WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED
WESTERN HIGHWAYS BUILDER

PUBLISHED MONTHLY
VOLUME XI, No. 1

JANUARY, 1936

25 CENTS A COPY
$2.00 PER YEAR

PROGRESS

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

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

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

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


IT'S HERE
a new NORTHWEST full-revolving 3/8 Yd. Shovel!
Big Machine Quality at an attractive price
NEVER before a small machine like this!
A small and lighter NORTHWEST of "Sensible Weight" which insures sturdiness, strength and durability — not a "skinned down" weight built purely for price.
SUPER MOBILITY—maneuvers with the ease of a tractor! Steering controlled by the operator with the cab in any position.
FEATHER TOUCH CLUTCH CONTROL retains the feel of the load—fast and smooth operation.
NORTHWEST INDEPENDENT CROWD —utilizes power other shovels waste.
BALL OR ROLLER BEARINGS on all high speed shafts.
FULLY ENCLOSED CAB—Operator protected in all kinds of weather.
LOADS ON A TRUCK OR TRAILER—take it anywhere at motor truck speed.
And there it is! A compact tool for a man sized job! Full-revolving, convertible, mobile and powerful! Be sure to see it before you buy.
NORTHWEST ENGINEERING COMPANY
1736 Steger Building, 28 E. Jackson Boulevard, Chicago, Illinois
NORTHWEST ENGINEERING COMPANY 255 Tenth Street, San Francisco, Calif. 3707 Santa Fe Avenue, 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.; Nell B. McGinnis Co., 1401 S. Central Ave., Phoenix, Ariz.
SHOVELS, CRANES
DRAGLINES
PULLSHOVELS
SKIMMERS
NORTHWEST
GASOLINE, OIL
DIESEL OR
ELECTRIC
POWERED
BUILT IN A RANGE OF 15 SIZES — 3/8 YD. CAPACITY AND LARGER

Ten Years Ago

Items taken from the first issue of "Western Construction News," published in January, 1926

Bent Bros. were well along on their contract for building Exchequer Dam for the Merced Irrigation District, the closure was made Nov. 24, 1925. M. H. Slocum was general superintendent.

•

R. C. Storrie & Co. was building camp and erecting equipment on the Bucks Creek project near Quincy, Calif., to get a start on a season of dam and tunnel construction. B. T. Willard was superintendent for R. C. Storrie & Co. Lars Jorgenson was consulting engineer for designing the two concrete arch dams.

•

In Arizona, the town of Flagstaff had just completed a new supply line and reservoir to supplement its water supply system, under the direction of Burns-McDonnell-Smith Engineering Co., consulting engineers.

•

Seattle was building the $289,000 Michigan St. trunk sewer. Felix Arcorace was contractor, H. C. Scott, superintendent and I. W. Embury, district engineer.

•

The $2,000,000 Antioch bridge across the San Joaquin River, near Antioch, Calif., was opened for traffic Jan. 1, 1926. Duncanson & Harrelson were foundation contractors.

•

Oberg Brothers, Los Angeles, had the contract for building the activated sludge sewage disposal plant at Pomona, Calif.

•

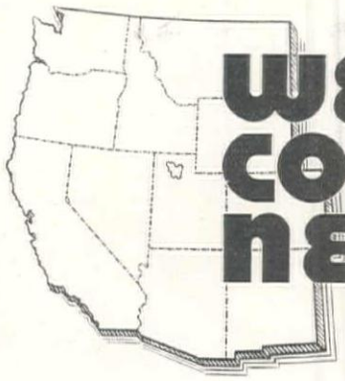
Heavy mountain grading was complete on an 8-mi. section of the Victory Highway (U. S. 40) in the Sierra Nevada in California. Contract was held by C. R. Adams, Merced, Calif. J. L. Piper was resident engineer for the California Highway Commission.

•

Vallejo, Calif., was building the Gordan Valley Dam for its water supply system. L. M. Canady was project engineer and A. Kempkey consulting engineer.

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.



