Alhambra and Eaton washes.

●

George B. Herrington, consulting engineer of Portland, Oregon, has been appointed regional labor advisor of the resettlement administration, with headquarters in Portland. Mr. Herrington was for many years manager of the Portland Chapter, Associated General Contractors, and more recently was connected with the formation of the NRA code for the sand, gravel, and rock industries, for which he served as arbitrator for more than a year.

●

Capt. Hans Kramer, Corps of Engineers, is in charge of preliminary work which has been started on the Conchas Dam to be built on the South Canadian River, near Tucumcari, N. Mex. About 4,000 men are expected to be employed on this $12,000,000 project by November.

●

J. D. Ross, manager of the Seattle Municipal Light Department, has been appointed chief consulting engineer for the power division of the Public Works Administration, according to an announcement by Administrator Harold I. Ickes on August 12.

●

Major Charles F. Williams, district engineer of the U. S. Engineers Office, Portland, District No. 2, which includes the Bonneville project, has recently been promoted to the rank of lieutenant-colonel.

●

F. Edgar Mineer has taken a position with the Nevada Highway Commission and will be engaged in securing information on the feeder roads which are to be constructed under the works-relief program.

●

Joseph B. Strauss and **Clifford E. Paine** have formed a corporation known as Strauss & Paine, Inc., and will carry on their practice as consulting bridge engineers under that name with offices at 111 Sutter St., San Francisco and 176 W. Adams St., Chicago.

●

Morris S. Jones has been appointed chief engineer and general manager of the Pasadena (Calif.) Water Department. Mr. Jones had been assistant chief engineer of the department under Samuel B. Morris, who resigned to become executive head of the department of civil engineering at Stanford University.

P. L. Crooks, well known contractor of Portland and past president of the Portland Chapter, A.G.C., has been selected as the official nominee for position of national vice-president of Zone 8 for the Associated General Contractors of America. Zone 8 includes the states of Idaho, Montana, Washington, and Oregon. The office of vice-president from this zone is now occupied by J. C. Compton, also a past president of the Portland Chapter.

●

B. C. Bellamy, civil engineer of Laramie, Wyo., has been appointed engineer examiner for various public works projects in that state by Administrator Ickes.

●

Richard B. Ward has been named resident engineer for the Cajalco dam now being started by the Metropolitan Water, as the terminal unit of the Colorado River Aqueduct. Mr. Ward has been with the distcrict for the past four years and his former experience included work with Bureau of Reclamation, the government railroad in Alaska, and the Los Angeles County Sanitation Districts.

E. W. Lane, research engineer of the Bureau of Reclamation at its Denver headquarters, and for the past six years in charge of the hydraulic studies made by this organization, has left the bureau to become professor of hydraulic engineering at the University of Iowa. Mr. Lane was the author of numerous technical papers on the flow of water and has been a contributor to *Western Construction News.*

●

Arthur Taylor of Taylor & Taylor consulting engineers, Los Angeles, has been appointed the representative of Beverly Hills on the board of directors. of the Metropolitan Water District succeeding George E. Barker. recently resigned. Mr. Taylor has been in charge of the water department at Beverly Hills for the past twelve years as advisory manager and consulting engineer.

●

B. F. Modglin, San Francisco contractor, has been appointed a director of the Northern California Chapter, Associated General Contractors, to fill the unexpired term of the late N. B. Ball.

Obituaries . . . .

Oscar Van Pelt Stout, widely known irrigation and reclamation engineer of Berkeley, Calif., died in a Denver hospital on August 5, following an emergency operation. He was 70 years old. At the time of his death he had been working for several months on a special assignment for the Bureau of Reclamation, studying power and irrigation possibilities along the Platte River. Born in Illinois in 1865, Mr. Stout was educated at the University of Nebraska and after several years of professional work returned as a member of the faculty of that institution. He subsequently became head of the civil engineering department of the university and later was made dean. Following service in the War, in which he received a commission as major, he entered into private practice. Major Stout came to California in 1922 and worked for many years with the Division of Agricultural Engineering, Department of Agriculture, and in 1932 was awarded the first Cyrus Hall McCormick medal for "exceptional and meritorious engineering achievement in agriculture." He was a member of the American Society of Civil Engineers.

●

Osmar Lysander Waller, irrigation consultant and for 42 years a member of the civil engineering faculty of Washington State College, died at his home in Pullman, Wash., on August 3 at the age of 77. He was born at Lykens, Ohio, and attended Hillsdale College in Michigan, graduating in 1883. Several advanced degrees were conferred on Dr. Waller, including a D.Sc. in 1931 from his alma mater and an L.L.D. degree in 1929 from Washington State College. In 1893 he joined the faculty of Washington State College as professor of mathematics and civil engineering, rising to the office of vice-president of the college in 1909. He held this position until 1930 when he was appointed vice-president emeritus because of poor health. Dr. Waller began his association with the Bureau of Reclamation in 1900 when he made studies of several irrigation projects. He was consulting engineer on construction work for the South Side Land & Water Company at Twin Falls, Idaho, during the years 1907 and 1912. During 1924 and 1925 he was secretary of the Columbia Basin Commission and consulting engineer for the Department of Interior, and he made several of the early reports on the feasibility of the reclamation project which now has started with construction of the Grand Coulee dam. Dr. Waller was author of many bulletins on irrigation practice and irrigation law and he was also chairman of the commission in 1910 that recommended important changes in Washington State water laws. He was a member of the Am. Soc. C.E. and Society for Promotion of Engineering Education.

Manufacturer and Distributor News . . . .

Portland Machinery Dealers Hold Annual Golf Frolic

The annual meeting and golf frolic of the Portland Machinery Dealers Association, held at Columbia Country Club on August 23, was featured by the election of officers and presentation of prizes to golfers and gifts to outgoing officers. Newly elected officers include: D. I. Cooper, president; Donald Feenaughty, vice-president; and Charles P. Cramer, secretary-treasurer.

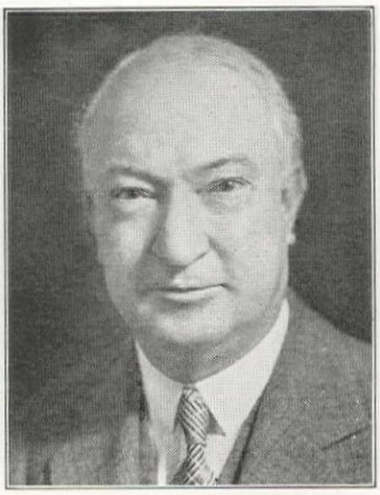
Several prizes, including the ribbon and plaque for the float entered in the recent Portland Rose Festival and an appropriately inscribed small-sized chamber representing the northwest machinery men's golf championship which was won from the Seattle group last fall, were presented to the Association. For his well balanced and effective work as local code administrator, a pencil set was presented to W. O. Feenaughty. To Oscar B. Bjorge, retiring president, was presented a siphon bottle, and a desk set was given to A. Freeman Sersanous, past secretary-treasurer.

During the meeting, members pledged their share of the $2000 deficit of the Code Authority which remains after the code was abandoned following the recent ruling of the Supreme Court that the N.R.A. was unconstitutional. D. I. Cooper made the suggestion that members investigate the possibility of offering a minimum interest rate of 6 % rather than 8% for long term paper due to the lower interest rates now being offered by banking interests.

The lion's share of golf prizes was won by Oscar B. Bjorge, general manager of Clyde Equipment Co., for his low net score (handicap furnished only by special request) including a cocktail set offered by the Portland Journal of Commerce and a trophy from Pacific Builder & Engineer for his firm. A leather bag, donated by Western Construction News, for the average low net score was won by W. Euster of Clyde Equipment Co. A prize of several golf balls was won by Roy Nelson, sales manager of Howard-Cooper Corp. for his low gross score. Twenty-eight members and guests attended the dinner and business meeting.

Charles P. Cramer

Donald Feenaughty



D. I. Cooper

Inertol Company Opens Southern Office

The Inertol Company, Inc., manufacturers of waterproofing and protective compounds, for concrete and steel, have opened a Southern California office in Los Angeles. Their new location is 1340 E. Sixth Street.

Gravelite Patent Cleared

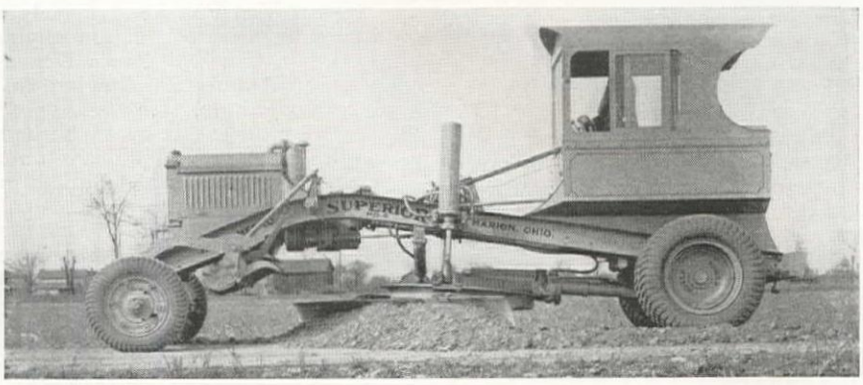
Patent infringement suits against the California Toll Bridge Authority, Gravelite, Inc., and certain contractors engaged on the transbay bridge, filed in the Federal Court here last March, have been dismissed by the plaintiffs, the American Aggregate Company of Kansas City, Mo., and the McNear Company of San Rafael.

The suit alleged infringement of patent claims of the Aggregate Company covering material used on the floors of the Bay bridge. The defendant denied the allegations of the original suit and recently the plaintiffs filed voluntary dismissals of the action.

The Gravelite Company manufactures a light weight aggregate which measures up to all the requirements for use in Portland cement concrete, while at the same time effecting a saving of one-third in the weight of the concrete. The material itself weighs only half as much as ordinary sand and gravel.

In the case of the San Francisco-Oakland Bay Bridge where it is being used for paving the upper deck, it is effecting a saving of over 40 million pounds in dead weight, according to a recent statement of Charles H. Purcell.

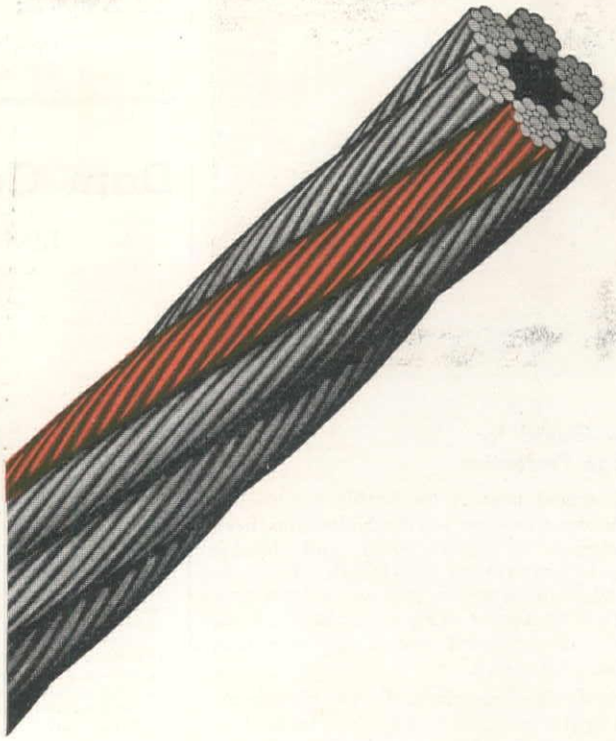
New Materials and Equipment . . . .



New Huber Motor Grader

A motor grader in which new features of design are incorporated is announced by the Huber Manufacturing Company of Marion, Ohio. Instead of being the conventional design with tractor mounted in the rear and with draw bars attached to front of frame as in a drawn grader, the new Huber "Superior No. 4" model has the engine mounted towards the front of frame, the power being transmitted to rear axle assembly through a shaft, similar to the method employed in heavy truck construction. Instead of drawing the blade by drawbars attached to front of frame the blade is pushed, bulldozer style, by a heavy tube attached direct to rear axle housing. The maker claims this design gives a balanced grader with more traction and less liability to side slip. It also leaves the entire wheel base available for proper positioning of the blade and provides flexibility. The blade may be used in any position, right or left, from straight across to horizontal with frame and it will ditch on either right or left side without changing position of blade on the hangers. It has a side shift of 36" and a blade clearance of about 18" when fully raised.

Other features are: heavy duty six cylinder engine; folding scarifier. When the scarifier is raised it automatically folds up completely out of the way of all grader operations; dual steering—hand and power steering instantly interchangeable; differential lock—pressure on foot pedal locks differential to make it inoperative when necessary; direct con-



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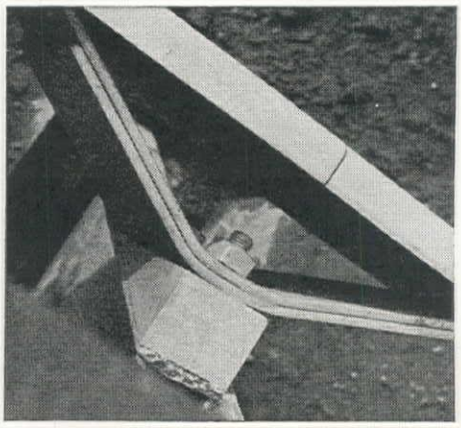

New Guard for Bridge Protection

A guard that is applicable to use on bridges as well as on roadsides, has been developed by Rex Road and Bridge Guard Company of Pittsburgh. The new guard is designed to provide utmost protection to motor cars, regardless of the angle or at what speed the car may strike the guard.

Its design has given the guard unusual strength for the amount of metal it contains, and provides exceptional resilience, under shock or stress. This type of highway guard lends itself to easy replacement of damaged sections and is readily accessible for painting and maintenance.

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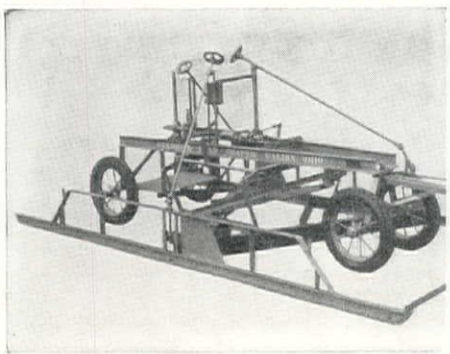
Gledhill Road Shaper

The Gledhill road shaper is a medium-weight machine which is a balanced load for a 1½-ton truck at speeds up to 35 miles per hour—and it operates most efficiently at the higher speeds.

This shaper levels traffic-bound and similar adjustable surfaces effectively. The two blades being set at opposing angles eliminates side draft. The straight-edges one on each side, keep blades true and even so that roads are shaped to a true level—bumps planed off and ruts and hollows filled, leaving a firm even surface.

A four-wheeled chassis with pneumatic tires, hydraulic lift and Timken Tapered Roller Bearings, helps to carry the mechanism and keeps it in accurate adjustment.

Low draft, rapid accurate work and very low operation cost are advantages offered by the Gledhill Road Shaper.



UNIT BID SUMMARY . . . .

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

Dam Construction

LOS ANGELES, CALIF.—CAJALCO DAM AND DIKE

Contract awarded to Griffith Co., L. A. Railway Bldg., Los Angeles, $4,646,857 by Metropolitan Water District, 306 W. 3rd St., L. A., for construction of the Cajalco Dam and dike and appurtenant features of the Cajalco storage reservoir, located about 10 mi. southwest from the city of Riverside, RIVERSIDE COUNTY, under Spec. No. 112. Bids from:

(1) Griffith Co., Los Angeles.....$4,646,856
(2) L. E. Dixon, Bent Bros. & Johnson 4,742,320
(3) Columbia Constr. Co., Oakland.... 4,769,986
(4) Macco Constr. Co., Emsco Derrick & Equip. Co. and Broderick & Gordon 4,837,977
(5) Walsh Constr. and Guy F. Atkinson $4,883,253
(6) W. E. Callahan Construction Co., Los Angeles 5,499,673

Bids received on the following schedules and items of work:

SCHEDULE NO. 1. Construction of the diversion tunnel and appurtenant works. Tunnel length 2,000 ft., diameter 9 ft.

	(1)	(2)	(3)	(4)	(5)	(6)
27,500 cu. yd. exc.	$1.50	$1.50	$ .78	$1.78	$1.50	$1.00
9,000 cu. yd. exc. tunnel	10.50	11.57	9.00	11.16	10.00	6.00
50 cu. yd. exc. tun. enlg.	10.00	11.57	11.00	12.66	12.00	20.00
30 tons erect. stl. sup.	45.00	35.00	42.00	40.00	40.00	100.00
50 M ft. B.M. perm. timb.	75.00	48.00	78.00	60.00	70.00	98.00
50 cu. yd. gunite coating	22.00	20.00	15.00	13.33	25.00	30.00
2,100 lin. ft. drill. and dr. holes	.70	.60	1.00	.67	.50	1.70
2,000 lb. install grout and dr. pipes	.12	.10	.10	.20	.15	.26
200 cu. yd. pressure grouting	23.00	25.00	24.00	26.66	25.00	36.00
350,000 lb. pl. reinfcem. steel	.018	.01	.014	.01	.015	.02
4,400 cu. yd. concr. in tunnel	10.00	8.00	10.00	11.00	11.00	11.00
1,500 ton mi. hauling steel	.22	.20	.18	.06	.10	.25
10,000 ton. mi. hauling cement	.14	.07	.12	.06	.06	.10
TOTALS	$200,790	$196,568½	$166,730	$214,618½	$198,550	$159,965

SCHEDULE NO. 2. Construction of the outlet tunnel and appurtenant works. Tunnel length, 2,565 ft., diameter 14 ft. Lining, steel cylinder with concr. backing and inner lining of gunite.

22,000 cu. yd. excavation	1.50	1.50	.78	.78	1.40	.76
24,000 cu. yd. exc. in tunnel	6.00	8.54	6.00	6.33	8.00	6.00
100 cu. yd. exc. for tunn. enlarg.	8.00	10.00	9.50	12.65	12.00	20.00
75 tons erect stl. support	40.00	45.00	42.00	40.00	40.00	100.00
80 M ft. B.M. furn. and pl. timber	70.00	48.00	78.00	60.00	70.00	98.00
75 cu. yd. gunite coat. of rock	21.00	20.00	15.00	13.33	25.00	30.00
3,000 lin. ft. drill. grout holes	.70	.60	1.00	.67	.50	1.70
2,000 lb. install. grout pipes	.10	.10	.10	.20	.15	.26
150 cu. yd. pressure grouting	23.00	25.00	24.00	26.66	25.00	36.00
1,540 lin. ft. furn. and install. ¼" plate stl. cylinders	38.00	30.00	38.50	40.40	33.00	43.50
115 lin. ft. same, 5/16"	45.00	40.00	50.00	53.72	44.00	53.50
270 lin. ft. same, ⅜"	54.00	50.00	60.00	64.00	53.00	64.00
640 lin. ft. same, 7/16"	61.00	55.00	72.00	74.39	60.00	74.50
5,000 lb. pl. reinforcement steel	.018	.01	.018	.01	.015	.02
7,600 cu. yd. concr. in tunnel	6.50	6.00	7.75	7.42	8.00	8.15
2,565 lin. ft. gunite lining, stl. cyl.	11.00	18.00	9.25	9.33	14.00	18.00
400 ton mi. hauling steel	.22	.20	.18	.06	.10	.25
15,000 ton mi. hauling cement	.14	.07	.12	.06	.06	.10
TOTALS	$390,933	$445,875	$391,333¼	$400,134.60	$446,340	$439,242½

SCHEDULE NO. 3. Construction of dam and spillway and appurtenant works.

Lump sum, rem. Holmes Lower Dam	$4500	$2500	$3000	$16,000	$5000	$7000
50,000 cu. ft. stripping, pits	.30	.15	.21	.13	.20	.30
575,000 cu. yd. exc. for dam found.	.26	.22	.41	.52	.51	.33
25,000 cu. yd. exc. for dam found.	.88	2.00	1.20	1.20	1.50	1.10
2,000 cu. yd. exc. for dam cut-off wall	1.25	2.00	2.10	1.33	2.00	2.00
2,000 cu. yd. exc. for dam cut-off	1.75	6.00	4.75	8.00	6.00	4.00
90,000 cu. yd. exc. for spillway	.25	.40	.38	.225	.40	.55
30,000 cu. yd. exc. for same, rock	.70	1.50	1.10	.73	1.60	1.20
3,000 cu. yd. exc. for cut-off walls	1.25	2.25	2.10	.53	1.00	2.00
2,000 cu. yd. exc. for cut-off walls	2.50	6.00	4.75	5.33	6.00	4.00
8,000 cu. yd. exc. for dam toe trench	1.00	.75	1.00	.67	.75	1.35
10,000 cu. yd. backfill above cut-off	.50	.50	.42	.67	.30	.80
400,000 cu. yd. earthfill in embankment	.06	.05	.17	.20	.04	.15
3,000,000 cu. yd. earthfill in embankment	.37	.39	.384	.351	.40	.45
2,400,000 yd. rolling material	.0025	.0025	.0025	.0025	.0025	.0025
40,000 cu. yd. rock blanket on dam	.30	.30	.42	.33	.50	.34
10,000 cu. yd. rock blanket, fr. quarries	.70	1.15	1.20	1.33	.90	1.05
3,300 cu. yd. embankment crest surf.	.53	.70	1.20	.40	.60	1.05
210 lin. ft. constr. 6" tile drains	.30	.50	.72	.47	.35	1.00
8,000 lin. ft. constr. 8" same	.75	.50	.90	.60	.40	1.05
3,000 lin. ft. drill grout holes	1.00	.50	1.10	2.00	2.50	1.85
4,500 lin. ft. same, 30 to 60 ft.	4.25	3.50	1.80	3.67	2.50	3.85
2,800 lin. ft. same, 60 to 100 ft.	4.25	3.50	3.00	4.67	2.75	3.85
2,400 lin. ft. same, 100 to 150 ft.	4.25	3.50	4.20	5.00	3.00	3.85
2,000 lin. ft. same, 150 to 200 ft.	4.25	3.50	5.10	5.33	3.50	3.85
60,000 lb. install grout pipes	.15	.07	.07	.10	.08	.16
270 cu. yd. pressure grouting	28.00	25.00	24.00	18.00	40.00	36.00
9,000 cu. yd. concr. in cut-off walls	5.20	5.00	6.25	5.77	5.00	7.00
16,000 cu. yd. concr. pav. on dam	4.50	6.75	6.00	6.10	6.00	8.35
2,050 cu. yd. concr. in spillw.	4.50	6.75	9.50	10.00	8.00	12.30
700 cu. yd. concr. in parapet wall	8.50	15.50	15.50	9.36	10.00	15.75
100 cu. yd. concr. in struct.	16.00	20.00	21.50	33.33	15.00	33.00
100 cu. yd. concr. in diversion	9.00	10.00	15.50	26.67	6.00	8.50
1,510 lin. ft. constr. supports	1.70	1.75	1.75	2.13	2.00	1.90
75,000 lb. install 24 in. sluice pipe	.02	.03	.025	.04	.025	.025
10,000 lb. install valves, C. I. P.	.07	.05	.05	.026	.04	.07
600 lb. install. handrailings	.20	.10	.12	.067	.20	.25
18,000 lb. install misc. metal work	.02	.05	.06	.10	.05	.15
1,510 lin. ft. install elec. cond.	.40	.20	.24	.27	.20	.30
Lump sum, install elec. conductors	300.00	150.00	175.00	250.00	100.00	1,000.00
2,850,000 lb. pl. reinf. streel in pav.	.006	.01	.01	.007	.006	.015
150,000 lb. pl. reinforcem. stl. in struc.	.01	.01	.02	.02	.01	.025
12,000 ton. mi. hauling steel	.22	.20	.18	.06	.10	.16
50,000 ton mi. hauling cement	.14	.07	.12	.06	.06	.10
TOTALS	$1,669,213	$1,815,957	$1,937,663	$1,895,675.90	$1,978,270	$2,191,797

Continued on Next Page

"Two-In-One" Interchangeable Breaker and Sheeting Driver

A powerful, easy-running breaker for heavy demolition and kindred work, is one of the most recent developments of the Worthington Pump and Machinery Corporation, Harrison, New Jersey. The Worthington No. 10 Master Breaker is convertible also into a useful sheet piling driver called the Worthington No. 10 SD Master Sheeting Driver.

It is useful for the heaviest classes of concrete breaking, general demolition work, crushed rock tamping, ripping up pavements, loosening hardpan, and in its converted form for driving sheet piling.

Easily manipulated by the workman, the blows struck by this tool are hard, slow, and effective. Besides, all of the old-time fatigue-creating recoil being eliminated the operator is not worn down and produces more work per day, the makers state. Conversion to a sheeting driver tool is simple and quickly performed. The sheeting driver head can be swung around to its best working position by removing the head bolts.