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J. I. BALLARD, Editor

Contents for January, 1936

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New York Office: 509 Fifth Avenue . . . . . Ralph H. Flynn, Manager

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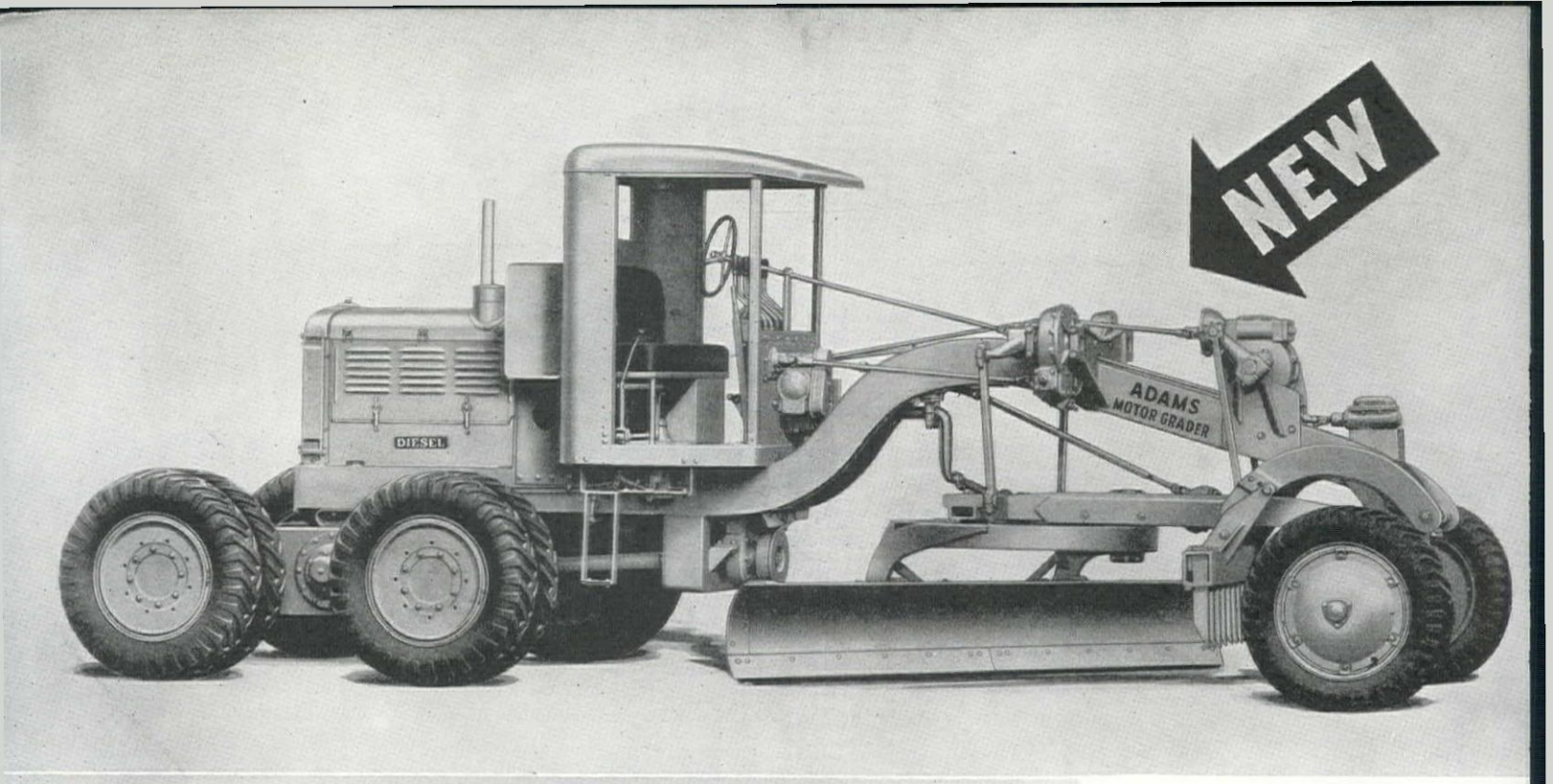
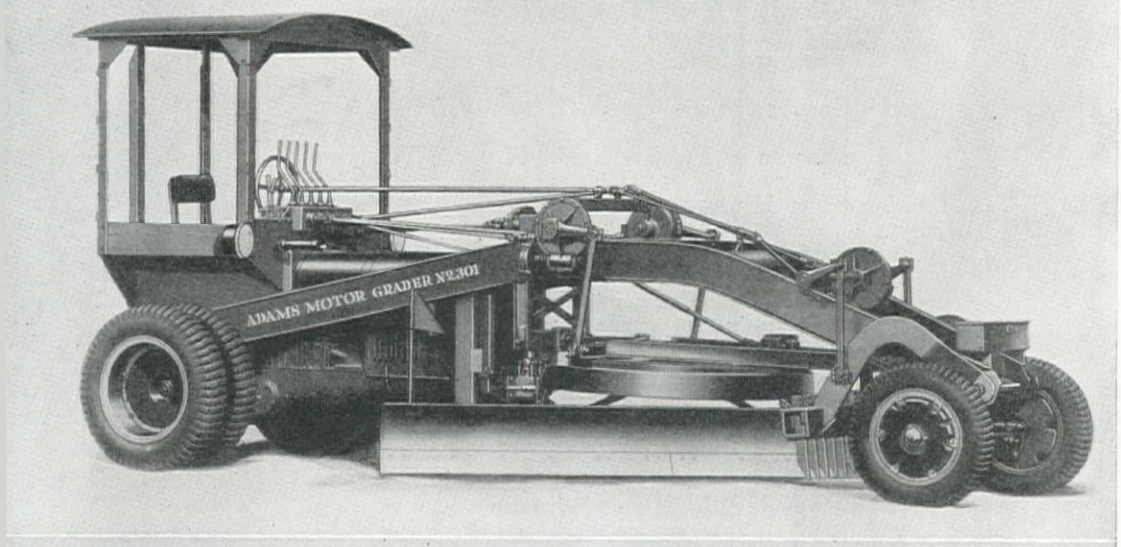
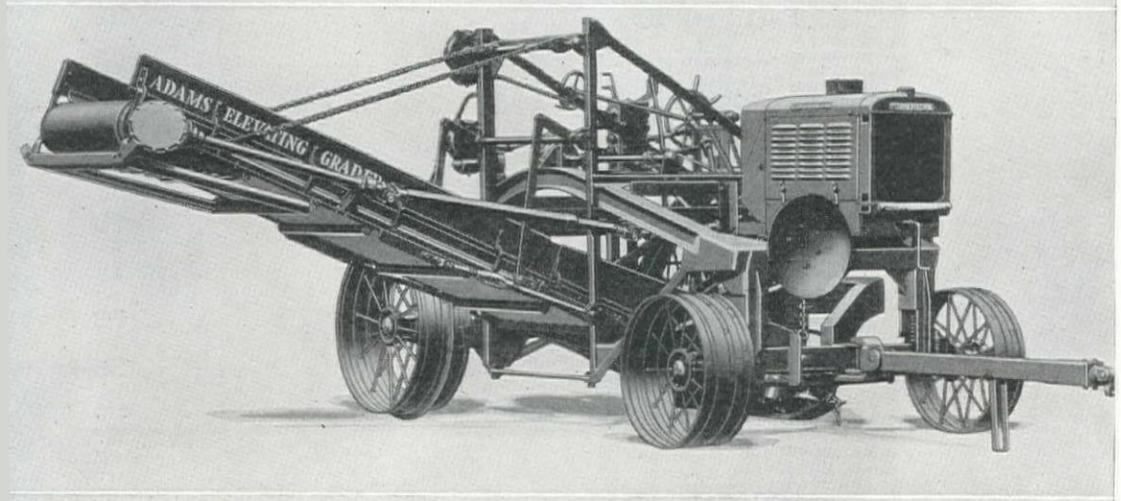
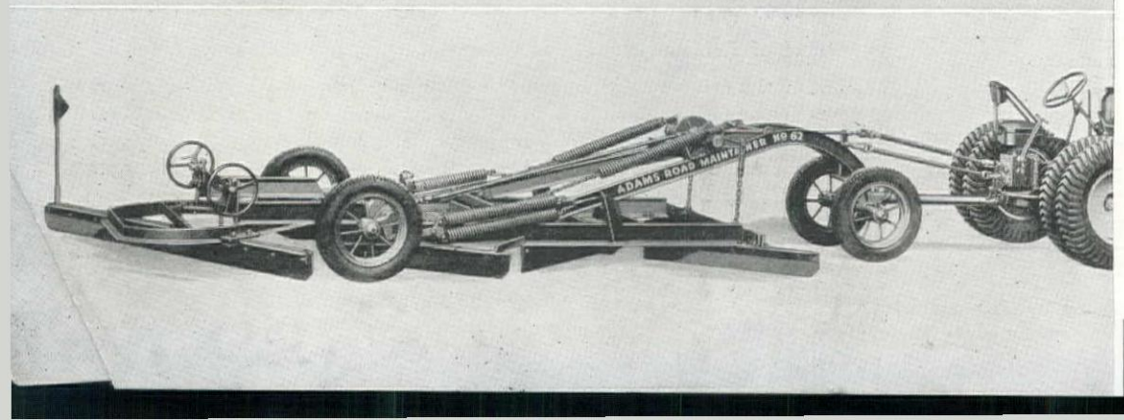