If desired, either the breaker or the sheeting driver may be purchased as a separate unit. The net weight of the breaker is 82 lbs.; length over all without tools, 29 in. The net weight of the sheeting driver is 120¼ lbs.; length over all 28¾ in. The steps of the sheeting driver are adjustable and removable. The standard head is for 2 in. sheeting but, when specified, heads are furnished for 2½ in. and 3 in. sheeting. Cheek plates make it possible to drive any of the three sizes.

●

New Type Backfill Scraper

The Newo Hoist Co., 17309 Fernway Rd., Cleveland, Ohio, has just announced a new type scraper board. It is claimed the construction is heavier and more rigid than the conventional type backfill scraper board. This board will dig hard material, due to the fact that the cutting edge strikes the material first and there are no side bars or braces to keep the cutting edge from entering the material.

There are no parts on this scraper board to catch on obstructions such as trees and telephone poles. Quick change is made possible by the use of rope sockets. Built in widths of three to twelve feet to fit all makes of cranes.

SCHEDULE No. 4. Construction of dike and appurtenant works						
25,000 cu. yd. stripping for borrow	.30	.15	.21	.13	.20	.35
30,000 cu. yd. stripping for dike	.27	.15	.21	.16	.25	.36
10,000 cu. yd. exc. for dike found	.90	.75	1.10	1.00	1.00	1.30
20,000 cu. yd. exc. for dike cut-off	.35	2.40	.90	.67	.50	1.60
4,000 cu.yd. exc. for dike, rock	2.00	6.00	4.00	8.00	5.00	4.00
5,000 cu. yd. exc. for toe trench	1.25	.50	.60	.67	.67	1.10
13,000 cu. yd. backfill above cut off	.50	.50	.42	.33	.30	.80
4,000,000 cu. yd. earthfill in embankm.	.445	.39	.384	.41	.39	.43
90,000 cu. yd. earth blanket	.32	.20	.30	.27	.30	.42
10,000 cu. yd. earth blanket, borrow	.45	.39	.43	.37	.35	.53
53,000 cu. yd. rock in toe trench	.35	.50	.12	.53	.40	.33
10,000 cu. yd. same, from quarries	.75	1.15	1.25	1.33	.90	1.20
6,200 cu. yd. embankm. crest surf	.60	.70	1.20	.40	.60	.70
15,000 lin. ft. constr. 8 in. tile drain	.75	.50	.90	.60	.40	1.05
12,000 cu. yd. concr. in cut-off wall	5.00	5.00	6.50	5.75	8.00	6.85
36,000 cu. yd. concr. pav. on dike	5.00	6.00	6.00	6.10	6.00	7.65
2,400 cu. yd. concr. in parapet wall	8.50	10.00	15.50	9.36	10.00	15.75
200 cu. yd. concr. in struc.	17.00	20.00	21.50	33.33	15.00	33.00
5,000 lb. install miscell. metal wk.	.04	.05	.10	.09	.05	.15
6,100,000 lb. pl. reinf. steel	.005	.01	.01	.007	.006	.015
375,000 lb. pl. reinf. stl. struc.	.01	.01	.015	.02	.01	.025
17,000 ton. mi. hauling steel	.22	.20	.18	.06	.10	.16
70,000 ton mi. hauling cement	.14	.07	.12	.06	.06	.10
TOTALS	$2,222,460	$2,110,590	$2,090,995	$2,170,440	$2,080,120	$2,428,595
SCHEDULE NO. 5. Construction of the outlet tower, approach channel and bridge supports.						
148,000 cu. yd. exc. for tower	.70	.80	.72	.63	.90	.95
2,500 cu. yd. exc. for tower below	2.00	1.50	2.20	2.00	2.00	4.00
1,050 cu. yd. backfill about struc.	.60	.50	.60	.33	.40	.80
2,100 cu. yd. conc. in outlet tower	5.00	6.00	6.50	5.00	5.50	9.15
1,010 cu. yd. concr. outlet tower	20.00	20.00	28.00	23.00	12.00	23.60
544,000 lb. install metal work	.025	.02	.035	.026	.02	.04
6,400 lb. install high pressure pipe	.10	.25	.12	.067	.15	.25
450 lin. ft. install. elec. conduit	.45	.40	.24	.26	.20	.26
Lump sum, install elec. cond. and apparatus	300.	150.00	125.00	1,000.00	1,000.00	660.00
425,000 lb. pl. reinf. steel	.018	.01	018	.02	.01	.025
2,500 ton. mi. hauling steel	.22	.20	.18	.06	.10	.16
4,200 ton. mi. hauling cement	.14	.07	.12	.06	.06	.10
TOTALS	$163,460½	$173,329	$183,265	$156,908	$179,972	$230,073

Tunnel Construction

LOS ANGELES, CALIF.—SIERRA MADRE & PASADENA TUNNELS

Contract awarded to J. F. Shea, Inc., Mecca, $256,442. on SCHED. 1, L. E. Dixon, Bent Bros., and Johnson, Inc., $204,475. on SCHED. 2, by Metropolitan Water District, Los Angeles, for construction of concrete lined tunnels and precast concrete pipeline and apuurtenant works of the Colorado River Aqueduct distribution system, between Sta. 2289-00 and 2951-50, 3061-00 and 3117-14 of the Upper Feeder, under Spec. 110, in LOS ANGELES COUNTY, and principally within the cities of Sierra Madre and Pasadena. Complete bids follow:

SCHEDULE NO. 1. Construction of 6050 ft. of tunnel and 400 ft. of cast-in-place pipe betw. Upper Feeder Stations 2887-00 and 2951-50 in Sierra Madre. Bids from:

(1) J. F. Shea, Inc., Mecca.....$256,442.
(2) L. E. Dixon, Bent Br. & Johnson. 292,915.
(3) Morrison-Knudsen Co., L.A..... 311,058.
(4) S. S. Magoffin, Pasadena.....$337,510.
(5) Artukovich Bros. Hynes..... 372,853.

	(1)	(2)	(3)	(4)	(5)
30,000 cu. yd. excav. in tunnel	5.00	5.70	5.40	6.90	7.50
50 cu. yd. excav. tunnel enlargement	7.00	6.00	10.00	8.00	10.00
5,500 cu. yd. excav. for pipe	.35	.85	1.00	2.00	1.50
3,700 cu. yd. backfill for pipe	.17	.50	.50	.60	.50
250 tons steel support	23.00	20.00	37.00	40.00	35.00
250 M. ft. BM timbers	34.50	35.00	75.00	50.00	70.00
100 cu. yd. gunite coating	16.00	1.00	14.00	20.00	10.00
10,050 cu. yd. concrete in tunnel	5.92	7.00	8.00	6.00	6.93
685 cu. yd. concrete in pipe	9.20	9.00	10.50	8.00	9.25
15 cu. yd. concrete in structures	11.50	25.00	15.00	20.00	30.00
2,100,000 lb. reinforcing steel	.009	.01	.01	.011	.014
250,000 lb. reinf. steel in pipe	.009	.01	.01	.01	.014
6,000 lb. misc. metal	.06	.05	.05	.10	.10
300 ton mi. haul steel	.14	1.00	.30	.20	.10
500 ton mi. haul cement	.08	.50	.20	.10	.08

SCHEDULE No. 2. Construction of 5504 ft. of tunnel and 100 ft. of cast-in-place pipe, betw. Upper Feeder Stations 3061-00 and 3117-14, principally in Pasadena. Bids from:

(1) L. E. Dixon, Bent Br. & Johnson..$204,475.
(2) J. F. Shea, Inc., Mecca..... 234,574.
(3) Morrison-Knudsen Co., L.A..... 291,425.
(4) Artukovich Bros., Hynes.....$291,890.
(5) S. S. Magoffin, Pasadena..... 310,470.

	(1)	(2)	(3)	(4)	(5)
28,000 cu. yd. excav. in tunnel	4.00	4.83	5.50	6.30	6.90
50 cu. yd. excav. for tunnel enlargement	6.00	7.00	10.00	10.00	8.00
1,600 cu. yd. excav. for pipe	.50	.35	1.50	2.37	2.00
1,100 cu. yd. backfill for pipe	.40	.17	.50	.47	.60
225 tons steel support	20.00	23.00	37.00	30.00	40.00
225 tons M. ft. BM timbers	35.00	34.50	75.00	65.00	50.00
100 cu. yd. gunite coating	1.00	16.00	14.00	10.00	20.00
9,150 cu. yd. concrete in tunnel	5.00	5.92	8.10	6.02	6.00
172 cu. yd. concrete in pipe	10.00	9.20	11.00	9.17	8.00
5 cu. yd. concr. in struc. reinf.	25.00	13.00	20.00	40.00	30.00
10 cu. yd. concr. in struc. plain	8.00	11.50	15.00	30.00	20.00
2,900,000 lb. steel in tunnel	.01	.009	.01	.01	.011
62,000 lb. steel in pipe	.01	.009	.01	.014	.01
1,000 lb. steel in structures	.02	.009	.02	.02	.02
6,500 lb. install misc. metal	.05	.06	.05	.10	.10
2,600 ton mi. haul steel	.15	.14	.20	.10	.20
4,000 ton mi. haul cement	.10	.08	.15	.08	.10

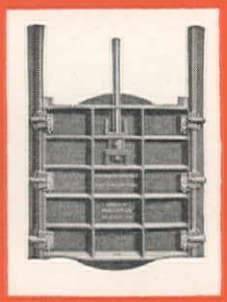
River and Harbor Work

PORTLAND, ORE.—GOVT.—CHANNEL EXCAVATION—COLUMBIA RIVER

Contract awarded to Siems-Helmers, Inc., 1014 Guardian Building, St. Paul, Minnesota, $346,520. by U. S. Engineer Office, Portland, Ore., for channel improvement in Columbia River, Oregon and Washington, from Celilo Falls to Wallula, under Spec. No. 694-36-35. Bids from:

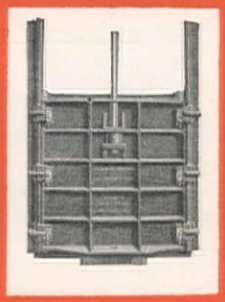
(1) Siems-Helmers, Inc., St. Paul.....$346,520.
(2) General Const. Co., Seattle..... 347,350.
(3) Brookfield Co., Astoria, and F. J. Kernan, Faloma ..... 358,550.
(4) Puget Sound Bridge and Dredging Co., Seattle.....$362,000.
(5) Engineers estimate ..... 331,925.

	(1)	(2)	(3)	(4)	(5)
31,000 cu. yd. rock excavation	9.20	8.85	9.80	10.50	9.00
73,000 cu. yd. gravel excavation	.84	1.00	.75	.50	.725



Circular sluice gates built with either rising or non-rising stem; rectangular slide; adjustable wedges; a complete size range up to 96 in.

A bay of the new Columbian machine shop at Chattanooga where the finest facilities are available for building water control equipment.



Rectangular sluice gates with rising or non-rising stem; rectangular slide; adjustable wedges; range of sizes up to 96x96 in.

Your assurance of

"THROUGH THE YEARS" DEPENDABILITY

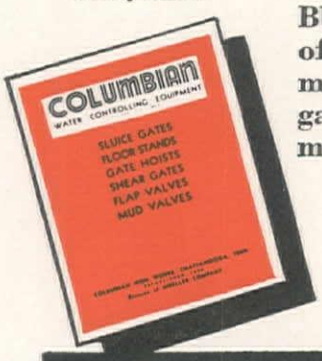
in Water Control Equipment

THE control equipment that goes into the sewage disposal, pumping or filtration plant of today may be called upon for unfailing service a half century hence . . . that's why the sluice gate or the lowly flap valve means something more than mere cast iron to the Columbian and Mueller organizations.

For a combined total of more than 100 years these two names have been associated with products of superior dependability . . . and in maintaining these traditions, improvement in product and manufacturing facilities have kept pace with the years.

Today, at Chattanooga, an entirely new shop has been equipped with every possible facility for building sewerage and filtration plant equipment, as well as fire hydrants and gate valves of the most modern design and to the highest standards of precision manufacturing . . . your assurance of dependability through the years.

Enclosed crank operated geared floor stands; also hand wheel as well as power operated types.



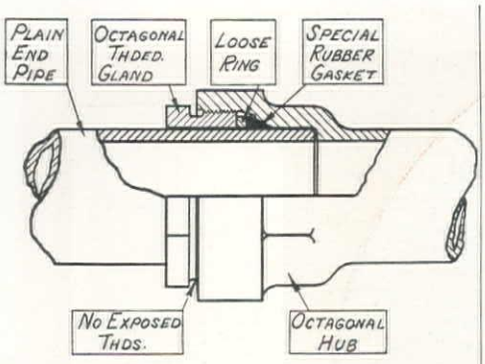
BULLETIN S-1 describes the complete line of Columbian water controlling equipment, covering sluice gates, floor stands, gate hoists, shear gates, flap valves and mud valves. ***Write for your copy.***

Upper view shows drain (mud) valve built with flat frame or spigot frame and for floor boxes or floor stands. Lower view shows bronze mounted flap valve. Mud and flap valves in sizes up to 24 inches.

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

COLUMBIAN

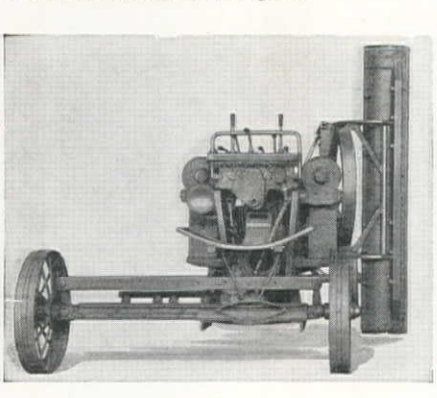
WATER CONTROLLING EQUIPMENT



Hi-Test Cast Iron Pipe

A new "Hi-Test" Cast Iron Pipe, developed for water and gas lines, has recently been announced by the Walworth Company, 6 East 42nd Street, New York, N. Y. The new pipe is suitable for water working pressures of 175 lb. per square inch. It is regularly furnished in sizes 1¼" to 6" inclusive, in 20-ft. lengths, with threaded joints for rapid assembly above ground, and can also be supplied in 5, 10 and 15-ft. lengths. Expansion joints, easily made up with open end wrenches after sections as long as 80 to 100 ft. have been lowered into the trench, provide for axial and to some extent for lateral movement, and assure a bottle-tight joint under the service conditions for which the pipe has been designed.

Cast iron used in the "Hi-Test" pipe has an ultimate tensile strength of 35,000 lb. per sq. in. Minimum bursting pressures for the threaded pipe range from 7,000 lb. per sq. in. for the 1¼" diameter size to 1,500 lb. per sq. in. for the 6 in. size. A bulletin giving complete specifications is available on request.



Four New Leaning Wheel Graders

Concurrent with the observance of their fiftieth anniversary, J. D. Adams Company of Indianapolis, Indiana, announces four new-type leaning wheel graders. The design is along modern lines featuring simplicity, strength, rigidity, and a wider range of blade working positions without mechanical adjustments.

The most apparent feature is a new all-welded, box-type frame made of heavy ship channels welded their entire length. The new frame, it is claimed, is much more rigid and stronger against

Irrigation and Reclamation

FAIRFIELD, MONTANA—GOVT.—EARTHWORK & CANAL LINING

Martin Wunderlich Co., 219 E. High St., Jefferson City, Mo., $211,085. low to Bureau of Reclamation, Fairfield, Mont., for constructing earthwork and canal lining for the Pishkun Canal and the Sun River Slope Canal, Greenfields Division, Sun River project, Montana, under Spec. No. 637. Bids from:

		Sched. 1	Sched. 2	Sch. 1 & 2
(1)	Martin Wunderlich, Jefferson City, Mo.	$ 77,600.	$133,485.	$211,085.
(2)	Morrison-Knudsen Co., Boise, Idaho	95,925.	151,106.	247,031.
(3)	J. A. Terteling & Sons, Boise, Idaho	138,950.	173,380.	312,330.
(4)	Winston Bros. Co., Minneapolis, Minnesota	149,150.	198,096.	347,246.
(5)	T. G. Rowland, Salt Lake City, Utah	141,900.	236,665.	378,565.
(6)	Tomlinson Arkwright Const. Co., Gr. Falls		165,266.	
(7)	Barnard Curtiss Co., Minneapolis, Minn.		166,154.	

	SCHEDULE NO. 1							
435,000	cu. yd. com. exc. for canal	.14	.175	.27	.29	.25		
15,000	cu. yd. rock exc. for canal	.60	.60	.80	.70	1.25		
130,000	sta. yd. overhaul	.02	.03	.02	.03	.04		
10,000	cu. yd. exc. & place matl.	.25	.30	.30	.47	.40		
130,000	sta. yd. haul matl.	.02	.03	.03	.03	.04		
	SCHEDULE NO. 2							
360,000	cu. yd. com. excav. canal	.14	.175	.26	.26	.30	.24	.175
5,000	cu. yd. rock excav. canal	.60	.60	.80	.70	1.25	.24	1.75
138,700	cu. yd. com. exc. canal alignm.	.15	.18	.10	.22	.30	.24	.185
65,200	cu. yd. rock exc. (canal align.)	.60	.60	.70	.70	.90	.24	.65
10,000	sta. yd. overhaul	.02	.03	.03	.03	.04	.08	.04
800	cu. yd. rem. defect. conc.	1.00	1.75	1.50	6.00	3.00	4.00	2.50
800	cu. yd. exc. (walls)	1.00	1.50	1.00	1.25	1.00	1.00	1.60
750	cu. yd. backf. (walls)	.80	.50	.60	.75	.50	1.00	1.10
800	cu. yd. concr. in canal lining	15.00	12.00	10.00	15.00	14.00	20.00	17.40
250	cu. yd. concr. in parapet walls	18.00	22.50	12.00	18.00	23.60	22.00	20.00
84,000	lb. reinforcing steel (place)	.015	.03	.03	.02	.0125	.02	.035

STIPULATIONS: Morrison-Knudsen Co. will accept both schedules or none; J. A. Terteling & Sons, will accept 1 sched. only; Winston Bros., will accept both schedules or none; T. G. Rowland will accept 1 sched. only.

DENVER, COLO.—CITY—INTAKE WORKS—FRASER RIVER CONDUIT

Hamilton & Gleasan Co., 505 Tramway Building, Denver, Colo., $165,980. low to Board of Water Commissioners, Denver, Colo., for constructing the intake works at the Fraser River Dam, the intake works and dams at Jim Creek and Buck Creek; the reinf. concr. spillways, transitions and stilling basin, for the Fraser River, Jim Creek and Ranch Creek conduits; the intake transitions, spillway and siphon at the shaft; the unlined and lined canals for the Fraser River Gin Creek and Ranch Creek conduits, of the Fraser River Collection Conduit. Bids from:

(1)	Hamilton & Gleason Co.	$165,980.	(3)	Utah-Bechtel-Morrison Kaiser Co.	$315,421.
(2)	Peter Seerie, Denver	194,188.	(4)	Engineers estimate	140,520.

		(1)	(2)	(3)	(4)
180,000	cu. yd. comm. excav. (canals)	.28	.37	.92	.20
33,000	cu. yd. rock excav. (canals)	1.00	.85	.92	1.00
4,560	cu. yd. comm. dry excav. (struct.)	1.00	.85	3.00	1.25
540	cu. yd. comm. wet excav. (struct.)	2.50	9.00	5.00	3.00
780	cu. yd. dry rock excav. (struct.)	1.50	1.50	3.00	3.00
70	cu. yd. wet rock excav. (struct.)	4.00	9.00	6.00	5.00
845	cu. yd. earthf. (Jim & Buck Cr. Dams)	1.00	1.25	1.75	.40
1,010	cu. yd. rolled earth backfill	1.50	1.00	1.50	.40
203	cu. yd. concrete (Jim Creek Dam)	17.50	20.20	32.00	14.00
719	cu. yd. concrete (intake struc. etc.)	18.50	24.90	27.00	16.00
291	cu. yd. concrete (piers & anchor piers)	19.00	23.70	21.00	14.00
441	cu. yd. concrete (canal lining, etc.)	15.00	17.90	19.00	14.00
176	lin. ft. precast concr. pipe	15.00	15.00	20.00	11.50
780	sq. yd. stone riprap	1.00	4.00	1.50	3.00
295	sq. yd. cobblestone paving	1.00	3.00	2.00	2.00
95,250	lb. reinforcing steel	.0525	.06	.06	.055
93	lin. ft. copper expansion joints	.60	1.00	1.00	1.00
296,350	lb. steel pipe	.096	.099	.11	.07
10,200	lb. taintor gates and trashracks	.13	.12	125	.07
	Lump sum sluice gates and gate valves, etc.	1500.00	1350.00	1630.00	1835.00
	Lump sum creos. timb. & rubber belt. water seals	75.00	100.00	55.00	100.00
152	lin. ft. pipe railing	2.50	3.00	3.50	2.50
210	cu. ft. yd. excav. & backf. (Fraser River Dam)	4.00	9.00	7.00	1.50

Railroad Construction

GLASGOW, MONTANA—GOVT.—RAILWAYS & TRESTLE—FORT PECK DAM

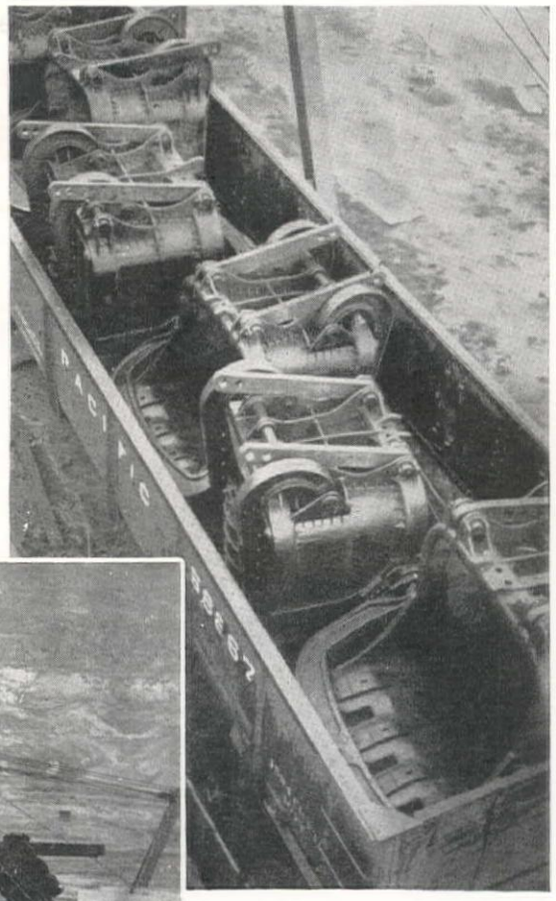
Contract awarded to Morrison-Knudsen Co., 319 Broadway, Boise, Idaho, $198,672 by U. S. Engineer ce, Postal Telegraph Bldg., Kansas City, Mo., for constructing standard gauge railways and trestles, spillway to dam, and other appurtenant work, at the site of the Fort Peck Dam. Bids from:

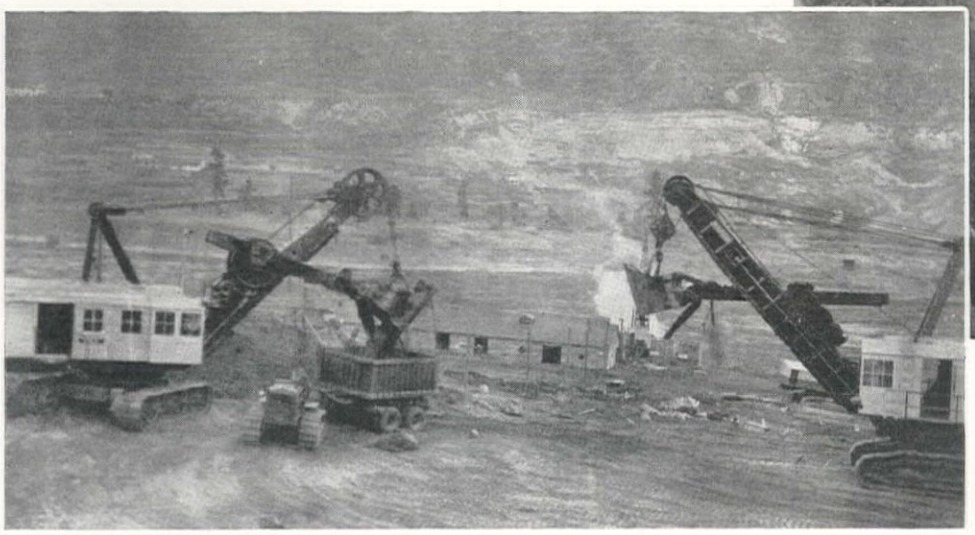
(1)	Morrison-Knudsen Co., Boise	$198,672	(5)	David H. Ryan, San Diego	$252,813
(2)	Siems-Spokane Co., Spokane	222,691	(6)	Spillway Builders, Inc., Kansas City	262,140
(3)	Foley Bros. & Wunderlich Co.	227,341	(7)	S. J. Groves & Sons, Minneapolis	298,470
(4)	A. Guthrie & Co., & M. C. Walker & Son	247,103	(8)	Engineers Estimate	229,472

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
370,000	cu. yd. roadw. exc.	.22	.28	.28	.26	.34	.28	.39	.30
226,500	sta. yd. overhaul	.02	.01	.01	.01	.01	.01	.02	.02
40	lin. ft. 12 in. CMP.	1.60	1.50	1.53	1.60	1.50	2.00	2.00	2.00
140	lin. ft. 18 in. CMP.	2.30	2.10	2.12	2.30	2.00	2.50	2.75	2.25
890	lin. ft. 21 in. CMP.	2.60	2.55	2.38	2.65	2.50	3.00	3.50	2.50
870	lin. ft. 24 in. CMP.	4.00	2.90	2.66	3.00	3.00	4.00	4.00	2.80
520	lin. ft. 30 in. CMP.	5.00	4.55	4.30	4.75	4.00	5.50	6.00	4.00
960	lin. ft. 36 in. CMP.	6.00	5.40	5.16	5.80	5.00	6.50	9.00	5.25
10,800	cy. plc. grav. ballast.	.60	.48	.60	1.40	1.10	.90	1.20	.75
15,500	ea. cross ties	1.05	1.08	1.44	1.55	1.10	2.00	1.50	1.25
31.3	MFBM switch ties	32.00	80.00	42.50	30.00	30.00	70.00	50.00	45.00
27,30	track ft. lay track	.25	.27	.25	.30	.30	.19	.20	.30
9	ea. turnouts (No. 9)	100.00	110.00	125.00	175.00	110.00	160.00	500.00	82.00
6,590	cy. plac. grav. (subdr)	.70	.50	1.00	1.25	1.50	.70	.70	.80
20,500	l. ft. untr. piling	.68	.45	.66	.85	.75	.75	.75	.60
555	MFBM untr. timber	65.00	80.00	64.90	76.50	65.00	97.00	80.00	57.50
85	MFBM trestle ties	55.00	80.00	64.90	68.00	50.00	65.00	80.00	52.50
1,958	trk. ft. lay tres. trk.	.50	.15	.25	.50	.45	.50	.15	.40
2	ea. trestle turnouts	100.00	110.00	125.00	200.00	150.00	200.00	350.00	105.00
23,700	lb. struc. steel	.08	.075	.063	.08	.06	.10	.08	.06
72,600	lb. hardware	.055	.05	.08	.074	.06	.10	.08	.07
100	cy. trestle excav.	1.50	2.00	1.30	1.00	1.00	1.00	2.00	1.00
L.S.	remodel trestle deck	200.00	1,500.00	1,590	2,750.00	1,000.00	600.00	3,000.00	2,411.00

On the way to Coulee Dam

No shovel is any better than the dipper on the front end of it.