Adams Motor Graders

Shown above is Adams new, heavy-duty motor grader offered with 57 h.p. International Diesel power unit or 59 h.p. International gasoline engine. Has abundance of power and capacity to handle all kinds of heavy work. Five forward speeds provide proper speed for any job... Furnished with dual-tired, two-wheel drive or Adams Tandem Drive. Scarifier and long front axle with adjustable leaning wheels optional equipment.

Motor grader at left is powered by International I-30 Tractor developing 39 h.p.—a popular machine for general maintenance work. Available with two-wheel or tandem drive.

Adams Elevating Graders

Have several exclusive and patented features of fundamental design which make them unequalled for capacity and stability. Furnished with 19, 22, or 25 ft. carriers and 42 in. or 48 in. belts. Power unit for driving belt and operating controls available in gasoline or Diesel type.

Adams Multiple-Blade Maintainer

Has 40 feet of blades which work the road surface four times in one trip. Unequalled as "chatter bump" remover on gravel and stone roads. Used also on light retread work.

ROAD
ADAMS
MACHINERY

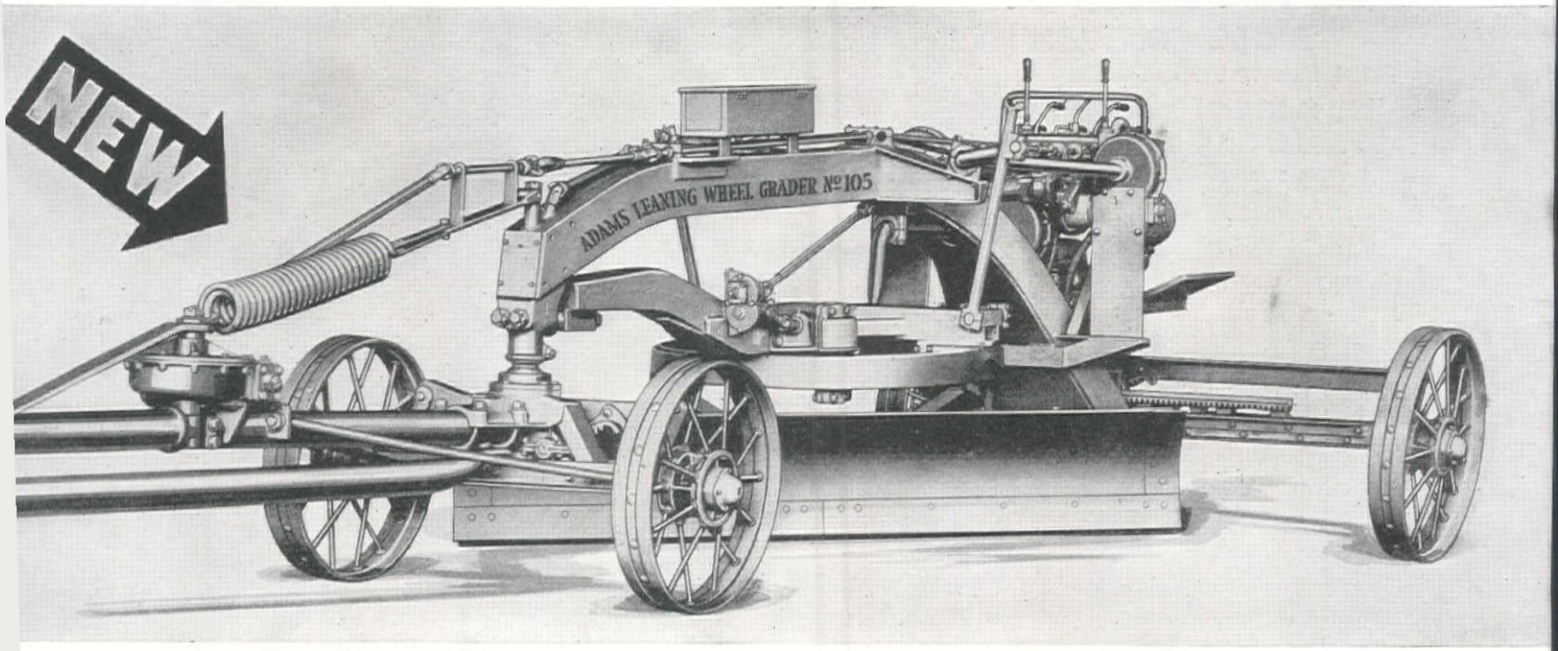
ADAMS Sets the Pace for 1936

In a line that fairly sparkles with new machines Adams offers, in 1936, the most outstanding equipment of its kind in road-building history... Each type of machine shown is "ace-high" in its class—the result of highly developed specialization. Each offers features and working advantages not to be found in any similar machine—features which mean more work per dollar of operating cost or less cost per unit of work done... Don't buy any road grading or maintenance machinery until you inspect the new Adams line. Ask your local Adams representative or dealer for particulars, or write directly to