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twisting stresses than previous Adams frames and affords valuable operating advantages. From the front end of the frame to a point well back of the blade circle (where it spreads to connect to the rear axle) the frame is only 7 in. wide. This permits absolute freedom in the rotation and throw of the blade lift arms and lift links so that the blade can be swung through an arc of more than 90 degrees from ditching position to perpendicular, as illustrated, without any adjustment of the lift links. The narrow frame and simplicity of the grader affords the operator extra visibility so that he can always see the full length of the blade and observe the work being done.

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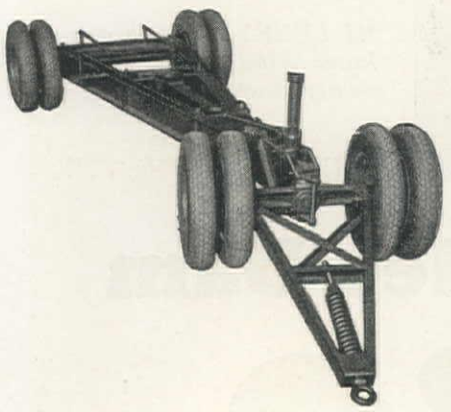


Trailer for Bucyrus-Erie Shovel

A new 10-B trailer for carrying their 10-B excavator from job to job—over long, or short, distances speedily—is now being offered by Bucyrus-Erie Company to its 10-B shovel owners.

This simple, convenient trailer, with front-axle steering, dual-pneumatic tires, front and rear, rear-wheel brakes, and an effective loading system, gives speed and safety in 10-B transportation. In most states it meets required highway regulations.

Only four simple steps are necessary in loading. First, the trailer front axle is disconnected. Second, the shovel moves into place over the rear assembly under its own power. Third, the trailer is reassembled, and the frame raised into position with the built-in screw jack. Fourth, the machine is fastened by clamping the excavator axles to the trailer frame. The traction belts are suspended outside the trailer frame, with

Street and Road Work

SAN FRANCISCO, CALIF.—GOVT.—GRADING—LOS ANGELES COUNTY

Award recommended to Guy F. Atkinson Co., Russ Bldg., San Francisco, $228,471, by Bureau of Public Roads, San Francisco, for 4.103 miles grading Sections "A" and "B" of Rt. 61, the Angeles Crest National Forest Highway, Angeles National Forest, LOS ANGELES COUNTY, Calif. Bids from:

(1) Guy F. Atkinson Co., S. F. $228,471
(2) Granfield, Farrar & Carlin, S. F. 240,187
(3) Bayshore Const. Co., S. F. 253,263
(4) Healy Tibbitts Const. Co., S. F. 268,173
(5) Basich Bros., Torrance 269,291
(6) Geo. J. Bock, Los Angeles 271,612
(7) Peninsula Paving Co., S. F. 274,396
(8) Lewis Const. Co., L. A. 277,565
(9) C. G. Willis & Sons and Chas. G. Willis and Sander Pearson, L. A. 282,408
(10) Frank C. Cuffe, San Rafael 282,803
(11) Fredrickson & Watson, Fredrickson Bros. and Jones & King $286,311
(12) Isbell Const. Co., Reno 299,837
(13) Ralph A. Bell, Los Angeles 307,026
(14) Sharp & Fellows Contr. Co., L. A. 314,736
(15) Mittry Bros. Const. Co., L. A. 331,197
(16) Gibbons & Reed, Burbank 361,494
(17) Daley Corp., San Diego 399,482
(18) Gunther & Shirley, L. A. 430,441
(19) R. E. Campbell, Los Angeles 443,601
(20) Engineer's estimate 273,360

		(1)	(2)	(3)	(4)	(5)	(6)	7)
(A)	54 acres clearing $150.00	$100.00	$100.00	$75.00	$275.00	$250.00	$225.00	
(B)	644,000 cu. yd. uncl. excavation	.30	.32	.348	.36	.34	.36	.356
(C)	2,700 cu. yd. uncl. excav. (struc.)	1.30	1.50	1.50	1.50	1.75	1.50	1.50
(D)	744,000 sta. yd. overhaul	.005	.005	.0035	.005	.01	.001	.01
(E)	4.103 mi. finish earthgraded road	500.00	400.00	211.20	600.00	50.00	250.00	325.00
(F)	212 lin. ft. 8" corr. metal pipe..	1.00	.95	.73	1.25	1.25	1.00	1.10
(G)	90 lin. ft. 12" corr. metal pipe..	1.25	1.25	.94	1.60	1.50	1.10	1.40
(H)	3,406 lin. ft. 24" corr. metal pipe	2.25	2.40	2.00	3.00	3.50	2.75	2.75
(I)	174 lin. ft. 30" corr. metal pipe	2.75	3.00	2.53	4.00	5.00	3.50	3.50
(J)	154 lin. ft. 36" corr. metal pipe	4.00	4.60	4.00	5.50	6.00	5.00	5.50
(K)	5 ea. 24" cor. met. pipe elbows	20.00	25.00	16.32	22.00	15.00	15.00	20.00
(L)	1 ea. 30" cor. met. pipe elbow	25.00	25.00	18.87	25.00	18.00	18.00	25.00
(M)	1 ea. 36" cor. met. pipe elbow	30.00	30.00	26.65	30.00	25.00	25.00	35.00
(N)	3 ea. Type "A" spillw. inlets	10.00	20.00	11.76	25.00	25.00	15.00	20.00
(O)	2 ea. Type "B" spillw. inlets	20.00	25.00	19.41	30.00	30.00	22.00	30.00
(P)	2 ea. Type "C" spillw. inlets	20.00	30.00	20.53	35.00	25.00	25.00	35.00
(Q)	438 ft. rem. and stockp. or relay C.M.P.	.50	1.00	.87	1.00	.50	.75	.50
(R)	38 cu. yd. "A" concrete	25.00	30.00	25.00	35.50	30.00	30.00	27.00
(S)	1,600 lb. reinforcing steel	.06	.06	.05	.10	.06	.10	.06
(T)	15 ea. steel grates	18.00	35.00	10.00	30.00	20.00	35.00	20.00
(U)	43 ea. culvert markers	2.50	3.00	1.50	5.00	1.25	2.00	2.00
(V)	L.S. erosion control (culvert outlets)	$1300	$1300	$1300	$1300	$1300	$1300	$1300
(W)	L.S. fill slope erosion control	$5000	$5000	$5000	$5000	$5000	$5000	$5000
(X)	L.S. tree protection	$600	$600	$600	$600	$600	$600	$600

	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(A)	$200.00	$90.00	$250.00	$150.00	$100.00	$180.00	$270.00	$225.00	$330.00	$300.00	$200.00	$600.00	$200.00
(B)	.36	.385	.37	.38	.40	.41	.415	.43	.47	.54	.60	.59	.36
(C)	1.50	1.50	1.25	1.25	1.50	1.50	1.50	2.50	2.50	2.00	1.50	1.50	1.50
(D)	.01	.005	.008	.01	.015	.01	.01	.01	.015	.01	.01	.005	.0075
(E)	500.00	500.00	300.00	400.00	500.00	500.00	600.00	575.00	500.00	500.00	300.00	600.00	400.00
(F)	1.00	1.00	1.15	1.00	1.25	1.60	1.00	1.50	.85	1.00	1.00	1.50	1.00
(G)	1.50	1.25	1.50	1.50	1.50	1.75	1.25	2.00	1.40	1.15	1.50	2.00	1.40
(H)	2.80	2.50	2.75	2.75	2.40	2.50	2.40	3.50	2.80	2.75	2.75	2.75	2.50
(I)	3.50	3.50	3.70	4.10	3.60	4.00	3.25	4.50	3.60	3.30	3.75	4.20	3.25
(J)	5.00	5.50	5.70	5.50	5.25	6.00	4.75	7.50	5.80	5.15	4.75	5.50	5.00
(K)	10.00	18.00	18.40	18.00	20.00	15.00	6.00	20.00	20.00	20.00	20.00	25.00	14.00
(L)	10.00	22.00	21.20	22.00	23.00	18.00	8.50	30.00	22.00	25.00	28.00	30.00	18.00
(M)	10.00	30.00	30.00	26.00	30.00	25.00	10.00	36.00	30.00	30.00	35.00	35.00	24.00
(N)	20.00	12.00	15.00	15.00	15.00	12.00	15.00	15.00	15.00	20.00	15.00	15.00	15.00
(O)	20.00	20.00	25.00	25.00	30.00	20.00	20.00	30.00	25.00	25.00	25.00	25.00	25.00
(P)	20.00	22.00	20.00	30.00	24.00	22.00	25.00	33.00	27.00	30.00	30.00	30.00	20.00
(Q)	3.00	1.50	1.00	.70	1.00	1.00	.70	4.50	.75	1.00	1.00	1.50	1.00
(R)	30.00	32.00	26.00	40.00	35.00	30.00	35.00	35.00	35.00	35.00	32.00	30.00	30.00
(S)	.08	.10	.06	.07	.07	.10	.06	.065	.07	.10	.09	.06	.08
(T)	20.00	20.00	20.00	36.00	22.00	20.00	15.00	30.00	38.00	20.00	20.00	20.00	20.00
(U)	3.00	2.00	2.50	2.50	3.50	2.50	2.50	3.00	3.00	3.00	2.50	3.00	2.50
(V)	1300.00	1300.00	1300.00	1300.00	1300.00	1300.00	1300.00	1300.00	1300.00	1300.00	1300.00	1300.00	1300.00
(W)	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00	5000.00
(X)	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00

BOISE, IDAHO—STATE—BITUM. CRUSHED ROCK—BENEWAH COUNTY

Contract awarded to Triangle Const. Co., 1220 Ide Street, Spokane, Wn., and Warren Northwest, Inc., P. O. Box 5072, Portland, Oregon, $189,616 by Commissioner of Public Works, Boise, Idaho, for 17.870 miles const. plant mix. bitum. material and cr. rock shoulders on Heyburn Park Highway betw. Plummer and St. Maries in BENEWAH CO. (FAP 143-ABCD) Idaho. Bids from:

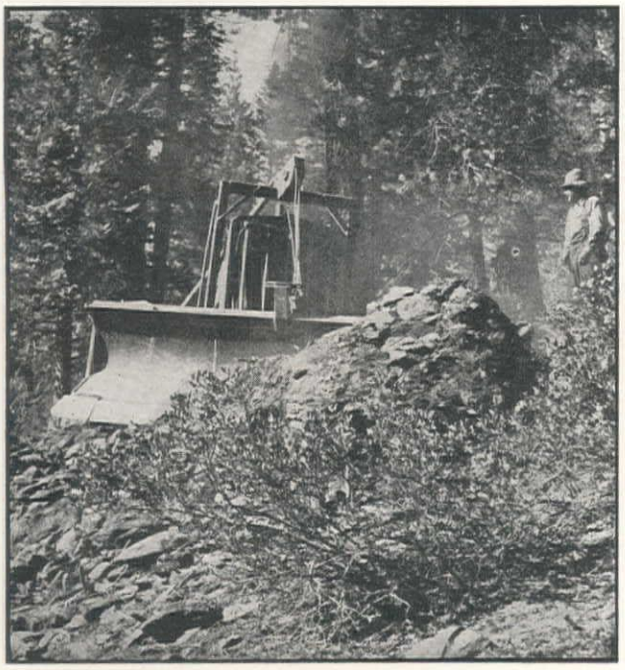
(1) Triangle Const. Co., Spokane, and Warren Northwest, Inc. ..... $189,616.
(2) Woodward Const. Co., Rock Spr. ... 193,860.
(3) Morrison-Knudsen Co., Boise ..... 198,736.
(4) Utah Const. Co., Ogden ..... 199,075.
(5) Olof Nelson, Logan, Utah ..... $207,964.
(6) Nolan Bros., Minneapolis ..... 222,525.
(7) S. Birch & Sons Const. Co. ..... 231,667.
(8) Gibbons & Reed, S.L.C. ..... 238,702.
(9) Engineers estimate ..... 183,669.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
4,100 cu. yd. exc. for subbase	.30	.56	.30	.35	.30	.60	1.00	1.90	.25
400 sta. yd. overhaul	.05	.05	.10	.02	.10	.03	.04	.04	.04
2,000 cu. yd. mi. haul on exc.	.20	.20	.25	.25	.20	.25	.20	.15	.18
1,887.5 sta. remove shoulders	3.00	3.00	2.50	3.00	4.00	3.50	5.00	3.00	2.25
1,870 cu. yd. salv. surfacing	.50	.50	.25	.70	.30	.50	.80	1.00	.40
6,700 tons cr. rock subbase	.89	.945	1.25	.75	1.50	.97	1.20	1.30	.90
58,600 tons cr. rock surfacing	.94	1.00	1.10	1.10	1.30	1.43	1.25	1.30	1.00
1,000 cu. yd. binder (subbase)	.30	.25	.35	.25	.20	.25	.30	.47	.50
8,850 cu. yd. binder (surfacing)	.30	.25	.30	.25	.30	.25	.30	.47	.25
22,400 mi. yd. haul on binder	.14	.15	.12	.20	.15	.20	.20	.12	.18
780 M. gallons water	1.50	2.50	2.25	2.00	2.00	2.00	2.00	2.00	2.00
35 days rolling	15.00	22.00	20.00	22.50	20.00	25.00	25.00	25.00	15.00
194 tons liq. asph. MC 1 (pr.)	27.30	25.36	27.50	25.80	24.00	29.20	24.60	30.00	26.00
1,336 tons liq. aph. MC 3	23.30	23.00	25.00	25.30	23.50	25.45	24.60	29.00	24.00
205 tons liq. asph. MC 3 (sl.)	25.80	25.20	27.50	25.30	24.00	29.20	27.00	29.00	25.00
32,300 tons pl. mix bitum. mtl.	2.04	1.94	1.90	1.93	1.70	1.89	2.30	2.37	1.75
2,540 tons cover ct. material	1.95	3.00	2.00	2.00	3.00	2.23	3.00	2.00	2.00

SAN FRANCISCO, CALIF.—GOVT.—BITUM. SURFACE—TULARE COUNTY

Award recommended to Fredrickson & Watson & Fredrickson Bros., 873 81st Ave., Oakland and Jones & King, Hayward, Calif., $144,792. by Bureau of Public Roads, San Francisco, for 13.323 miles bitum. tr. crushed rock base course on Sections D3 and D4 of Rt. 1, the Generals Highway, Sequoia Natl. Park and on Section A, General Grant-Sequoia Park Approach Road, Sequoia Natl. Forest, TULARE COUNTY, Calif. Bids from:

(1) Fredrickson & Watson & Fredrickson Bros. & Jones & King ..... $144,792.
(2) Basich Bros., Torrance ..... 156,456.
(3) Heafey Moore, Oakland ..... $178,746.
(4) Engineers estimate ..... $164,538.



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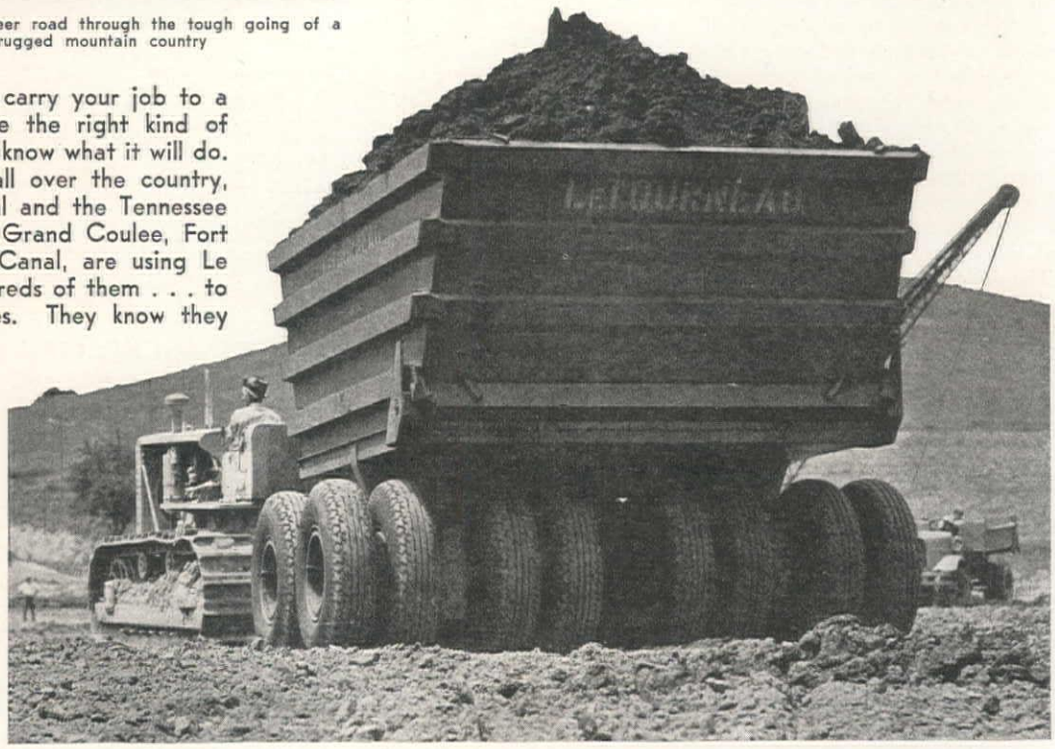
AFTER THE AWARD What ?

IF YOU are going to carry your job to a profit, you must have the right kind of equipment . . . You must know what it will do. That's why contractors all over the country, from the Delaware Canal and the Tennessee Valley Authority to the Grand Coulee, Fort Peck, the All-American Canal, are using Le Tourneau units . . . hundreds of them . . . to move enormous yardages. They know they can whip destructive costs and produce new profits with Le Tourneau equipment. Work that stumps ordinary tools is completed with a new and surprising ease. Many phases of work heretofore thought impossible with tractor drawn equipment are whipped into shape and beaten . . . costs cut . . . profits made.

Here are tools for every part of the job. Rooters for stumps, boulders, tough digging; Angledozers for pioneering, spreading, clearing; Sheep's Foot Rollers meeting the most exacting compaction demands; Scrapers for cut and fill work, grading, finishing, land leveling; Buggies for the bulk moving of dirt and rock, with capacities of 18 and 24 yard water level. All contractor designed and job proved to do more work . . . faster and cheaper.

Let us show you the way to bigger profits. Ask our engineering department to help you with your dirt and rock problems.



Thirty loose yards rolling over a new fill on one of the several dam jobs in Ohio where Le Tourneau equipment is now working

R. G. Le TOURNEAU, Inc.

STOCKTON, CALIFORNIA PEORIA, ILLINOIS

Northwest Office

703 S. E. 28TH AVE. PORTLAND, OREGON

Manufacturers of: Angledozers, Bulldozers, Buggies, Carryall Scrapers, Derricks, Rooters, Sheep's Foot Rollers, Power Control Units.

LE TOURNEAU

In writing to R. G. LeTOURNEAU, INC., *please mention Western Construction News.*

ample clearance—10 inches—above the ground.

Overall height of the 10-B shovel mounted on the trailer is only 10'8", and the weight on each axle of the trailer is 10,300 pounds. The loaded trailer can be turned around in a fifty-foot street without backing.

●

New Expansion Bolt for Concrete

A revolutionary method of securely tying new concrete to old in highway widening, repairing and resurfacing has been developed by J. Warren Isett, President of the American Expansion Bolt & Manufacturing Co., 108-128 North Jefferson Street, Chicago.

This method, patent No. 1,957,596, consists of drilling a series of holes approximately four and one-half inches deep into the old concrete sections. Into these holes are placed ⅝" or ¾" expansion anchors with 180 degree or 90 degree bend. The usual length of these anchors is 11 inches; longer or shorter are furnished if desired.

Rods, mesh or mats—whichever are being used—are attached to these anchors over which the new concrete is then poured. Thus, these American expansion anchors form a permanent and substantial mechanical bond between the new and the old forms.

The holes into which the anchors are to be placed can be drilled four and one-half inches deep at the average rate of one a minute!

Tests conducted by Robert W. Hunt Co. show that these anchors have a holding power of 8,500 pounds each. According to the manufacturer, the cost of this method represents a saving of 80 per cent over the underpinning method. (Accompanying diagram shows comparison).

These anchors eliminate digging under and weakening of the edge of the old concrete and prevents sag or separation between new and old concrete.

●

Preliminary Work Started On Taylor Park Dam in Colorado

Work is progressing rapidly on preliminary construction operations for the Taylor Park Dam in western Colorado. Actual construction on the earth and rock fill structure will not be started for several weeks but the Utah-Bechtel-Morrison-Knudsen-Kaiser organization has about completed the 1,100-ft. diversion tunnel. In addition, hydraulicing operations are under way, stripping loose material from the canyon walls at the site. More than 160 men are at work on the project which is to store additional water for the Uncomphagre reclamation development. Contract was awarded on a bid of $798,078.

		(1)	(2)	(3)	(4)
8,300	cy. yd. excavation	.50	.50	.75	.80
1,400	cu. yd. excav. structures	3.00	1.00	3.00	2.00
10,000	cu. yd. mi. haul excav.	.20	.12	.20	.15
13.323	mi. fine grading	450.00	400.00	550.00	300.00
1,600	M. gal. watering	2.00	1.00	3.00	2.00
25,800	tons cr. rock (bottom layer)	1.75	2.00	2.11	2.10
21,200	tons cr. rock (top layer)	1.85	2.50	2.48	2.35
800	tons suppl. crushed rock	2.00	2.50	2.25	2.15
167	tons liq. asphalt SC-1A	14.00	13.81	30.00	20.00
1,010	tons liq. asphalt MC-4 or 5	24.00	20.92	25.00	25.00
60	tons liq. asphalt RC-1	26.00	24.96	35.00	25.00
5,478	ft. perf. corr. pipe underdr.	1.20	1.00	1.30	1.10
1,200	cu. yd. cr. rock or gravel (backfill)	3.00	4.00	3.50	3.00
1,220	sq. yd. backfill seal	.30	.30	.90	.30

HARBOR COUNTY

Contract awarded to L. Collucio & Co., 2019 3rd Ave., Seattle, Wn., $160,623.00 by Director of Highways, Olympia, Wn., for 11 mi. grading and surf. and const. timb. trestles on St. Rd. No. 9, Humptulips to Quinault in GRAYS HARBOR COUNTY, Wn. Bids from:

(1) L. Collucio & Co., Seattle.....$160,623.00
(2) Lidral Const. Co., Seattle.....$179,971.00
(3) R. O. Dail & Warren Bros., Inc. $181,684.00
(4) Grays Harbor Const. Co.....$195,951.00
(5) Halleran Bros., Seattle.....$197,471.00
(6) L. J. Dowell, Inc., Seattle.....$199,590.00

		(1)	(2)	(3)	(4)	(5)	(6)
53.17	acres clearing	$250.00	$250.00	$160.00	$150.00	$200.00	$250.00
45.79	acres grubbing	250.00	250.00	300.00	400.00	300.00	400.00
86,830	cu.yd. "A" excavation, incl. haul	.29	.30	.36	.40	.34	.40
4,010	cu.yd. solid rock excavation	.90	.70	1.00	1.10	.80	1.00
1,570	cu.yd. struc. excavation	.85	1.00	.95	1.00	1.25	1.00
4,690	cu.yd. "D" excavation	.45	.75	.75	1.00	.80	1.00
22,410	cu.yd. cr. selected borrow	.50	.70	.90	1.20	1.25	.80
15,570	cu.yd. selected borrow pit run	.35	.40	.40	.23	.50	.25
55,010	cu.yd. sta. overhaul	.015	.01	.015	.015	.01	.01
73,120	cu.yd.mi. overhaul	.12	.15	.12	.10	.15	.20
3,090	cu.yd. shoulder material	1.00	.75	1.25	2.00	1.50	1.50
55,400	lin. ft. slope treatment	.10	.10	.10	.09	.10	.10
6,760	cu.yd. cr. stone surf. (top course)	1.50	2.00	2.15	1.95	2.00	2.00
7,560	cu.yd. cr. stone surf. (base course)	1.50	2.00	2.00	1.80	2.00	2.00
2,050	cu.yd. cr. st. surf. (top crse. stockp)	1.25	2.00	2.15	1.90	2.00	1.50
1,140	cu.yd. filler	.50	.75	.75	.60	.70	.70
578.1	sta. finish roadway	6.00	15.00	2.50	9.00	5.00	7.00
119.87	cu.yd. "B" concrete	20.00	20.00	24.00	22.00	27.00	30.00
17,210	lb. reinforcing steel	.07	.05	.065	.06	.07	.07
176	ea. reinf. concr. right-of-way markers	1.50	2.00	2.00	2.00	2.50	2.00
715	lin.ft. 1" galv. iron pipe	.30	.30	.20	.30	.25	.25
225	lin.ft. 12" plain concr. or vitr. pipe	.90	1.00	1.00	.90	1.00	1.00
267	lin.ft. 18" plain concr. or vitr. pipe	1.60	1.50	1.80	1.50	2.00	1.70
1,365	lin.ft. 18" std. reinf. concrete pipe	2.00	2.00	2.23	2.00	2.25	2.10
219	lin.ft. 24" std. reinf. concrete pipe	3.00	3.00	3.50	3.15	4.00	3.75
51	lin.ft. 30" std. reinf. concrete pipe	4.25	4.00	4.65	5.00	5.00	7.00
99	lin.ft. 36" std. reinf. concrete pipe	7.50	6.00	7.00	6.00	7.00	8.50
610	cu.yd. struc. excav. (bridges)	2.00	2.00	.95	2.00	2.00	2.00
25	cu.yd. "C" concrete (bridges)	24.00	20.00	25.00	22.00	27.00	27.00
11.8	MFBM untr. timber and lumber	45.00	45.00	51.00	60.00	50.00	55.00
212.5	MFBM creos. timber and lumber	75.00	75.00	74.00	80.00	80.00	77.00
3,800	lin.ft. furn. creos. piling	.65	.50	.65	.50	.60	.60
148	ea. pile points	6.00	5.00	2.50	3.00	5.00	5.00
148	ea. drive piles	10.00	10.00	11.00	15.00	12.00	14.00
7	ea. drive test piles	60.00	50.00	75.00	50.00	105.00	100.00

PORTLAND, ORE.—GOVT.—SURFACING—KLAMATH COUNTY

Contract awarded to A. Milne, 7253 N. E. Broadway, Portland Ore., $131,061 by Bureau of Public Roads, Portland, Ore., for 12.308 mi. surfacing the Crater Lake Natl. Park Rim Road, Proj. PEC 7B, & 7C, Natl. Park project, located in Crater Lake National Park, KLAMATH COUNTY, Oregon. Bids from:

(1) A. Milne, Portland.....$131,061.
(2) Edlefsen-Weygandt Co..... 142,886.
(3) A. C. Greenwood Co. Portl..... 154,213.
(4) R. O. Dail & Warren Bros..... 154,879.
(5) Newport Const. & Kern & Kibbe..$158,751.
(6) Homer G. Johnson, Portland..... 161,024.
(7) Dunn & Baker, Klamath Falls.... 163,956.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
1,000	cu. yd. excavation (slides)	.50	.40	.50	1.00	.60	.60	.50
1,200	cu. yd. struc. excavation	.50	1.50	1.50	1.00	.60	1.25	1.00
1,000	cu. yd. borrow excavation	.50	.40	.50	1.00	.60	.60	.40
12.308	mi. fine grading	200.00	150.00	400.00	275.00	240.00	500.00	200.00
27,000	tons cr. run bottom course	1.25	1.34	1.45	1.50	1.57	1.45	1.65
29,000	tons cr. run top course	1.35	1.34	1.60	1.50	1.57	1.30	1.75
21,500	tons supplem. crushed rock	1.05	1.12	1.30	1.50	1.57	1.40	1.50
1,500	cu. yd. mi. binder haul	.25	.25	.25	.15	.15	.20	.20
1,000	M. gallons water	4.00	3.00	2.00	3.00	2.00	2.50	2.25
150	days roller operation	24.00	18.00	20.00	20.00	20.00	15.00	12.00
435	cu. yd. masonry guardrail, Type 2	20.00	22.00	19.00	12.00	24.00	22.00	22.00
875	cu. yd. masonry retain wall	10.00	17.00	14.00	12.00	12.50	20.00	15.00
3,000	ft. log guardrail, Type 4A	1.50	2.45	1.50	3.00	1.00	3.00	1.00

SAN FRANCISCO, CALIF.—GOVT.—GRADING—MONO COUNTY

Contract awarded to Morrison-Knudsen Co., 1121 Title Guaranty Bldg., Los Angeles, $147,390., by Bureau of Public Roads, San Francisco, for 6.823 mi. grading Sec. "A" of Rt. 81, the Mammoth Lakes Natl. Forest Highway, Inyo Natl. Forest, Mono County, Calif. Bids from:

(1) Morrison-Knudsen Co., L. A.....$147,390
(2) Basich Bros., Torrance..... 149,431.
(3) Union Paving Co., S. F..... 163,486.
(4) Isbell Const. Co., Reno.....$178,905.
(5) Engineers estimate ..... 115,095.

		(1)	(2)	(3)	(4)	(5)
27	acres clearing	375.00	650.00	300.00	450.00	300.00
133,400	cu. yd. unclass. excavation	.61	.67	.80	.86	.50
1,700	cu. yd. struc. excavation	2.00	1.75	2.00	2.00	1.60
29,600	cu. yd. unclass. excav. for borrow	.40	.25	.30	.40	.30
255,000	sta. yd. overhaul	.02	.02	.02	.02	.01
16,200	cu. yd. mi. borrow haul	.30	.15	.20	.20	.20
6.812	mi. finish earthgraded road	500.00	400.00	600.00	500.00	300.00
53	cu. yd. "B" concrete	40.00	40.00	30.00	31.00	28.00
95	cu. yd. "D" concrete	40.00	40.00	35.00	32.00	24.50
20,530	lb. reinforcing steel	.08	.06	.07	.07	.06
307	cu. yd. cement rubble masonry	20.00	10.00	18.00	19.00	14.00
238	lin. ft. 8 in. corr. metal pipe	1.20	1.00	1.00	1.25	1.00
704	lin. ft. 18 in. corr. metal pipe	2.20	2.00	2.00	2.25	1.90
1,502	lin. ft. 24 in. corr. metal pipe	3.40	2.80	3.00	3.25	3.00
394	lin. ft. 30 in. corr. metal pipe	4.40	3.30	4.00	3.75	3.70
80	lin. ft. 36 in. corr metal pipe	6.70	6.00	6.00	8.00	6.00
9	ea. spillway inlets	18.00	12.00	15.00	18.00	15.00
2	ea. steel grates (18 in. inlets)	30.00	25.00	20.00	25.00	15.00
8	ea. steel grates (24 in. inlets)	36.00	25.00	25.00	28.00	16.00
87	cu. yd. handlaid riprap	4.00	3.00	5.00	4.50	3.00
400	lin. ft. log guardrail	1.50	1.25	1.20	1.50	1.25
150	lin. ft. log rail for bridge	2.00	2.00	2.00	2.00	3.00
120	lin. ft. log stringers	2.00	1.75	1.00	2.00	1.50
2,650	lin. ft. protection ditch Type 1	.20	.25	.25	.20	.10

CONSTRUCTION

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

Large Western Projects . . . . .

WORK CONTEMPLATED

Conchas Dam on South Canadian River, New Mexico, to be earthfill, 26,600 ft. long, 230 ft. high, for Corps of Engrs., War Dept. Est. cost $4,500,000.

Sewage disposal system for South Salt Lake, Utah. Est. cost $300,000.

Double leaf bascule High St. bridge for Alameda County, Oakland. Est. cost $682,025.

Soil erosion projects in five Western States for U. S. Soil Conservation Service, to cost $1,798,296.

9 conservation dams and canals for Montana State Water Conservation Board, Helana. Est. cost $2,248,910.

Wikiup Dam on Deschutes River, Oregon, for Bureau of Reclamation. Est. cost $1,000,000.

Storage dam on Burnt River, Oregon, for Bureau of Reclamation. Est. cost $500,000.

Bartlett Dam on Verde River and spillways at Roosevelt, Horse Mesa and Mormon Flat Dams of Salt River Valley Proj., Arizona, for Bureau of Reclamation. Est. cost $4,500,000.

Bull Lake Reservoir and Canals on the Riverton Recl. Proj. for Bureau of Reclamation. Est. cost $1,000,000.

Dredging harbor at Bixby Slough for Torrance, Calif. P.W.A. loan and grant of $6,500,000 is being applied for.

CALL FOR BIDS

Roads and services at Naval Ammunition Depot, Coco Solo, C. Z., for U. S. Navy. Bids to Oct. 9.

BIDS RECEIVED

Island Park Dam, Idaho, for Bur. of Reclamation, Ashton, Idaho, low bid Max J. Kuney, Spokane, $478,838.

4.103 mi. grading Sec. A and B, Rt. 61, Angeles Crest Natl. Forest Hgwy for Bur. of Public Roads, S. F., award recommended to Guy F. Atkinson Co., S. F., $228,471.

Steel sheet pile bulkhead at Coast Guard Base Eleven, Govt. Island, low bid Ben C. Gerwick, Inc., S. F., $249,117.

CONTRACTS AWARDED

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

Gantry cranes and steel gates for Bonneville Dam for U. S. Engr. Office, Portland, to Columbia Steel Co., Portland, $1,191,000.

10.985 mi. grade and subgr. reinforcement, Secs. C and D, Rt. 73, Laguna Natl. Forest Hgwy., for Bureau of Public Roads, S. F., to J. E. Haddock Co., Ltd., Pasadena, $203,683.

Gunite lining 4,890,900 sq. ft. irrigation canal for Roosevelt Irrigation Dist., Buckeye, Ariz., to Vinson & Pringle, Phoenix, $462,685.

Mechanical apparatus for desilting basins at Imperial Dam for Bur. of Reclamation to Dorr Co., Inc., N. Y., $564,800.

2,000 ft. breakwater at L. A.-Long Beach Harbor for U. S. Engr. Office, L. A., to Rohl-Connolly Co., L. A., $827,560.

Sierra Madre and Pasadena tunnels and pipeline for Metropolitan Water Dist., L. A., to J. F. Shea, Inc., Mecca, $256,442, Sched. No. 1, and to L. E. Dixon, Bent Bros. & Johnson, Inc., L. A., $204,475, Sched. No. 2.

Cajalco Dam and dike for Metropolitan Water Dist., L. A., to Griffith Co., L. A., $4,646,856.

Dike and dredged fill at San Diego Bay for U. S. Engr. Office, to Hydraulic Dredging Co., Ltd., Oakland, $1,216,930.

45 mi. steel gas pipeline for Pacific Gas & Electric Co., S. F., to Western Pipe & Steel Co., S. F., $800,000 for furnishing and fabricating only.

Channel improvements in Columbia River for U. S. Engr. Office, Portland, to Siems-Helmers, Inc., St. Paul, $346,520.

83,790 tons reinforcing steel for Metropolitan Water Dist., L. A., awarded to: Blue Diamond Corp., L. A., $692,955 for 17,950 tons; Truscon Steel Co., L. A., $686,874 for 17,950 tons; Concrete Engr. Co., L. A., $689,222 for 18,110 tons; Soule Steel Co., L. A., $671,419 for 17,780 tons; Security Matls. Co., L. A., $150,461 for 4,000 tons; Consolidated Steel Corp., L. A., $149,877 for 4,000 tons, and J. W. Black, L. A., $149,877 for 4,000 tons.

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

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

Earthwork and canal lining on Pishkin and Sun River Canals for Bur. of Reclamation, Fairfield, Montana, to Martin Wunderlich Co., Jefferson City, Mo., $211,085.

Street and Road Work . . . . .

WORK CONTEMPLATED

LOS ANGELES, CALIF.—City Engineer, Los Angeles, has been authorized to prepare plans for improving Dark Canyon Road, also known as Burbank Road and Barham Blvd., by construction of 56 ft. roadway, 8" pavement, curbs, gutters, sewer and storm drain, at est. cost of $143,232, including conduits for ornamental lighting. 8-10

CALLS FOR BIDS

SACRAMENTO, CALIF.—Bids ta 2 p.m., Sept. 18, by Calif. Div. of Highways, Sacramento, for 0.4 mi. slides to be removed betw. Greenbrae and Alto in MARIN COUNTY, Calif. Work involves 50,000 cu. yd. roadway excavation. 8-27

SACRAMENTO, CALIF.—Bids to 2 p.m., Sept. 18, by Calif. Div. of Highways, Sacramento, for 5 mi. grading betw. 2 mi. southwest of Searles and Rademacher in KERN COUNTY. Work involves in the main: 14,650 cu. yd. roadway excav, 1,300 cu. yd. ditch and channel excav., 532 lin. ft. 18" corr. metal pipe. 8-27

BALBOA, C. Z.—Bids to October 9 by Public Works Officer, 15th Naval District, Balboa, C. Z., for building roads and services at Naval Ammunition Depot at Balboa, C. Z. Est. cost $750,000. 8-6

NEWS SUMMARY

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

OLYMPIA, WN.—Bids to 10 a.m., Sept. 17, by Director of Highways, Olympia, Wn., for: (1) SNOHOMISH CO. (PWP 5960)—4.2 mi. grading, draining and const. tr. pile and timber trestles on St. Rd. No. 1, Island School-North, involving: 383,705 cu. yd. excav., 740 cu. yd. concrete, 103,490 lb. steel reinf. bars, 7,063 lin. ft. pipe culverts. (2) STEVENS CO. (WPH 154-E)—1.9 mi. grading, draining and surf. with crushed stone on St. Rd. No. 3, Colville to Palmers Siding, Wn., involving: 24,150 cu. yd. excav., 6,820 cu. yd. cr. stone surfacing. (3) SKAMANIA CO. (WPH 112-H)—1.8 mi. grading, draining, etc., on St. Rd. No. 8, Cooks East to Underwood West, Sec. 3, involving: 163,340 cu. yd. excav., 2,616 cu. yd. concrete, 100,850 lb. steel reinf. bars. (4) STEVENS CO. (PWP 7570)—2.0 mi. grading, draining and surf. with cr. stone on St. Rd. 22, Onion Creek to Hudson Spur, involving: 74,250 cu. yd. excav, 4,610 cu. yd. place cr. stone surf., 142 cu. yd. cement rubble masonry, 642 lin. ft. pipe culverts. 8-29

BIDS RECEIVED

PHOENIX, ARIZ.—George W. Orr, R.F.D. No. 1, Box 127, El Paso, Tex., $133,997 (using LAYKOLD ASPH. CONCR.) and $147,500 (using CUT-BACK ASPHALT), low to Bureau of Public Roads, Phoenix, for 25.303 mi. placing a bitum. tr. surf. on Secs. A, B1 and B2 of Rt. 1, and all of Rt. 2 of the Petrified Forest Natl. Monum., APACHE and NAVAJO COUNTIES, Arizona. 8-22

LOS ANGELES, CALIF.—R. E. Hazard Contr. Co., P. O. Box 1438, San Diego, $24,354 low to State Div. of Highways, State Bldg., Los Angeles, for 2.4 mi. plant mix surfacing medium curing type to be placed, shoulders to be constructed and road mix surface treatment applied at various locations betw. 4 mi. east of Bostonia and 2 mi. east of Alpine in SAN DIEGO COUNTY. 8-29

MARYSVILLE, CALIF.—Hayward Building Material Co., Hayward, $13,263 low to District Engineer, Calif. Div. of Highways, Marysville, for 18.8 mi. "A" and "B" seal coat treatment betw. Nevada City and Washington Road; betw. Placer-Nevada County Line and Soda Springs, and betw. Oroville and Junction of Routes 3 and 87 south of Chico in NEVADA, PLACER and BUTTE COUNTIES, California. 8-26

MARYSVILLE, CALIF.—Hayward Building Matl. Co., Hayward, Calif., $13,870 low to District Engineer, Calif. Div. of Highways, Marysville, for 27.1 mi. seal coat treatm. Class "A", "B" and "C" betw. Chico and Tehama Co. line; betw. Davis Wye and Woodland; betw. Maxwell and Delavan; betw. Placerville and R.R. crossing; betw. Riverton and Kyburz; and betw. 2.5 mi. east of Lake-Colusa Co. Line and 5.5 mi. east, in BUTTE, YOLO, COLUSA and EL DORADO COUNTIES, Calif. 8-26

REDDING, CALIF.—Hemstreet & Bell, 501 11th St., Marysville, $10,469 low to Dist. Engr., Calif. Div. of Highways, Redding, for 0.1 mi. grad. and surf. with roadmix surf. on cr. run base betw. Court St. and California St. in Redding, SHASTA COUNTY. 8-15

DENVER, COLO.—Hamilton & Gleason, 505 Tramway Bldg., Denver, Colo., $74,525, low to Bureau of Public Roads, Denver, Colo., for const. approx. 13.579 mi. open graded bitum. road mix on proj. 54-A2 to E2 of the Mount Evans Forest Highway Route, located in Pike Natl. Forest, CLEAR CREEK COUNTY, Colo. 8-21

SEATTLE, WN.—J. B. Covello, 1510 Sturgis Ave., S., Seattle, Wn., $58,783 (CLAY PIPE) and $58,599 (CONCR. PIPE) low to Br. of Public Works, Seattle, Wn., for improv. of Delmar Drive, East Lynn St., and Interlaken Blvd. by grading, paving and otherwise improving same, under Ordinance No. 63897. 8-26

CONTRACTS AWARDED

JUNEAU, ALASKA—To Wright & Stock, Lowman Bldg., Seattle, Wn., $18,847 by Bureau of Public Roads, Juneau, Alaska, for 5.6 mi. clearing and grubbing on the Seward highway, Snow River-Lawing Section in the Chugach National Forest. 8-16

PHOENIX, ARIZ.—To Skousen Bros., Albuquerque, N. M., $43,600 by Bur. of Pub. Roads, Phoenix, for 3.090 mi. grad and const. bridges on Sec. J, Rt. 7, Oak Cr. Natl. Forest Highway, YAVAPAI COUNTY, Arizona. 8-14

PHOENIX, ARIZ.—To Skousen Bros., Albuquerque, N. M., $47,240 by Bur. of Pub. Roads, Phoenix, Ariz., for 8.125 mi. grading Sec. "B" and plac. selected matl. subgrade reinforcement on Secs. A and B of Rt. 30, the Globe-Sholow Natl. Forest Highway, Sitgreaves Natl. Forest, NAVAJO COUNTY, Arizona. 8-20

CHULA VISTA, CALIF.—To V. R. Dennis, P. O. Box "F", Sta. A, San Diego, $129,661 (based on revised quantities), by City Clerk, Chula Vista, for asph. concr. pavem. and fuel oil shoulder tr. on 21 mi. of streets, Chula Vista. 8-22

EUREKA, CALIF.—Awards as follow by Dist. Engr., Calif. Div. of Highways, Eureka, for: (1) LAKE COUNTY—To Basalt Rock Co., Inc., 900 8th St., Napa, $2,537 for 20.11 mi. liq. asph. treatment betw. Middletown and Lower Lake Road on Rt. 89. (2) MENDOCINO COUNTY—To Helwig Const. Co., 115 S. Main St., Sebastopol, $12,405 for 67.5 mi. liq. asph. treatment on Rt. 56, betw. Gualalla and 8 mi. N. of Fort Bragg, Calif. 8-8

LOS ANGELES, CALIF.—Awards as follow by Calif. Div. of Highways, State Bldg., L. A., for: (1) LOS ANGELES CO.—To Griffith Co., L. A. Ry. Bldg., L. A., $39,913 for 1.4 mi. asph. concr. pav. on Sunset Blvd. betw. La Veta and Santa Monica. (2) RIVERSIDE CO.—To C. O. Sparks, 2309 E. 9th St., L. A., $16,135 for 66.7 mi. apply seal coat to exist. shoulders betw. Corona and southerly boundary and betw. Riverside and Elsinore. 8-15

LOS ANGELES, CALIF.—To Square Oil Co., Inc., 916 Adobe St., Los Angeles, $21,644 by Dist. Engr., Calif. Div. of Highways, State Bldg., Los Angeles, for 50.1 mi. applying seal coat betw. Valle Vista and Route 187, RIVERSIDE COUNTY, California. 8-8

LOS ANGELES, CALIF.—Awards as follow by Calif. Div. of Highways, State Bldg., L. A., for: (1) SAN BERNARDINO CO.—To George R. Herz Co., 311 Platt Bldg., San Bernardino, $74,578 for 1.9 mi. grading and concr. paving betw. Alabama St. and State St. in Redlands. (2) SAN BERNARDINO CO.—To Griffith Co., L. A. Ry. Bldg., L. A., $90,420 for 1.3 mi. grading and asphalt concr, paving and const. a reinf. concr. bridge on steel piles on "I" St., betw. "E" and "W", city limits of Colton. (3) SAN BERNARDINO CO.—To B. G. Carroll, 4396 Maryland St., San Diego, $29,877 for 1 mi. grading and road mix surf. treatm. applied and const. reinf. concr, abutments for an undergrade R.R. crossing betw. Santa Ana River and "M" St. in Colton. 8-8

LOS ANGELES, CALIF.—To Oswald Bros., 366 E. 58th St., L. A., $9940 by Dist. Engr., Calif. Div. of Highways, L. A., for 4.6 mi. shoulders to be tr. with liq. asph. by roadmix method and seal coat applied betw. Cerritos Ave. and Mercantile Pl. and Ramona Blvd., betw. Aliso St. and Fickett St., in LOS ANGELES CO., Calif. 8-28

MARYSVILLE, CALIF.—Awards as follow by Dist. Engr., Calif. Div. of Highways, Marysville, for: (1) EL DORADO and YOLO CO.—To E. F. Hilliard, 1355 43rd St., Sacramento, $6,325 for 28 mi. liq. asph. treatm. betw. Auburn Junction (mile 7.89) and Cool (III-E.D.-93-A, B) and betw. 4 mi. north of Sol-Yol County line and Irrigation Canal (III-Yol-99-A). (2) EL DORADO CO.—To M. J. B. Const. Co., 319 Elks Bldg., Stockton, $13,915 for 1.0 mi. untr. cr. grav. or stone base and roadmix surf. at Oglesby Canyon. 8-10

SACRAMENTO, CALIF.—Awards as follow by Calif. Div. of Highways, Sacramento, for: (1) KERN CO.—To Griffith Co., L. A. Ry. Bldg., L. A., $94,994 ALT. "B" for 1.0 mi. grad. and concr. pav. and const. reinf. concr. underpass abutments betw. 1 mi. S. of Delano and Delano. (2) SAN MATEO CO.—To Union Paving Co., Call Bldg., S. F., $970,437 for 3.6 mi. grad. and surf. with crusher run base and applying bitum. surm. tr. betw. Edgemar and Thornton. 8-8