J. D. ADAMS COMPANY • INDIANAPOLIS, INDIANA

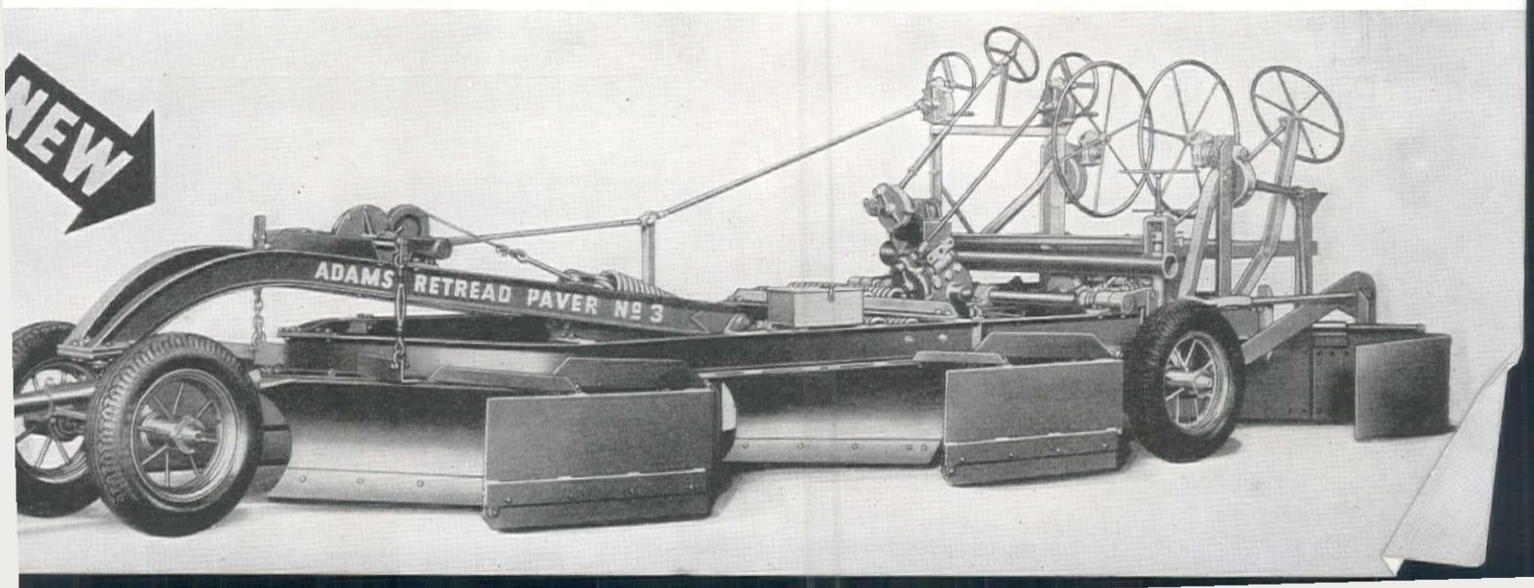
SAN FRANCISCO—LOS ANGELES—BILLINGS

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



Adams New-Type Leaning Wheel Graders: The real sensation of the road grader field. New, wide range of blade positions permits cuts not possible with other machines. Have extraordinary strength, rigidity and visibility. Don't buy any road grader until you see these remarkable machines demonstrated. Available in 10 ft. and 12 ft. blade sizes—power-operated controls.

Adams Retread Paver: The outstanding, moderately-priced machine for "road mix" jobs. Thoroughly mixes tar, asphalt, or road oils with stone, gravel or other aggregates and spreads the mixture to specifications ready for rolling. Mixes quicker and finishes much better than is possible with graders. Also ideal for mixing and spreading on gravel road stabilization work.



WHAT TO SEE AT THE ROAD SHOW—

THE whole Cleveland Line will be on exhibit in Space No. F-28. Be sure to see our many sizes and types of Hand Hammer Drills, Paving Breakers, Pneumatic Diggers, and Tampers. Don't miss our Models DR and WD Drill Rigs. They are the outstanding rock drill design accomplishment of the year. While attending the Show you are cordially invited to be our guest at our extensive manufacturing plant. See how we make Cleveland Rock Drills, and observe a demonstration of any type of air tool which may interest you.

A bright new catalog awaits your request. Ask us about the newly revised Driller's Handbook. You get a copy free by filling in the coupon and presenting it to the attendant at our booth.

THE CLEVELAND ROCK DRILL COMPANY

3734 East 78th Street, Cleveland, Ohio

If you do not attend the Road Show, fill in the coupon completely and mail it to us. The book will be sent GRATIS to all bona fide rock drill owners and operators who apply.

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EL PASO
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BUTTE
501 Dooly Building
SALT LAKE CITY

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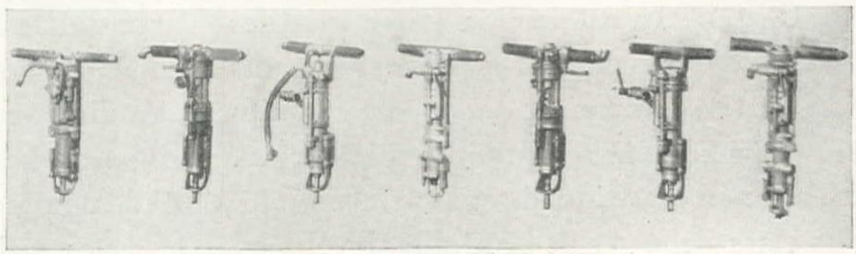
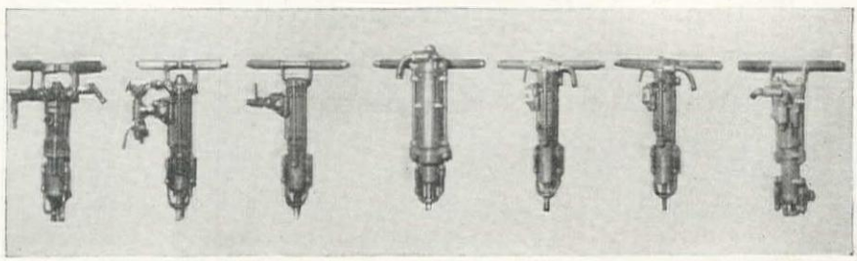