SAN BERNARDINO, CALIF.—Awards as follow by Dist. Engr., Calif. Div. of Highways, San Bernardino, for: (1) SAN BERNARDINO CO.—To E. L. Yeager, P. O. Box 470, San Bernardino, $10,320 for 18.6 mi. seal coat betw. Adelanto and Rt. 58. Ref. issue July 29 for units. (2) SAN BERNARDINO CO.—To C. O. Sparks, 2309 E. 9th St., L. A., $14,025 for 30.8 mi. seal coat betw. Barstow and Mountain Pass. 8-15

SAN DIEGO, CALIF.—To Paulsen & March, Inc., 8275 Compton Ave., L. A., $12,318 by Dist. Engr., Calif. Div. of Highways, San Diego, for 46 mi. liq. asph. treatm. betw. Gamul and White Star in SAN DIEGO COUNTY, Calif. 8-21

SAN FRANCISCO, CALIF.—Award recommended to L. F. Piazza, 296 N. 6th St., San Jose, $16,939 by Bureau of Public Roads, San Francisco, for 9.603 mi. placing subgrade reinf. on portions of Sec. F and G of Rt. 21, the Deer Creek Meadows Natl.. Forest Highway, Lassen Natl. Forest, BUTTE and TEHAMA COUNTIES, Calif. 8-21

SAN FRANCISCO, CALIF.—To Hemstreet & Bell, 501 11th St., Marysville, $53,910 by Bur. of Pub. Roads, San Francisco, for 1.823 mi. grading Sec. "B" of Rt. 20, the Almanor Natl. Forest Highway, Plumas Natl. Forest, PLUMAS COUNTY, Calif. 8-15

SAN FRANCISCO, CALIF.—Award recommended to Guy F. Atkinson Co., Russ Bldg., S. F., $228,471 by Bur. of Pub. Roads, S. F., for 4.103 mi. grading Secs. "A" and "B" of Rt. 61, the Angeles Crest Natl. Forest Highway, Angeles Natl. Forest, LOS ANGELES COUNTY, California. (See Unit Bid Summary.) 8-27

SAN FRANCISCO, CALIF.—Award recommended to Fredrickson & Watson and Fredrickson Bros., 873 81st Ave., Oakland, and Jones & King, Hayward, Calif., $144,792 by Bur. of Pub. Roads, 461 Market St., San Francisco, for 13.323 mi. bitum. tr. cr. rock base course on Secs. D3 and D4 of Rt. 1, the Generals Highway, Sequoia Natl. Park, and on Sec. A, General Grant-Sequoia Park Approach Road, Sequoia Natl. Forest, TULARE COUNTY, Calif. 8-23

SAN FRANCISCO, CALIF.—To Pacific Truck Service, Inc., 646 Park Ave., San Jose, $12,559 by Dist. Engr., Calif. Div. of Highways, State Bldg., S. F., for 48.9 mi. applying seal coat betw. Manzanita and northerly boundary in MARIN COUNTY, Calif. 8-15

SAN FRANCISCO, CALIF.—Award recommended to Jack Casson, 319 Warren St., Hayward, $29,698 by Bur. of Pub. Roads, S. F., for 20.699 mi. bitum. treatm. on Sec. A of FLHP No. 6, Lava Beds, Modoc County, Calif., and on Secs. B and C of Rt. 11, the Lava Beds Natl. Forest Highway, MODOC COUNTY, Calif. 8-14

SAN FRANCISCO, CALIF.—To Young & Son Co., Ltd., 599 Colusa Ave., Berkeley, $70,320 by Bur. of Pub. Roads, S. F., for 2.200 mi. grading Sec. "B" of Rt. 81, the Mammoth Lakes Natl. Forest Highway, Inyo Natl. Forest, MONO COUNTY, Calif. 8-14

SAN FRANCISCO, CALIF.—To Morrison-Knudsen Co., 1121 Title Guaranty Bldg., Los Angeles, $147,390 by Bur. of Pub. Roads, S. F., for 6.823 mi. grad. Sec. "A" of Rt. 81, the Mammoth Lakes Natl. Forest Highway, Inyo Natl. Forest, MONO COUNTY, Calif. 8-14

SAN FRANCISCO, CALIF.—To Eaton & Smith, 714 Ocean Ave., S. F., $33,726 by Dept. of Pub. Works, City Hall, S. F., for improving Army St. betw. Potrero Ave. and Bryant St., in San Francisco. 8-10

SAN FRANCISCO, CALIF.—To J. E. Haddock, Ltd., Pasadena, $203,683 by Bur. of Pub. Roads, S. F., for 10.985 mi. grad. and subgr. reinf. on Secs. C and D, Rt. 73, Laguna Natl. Forest Highway, SAN DIEGO COUNTY, Calif. 8-6

SAN JOSE, CALIF.—Awards as follow by County Board of Supervisors, San Jose, for: (1) To A. J. Raisch, 358 N. Lincoln Ave., San Jose, $15,960, for improv. Junipero Serra Blvd. betw. Fremont Ave. and Stanford Ave. in Superv. District No. 5. (2) To Union Paving Co., Call Bldg., San Francisco, $29,250, for improving King Road from Berryessa Road to Alum Rock Ave. in Superv. District No. 3. 8-19

SAN JOSE, CALIF.—To A. J. Raisch, 358 Lincoln Ave., San Jose, $10,645, by County Board of Supervisors, San Jose, for improvement of Hill Road from Main Ave. to Dunne Ave. in Superv. District No. 1, involving 109,100 sq. ft. oil macadam. 8-26

REDDING, CALIF.—To Hemstreet & Bell, 501 11th St., Marysville, $10,200, by District Engr. Calif. Div. of Highways, Redding, for producing 12,000 cu. yd. cr. gravel for use between Rush Creek and Adin in MODOC COUNTY, Calif. 8-28

DENVER, COLO.—Award recommended to Ed. H. Honnen Const. Co., Colorado Sprgs., Colo., $47,381, by Bureau of Public Roads, Denver, Colo., for 3.563 mi. const. or improving Proj. 29-C of the Boulder-Idaho Springs Forest Highway Route, located in Roosevelt National Forest, GILPIN COUNTY, Colo. 8-19

DENVER, COLO.—Award recommended to Hoops Construction Co., Twin Falls, Ida., $12,180, by Bureau of Public Roads, Denver, Colo., for 7.109 mi. base treatment on Proj. 3-A-10,C-5 of the Hoback Canyon Forest Highway Route, located in Teton Natl. Forest, TETON AND SUBLETTE COUNTIES, Wyoming. 8-28

BOISE, IDAHO—Awards as follow by Comm. of Public Works, Boise, Idaho, for: (1) CASSIA CO. (NRH & M. 70-C D)—To Dan J. Cavanagh, Twin Falls, Ida., $26,207 (RESILIFLEX), for 3.174 mi. const. roadbed drain. struc. and cr. grav. surf. on the Old Oregon Trail Highway from Burley west. (2) BENEWAH CO. (FAP 143-ABCD)—To Triangle Const. Co. and Warren Northwest, Inc., 120 Ide St., Spokane, Wn., and P.O. Box 5072, Portland, Ore., $189,616, for 17.870 mi. const. plant mix bitum. mat. and cr. rock shoulders on Heyburn Park Highway betw. Plummer and St. Maries. (3) ADAMS CO. (Reconst. Proj. 454)—To Morrison-Knudsen Co., 319 Broadway, Boise, $53,839, for 12.671 mi. pl. mix bitum. mat. and cr. grav. shoulders on the North and South Highway betw. Mesa and Fruitvale. (4) VALLEY CO. (FAP 130-AH)—To Robinson Const. Co., Twin Falls, Ida., $45,525, for 12.505 mi. const. pit run subbase and shoulders and cr. gravel surf. on the Payette Highw. betw. Donnelly and McCall. 8-19

HELENA, MONTANA—To Nolan Bros., 18 N. 2nd St., Minneapolis, Minn., $147,754, by State Highway Comm., Billings, Mont., for 24.332 mi. surf. with Grade "A" top course cr. grv. surf. matl. and road-mix oil tr. of the surf. course on the Glendive-Wibaux Road in DAWSON & WIBAUX CO., Mont. (NRH 1, 6, 234 A & 234 B). 8-6

HELENA, MONTANA—Awards as follow by State Highway Engineer, Billings, Mont., for: (1) FLATHEAD & LAKE CO. (NRS 102 C&D)—To Kirkpatrick Bros., Kalispell, Mont., $56,695, for .635 mi. grad., surf. with grav. subbase matl. and with top course cr. grav. and const. small drain. struc. on Sec. C and D of Flathead Lake East Shore Road. (2) CASCADE CO. (NRS 329 B)—To Thos. Staunton and E. C. Powell, Great Falls, Mont., $43,992, for 5.035 mi. grad. and surf. with grav. subbase matl. and with a top course of cr. grav. and const. small drain. struc. on Sec. B of the Great Falls-Millegan Road. 8-6

MISSOULA, MONTANA—To Ralph Davis, Conner, Mont., $53,277, by Bureau of Public Roads, Missoula, Mont., for 3.3684 mi. grading the Bitterroot-Salmon Highway in Bitterroot Natl. Forest, RAVALLI COUNTY, Mont. 8-22

MISSOULA, MONTANA—To James Crick, Realty Bldg., Spokane, Wn., $78,498, by Bureau of Public Roads, Missoula, Mont., for 4.9595 miles grading Pleasant Valley Ray Road, located in Kootenai Natl. Forest, LINCOLN COUNTY, Montana. 8-22

CARSON CITY, NEVADA—To U. B. Lee, 1059 Carpentier Ave., San Leandro, $42,404, by Nev. State Highway Comm., Carson City, Nev., for 22.86 mi. asph. roadmix surf. on a portion of St. Highway system from 34 mi. to 11 mi. southwest of Ely, in WHITE PINE COUNTY, Nev. 8-7

SANTA FE, NEW MEXICO—Awards as follow by State Highway Engineer, Santa Fe, New Mexico, for: (1) RIO ARRIBA COUNTY (Proj. NRH 110-B)—To A. O. Peabody, Las Cruces, who bid $55,590 for 8.792 mi. prepara. of base course, base course surf. top course surf., and oil processing on U. S. Highway Route No. 285, betw. Espanola and Chama. (2) GUADALUPE CO. (NRM 22)—To R. L. Hanes, Albuquerque, N. M., $134,558, for .143 mi. grading, minor drainage struc. one 269 ft. continuous span, concrete and steel I beam bridge, one 7-25 ft. span temporary untr. timb. bridge; and one 2-50 ft. same with steel stringers, base course surf. 8-9

SANTA FE, NEW MEXICO—Awards as follow by State Highway Engr., Santa Fe, N. M.: (1) BERNALILLO and VALENCIA COUNTIES—to Skousen Bros., Albuquerque, N. M., $37,274 for 16.493 mi. base course surf. Proj. 4, being U. S. Highway Rt. 66, betw. Los Lunas and Gallup, Proj. 178-C, St. Rd. No. 6, betw. Albuquerque and Gallup. (2) OTERO COUNTY (Proj. 165-E)—To Lee Moor Contr. Co., El Paso, $25,706 for 5.205 mi. top course surf. and oil process. betw. Hondo and Tularosa, U. S. Highway Rt. 70. 8-31

SANTA FE, NEW MEXICO—Awards as follow by State Highway Engr., Santa Fe, N. M.: (1) SIERRA COUNTY (FAP 68 and 104)—To Cook Ransome, Ottawa, $35,635 for 5.661 mi. top course surf., oil processing and const. of wire cable guard fence on U. S. Highway Rt. 85, beginning at south city limits and running south toward Las Cruces. (2) OTERO COUNTY (FAP 165-F)—To W. H. Denison, Roswell, $78,185 for 7.537 mi. grading, minor drainage struc., 7 multiple span concr. box culverts, each over 20 ft. clear span, base course surf. prime coat treatm. and misc. const. on U. S. Highway Rt. 54, betw. Alamogordo and Valmont. (3) BERNALILLO COUNTY—To New Mexico Const. Co., Santa Fe, N. M., $139,393 for 17.505 mi. top course surf. oil, processing, rock asph. seal coat and misc. constr. on State Highway Rt. 6, betw. Albuquerque and Suwanee. 8-31

PORTLAND, ORE.—Award recommended to Elliott & Co., Inc., Insurance Bldg., Seattle, Wn., $189,026 (METAL PIPE) by Bureau of Public Roads, Portland, Ore., for 1.167 mi. constructing or improving the Mt. Rainier Natl. Park, Stevens Canyon Highway, Proj. 4-C2, grading and tunnel, located in the Mt. Rainier Natl. Park, LEWIS CO. 8-31

PORTLAND, ORE.—Contracts awarded as follows by Bureau of Public Roads, Portland, Oregon: (1) PARK and PARK CO.—To J. L. McLaughlin, Great Falls, Mont., $141,529, for 11.5698 mi. const. or improv. the Red Lodge-Cooke City, Approach Road, Sec. D (portion) surf. and bitum. base treatm. and bitum. road mix, Natl. Park, Wyoming and Montana. (2) JACKSON CO. (Proj. 16-G1, H)—To F. C. Dillard, Medford, Ore., $57,576 (MET. PIPE) for const. or improv. the Tiller-Trail grading and advance clearing road project in Rogue River Natl. Forest, Oregon. 8-22

PORTLAND, ORE.—To C. E. Oneal Co., Stevenson, Wn., $72,757, by Bur. of Public Roads, Portland, Ore., for .3078 mi. grading Republic-Kettle Falls Highway in Colville Natl. Forest, Wn., FERRY CO. Proj. NR 20-C). 8-26

PORTLAND, ORE.—To McNutt Bros., 351½ E. Broadway, Eugene, Ore., $107,086 (MET. PIPE), by Bureau of Public Roads, Portland, Ore., for 4.454 mi. grad. and subgr. reinforcement on Santiam Highway in LINN COUNTY, Ore. 8-26

PORTLAND, ORE.—To E. L. Gates, McCredie Springs, Ore., $136,630, by Bur. of Public Rds., Portland, Ore., for 13.5305 mi. grading on Salmon River Highway, Siuslaw Natl. Forest, LINCOLN AND TILLAMOOK COUNTIES, Oregon. 8-29

PORTLAND, ORE.—Award recommended to Northwest Const. Co., 3950 6th N. W., Seattle, Wn., $82,754 (METAL PIPE), by Bureau of Public Roads, Portland, Ore., for 4.620 mi. grading Proj. 6-A7, in Mt. Baker National Forest, WHATCOM COUNTY, Wn. 8-29

PORTLAND, ORE.—To E. L. Gates, McCredie Springs, Ore., $95,861 (MET. PIPE), by Bureau of Public Roads, Portland, Ore., for 3.2729 miles grading the North Santiam Forest Road project, located in the Willamette National Forest, in LINN COUNTY, Oregon, Project (24-F2). 8-14

PORTLAND, ORE.—To Colonial Const. Co., W. 326 1st Ave., Spokane, Wn., $165,390 (METAL PIPE), by Bureau of Public Roads, Portland, Ore., for 14.17 mi. grading, advance clearing and improving existing road on Willamette Highway, Proj. 21-H1, I, located adjacent to or within the Willamette National Forest, LANE COUNTY, Ore. 8-29

PORTLAND, ORE.—To A. Milne, Portland, Ore., $131,061, by Bureau of Public Roads, Portland, Oregon, for 12.308 mi. surfacing the Crater Lake National Park, Rim road, Proj. PEC 7B, 7C, Natl. Park Project, located in the Crater Lake National Park, KLAMATH COUNTY, Oregon. 8-5

PORTLAND, ORE.—To Myers & Goulter, 3227 1st, South, Seattle, Wn., $98,027, by Bureau of Public Roads, Portland, Ore., for 1.581 mi. grading Stevens Pass Highway, located in Wenatchee National Forest, Washington. 8-20

OGDEN, UTAH—To L. A. Young Const. Co., Richfield, Utah, $52,774, by Bureau of Pub. Roads, Ogden, for 5.130 mi. surf. the Logan-Garden City Natl. Forest Road Proj. No. 1-A7, located in Cache Natl. Forest, CACHE COUNTY, Utah. 8-29

OGDEN, UTAH—To Utah Const. Co., Ogden, Utah, $155,773, by Bureau of Public Roads, Ogden, Utah, for 5.856 mi. surf. the N. Pacific Highway, NR-7-C5, located in Coeur d'Alene Natl. Forest, KOOTENAI CO., Idaho. 8-7

SALT LAKE CITY, UTAH—Awards as follow by Utah State Road Commission, Salt Lake City, Utah, for: (1) CACHE CO.—To Olof Nelson, Logan, Utah, $96,859, for 5.109 mi. const. concr. and bitum. concrete OR Alt. Natur. rock asphalt road betw. Logan and Wellsville. (2) TOOELE CO.—To Mullins & Wheeler, 22½ E. 1st South, Salt Lake City, $16,178, for 0.347 mi. constructing paved road on Lake Point Overhead approach. 8-28

COLEVILLE, WN.—To D. A. Sullivan & Co., Inc., 415 E. Sprague Ave., Spokane, Wn., $9596, by County Comm., Coleville, Wn., for improv. 1.6 mi. of the Hunter-Springdale Secondary Road. 8-12

DAVENPORT, WN.—To Diesel Oil Sales Co., 2155 N. Lake Ave., Seattle, $11,994, by County Comm., Davenport, for 16 mi. oiling from 3 mi. N. of Wilbur on Kellar Rd. to Grant-Lincoln County Line, Wilbur-Grand Coulee Highway. 8-15

KELSO, WN.—To Hendricks & Co., Chehalis, Wn., $7,123, Cowlitz County Comm., Kelso, Wn., for clearing, grubbing, grading, draining and surfacing Secondary Road Project No. 46. 8-15

MT. VERNON, WN.—To Jansen & Whipple, 2623 So. "G" St., Bellingham, Wn., $4984, by County Comm., Mt. Vernon, Wn., for pav. the Sedro Woolley fill. 8-12

OLYMPIA, WN.—To Sather & Sons, 12039 Greenwood Ave., Seattle, Wn., $31,035, by Dir. of Highways, Olympia, Wn., for 13,598 lin. ft. cable guardrail and 28,205 lin. ft. metal guardrail on 11.2 mi. of St. Road No. 5, Oak Flat to Chinook Pass, YAKIMA & KITTITAS CO. 8-9

OLYMPIA, WN.—To L. Cullucio & Co., 2019 3rd Ave., Seattle, Wn., $160,623 by Director of Highways, Olympia, Wn., for 11 mi. grading and surf. and const. timb. trestles on St. Rd. No. 9, Humptulips to Quinalt in GRAYS HARBOR COUNTY, Wn. 8-9

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) PIERCE CO. (FAP 171-H)—To Warren Northwest, Inc., P. O. Box 5072, Portland, Ore., $24,423 for paving and resurf. existing concr. pavement with asph. concr. on St. Road No. 1, Sales Road to South Corporate Limits of Tacoma. (2) CHELAN COUNTY (PWP 7714)—To Toney Romano, 1833 Dearborn St., Seattle, $54,784 for 1.2 mi. grading and concr. paving on St. Road No. 2, Austin Revision. (3) YAKIMA COUNTY (FAP 161-F)—To L. Romano, 1300 Dearborn St., Seattle, $107,952 for 12.9 mi. surf. and const. a bitum. macadam surf. on St. Rd. No. 5, Oak Flat to Nelson Bridge. 8-31

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) LEWIS and PACIFIC COUNTIES (FAP 131-B, 131-D and 178-E)—To H. P. Dorsey, 2006 State St., Bellingham, Wn., $49,146 for 1.0 mi. concr. paving on St. Rd. No. 12, Meskill Hill, Doty Hill and Skidmore Dike-Paving Gaps. (2) CHELAN COUNTY (FAP 190-A)—To Fred G. Redmon, 303 S. 5th Ave., Yakima, Wn., $48,286 for 9.5 mi. surf. with cr. stone on St. Rd. No. 15, Summit to Crescent Creek, Unit 3. (3) STEVENS COUNTY (PWP 4648)—To N. A. Degerstrom, P. O. Box 803, Spokane, $64,559 for 5.5 mi. grad. and surf. with cr. stone on St. Rd. No. 22, Cedonia, N., Sec. 2. 8-31

PORT ORCHARD, WN.—To F. E. Wilder, Rt. 2, Olympia, Wn., $13,443, by County Auditor, Port Orchard, Wn., for constructing the Illahee South Road Secondary Highway No. 26. 8-12

REPUBLIC, WN.—To Triangle Const. Co., 1220 Ide, Spokane, Wn., $12,849, by County Comm., Republic, Wn., for const. 2.029 mi. road betw. Kettle Falls bridge and Inchelium, known as Secondary Road Proj. 15, in FERRY COUNTY, Washington. 8-16

SEATTLE, WN.—To Acme Const. Co., 428 McGilvra Blvd., Seattle, Wn., $66,177, by Board of Public Works, Seattle, Wn., for grading and paving 25th Avenue, Northeast (Empire Way) from Montake Blvd. to E. 55th St., under Ordinance No. 63896. 8-19

SEATTLE, WN.—Awards as follow by Board of Public Works, Seattle, Wn., for (1) To L. J. Dowell, Inc., 1437 Elliott Ave., West Seattle, Wn., $38,826, for grading and paving Lakeview Blvd. from E. Prospect St. to E. Blaine Street. (2) To J. B. Covello, 1510 Stingis Ave., S., Seattle, Wn., $14,188, for widening and paving East Pacific St., Montlake Blvd. to University Way. 8-12

VANCOUVER, WN.—To Fisher Bros., Oregon City, Oregon, $9,705, by County Clerk, Vancouver, Wn., for 1.25 mi. clearing, grading, draining and surfacing from Manor Road to Pleasant Valley, Project No. 65 (F. M. 59). 8-26

VANCOUVER, WN.—Awards as follow by County Clerk, Vancouver, Wn., for (1) To Klineline Varn & Johnson, 909 E. 34th St., Vancouver, Wn., $11, 612, for 1.25 mi. clearing, grading, dr. and surf. from Manor Road to Pleasant Valley; (2) To O. N. Pierce and Frank Connor, 212 N. Russell St., Portland, Ore., $8,287, for 0.37 mi. approaches and replace 2 bridges on Veneisborg road; also improvements to Orchards-Camas Road near Proebstel. 8-21

WENATCHEE, WN.—To Warren Northwest, Inc., P.O. Box 5072, Portland, $34,972, by City Clerk, Wenatchee, Wn., for 6.44 mi. surf. using Type B road mix bitum., and 10.3 mi. surf. using light bitum. surf. tr. 8-19

CHEYENNE, WYOMING—To Northwest Engr. Co., Rapid City, S. D., $79,266, for 5.22 miles grading, draining and base course surfacing on Wheatland-Glendo Road, in PLATTE COUNTY, Wyoming, by State Highway Commission, Capitol Building, Cheyenne, Wyoming. 8-23

CHEYENNE, WYOMING—Awards as follow by State Highway Commission, Cheyenne, Wyoming, for: (1) ALBANY CO., to Chas. B. Owens, Box 194, Denver, $73,207, for 7.325 mi. grading, draining, etc., on Bosler-Wheatland Road. (2) FREMONT CO., to Blanchard Bros., 1641 So. Logan St., Denver, Colorado, $54,009, for 6.837 mi. grading, dr. and base course surf. on Lander-Muddy Gap Road. (3) SUBLETTE CO., to Taggart Const. Co., Cody, Wyo., $112,152, for 14.103 mi. grading, draining and base course surf. on Kimmerer-Marbleton Road. (4) LARAMIE CO., to Northwest Engrg. Co., Rapid City, S. D., $33,005, for 2.612 mi. grading, draining and base course surf. on Cheyenne-Wheatland Road. (5) CROOK CO., to Sharrock &Pursel, Casper, Wyo., $136,909, for 12.181 mi. grading, draining and base course surf. betw. Sundance and South Dakota State Line. 8-23

Bridges and Culverts . . . . .

WORK CONTEMPLATED

COLORADO SPRINGS, COLO.—The P.W.A. has made a grant of $44,610 to Colorado Springs, Colorado, to finance construction of 2 reinf. concr. and struct. steel bridges, one across Monument Creek on Uintah St. and the other across Mesa Road. 8-16

OAKLAND, CALIF.—Preliminary plans and spec. have been completed by County Surveyor and have been approved by the Board of Supervisors, Oakland, and application has been made to the P.W.A. for $727,025 to finance const. of: (1) Double leaf bascule type High Street Bridge. Estimated cost of work $682,025. (2) New bridge at Decoto. Estimated cost $45,000. 8-8

WATER SUPPLY SYSTEMS . . . . . .

SEWER CONSTRUCTION . . . . . .