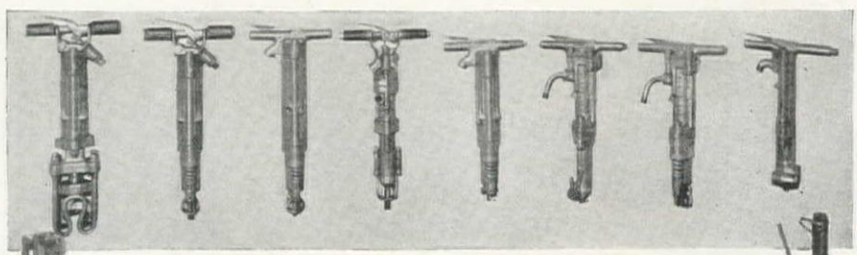
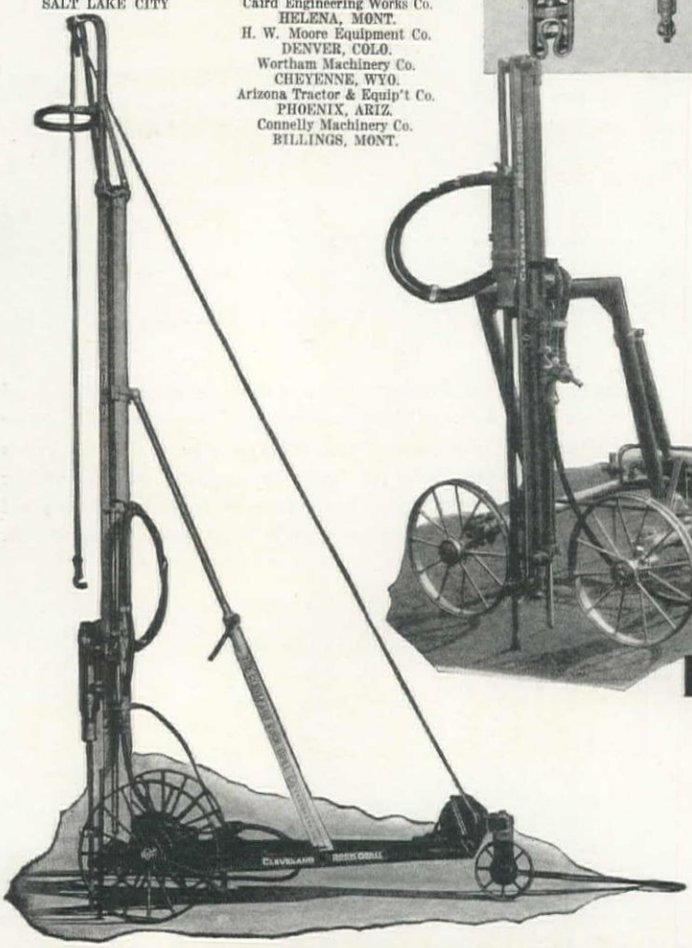
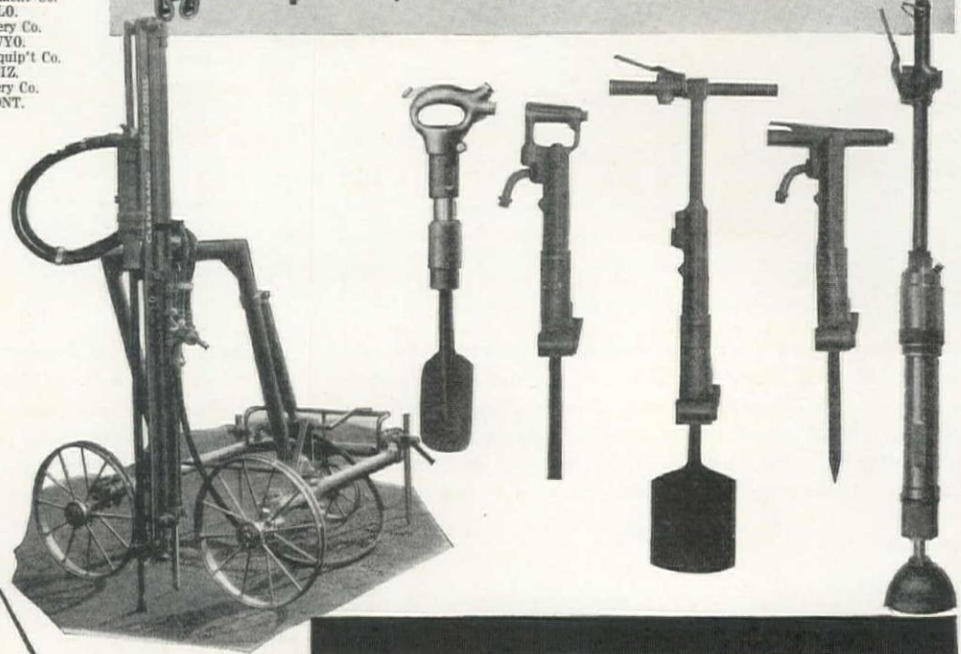