CALLS FOR BIDS

SACRAMENTO, CALIF.—Bids to 2 p.m., Sept. 18, by Calif. Div. of Highways, Sacramento, for reinf. concr. girder bridge across Sonoma Creek, 7 mi. N. of Sonoma, consisting of three 52-ft. spans on concr. piers and abutments, in SONOMA COUNTY, Calif. Work involves: 77,000 lb. reinf. steel, 41 cu. yd. "A" concr. (footing blocks), 404 cu. yd. "A" concr. (structures). 8-27

CONTRACTS AWARDED

SACRAMENTO, CALIF.—To Harms Bros., Doyle, Calif., $35,981 by Calif. Div. of Highways, Sacramento, for 3.7 mi. installing perf. metal pipe underdrain and corr. met. pipe culverts betw. ½ mi. W. of Soda Springs and Donner Summit, in NEVADA and PLACER COUNTIES, Calif. 8-21

SACRAMENTO, CALIF.—To Harms Bros., Doyle, Calif., $18,626 by Calif. Div. of Highways, Sacramento, for 7.9 mi. installing corr. metal pipe culverts, perforated metal pipe underdrains, and spillway assemblies betw. Kyburz and Strawberry in EL DORADO COUNTY, Calif. 8-21

SACRAMENTO, CALIF.—To Earl W. Heple, 494 Delmas Ave., San Jose, $103,850 by Calif. Div. of Highways, Sacramento, for const. an undergrade crossing under the tracks of the S. P. R.R. 1½ mi. S. of Agnew, consisting of 2 concr. abutments with wing walls and approx. 0.29 mi. roadway graded and paved with concrete, in SANTA CLARA COUNTY, Calif. 8-8

SANTA ANA, CALIF.—To B. L. Rhea, 4315 E. 15th St., Long Beach, $7300 by Bd. of Superv. Santa Ana, for const. of a steel bridge over Silvrado Creek, ORANGE COUNTY, Calif. 8-21

MISSOULA, MONTANA—To Joseph Iten, Hamilton, Mont., $15,202 by Bur. of Pub. Roads, Missoula, Mont., for const. a 3-span steel beam bridge over East Fork of the Bitterroot River, Bitterroot Salmon Highway, Project 19-D1, located in Bitterroot National Forest, RAVALLI COUNTY, Montana.

HELENA, MONTANA—To S. G. Morin & Co., 309 S. Bernard St., Spokane, Wn., $118,560 by State Highway Dept., Billings, Mont., for const. a 3-panel 57 ft. tr. timber pile trestle bridge and a tr. timb. stockpass on Sec. "C" of the Flathead Lake East Shore Road, in FLATHEAD COUNTY (NRS 102 "C"), Mont. 8-6

PORTLAND, ORE.—Award recommended to W. P. Roscoe Co., Billings, Mont., $49,882 by Bureau of Public Roads, Portland, for const. 3-span steel beam bridge over North Fork of Lee Creek and a 12x8-ft. reinf. concr. box culvert at Jule Creek, Glacier Natl. Park, Kennedy Creek Cutoff, Proj. 4, Natl. Park Road project, located in Glacier Natl. Park, GLACIER COUNTY. 8-29

PORTLAND, ORE.—Award recommended to W. K. Trippet, Whitefish, Mont., $48,134 by Bur. of Pub. Roads, Portland, for const. a 3-span slab bridge over Avalanche Cr., together with approach grading, Glacier Natl. Park, Transmountain Highway, West Side. Proj. 1-A, Unit 1, FLATHEAD COUNTY, Montana. 8-31

CHEHALIS, WN.—Awards as follows by the Lewis Couny Comm., Chehalis: (1) W. O. Salesky of Centralia, Wn., $4908 for reconst. part of Claquato Bridge No. 92 over Chehalis River, Secondary Road Proj. No. SM-8. (2) W. O. Salesky, Centralia, Wn., $4244 for const. 1 new bridge and reconst. 3 bridges on the Hanaford Valley Roads, Secondary Road Proj. No. 29. (3) Frank J. Pakar, Chehalis, Wn., $5360 for reconst. part of Ceres Bridge No. 31 over Chehalis River by retimbering existing 160-ft. combination span and reconst. part of existing pile approaches on Secondary Road Proj. No. 32. 8-26

SHELTON, WN.—To F. E. Wilder, Rt. 2, Olympia, Wn., $5,842 by Mason County Comm., Shelton, Wn., for construction of Secondary Road Project No. 17 (Goldsborough Creek Bridge). 8-15

CHEYENNE, WYOMING—Awards as follow by State Highway Comm., Wyoming, for: (1) SUBLETTE CO.—To George Carruth, Evanston, Wyo., $50,293 for const. 8 tr. timber bridges, 1 struc. steel bridge, 3 farm approach bridges and misc. work on the Kemmerer-Marbleton Road. (2) FREMONT CO.—To Swenson Lbr. Co., Laramie, Wyo., $44,935 for 5 treated timber bridges, 1 steel bridge and misc. work on the Lander-Muddy Gap Road (3) LARAMIE CO.—To J. E. Crum, Casper, $33,05 for 1 tr. timb. 0bridge, 1 concr. and steel bridge and misc. work on the Cheyenne-Wheatland Road. (4) CROOK CO.—To Treaster & Petersen, Casper, Wyo., $20,146 for 2 tr. timb. bridges, widening 1 concr. bridge and misc. work on the Sundance-Beulah Road. 8-23

Water Supply Systems . . . . .

WORK CONTEMPLATED

VICTORVILLE, CALIF.—The P.W.A. has approved a loan of $50,000 to the Victorville County Water District and call for bids will be issued shortly for construction of a waterworks system involving surface reservoir, well pumping plant and distribution system as follows: Reinf. concr. reservoir, $3,500; distribution system, $27,500; (25,500 ft. 4" and 11,600 ft. 6" cast iron pipe; 32 4" and 10 6" gate valves; 30 hydrants); water well, 16-in. diameter, 280 ft. deep, $7,300. Also pumps, sand trap, piping, etc. 8-16

DENVER, COLO.—The P.W.A. has made a grant of $2,137,725 to City and County of Denver for an extension of the Moffat Water Tunnel Project, by means of which water from the Moffat Tunnel Project will be brought direct to Denver. 8-27

TRINIDAD, COLO.—The P.W.A. has made a loan and grant of $30,909 to Trinidad, Colo., for construction of waterworks improvements. 8-28

PALISADES, COLO.—The P.W.A. has made a loan and grant of $40,000 to Palisades, Colorado, to finance construction of extensions and enlargements of watermains, additional fire hydrants, meters, and service connections and a new reinf. concr. reservoir. 8-16

KIMBERLY, IDAHO—The P.W.A. has approved a loan and grant of $50,000 to Kimberly, Idaho, for construction of a complete waterworks system, including well pump, tank, distributing system, hydrants, meters, and services. 8-28

CORBETT, ORE.—The P.W.A. has made a loan and grant of $50,909 to Corbett Water District for construction of a crib dam, 200,000 gal. concr. reservoir, with intake and distribution system in connection wih waerworks. 8-27

DUCHESNE, UTAH—The City of Duchesne, Utah, has made application to the W.P.A. for $30,000 for water works improvements. 8-21

MINERSVILLE, UTAH—The City of Minersville, Utah, has filed an application for a loan and grant of $32,000 with the P.W.A. to finance construction of improvements to waterworks system, involving: 5,638 lin. ft. 8" steel pipe, 18,173 lin. ft. 6" steel pipe, and necessary fittings and valves. 8-15

EVERETT, WN.—Plans and specifications have been completed and call for bids will be issued shortly by City Clerk, Everett, Wn., for constructing 17,000 lin. ft. of pipepine. Est. cost $125,000. 8-5

PATEROS, WN.—The P.W.A. has made a loan and grant of $15,954 to Pateros for improvements to water supply system, consist. of replacing approx. 8,500 ft. of 8"-4" wood mains with cast iron pipe. Street improvements consist of scarifying, grading, graveling and oiling of 18,000 sq. yd. of street. 8-27

SPOKANE, WN.—A P.W.A. grant of $148,500 will be applied for by Spokane, Wn., to aid in financing construction of the South Side pumping plant. Total estimated cost $330,000. 8-19

TACOMA, WN.—A P.W.A. grant of $243,000 has been made to Tacoma, Wn., for replacement, betterment and extension of the city water supply line. Total est. cost $540,000. 8-28

CALLS FOR BIDS

SAN FRANCISCO, CALIF.—Bids to 3 p.m., Sept. 17, by Public Utilities Comm., San Francisco, for laying 6" and 8" cast iron mains in Cotter St. from Alemany to Cayuga and in Cayuga from Theresa to Santa Rosa Sts. under SFWD Spec. No. 87. 8-28

SAN FRANCISCO, CALIF.—Bids to 3 p.m., Sept. 17, by Public Utilities Comm., S. F., for laying 6" and 8" cast iron mains in the Twin Peaks District under S.F.W.D. Spec. No. 83.

SAN FRANCISCO, CALIF.—Bids to 3 p.m., Sept. 17, by Public Utilities Comm., S. F., for laying 6" and 8" cast iron mains in the University Mound District under S.F.W.D Spec. No. 82. 8-28

BIDS RECEIVED

DENVER, COLO.—Hamilton & Gleason Co., 505 Tramway Bldg., Denver, Colo., $165,980 low to Board of Water Comm., Denver, Colo., for const. the intake works at the Fraser River Dam, the intake works and dams at Gin Creek and Buck Creek; the reinf. concr. spillways, transitions and stilling basin, for the Fraser River, Gin Creek and Ranch Creek conduits; the intake transitions, spillway and siphon at the shaft; the unlined and lined canals for the Fraser River-Gin Creek and Ranch Creek conduits, of the Fraser River Collection Conduit. (See Unit Bid Summary.) 8-8

CONTRACTS AWARDED

SAN FRANCISCO, CALIF.—To W. C. Akard, 225 Cervantes Blvd., S. F., $11,647 by Dept. of Pub. Works, S. F., for installation of Sec. "B" of Embarcadero Extension to the Auxiliary Water Supply System. 8-7

SAN FRANCISCO, CALIF.—To Pacific States Construction Co., 708 Call Bldg., San Francisco, $55,840 by Dept. of Pub. Works, City Hall, San Francisco, for constructing the Hayes Valley Extension to the Auxiliary Water Supply System. 8-7

SAN FRANCISCO, CALIF.—To Knowlton & Rupert, Layton, Utah, $36,319 by Chief Engr. Natl. Park Service, 409 Underwood Bldg., S. F. (USING TRANSITE PIPE), for const. a water supply and distrib. pipeline system at Old Faithful Area, Yellowstone Natl. Park. 8-14

SIGNAL HILL, CALIF.—To Chicago Bridge & Iron Co., 608 S. Hill St., L. A., $4,310 by City Clerk, Signal Hill, for furn. and erect. elevated steel water storage tank on Raymond Ave. betw. 23rd St. and Panorama Dr., cap. 50,000 gal., to be erected on concr. foundations furn. by contractor. 8-20

ROSEVILLE, CALIF.—Awards as follow by City Clerk, Roseville, for installing a distribution system. (1) To M. A. Carpenter, Roseville, Calif., $18,284 for labor only. (2) To U. S. Pipe & Foundry Co., Monadnock Bldg., S. F., $37,992 for materials only. 8-5

HEBER CITY, UTAH—Awards as follow by Heber City, Utah, for constructing a water supply line: (1) To Provo Foundry and Machine Co., Provo, Utah, for furnishing 4,800 lin. ft. 16" pipe. (2) To Ferguson & Sons, Spanish Fork, Utah, for trenching and backfilling. Est. cost $31,000. 8-21

PRICE, UTAH—Awards as follow by City Clerk, City Hall, Price, Utah, for replacement of 2 mi. of 12" and 14" water pipe: (1) To Hardesty Mfg. Co., Salt Lake City, Utah, for furnishing steel welded pipe. (2) To Bernston & Kuhre, 2336 21st South, Salt Lake City, for trenching and laying. Total cost is $150,000. 8-31

SEATTLE, WN.—To R. Mastro & Co., Whipple Station, Seattle, $4,804 by Bd. of Pub. Wks., Seattle, for const. 21" weld. steel watermains and hydrants on R.R. Ave. 8-22

Sewer Construction . . . . .

WORK CONTEMPLATED

PRESCOTT, ARIZ.—Call for bids will be issued shortly by the City of Prescott for construction of a sewage disposal system near Granite Creek on the Dells Highway. Est. cost $40,000. 8-16

SAN BERNARDINO, CALIF.—A special election will be held Oct. 1 by the electors of San Bernardino County, for formation of a sanitary district, to be known as the "Big Bear Sanitary District." 8-27

COLORADO SPRINGS, COLO.—The P.W.A. has made a grant of $121,500 to Colorado Springs, Colo., for financing construction of a sewage disposal plant, 10 m.g.d. capacity. 8-16

GREELEY, COLO.—The P.W.A. has made a grant of $42,075 to Greeley, Colo., to finance const. of a sewage disposal plant and intercepting sewers. 8-16

BOISE, IDAHO—Bond election will be held shortly by Boise, Idaho, to vote $300,000 in bonds to finance construction of a sewage disposal plant, storm sewers, and a new municipal swimming pool. Total est. cost is $546,000. 8-24

SALT LAKE CITY, UTAH—A P.W.A. application for $300,000 loan and grant will be applied for by Salt Lake County, Utah, to finance construction of a sewage disposal system in the area bounded by 1st West and 9th East Sts., and 21st and 33rd South Sts., in unincorporated District known as South Salt Lake City. 8-7

BIDS RECEIVED

LOS ANGELES, CALIF.—Artukovich Bros. Co., Inc., 912 S. Atlantic Blvd., Hynes, $42,579 low to Board of Public Works, Los Angeles, for constructing a sewer in Centinela Ave. and Venice Blvd., sewer district. 8-22

CONTRACTS AWARDED

CAMARILLO, CALIF.—To Fred J. Early, Jr., 369 Pine St., San Francisco, $83,900 by State Architect, Public Works Bldg., Sacramento, for const. a complete sewage disposal plant at Camarillo State Hospital, Camarillo, Calif. 8-8

LOS ANGELES, CALIF.—To Harry Barkelew Co., 652 N. San Julian St., Los Angeles, $4,996 by Board of Public Works, L. A., for furn. and installing gas, hot and cold water piping systems at Terminal Island Sewage Treatment Plant, Terminal Island, San Pedro, Proj. 5633. 8-8

SAN FRANCISCO, CALIF.—To Eaton & Smith, 715 Ocean Ave., S. F., $3,055 by Dept. of Public Works, S. F., for const. sewer on LeGrande Ave., etc. 8-10

SAN MATEO, CALIF.—Award (with P.W.A. approval) to W. J. Tobin, 3701 Balfour Ave., Oakland, $71,630 (after deductions of items 2, 4, 5 and 6), by City Manager E. P. Wilsey, City Hall, San Mateo, for constructing Unit "B" of sewage pumping plant in connection with the San Mateo outfall sewer. 8-5

GRANTS PASS, ORE.—Awards as follow by City Recorder, Grants Pass, Ore., for const. a sewage disposal plant and for furn. and placing the necessary equipment in the plant: GENERAL CONTRACT—To Warren Northwest, Inc., P. O. Box 5072, Portland, $27,565. (Round tanks) SCH. 1. SCHED. 2—(Glassover for Sludge Bed)—To Greenhouse Mfg. Co. $4,983. SCHED. 3—(Settling Tank Mechanism)—To Link Belt Co., 200 Paul Ave., San Francisco, $3,350. 8-9

MEDFORD, ORE.—To R. I. Stuart & Sons, Medford, Ore., $102,993 by City Supt., Medford, for const. sewage disposal plant, to be activated sludge type with primary clarifiers, aerator, final clarifier, blowers, plain digester, sludge pumps, and sewage circulation pumps. 8-19

River and Harbor Work .....

SACRAMENTO, CALIF.—An election will be held Nov. 5 by Sacramento to vote a $77,440 bond issue to finance the construction of a Yacht Harbor. The total est. cost $122,000, balance to be a P.W.A. grant. 8-30

SAN DIEGO, CALIF.—City Council, City Hall, San Diego, contemplates construction of a 2,600 ft. pier at Ocean Beach at cost of $100,000. 8-23

SAN JOSE, CALIF.—The City of San Jose voted to form a Port District at a special election held Aug. 27. A P.W.A. application for a loan and grant of $1,750,000 has been applied for. 8-28

TORRANCE, CALIF.—The City of Torrance will ask a loan and grant from the P.W.A. to finance construction of an inland harbor through Bixby Slough by dredging the slough from Wilmington to the east boundary of the City of Torrance. Est. cost $6,500,000. 8-23

BIDS RECEIVED

OAKLAND, CALIF.—Ben C. Gerwick, 112 Market St., San Francisco, $249,117, low to U. S. Coast Guard Headquarters, Washington, D. C., for construction of a steel sheet pile bulkhead approximately 1,528 lin. ft. long, anchorages, and bollard piles and accessories at the U. S. Coast Guard Base Eleven, Govt. Island, Oakland. 8-27

PORTLAND, ORE.—R. S. McClintock, South Wall St., Spokane, Wn., $10,303, low to U. S. Engr. Office, Portland, Ore., for probing and drilling in the bed of Columbia River betw. Vancouver, Wn., and the site of the Bonneville Dam, under Spec. No. 694-36-34. 8-22

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To Rohl Connolly Co., 4351 Alhambra Ave., L. A., $827,560 by U. S. Engr. Office, L. A., for const. a composite type breakwater approx. 2,000 ft. long in Los Angeles-Long Beach Outer Harbors, Calif. 8-8

SAN DIEGO, CALIF.—To V. R. Dennis Const. Co., 3911 5th Ave., San Diego, $18,749 by 11th Naval Dist., San Diego, for 170-ft. extension to the quay wall at the Naval Operating Base (Destroyer Base), San Diego, under Spec. 8059. 8-19

SAN DIEGO, CALIF.—To Hydraulic Dredging Co., Ltd., 1210 Central Bank Bldg., Oakland, $1,216,930 by U. S. Engr. Office, L. A., for dredging approx. 13,910,000 cu. yd. matl. in San Diego Bay, const. retain, dike and making a fill with dredged material; excav. 6,000 cu. yd. material to provide for an outlet ditch from Whaler's Bight to Pacific Ocean. 8-14

COCO SOLO, C. Z.—To Tucker McClure, Balboa, C. Z., $32,980 by Bureau of Yards and Docks, Navy Dept., Wash., D. C., for extension to earth filled steel sheet pile pier with timb. fender system, concr. curbs, service piping, and fittings, at the Naval Submarine Base, Coco Solo, C. Z., under Spec. 8013. 8-8

PORTLAND, ORE.—To Kern & Kibbe, 42 S.E. Salmon St., Portland, Ore., $32,947 by U. S. Engr. Office, 1st Portland Dist., 306 Customhouse, Portland, Ore., for bank clearing, bar clearing, grading of river bank, and const. of approx. 8630 lin. ft. protective gravel fill, all along the Willamette River, Oregon, betw. Eugene and Harrisburg, Ore. 8-22

PORTLAND, ORE.—To Siems-Helmers, Inc., 1014 Guardian Bldg., St. Paul, Minn., $346,520 by U. S. Engr. Office, 2nd Portland Dist., 627 Pittock Block, Portland, Ore., for channel improvement in Columbia River, Oregon and Washington, from Celilo Falls to Wallula, under Spec. No. 694-36-35. (See Unit Bid Summary.) 8-22

PORTLAND, ORE.—To Star Iron & Steel Co., 435 E. 11th St., Tacoma, Wn., $96,420. SCH. 1 (Alt. "B") by U. S. Engr. Office, 2nd Portland Dist., 627 Pittock Block, Portland, Ore., for furnishing, erecting and putting in operating condition, gantry cranes for powerhouse and lifting beams for powerhouse cranes, for Bonneville Power Navigation Project, Bonneville, Ore., under Spec. 694-35-29. 8-16

PORTLAND, ORE.—To Pacific Building Materials Co., 200 N. Thompson St., Portland, Ore., $13,870 by U. S. Engr. Office, Customhouse, Portland, Ore., for dredging a channel about 4200 ft. long, 150 ft. wide and 3½ ft. deep at low water in the Willamette River, Oregon, at Ash Island Bar, about 52 mi. above the mouth of the river, under Invit. for Bids No. 698-36-32. 8-16

PORTLAND, ORE.—To Tidepoint Co., Astoria, Oregon, $6,750. By U. S. Engr. Office, Portland, Ore., for placing approx. 3000 cu. yd. stone in revetments on Sand Island, Columbia River. 8-15

WORK CONTEMPLATED

PORTLAND, ORE.—To Eugene Sand & Gravel Co., Box 607, Eugene, Ore., $16,650 by U. S. Engr. Office, Portland, Ore., for bank clearing, grading of river bank, and placing approx. 7,500 cu. yd. riprap stone over 1,750 lin. ft. of river bank, all along the Willamette River, Oregon, near Eugene, under Invit. for Bids No. 698-36-58. 8-30

Irrigation and Reclamation

WORK CONTEMPLATED

PHOENIX, ARIZ.—An allocation of $4,500,000 has been made to the Bureau of Reclamation, for improvements to the Salt River Valley Project, Arizona. Immediate work contemplated involves construction of the Bartlett Dam on the Verde River, installation of spillways at the Roosevelt, Horse Mesa and Mormon Flat Dam and miscellaneous improvements to the entire system. 8-21

PRESCOTT, ARIZ.—The P.W.A. has made a payment of $80,000 on its $100,000 loan and grant to the Chino Valley Irrigation District for improving its system. This payment will apply on the loan portion of the allotment. 8-13

DENVER, COLO.—An allocation of $200,000 has been made to the Bureau of Reclamation, for construction of canals and pumping plants for the Grand Valley Project, Colorado. 8-21

BOISE, IDAHO—An allocation of $1,000,000 has been made to the Bureau of Reclamation for canals, laterals and pumping plants for the Payette division of the Boise Reclamation Project, Gem County, Idaho. 8-21

ALBUQUERQUE, NEW MEXICO—The P.W.A. has made a loan and grant of $47,272 to Barr Irrigation District for construction of canals, laterals, irrigation structures, and a central pumping plant for the service of approx. 800 acres of land in the District. 8-27

CARSBAD, NEW MEXICO—An allocation of $1,500,000 has been made to Bur. of Reclamation for const. of an earthfill dam on the Pecos River near Ft. Sumner and lining with concr. portions of the canal system for the Carlsbad project. 8-21

CHEYENNE, WYOMING—An allocation of $1,000,000 has been made to the Bureau of Reclamation for const. of the Bull Lake Reservoir and canals for the Riverton Reclamation Project, Wyoming. 8-21

BIDS RECEIVED

MONTROSE, COLO.—Henry Shore, Grand Junction, Colo., $59,998, low to Bureau of Reclamation, Montrose, Colo., for const. canal lining and structures for South Canal and West Canal, Uncompahgre Project, Colorado, under Spec. 636. 8-8

MISSOULA, MONTANA—Nick Burggraf, Inc., Idaho Falls, Idaho, $19,796, low to Bureau of Reclamation, Missoula, Mont., for const. of earthwork, Main Canal, Frenchtown Project, Mont., under Spec. 706-D. 8-21

ONTARIO, ORE.—H. J. Adler Co., 2310 S. Alaska St., Tacoma, Wn., $14,293 low to Bureau of Reclamation, Ontario, Oregon, for construction of structures, North Canal laterals N. C. 26.4 to 28.7 Mitchell Butte Div., Owyhee Project, Oregon-Idaho, under Spec. No. 708-D. 8-23

ONTARIO, ORE.—H. J. Adler Co., 2310 S. Alaska St., Tacoma, Wn., $21,103 low to Bur. of Reclamation, Ontario, Ore., for const. struc., North Canal, laterals NC 28.7 to 31.8, Mitchell Butte Div., Owyhee Proj. Oregon-Idaho, under Spec. No. 715-D. 8-31

CONTRACTS AWARDED

BUCKEYE, ARIZ.—To Vinson & Pringle, 919 E. Madison Ave., Phoenix, $462,685 by Roosevelt Irrigation District, Buckeye, Ariz., for sloping, reinforcing and backfilling 1" gunite lining on 4,890,900 sq. ft. of irrigation canal from Hassayampa River to Phoenix. 8-6

YUMA, ARIZ.—To Triangle Rock & Gravel Co. and Chas. Holmes, Highland Ave., San Bernardino, $149,900 by Bureau of Reclamation, Yuma, Ariz., for preparation of concrete aggregate at Sta. 90 of the All American Canal, Boulder Canyon Project, Arizona-California-Nevada, under Spec. 633. 8-12

ONTARIO, ORE.—To Henry L. Horn, Nyssa, Ore., $21,540. SCH. 1 and 2 by Bureau of Reclamation, Ontario, Ore., for const. structures, N. Canal laterals N. C. 25.4 to 25.4-4.8 Mitchell Butte Div., Owyhee Proj., Oregon-Idaho, under Spec. 694-D. 8-20

FAIRFIELD, MONT.—To Martin Wunderlich, 219 E. Fifth St., Jefferson City, Mo., $211,085, Bur. of Reclamation, Fairfield, Mont., for constg. earthwork and canal lining for the Pishkun Canal and the Sun River Slope Canal, Greenfields Division, Sun River Project, Montana, under Spec. No. 637. Work is located near Fairfield and Augusta, Montana. (See Unit Bid Summary.) 8-30

OGDEN, UTAH—To J. A. Terteling & Son, 2223 Fairview Ave., Boise, $156,091 on SCH. 1 and to Utah Const. Co. and Morrison-Knudsen Co., Box 726, Ogden, Utah, $197,429 on SCH. 2, by Bur. of Reclamation, Ogden, Utah, for const. earthwork, canal lining and struc. Sta. O to Sta. 587, Ogden-Brigham Canal, Ogden River Project, Utah, under Spec. No. 623. 8-29

Dam Construction . . . . .

WORK CONTEMPLATED

HELENA, MONTANA—The Montana State Water Conservation Board, c/o R. R. Purcell, Capitol Bldg., Helena, Mont., has applied to the P.W.A. for $2,248,910 to finance construction of the following projects: (1) BEAVERHEAD CO.—Dam and reservoir, $1,128,000; (2) WHEATLAND CO.—5 dams, reservoir and canals on the Upper Musselshell River, $803,637; (3) PARK COUNTY—Dam and reservoir on Mill Creek, $177,000; (4) HILL COUNTY—Dam and reservoir on Beaver Creek, $107,273; (5) BEAVERHEAD CO.—Dam and reservoir on Medicine Lodge Creek, $32,000. 8-17

TUCUMCARI, NEW MEXICO—An allotment of $4,500,000 has been approved by the President for the construction of the Conchas Dam on the South Canadian River, San Miguel County, New Mexico. Work will be handled by the Corps of Engineers, War Department. Dam is to be earthfill, 26,600 ft. long, 230 ft. high, capacity 800,000 ac. ft. Work involves: 550,000 cu. yd. rock and earth excav., 6,500,000 cu. yd. earth fill, 250,000 cu. yd. riprap, 70,000 cu. yd. plain and reinforced concrete. 8-5

BIDS RECEIVED

ASHTON, IDAHO—Max J. Kuney Co., 102 E. Augusta St., Spokane, Wn., who bid $478,838, low to Bur. of Reclamation, Ashton, Idaho, for constructing the Island Park Dam, Upper Snake River project, Idaho, under Spec. No. 632. Work is located near Island Park, Idaho. 8-7

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To Griffith Co., Los Angeles Ry. Bldg., L. A., who bid $4,646,857 to the Metropolitan Water District, L. A., for construction of the Cajalco Dam and dike and appurtenant features of the Cajalco storage reservoir located about 10 mi. S.W. from the City of Riverside, RIVERSIDE COUNTY, Calif., under Spec. 112. 8-16

CASPER, WYOMING—To Winston Bros., 1470 Northwestern Bank Bldg., Minneapolis, Minn., $2,194,007 by Bureau of Reclamation, Casper, Wyo., for constructing the Seminoe Dam and Power Plant, to be located about 33 mi. N.E. of Rawlins, Wyo., on North Platte River, Casper, Wyo., Alcova Project, under Spec. 630. Dam is to be massive concrete arch type, 260 ft. high, 540 ft. crest length, 89 ft. thick at base and 15 ft. thick at top. 8-29

CASPER, WYOMING—To W. E. Callahan Const. Co., Kirby Bldg., Dallas, Texas, and Gunther & Shirley, 206 S. Spring St., Los Angeles, $1,482,651 by Bureau of Reclamation, Casper, Wyo., for constructing the Alcova Dam, to be located on the North Platte River about 30 mi. S.E. of Casper, Wyo. Dam is to be earth and rockfill type, about 235 ft. high, crest length 900 ft., and crest width of 40 ft., under Spec. No. 590. 8-29

Tunnel Construction....

CONTRACTS AWARDED

LOS ANGELES, CALIF.—Awards as follow by Metrop. Water Dist., L. A., for const. concr. lined tunnels OR precast concr. pipeline and appurtenant works of the Colorado River Aqueduct distrib. system, in cities of Sierra Madre and Pasadena, under Spec. No. 110: (1) SCHED. NO. 1—To J. F. Shea, Inc., Mecca, Calif., $256,442 for 6,050 ft. tunnel and 400 ft. cast-in-place pipe betw. Upper Feeder Sta. 2887-00 and 2951-50 in Sierra Madre. (2) SCHED. NO. 2—To L. E. Dixon, Bent Bros. & Johnson, 609 S. Grand Ave., L. A., who bid $204,475 for 5504 ft. tunnel and 100 ft. cast-in-place pipe, betw. Upper Fed. Sta. 3061-00 and 3117-14, in Pasadena. (3) SCHEDS. 3 and 4—All bids have been rejected. 8-10

SALT LAKE CITY, UTAH—To Morrison-Knudsen Co., 319 Broadway, Boise, Idaho, $162,434 on SCHED. 1, to the Bureau of Reclamation, Salt Lake City, Utah, for const. the Ephraim Tunnel, Spec. 602. 8-14

Flood Control Work.....

WORK CONTEMPLATED

NOGALES, ARIZ.—The P.W.A. has made an allotment of $110,000 from old pub. works fund to Internat'l Bound. Comm. to comp. const. of internat'l flood waterway and improve channels. 8-27

LOS ANGELES, CALIF.—The Board of Supervisors, Hall of Records, L. A., will ask the U. S. Govt. for $30,997,386 to finance the following flood control projects: San Gabriel River, $7,426,000; Big Tujunga Wash, $6,914,729; Ballona Creek, $1,100,000; L. A. River at Dayton Ave., $1,795,858; Rio Hondo at Valley Blvd., $2,438,000; Sawtelle-Westwood, $2,090,000; Wilson and May Canyon, $1,086,545; Pacoima Wash, $1,038,147; Rio Hondo, L. A. River to Valley Blvd., $2,739,400; Valley Blvd. to San Gabriel River, $779,300; La Verna area, $359,921; Altadena area, $492,985; Burbank Wash, $2,206,654; Santa Anita Wash, $535,047. 8-22

Railroad Construction....

WORK CONTEMPLATED

SPOKANE, WN.—Reconstruction of 25 mi. of the Humbird Lumber Co. railroad line into Lightning Creek in North Idaho, is planned by the Diamond Match Co., Spokane, Wn. Work will start shortly. Est. cost $150,000. 8-5

CONTRACTS AWARDED

GLASGOW, MONTANA—To Morrison-Knudsen Co., 319 Broadway, Boise, Idaho, $198,672 by U. S. Engr. Office, Kansas City, Mo., for constr. standard gauge railways and trestles, spillway to dam, and other appurtenant work, at the site of the Fort Peck Dam. (See Unit Bid Summary.) 8-9

Pipe Line Construction.....

WORK CONTEMPLATED

SAN DIEGO, CALIF.—City Council, San Diego, has asked City Manager to determine feasbiility of transferring approx. $400,000 from funds available for the Sutherland Dam project for use in financing construction of the El Capitan Dam pipeline and repairs to the water system. Est. cost of the project will be $560,000, of which sum the Lakeside-La Mesa-Lemon Grove Irrigation Dist. will pay $130,000. 8-27

CONTRACTS AWARDED

SAN FRANCISCO, CALIF.—To Western Pipe & Steel Co. of California, 444 Market Street, San Francisco, $800,000 by Pacific Gas & Electric Company, 245 Market St., S. F., for furn. and fabricating 45 mi. 22" diam. gas transmission pipe for line betw. San Francisco and Milpitas. 8-16

SAN FRANCISCO, CALIF.—To Youdall Const. Co., Matson Bldg., San Francisco, by Pacific Gas & Electric Co., 245 Market St., S. F., for hauling, trenching, laying, welding and backfilling 31½ mi. 22" pipeline betw. Peninsula R.R. Crossing below Palo Alto through Woodside, etc., to San Francisco City and County line. Youdall Construction Co. have let sub-awards to R. A. Conyes Co., 1043 38th St., Oakland, for hauling, and H. C. Price & Co., 894 Folsom St., S. F., for welding. 8-30

Power Development.....

BIDS RECEIVED

LOS ANGELES, CALIF.—Fritz Ziebarth, 808 Security Bldg., Long Beach, $429,830 on SCH. 1, $407,247 on SCH. 2, $887,134 on SCH. 3, and $818,538 on SCH. 4, apparent low bid to Metropolitan Water District, Los Angeles, for constructing approx. 237 mi. of 230 KV transmission line. 8-20

LOS ANGELES, CALIF.—Pacific Coast Steel Co., L. A., $429,050 Sched. No. 1, and $402,300 Sched. No. 2, low to Metropolitan Water Dist., L. A., for furn. fabricated steel for towers and tower foundations for 237 mi. of 230 KV transmission line betw. the Boulder Dam and Colorado River Aqueduct pumping plants, under Spec. 105. 8-21

EQUIPMENT and MATERIALS SECTION

This is a directory of products made by manufacturers whose advertisements appear in this issue of *Western Construction News*. If you do not find what you want, write for further information to *Western Construction News*, 114 Sansome Street, San Francisco, California.

On the following pages will be found the "Where to Buy in the West" section; and an alphabetical index of advertisers is on the last page of this issue.

Acetylene Generators
Air Reduction Sales Co.

Asphalt Plants
Clevear-Brooks Co.
Madsen Iron Works

Backfillers
Austin-Western Road Mchy. Co.
Harnischfeger Corp.
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co.

Batchers, Concrete Aggregates
Western Pipe & Steel Co.

Bearings, Rollers
Timken Roller Bearing Co.

Bins, Storage and Hopper
Western Pipe & Steel Co.

Bits, Rock Drilling
Ingersoll-Rand Co.
Timken Roller Bearing Co.

Blades, Grader and Scraper
Adams, J. D., Co.
Allis-Chalmers Mfg. Co.
Austin-Western Road Mchy. Co.
Caterpillar Tractor Co.

Blasting Supplies
Apache Powder Co.
Atlas Powder Co.
Halafax Explosives Co.
Trojan Powder Co.

Bridges
Columbia Steel Co.

Buckets
Bucyrus-Erie Co.
Electric Steel Foundry Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Northwest Engineering Co.
Page Engineering Co.
Wellman Engineering Co.

Bulldozers
Austin-Western Road Mchy. Co.
LeTourneau, R. G., Inc.

Cable, Highway Guard Rail
Columbia Steel Company
Leschen, A., & Sons Rope Co.

Cableways
Columbia Steel Co.
Leschen, A., & Sons Rope Co.

Carbide Torches
Air Reduction Sales Co.

Castings Steel, and Alloy Steel
Columbia Steel Company
Pacific Coast Steel Corp.
Electric Steel Foundry Co.

Cement
Pacific Portland Cement Co.
Portland Cement Association

Cement Pumping Equipment
Fuller Co.

Cement, Tan
Pacific Portland Cement Co.

Chemicals
Great Western Electro-Chemical Co.

Chlorinators
Wallace & Tiernan Co., Inc.

Chlorine
Great Western Electro-Chem-

Clarifiers, Water
Dorr Company
Hardinge-Western Co.
Link-Belt Co.

Compressors, Air
Ingersoll-Rand Co.
Worthington Pump & Mchy Co.

Conveyors, Belt
Jeffrey Manufacturing Co.
Link-Belt Co.
Stephens-Adamson Mfg. Co.

Cranes, Diesel, Electric, Gas and Steam
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Koehring Co.
Lima Locomotive Works, Inc.
Link-Belt Co.
McKiernan-Terry Corp.
Northwest Engineering Co.
Thew Shovel Co.
Universal Crane Co.

Crushers
Austin-Western Road Mchy. Co.
Pioneer Gravel Equipt. Mfg. Co.

Culverts
Austin-Western Road Mchy. Co.
Toncan Culvert Mfgs. Assoc.
Western Pipe & Steel Co.

Derricks, and Derrick Fittings
Harnischfeger Corp.
McKiernan-Terry Corp.

Drills, Rock
Ingersoll-Rand Co.
Worthington Pump & Mchy. Corp.

Dynamite
Apache Powder Co.
Atlas Powder Co.
Halafax Explosives Co.
Trojan Powder Co.

Elevators, Bucket
Jeffrey Manufacturing Co.
Link-Belt Co.
Stephens-Adamson Mfg. Co.

Engines, Diesel, Gasoline and Steam
Caterpillar Tractor Co.
Ingersoll-Rand Co.
International Harvester Co. of America
Worthington Pump & Mchy. Corp.

Equipment, Rebuilt
(See Opportunity Section)

Equipment for Rent
(See Opportunity Section)

Equipment, Used
(See Opportunity Section)

Excavators, Ditching and Trench
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Lima Locomotive Works, Inc.
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co.

Excavators, Dragline
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Lima Locomotive Works, Inc.
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co.

Explosives
Apache Powder Co.
Atlas Powder Co.
Halafax Explosives Co.
Trojan Powder Co.

Fence Posts
Columbia Steel Company

Fence, Wire
Columbia Steel Company

Ferric Chloride
Great Western Electro-Chemical Co.

Fire Hydrants
Columbian Iron Works

Flumes, Metal
Western Pipe & Steel Co.
Toncan Culvert Mfgs. Assoc.
Western Pipe & Steel Co.

Flumes, Wood Stave
Federal Pipe & Tank Co.

Forms, Concrete
Western Pipe & Steel Co.

Gasoline
Union Oil Co. of Calif.
General Petroleum Corp.

Generators, Electric
General Electric Co.
Harnishfeger Sales Corp.

Generators, Turbine
Pelton Water Wheel Co.

Governors, Turbine
Pelton Water Wheel Co.

Graders, Road
Adams, J. D., Co.
Allis-Chalmers Mfg. Co.
Austin-Western Road Mchy. Co.
Caterpillar Tractor Co.

Gravel Plant Equipment
Austin-Western Road Mchy. Co.
Link-Belt Co.
Pioneer Gravel Equipt. Mfg. Co.
Standard Steel Works

Heaters, Tank Car
Cleaver Brooks Co.

Hoists, Diesel, Gas, Electric and Hand Power
Chicago Pneumatic Tool Co.
Harnischfeger Corp.
Ingersoll-Rand Co.
Link-Belt Co.
McKiernan-Terry Corp.
United Machinery Company
Wellman Engineering Co.

Hoppers, Steel
Link-Belt Co.
Standard Steel Works
Western Pipe & Steel Co.

Hydrants
Columbian Iron Works
Pac. States Cast Iron Pipe Co.

Lighting Plants
General Electric Co.
Harnischfeger Sales Corp.

Liner Plates
Western Pipe & Steel Co.

Loaders, Power, Truck and Wagon
Austin-Western Road Mchy. Co.
Link-Belt Co.

Locomotives
Plymouth Locomotive Works (Fate-Root-Heath Co.)

Lumber
Baxter, J. H., & Co.

Lumber, Redwood
California Redwood Assn.

Lumber, Treated
Baxter, J. H., & Co.

Meters
Neptune Meter Co.

Mixers, Concrete
Koehring Co.

Motors, Electric
General Electric Co.
Harnischfeger Sales Corp.
Lincoln Electric Co.

Oxygen
Air Reduction Sales Co.

Paints, Protective
General Paint Corp.

Paving Breakers
Ingersoll-Rand Co.
Worthington Pump & Mchy. Corp.

Penstocks
Western Pipe & Steel Co.

Pile Drivers
Harnischfeger Corp.
Industrial Brownhoist Corp.
McKiernan-Terry Corp.

Piling, Creosoted
Baxter, J. H., & Co.

Piling, Steel
Columbia Steel Co.
Pacific Coast Steel Corp.

Piling, Wood
Baxter, J. H., & Co.

Pipe, Cast Iron
Pacific States Cast Iron Pipe Co.

Pipe, Riveted Steel
Western Pipe & Steel Co.

Pipe, Steel
Columbia Steel Co.
Western Pipe & Steel Co.

Pipe, Welded Steel
Columbia Steel Co.
Western Pipe & Steel Co.

Pipe, Wood
Federal Pipe & Tank Co.

Powder
(See Explosives)

Pumps
Ingersoll-Rand Co.
Pelton Water Wheel Co.
Pomona Pump Co.
Worthington Pump & Mchy. Corp.

Rails and Rail Specialties
Columbia Steel Co.

Reinforcing, Steel Bar and Fabric, for Concrete
Columbia Steel Co.
Pacific Coast Steel Corp.

Rollers, Compacting
LeTourneau, R. G., Inc.

Rollers, Road
Austin-Western Road Mchy. Co.

Rope, Wire
Columbia Steel Co.
Leschen, A., & Sons Rope Co.

Scarifiers
Adams, J. D., Co.
Allis-Chalmers Mfg. Co.
Austin-Western Road Mchy. Co.
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Scrapers
Adams, J. D., & Co.
Austin-Western Road Mchy. Co.
LeTourneau, R. G., Inc.

Screens, Sand and Gravel
Austin-Western Road Mchy. Co.
Link-Belt Company
Pioneer Gravel Equipt. Mfg. Co.

Second Hand Equipment
See Opportunity Section

Sewage Disposal Equipment
Dorr Company, Inc.
Link-Belt Company
Wallace & Tiernan Company

Sharpeners, Drill
Ingersoll-Rand Company
Worthington Pump & Mchy. Corp.

Shovels, Power
Austin-Western Road Mchy. Co.
Bucyrus-Erie Company
Harnischfeger Sales Corp.
Koehring Company
Lima Locomotive Works, Inc.
Link-Belt Company
Northwest Engineering Co.
Thew Shovel Company

Steel, Abrasion Resisting
Columbia Steel Company
Electric Steel Foundry Co.
Pacific Coast Steel Corp.

Steel, Hollow Drill
Ingersoll-Rand Company
Pacific Coast Steel Corp.

Steel, Reinforcing
Columbia Steel Company
Pacific Coast Steel Corp.

Steel, Sheet-Galvanized Corrugated
Columbia Steel Company
Pacific Coast Steel Corp.
Toncan Culvert Mfgs. Assoc.

Steel, Structural
Western Pipe & Steel Co.

Tanks, Metal
Western Pipe & Steel Co.

Tanks, Wood
Federal Pipe & Tank Co.

Timber, Creosoted
Baxter & Company, J. H.

Tools, Pneumatic
Ingersoll-Rand Company
Worthington Pump & Mchy. Corp.

Torches, Carbide
Air Reduction Sales Co.

Tractors
Allis-Chalmers Mfg. Co.
Caterpillar Tractor Company
International Harvester Co. of America

Trucks, Motor
International Harvester Co. of America

Tramways, Aerial
Columbia Steel Co.
Leschen, A., & Sons, Rope Co.

Turbines
General Electric Co.
Pelton Water Wheel Co.

Valves, Gate
Columbian Iron Works
Pacific Pipe Co.
Pelton Water Wheel Co.

Vibrators, Concrete
Electric Tamper & Equipment Co.

Wagons and Trailers
Austin-Western Road Mchy. Co.
Koehring Co.
LeTourneau, R. G., Inc.

Welding and Cutting Equipment
Air Reduction Sales Co.
Adams, J. D., Co.
Harnischfeger Corp.
Lincoln Electric Co.

Welding Gas
Air Reduction Sales Co.

Welding Rods and Wire
Air Reduction Sales Co.
Lincoln Electric Company

Water Wheels
Pelton Water Wheel Co.

WHERE TO BUY IN THE WEST

A directory of distributors and branch offices of the manufacturers whose advertisements appear in this issue of *Western Construction News*. Because of space limitations only the principal centers of the west are listed. If you do not find what you want, or the firm you want, write for further information to *Western Construction News*, 114 Sansome Street, San Francisco, California. In communicating with distributors or branch offices, please mention *Western Construction News*.

A directory of equipment and materials and an alphabetical index of advertisers will be found on the last pages of this issue.

Arizona

Phoenix

Arizona Tractor & Equipment Co.,
134 South First Ave.
3-1146
Bucyrus-Erie Co.
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

General Electric Company,
441 West Madison St.
3-6139

McGinnis, Neil B., Company,
1401 South Central Ave.
4-1493
Adams, J. D., Co.
Allis-Chalmers Mfg. Co.
Mall Tool Co.
Northwest Engineering Co.
Pioneer Gravel Equipment Mfg. Co.

Mine & Smelter Equipment Co.,
110 South 3rd Ave.
3-6418
Link-Belt Co.
Page Engineering Co.

Motor Supply Co.,
315 North Central Ave.
4-1153
Lincoln Electric Co.

Pratt-Gilbert Hardware Co.,
701 South Seventh St.
3-5145
Air Reduction Sales Co.
Apache Powder Co.
Ingersoll-Rand Co.
Koehring Co.
Leschen, A., & Sons Rope Co.

Southwest Equipment Co.
528 West Jefferson St.
3-2986
Marmon-Herrington Co., Inc.

Stapley, O. S., Company,
723 Grand Ave.
4-1116
Austin-Western Road Machinery Co.
Columbia Steel Co.
International Harvester Co. of America

Torson Construction Co.,
220 South 7th Ave.
Electric Tamper & Equipment Co.

Western Pipe & Steel Co.,
611 South Dunlap Ave.
3-5602
Toncan Culvert Mfrs. Assn.

Tucson

Austin-Western Road Machinery Co.

Baum & Adamson,
296 North Stone Ave.
4050

Corbett, J. Knox, Lumber & Hdw. Co.,
340 North Sixth Ave.
2140

Motor Supply Co.
140 South Sixth Avenue
Lincoln Electric Co.

Ronstadt Hdw. & Mchy. Co.,
92 East Broadway
680
Galion Iron Works & Mfg. Co.
International Harvester Co. of America

Steinfeld, Albert, & Co.,
119 North Stone Ave.
882
Apache Powder Co.

Threlkeld Commissary, Inc.,
P. O. Box 1881

California

Los Angeles

Adams, J. D., Company,
1202 Mateo Street
TRinity 8381
Adams, J. D., Co.
International Harvester Co. of America

Air Reduction Sales Co.
2423 East 58th St.
JEfferson 6141

Atlas Powder Co.,
805 Title Guarantee Bldg.
MIchigan 8896

Austin-Western Road Mchy. Co.,
4400 District Boulevard
KImball 4156

Barrett Co.
1136 South Hayworth Ave.
YOrk 1559

Bevis Machinery Co.,
3649 Santa Fe Ave.
KImball 4149
Industrial Brownhoist Corp.
Marmon-Herrington Co., Inc.

Brown-Bevis Equipment Co.,
4900 Santa Fe Ave.
JEfferson 5221
Electric Tamper & Equipment Co.
Ingersoll-Rand Co.
Page Engineering Co.

California Redwood Association
117 West Ninth Street
MUtual 8156

Chicago Bridge & Iron Wks.

Columbia Steel Company
2087 East Slauson
LAfayette 1171

Columbian Iron Works
2801 East 12th St.

Collins, Harry C., Machinery Co.,
1919 Santa Fe Ave.
Link-Belt Co.
Plymouth Locomotive Works
(Division of Fate-Root-Heath Co.)

Crook Company,
2900 Santa Fe Ave.
KImball 5137
Allis-Chalmers Mfg. Co.
Bucyrus-Erie Co.

Dorr Company, The
108 West 6th St.
TUcker 8562

Electric Steel Foundry Co.,
2205 Santa Fe Ave.
JEfferson 4191

Fuller Company
1041 South Olive St.
Garlinghouse Bros.,
2416 East 16th St.
JEfferson 5291
Leschen, A., & Sons Rope Co.
Mall Tool Co.
McKiernan-Terry Corp.
United Machinery Company
Worthington Pump & Machinery Corp.

General Electric Company,
5201 Santa Fe Ave.
LAfayette 0961

General Paint Corp.,
544 Mateo St.
TRinity 4941

Halafax Explosives Co.,
810 South Spring St.
TRinity 8528

Harnischfeger Sales Corp.,
2029 Santa Fe Ave.
MAdison 2444

Harron, Rickard & McCone Co.,
2205 Santa Fe Ave.
JEfferson 4191
Electric Steel Foundry Co.
Harnischfeger Corp.—Welders
Koehring Co.
Pioneer Gravel Equipment Mfg. Co.
Wellman Engineering Co.

Fidelity Bldg.
MUtual 6397

Ingersoll-Rand Co.,
1460 East Fourth St.
ANgelus 6761

International Harvester Co. of America
(Tractors and Power Units)
734 Lawrence St.
TRinity 5132

International Harvester Co. of America
(Motor Trucks)
1628 East 7th St.
TRinity 5132

Lincoln Electric Co.
812 Mateo St.

Link-Belt Company,
361 South Anderson St.
ANgelus 6171

Neptune Meter Company,
701 East Third St.
TRinity 2879

Madsen Iron Works
5631 Bickett Street (Huntington Park)
LAfayette 1141

Northwest Engineering Co.,
3707 Santa Fe Ave.
JEfferson 2196

Ornitz, Edward M.
206 S. Spring St.
MUtual 3812
Cleaver-Brooks Company

Pacific Coast Steel Company
E. Slauson Ave. and Downey Road
LAfayette 1161

Pacific Portland Cement Co.
633 East Gage Ave.
ADams 6103

Portland Cement Association
816 West 6th St.
MIchigan 9897

Rix Company, Inc., The,
810 Santa Fe Ave.
TRinity 4134
Page Engineering Co.
Thew Shovel Co.

Shepherd Tractor & Equipment Co.,
150 West Jefferson St.
PRospect 0247
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Smith Booth Usher Company
2001 Santa Fe Ave.
TRinity 6911
Lima Locomotive Works, Inc. (Shovel and Crane Division)
Page Engineering Co.
United Machinery Company
Worthington Pump & Machinery Corp.

Standard Steel Works,
5001 Boyle Ave.
LAfayette 1138

St. John, A. S., Co., Inc.
126 West Third St.
VAndike 8865
Apache Powder Co.

Standard Steel Works
5001 S. Boyle Avenue
LAfayette 1138

Stevenson Chemical Co.,
641 Gibbons St.
Gt. Westn. Electro-Chemical Co.

Stephens-Adamson Manufacturing Company
2227 E. 37th, Vernon
JEfferson 1191

Victor Welding Equipment Co.,
2032 Santa Fe Ave.
JEfferson 6246
General Electric Company

Wallace & Tiernan Company,
3923 West Sixth St.
FEderal 6823

Western Pipe & Steel Co.,
5717 Santa Fe Ave.
JEfferson 3131
Toncan Culvert Mfrs. Assn.

Worthington Pump & Machinery Corp.
5075 Santa Fe Avenue
JEfferson 6251

Oakland

Air Reduction Sales Co.
Park Ave. & Halleck St.
OLympic 4100

Allis-Chalmers Manufacturing Company
(Tractor Division)
2533 Peralta Street
GLencourt 2530

Bacon, Edw. R., Company
1135 57th Avenue
FRuitvale 0715
Mall Tool Co.
McKiernan-Terry Corp.
Page Engineering Co.
United Machinery Co.

Bates, Sam, Co.,
1925 Dennison St.
ANdover 4327
Page Engineering Co.

Industrial Equipment Co.,
Outer Harbor
GLencourt 5909
Bucyrus-Erie Co.

International Harvester Co. of America
1640 East 12th St.
ANdover 5700

Link-Belt Co.,
526 Third St.
HIgate 4286

Mall Tool Co.,
2308 Webster St.
TEmplebar 6878

Pacific Electric Motor Co.,
10th and Oak Sts.
GLencourt 1844
General Electric Co.

Robinson Tractor Co.,
1705 East 12th St.
FRuitvale 2485
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Sacramento

Air Reduction Sales Co.
501 I St.
Main 852

Bacon, Edward R., Co.
720 I Street
MAin 445
Mall Tool Co.
McKiernan-Terry Corp.
Page Engineering Co.

General Paint Corp.
11th and R
Capital 2121

Sacramento Tractor & Equipment Co.
1730 16th St.
Capitol 1065
Allis-Chalmers Mfg. Co.

Vandercook Gold Company
F & M Building
Sacramento
Main 2085
Worthington Pump & Machinery Corp.

Where to Buy in the West

Weaver-Rye Tractor Company
1701 Second Street
MAin 4100
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Western Machinery Co.
1210 G Street
MAin 1790
Ingersoll-Rand Company

Western Pipe & Steel Co.,
c/o Sutter Club
Main 217
Toncan Culvert Mfrs. Assn.

San Diego

Charles N. Bottiger
209 West E
Main 1657
Lincoln Electric Co.

Contractors Equipment & Machinery Co.
1344 National Ave.
Main 8833
Worthington Pump & Machinery Co.

General Electric Co.,
206 W. Market St.
Main 4288

Hazard-Gould & Co.
Fifth and K Sts.
Main 6174
Allis-Chalmers Mfg. Co.

International Harvester Co. of America
1482 Broadway
Franklin 1550

San Diego Tractor & Equipment Co.,
701 First Ave.
Main 6151
Caterplilar Tractor Co.

Southern Machinery Co.,
666 State St.
Franklin 6388
Ingersoll-Rand Co.
Stephens-Adamson Manufacturing Co.

Western Metal Supply Co.
215 7th St.
FRanklin 3111
Air Reduction Sales Co.

San Francisco

Adams, J. D., Co.,
230 Utah St.
UNderhill 5120
Adams, J. D., Co.
International Harvester Co. of America

Harron, Rickard & McCone Company
Harnischfeger Sales Corp.

Air Reduction Sales Co.
313 6th St.
SUtter 4582

Associated Equipment Co., Ltd.,
355 Fremont St.
KEarny 1181
Thew Shovel Co.

Atlas Powder Co.,
1 Montgomery St.
GArfield 8640

Austin-Western Road Mchy. Co.,
435 Brannan St.
DOuglas 2183

Bacon, Edward R., Co.
17th and Folsom Sts.
HEmlock 3700
Allis-Chalmers Mfg. Co.
Mall Tool Co.
McKiernan-Terry Corp.
Page Engineering Co.
United Machinery Company

Bucyrus-Erie Co.,
989 Folsom St.
GArfield 8192

California Redwood Association,
Financial Center Bldg.
EXbrook 7880

Columbia Steel Company
1400 Russ Building
SUtter 2500

Columbian Iron Works
1072 Howard St.

Fuller Co.,

Garfield & Co.,
Hearst Bldg.
SUtter 1036
Plymouth Locomotive Works
(Division of Fate-Root-Heath Co.)
Industrial Brownhoist Corp.
Link-Belt Co.

Worthington Pump & Machinery Co.
General Electric Co.,
235 Montgomery St.
DOuglas 3740

General Paint Corp.,
2627 Army St.
ATwater 5100

Great Western Electro-Chemical Co.,
9 Main St.
GArfield 8323

Halafax Explosives Company
116 New Montgomery St.
GArfield 4759

Harnischfeger Sales Corp.,
82 Beale St.
DOuglas 2313

Harron, Rickard & McCone Co.,
2070 Bryant St.
ATwater 2202
Electric Steel Foundry Co.
Koehring Co.
Mall Tool Company
Pioneer Gravel Equipment Mfg. Co.
Wellman Engineering Co.

Ingersoll-Rand Co.,
350 Brannan St.
GArfield 6330
International Harvester Co. of America
201 Potrero Ave.
HEmlock 6681

Knapp, J. E., Co.,
593 Market St.
GArfield 4783
Ingersoll-Rand Co.

Kratz & McClelland, Inc.,
522 Bryant St.
SUtter 6807
Electric Tamper & Equipment Co.

Leschen, A., & Sons Rope Co.,
520 Fourth St.
GArfield 8134

Lincoln Electric Co.
894 Folsom St.
GArfield 5507

Link-Belt Co.,
400 Paul Ave.
DElaware 6400

Neptune Meter Co.,
320 Market St.
GArfield 8144

Northwest Eigineering Co.,
255 Tenth St.
HEmlock 5060

Pacific Coast Steel Company
20th and Illinois Sts.
MArket 3200

Pacific Pipe Co.,
207 Folsom St.
EXbrook 6255

Pacific Portland Cement Co.,
111 Sutter St.
GArfield 4100

Pacific States Cast Iron Pipe Co.,
Rialto Bldg.
KEarny 5075

Portland Cement Association
564 Market St.
SUtter 8159

Robinson Tractor Company
1175 Howard St.
MArket 8020
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Stephens-Adamson Manufacturing Company
85 Second Street
KEarny 7181

Thew Shovel Co.,
355 Fremont St.
KEarny 1181

United States Pipe and Foundry Co.
907 Monadnock Bldg.
GArfield 5140

Victor Welding Equipment Co.,
844 Folsom St.
GArfield 5727
General Electric Co.

Wallace & Tiernan Co., Inc.,
171 Second St.
KEarny 5072

Welding Service, Inc.,
954 Howard St.
DOuglas 3292
Harnischfeger Corp.—Welders

Western Machinery Co.,
760 Folsom St.
EXbrook 4167
Ingersoll-Rand Co.

Western Pipe & Steel Co.,
444 Market St.
GArfield 6788
Toncan Culvert Mfrs. Assn.

Western Traction Co.
355 Fremont St.
KEarny 1181
Marmon-Herrington Co., Inc.

Worthington Pump & Machinery Corp.
543 Howard St.

Young, A. L., Machinery Co.,
26 Fremont St.
SUtter 5736
Lima Locomotive Works, Inc.

Colorado

Denver

Atlas Powder Co.,
401 Midland Savings Bldg.
Bostwick, Frederick H.,
Denver Natl. Bank Bldg.
TAbor 5744

Western Pipe & Steel Co.
Cederberg, C. R.
5531 East 14th Ave.
YOrk 0604
Wallace & Tiernan Co., Inc.

Clinton & Held Co.,
1637 Wazee St.
TAbor 3291
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Corson, Ray, Machinery Co.,
1646 Wazee St.
KEystone 6632
Bucyrus-Erie Co.
Page Engineering Co.

Denver Metal & Machinery Co.,
130 Larimer St.
TAbor 6178
Ingersoll-Rand Co.

Denver Oxygen Co.
901 Navajo
TAbor 4725
Air Reduction Sales Co.

Dorr Company, The
1009 17th St.
TAbor 1281

Fair, Elton T., Co.,
1646 Wazee St.
TAbor 1685
Adams, J. D., Co.
Pioneer Gravel Equipment Mfg. Co.
Plymouth Locomotive Works
(Division of Fate-Root-Heath Co.)
Fair, Elton T., Co.
Madsen Iron Works
Fitzgerald, Paul,
U. S. Natl. Bank Bldg.
TAbor 1841
Harnischfeger Corp.—Welders
Plymouth Loco. Works
General Electric Co.,
650 17th St.
KEystone 7171

General Machinery & Supply Co.
635 Walnut St.
KEystone 1500
Worthington Pump & Machinery Co.

Goodrich, B. F., Co.,
14th and Glenarm Sts.
KEystone 0175

Great Northern Tool & Sup. Co.
2125 Blake St.
TAbor 0197
Lincoln Electric Co.

Hendrie & Bolthoff Mfg. & Supply Co.,
1639 17th St.
KEystone 4111
General Electric Co.

Hoskins Beatty Motor Co., Inc.
1147 Broadway
MAin 3271
Marmon-Herrington Co., Inc.

Ingersoll-Rand Co.,
1637 Blake St.
KEystone 2245
International Harvester Co. of America
2308 15th St.
GAllup 0138

McKelvy Machinery Company
754 South Broadway
Adams, J. D., Co.
Koehring Company

Leschen, A., & Sons Rope Co.,
1554 Wazee St.
MAin 1366

Liberty Trucks & Parts Co., Inc.,
615 East 18th Ave.
MAin 3241
Austin-Western Road Machinery Co.

Link-Belt Co.,
Boston Bldg.
MAin 0231

Mine & Smelter Supply Co.,
1422 17th St.
KEystone 3111
McKiernan-Terry Corp.
Northwest Engineering Co.

Moore Hardware & Iron Co.,
1529 15th St.
TAbor 2251
Harnischfeger Corp.—Welders

Moore, H. W., Equipment Co.,
Sixth and Acoma Sts.
TAbor 1361
International Harvester Co. of America
Thew Shovel Co.
Wellman Engineering Co.

Neptune Meter Co.,
1700 15th St.
MAin 3221

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1921 Blake St.
MAin 0697

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MAin 3460
Lima Locomotive Works, Inc.

Thompson Mfg. Co.
3001 Larimer
KEystone 8196
Toncan Culvert Mfrs. Assn.

Worthington Pump & Machinery Co.
512 18th Street

Wilson Machinery Company
1936 Market St.
TAbor 0135
Allis-Chalmers Mfg. Co.

Idaho

Boise

Bunting Tractor Co.,
926 Front St.
2649
Caterpillar Tractor Co.

Feenaughty Machinery Co.,
9th and Grove Sts.
1333
Thew Shovel Co.

General Electric Co.,
906 East Bannock St.
368

General Paint Corp.,
2218 W. Fairview Ave.
2861-W

Intermountain Equipment Company
Broadway and Myrtle St.
171
Allis-Chalmers Mfg. Co.
Bucyrus-Erie Co.
General Electric Co.
Ingersoll-Rand Co.
LeTourneau, R. G., Inc.
Page Engineering Co.
Pioneer Gravel Equipment Mfg. Co.

Jeter, F. A.,
1116 North 18th St.
2612
Austin-Western Road Machinery Co.

Northwest Machinery Co.
710 Front St.
38
Marmon-Herrington Co., Inc.

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214 South 5th St.
4277
Leschen, A., & Sons Rope Co.

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LeTourneau, R. G., Inc.
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Lincoln Electric Co.
International Harvester Co. of America
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Midland Implement Co.,
2300 Montana Ave.
Koehring Co.
Page Engineering Co.

Butte

Atlas Powder Co.,
412 West Broadway
2-4868
Daugherty, H. H.,
420 South Idaho St.
3884
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Leschen, A., & Sons Rope Co.
LeTourneau, R. G., Inc.
Northwest Engineering Co.
Pioneer Gravel Equipment Mfg. Co.
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Worthington ump & Machinery Corp.
General Electric Co.,
20 West Granite St.
5479
Hall-Perry Machinery Co.,
812 East Iron St.
6376
Madsen Iron Works
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Page Engineering Co.
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Ingersoll-Rand Co.,
420 E. Iron St.
2-3903
Montana Hardware Co.,
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2-1295
Ingersoll-Rand Co.
Wright, S. P., & Co., Inc.,
48 East Broadway
2-3221
Lima Locomotive Works, Inc.

Great Falls

Connelly Machinery Co.,
315 2nd Street S.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Leschen, A., & Sons Rope Co.
LeTourneau, R. G., Inc.
International Harvester Co. of America
422 Second St. S.
7621
Northwest Equipment Co., Inc.,
Great Northern Tracks
3982
Koehring Co.
Pioneer Gravel Equipment Mfg. Co.
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1003 2nd Ave. N.W.
4755
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Scott Motors, Ltd.
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Sixth and Broad Sts.
371
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719 Market St.
314
Caterpillar Tractor Co.
Peoples' Warehouse
1425 South Sixth St.
704
Air Reduction Sales Co.

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BRoadway 2501
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(Tractor Division)
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BRoadway 5561
Bucyrus-Erie Co.
Electric Tamper & Equipment Co.
United Machinery Company
Columbia Steel Company
2345 N.W. Nicolai St.
BEacon 7261
Consolidated Supply Co.
139 S. W. Stark
ATwater 6511
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Cramer Machinery Co.,
Lewis Bldg.
ATwater 3852
Koehring Co.
Madsen Iron Works
Mall Tool Company
United Machinery Company
Feenaughty Machinery Co.,
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EAst 2187
LeTourneau, R. G., Inc.
Page Engineering Co.
Thew Shovel Co.
United Machinery Company
General Electric Co.,
621 S.W. Alder St.
ATwater 0281
Gordon & Finkbeiner Co.,
112 S.W. Pine St.
ATwater 9401
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International Harvester
McKiernan-Terry Corp.
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United Machinery Company
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56 S.E. Belmont St.
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ATwater 6481
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EAst 4128
Caterpillar Tractor Co.
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Plymouth Locomotive Works
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Wellman Engineering Co.
Neptune Meter Co.,
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BRoadway 0100
Pacific Coast Steel Company
American Bank Building
BEacon 7238
Pacific Portland Cement Co.,
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ATwater 6656
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Spaulding Bldg.
ATwater 5465
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ATwater 7425
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ATwater 7491
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83 S.E. Belmont St.
EAst 6611
Marmon-Herrington Co., Inc.
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TAbor 2370
Lima Locomotive Works, Inc.

Texas

El Paso

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Main 9000
Harnischfeger Corp.—Welders
Ingersoll-Rand Co.
General Electric Co.,
109 North Oregon St.
Main 5500
General Engineering & Equipment Co.
Worthington Pump & Machinery Corp.
Industrial Motor Service Co.
2227 Texas St.
Main 167
Allis-Chalmers Mfg. Co.
Ingersoll-Rand Co.,
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Main 1617
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Wagner, Francis, Company
1417 Texas
Main 90
Madsen Iron Works
Worthington Pumy & Machinery Corp.
206 San Francisco Street
Main 863
Zork Hardware Co.,
309 North El Paso St.
Main 1040
Leschen, A., & Sons Rope Co.

Utah

Salt Lake City

Ambler & Ritter,
Kearns Bldg.
Wasatch 1132
Thew Shovel Co.
Arnold Machinery Co.,
149 West Second South St.
Madsen Iron Works
Northwest Engineering Co.
Page Engineering Co.
Atlas Powder Co.,
822 Continental Natl. Bank Bldg.
Wasatch 4027
Columbiai Steel Company
1606 Walker Bank Building
Wasatch 1076
Eastern Iron & Metal Co.,
634 South Fourth West St.
Wasatch 1118
Ingersoll-Rand Co.
Galigher Company,
228 South West Temple St.
Wasatch 900
General Electric Co.
General Electric Co.,
200 S. Main St.
Wasatch 735
Harrison, Wm. Z.
Dooley Block
Fuller Co.
Ingersoll-Rand Co.,
51 West South Temple St.
Wasatch 8682
International Harvester Co. of America
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Wasatch 1617
Jones, C. H., Co.,
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Wasatch 2580
Lima Locomotive Works, Inc.
Landes Tractor & Equipment Co.,
245 West South Temple St.
Wasatch 4020
Caterpillar Tractor Co.
Harnischfeger Corp.—Welders and Hoists
LeTourneau, R. G., Inc.
Lang Company, The,
267 West First South St.
Wasatch 6693
Austin-Western Road Machinery Co.
International Harvester Co. of America
Lund Machinery Co.,
49 North Second West St.
Wasatch 5581
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National Equipment Co.,
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Wasatch 1722
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MAin 5110

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ELliott 6188
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1054 Fourth Avenue South
MAin 1972

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ELliott 1084

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SUnset 5878

Feenaughty Machinery Co.
1028 Sixth Ave. S.
ELliott 7808
LeTourneau, R. G., Inc.
Page Engineering Co.
Thew Shovel Co.

General Electric Co.,
821 Second Ave.
MAin 9790

General Paint Corp.,
1406 Dearborn St.
PRospect 7600

Grant Auto Electric Co., Inc.
1425 12th
EAst 0525
Air Reduction Sales Co.

Harnischfeger Sales Corp.,
2911 First Ave. S.
MAin 5576

Haseltine, J. E., & Co.,
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SEneca 0626
General Electric Co.

Howard-Cooper Corp.,
1520 Fourth Ave. S.
ELliott 0740
International Harvester Co. of America
McKiernan-Terry Corp.

Ingersoll-Rand Co.
526 First Ave. S.
MAin 2436
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MAin 7337

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WEst 1131

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SEneca 0916

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Colman Bldg.
MAin 6835
Industrial Brownhoist Corp.
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MAin 1123
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Snow, L. A., Co.,
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ELliott 4188
Koehring Co.
Madsen Iron Works

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1741 First Avenue South
ELliott 0760
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2208 First Avenue South

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MAin 0201

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Spokane

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1021 Broadway
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Construction Equipment Co.,
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Broadway 5076
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Plymouth Locomotive Works
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RIverside 3695

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N. 715 Division St.
Broadway 5606
Thew Shovel Co.
United Machinery Company

General Electric Co.,
421 Riverside Ave.
Main 5201

General Machinery Co.,
E. 3501 Riverside Ave.
Lakeview 1134
Lima Locomotive Works, Inc.
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Main 2166

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Pacific Hotel
Riverside 3141
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Harnischfeger Sales Corp.,
S. 1314 Bernard St.
Main 6805

Howard-Cooper Corp.,
134 Spokane International Rt. of Way
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International Harvester Co. of America
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Broadway 1954
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Hughes & Co.,
S. 119 Howard St.
Main 4277
Neptune Meter Co.

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S. 121 Monroe Street
Main 1271
Lundy, A. L.
Culmstock Arms Apt. Hotel
Riverside 7181
Columbia Steel Company

Nott-Atwater Co.,
S. 157 Monroe St.
Main 4377
Leschen, A., & Sons Rope Co.

Snow, L. A., Co.,
S. 151 Madison St.
Main 4226
Allis-Chalmers Mfg. Co.
Koehring Co.
Madsen Iron Works

Spokane Welders Supply Co.
919 1st
Main 2044
Air Reduction Sales Co.

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500 East Overland St.
Main 1507

Union Oil Co. of Calif.,
Chronicle Bldg.
Main 3266

Washington Mchy. & Supply Co.,
9 Cataldo St.
Broadway 0390

Tacoma

General Electric Co.,
1019 Pacific Ave.
MAin 2882
International Harvester Co. of America
102 Puyallup Avenue
BRoadway 2423

Wyoming

Cheyenne

Allied Equipment Co.
608 West 18th St.
Allis-Chalmers Mfg. Co.
International Harvester Co. of America
701 West 17th St.
3343
Moss, Glenn,
423 West 19th
Austin-Western Road Machinery Co.

Wortham Machinery Co.,
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4649
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OPPORTUNITY SECTION

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF THE INTERIOR

Bureau of Reclamation

(Federal Emergency Administration of Public Works Project)

Buildings at Seminoe and Alcova Dams

Washington, D. C., August 21, 1935.

Sealed bids (Specifications No. 643) will be received at the office of the U. S. Bureau of Reclamation, Casper, Wyoming, until 10 o'clock a.m., September 21, 1935, and will at that hour be opened for furnishing labor and materials and performing all work for the construction of an office building, dormitory, combined garage and shop, four four-room residences, and three five-room residences at the Government camp at Seminoe Dam and one five-room residence at Alcova Dam, Casper-Alcove Project, Wyoming. The Seminoe Dam is located about 37 miles northeast of Parco, Wyoming, and the Alcova Dam is located about 30 miles southwest of Casper, Wyoming. The buildings and residences, except the garage and shop building, will be of wood frame construction, with siding over sheathing on the exterior walls, and the interior walls and ceilings will be plaster over wood or metal lath. The foundation walls, footings, and basement floors will be of concrete. The walls and floors of the garage and shop building will be of concrete. The roofs will be covered with cement-asbestos shingles over solid sheathing. The walls and ceilings will be insulated. Gravity warm-air heating systems will be installed in the residences and in the office building and a mechanical warm-air and fan system in the dormitory. The schedule provides for lump-sum bids for the construction of the buildings and residences except excavation and concrete, and for unit prices for these items. The installation of plumbing, heating, and electrical facilities will be included in the lump-sum prices bid for the construction of the buildings and residences. This invitation for bids does not cover the purchase of materials which are to be furnished by the Government. Materials to be furnished by the contractor and those furnished by the Government are described in the specifications which will be a part of the contract. Bid security 10 per cent and performance bond 50 per cent will be required. The charge for copies of the specifications and drawings is $2.50, not returnable. For particulars, address the Bureau of Reclamation, Casper, Wyoming; Denver, Colorado; or Washington, D. C.

M. A. SCHNUER,
Acting Commissioner.

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF AGRICULTURE

Bureau of Public Roads

Grading and Placing Reinforcement on Mt. Shasta Highway Section

San Francisco, California, Sept. 3, 1935.

Sealed bids will be received at the office of the Bureau of Public Roads, 807 Sheldon Building, 461 Market Street, San Francisco, California, until 2:00 o'clock p.m. on September 24, 1935, for grading and placing subgrade reinforcement on Section H of Route 77, the Mt. Shasta-Mt. Lassen National Forest Highway, Shasta National Forest, Shasta County, California. The length of the project is 0.883 miles. The principal items of work are approximately as follows: 7 acres clearing, 6,200 cubic yards unclassified excavation, 50 cubic yards unclassified excavation for structures, 10,400 cubic yards unclassified excavation for borrow, 150 station yards overhaul, 6,100 cubic yard miles borrow haul, 1,600 cubic yards subgrade reinforcement, 400 M. Gal. watering, 310 lineal feet corrugated metal pipe, 12 cubic yards concrete, 300 pounds reinforcing steel, 10 each culvert markers, 12 each right of way monuments. The minimum wage paid labor employed on this project shall be in accordance with the classified labor rates attached to the specifications of which the minimum is $1.00 per hour for skilled labor, 68 cents per hour for intermediate labor and 60 cents per hour for unskilled labor. The attention of bidders is especially directed to the provisions covering the **subletting** and **assignment** of the contract; and to the **alternate** bids which must be submitted in case the bidder desires to offer any **foreign** articles, materials or supplies. Where copies of plans and specifications are requested a deposit of $10 will be required to insure their return. If these are not returned within 15 days after opening of bids the deposit will be forfeited to the Government. Checks should be certified and made payable to the Regional Fiscal Agent, U. S. Forest Service. Plans, specifications and proposals may be obtained at the office of the Bureau of Public Roads, 807 Sheldon Building, 461 Market Street, San Francisco, California.

C. H. SWEETSER,
District Engineer.

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