THE CLEVELAND ROCK DRILL COMPANY,
3734 East 78th Street, Cleveland, Ohio

Gentlemen: Please send me the "Driller's Handbook."

NAME.....

COMPANY.....

ADDRESS.....

We are now using the following types of machines:

Hand Hammer Drills.....

Paving Breakers.....

Clay Diggers.....

Back Fill Tampers.....

Wagon Drills.....

"YOU ROAD BUILDERS— Put this Tractor to the Test"

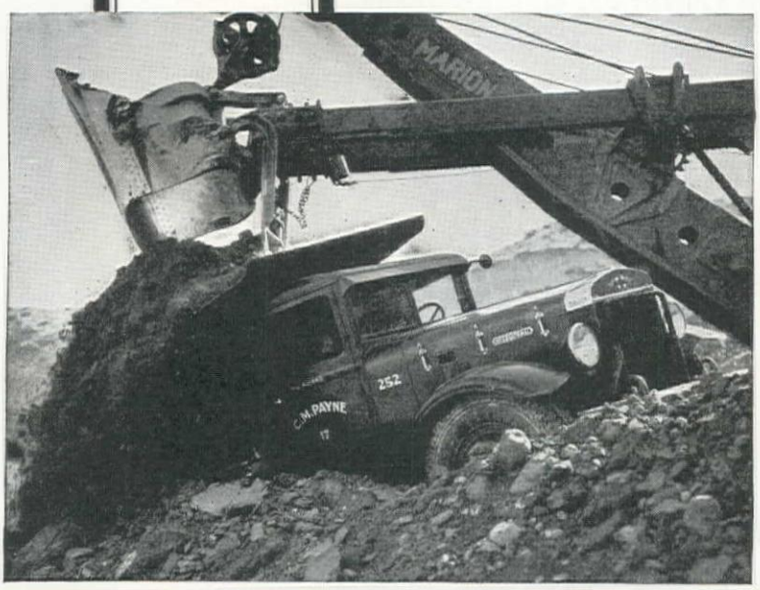
If you want real down-to-earth facts about efficiency in dirt-moving power, ask experienced operators—men who know both International Harvester Trac-TracTors and *other* crawler tractors. Then ask the owner-contractors. And finally, watch the TracTracTor on the job. You will come to definite conclusions as to TracTracTor *superiority*—in power, stamina, accessibility, service, and LASTING ECONOMY.

Remember this about Trac-TracTors: they are by far the *most accessible, most easily serviced* crawler tractors on the market.

Be guided by the 30-year experience of International Harvester—world's largest tractor builder—when you invest in power. For complete information on the International Harvester line of gasoline and Diesel power, consult the nearest distributor or branch.

SEE THE EXHIBIT of International Industrial Power and International Trucks at the Convention and Road Show of the American Road Builders' Association, Cleveland, O., January 20 to 24.

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



INTERNATIONAL TRUCKS

In most convincing fashion International Trucks have proved their reliability and economy in dump-truck work. Take the Model A-8 shown at the left. It is one of four owned by the C. M. Payne Contract Trucking Co., Spokane, Wash. All of them worked on the Grand Coulee dam, and C. M. Payne says *"Our Internationals worked at less cost at Grand Coulee than any trucks we ever had."* Experienced owners have put Internationals through their paces—depend on their judgment when you buy trucks.

INTERNATIONAL HARVESTER

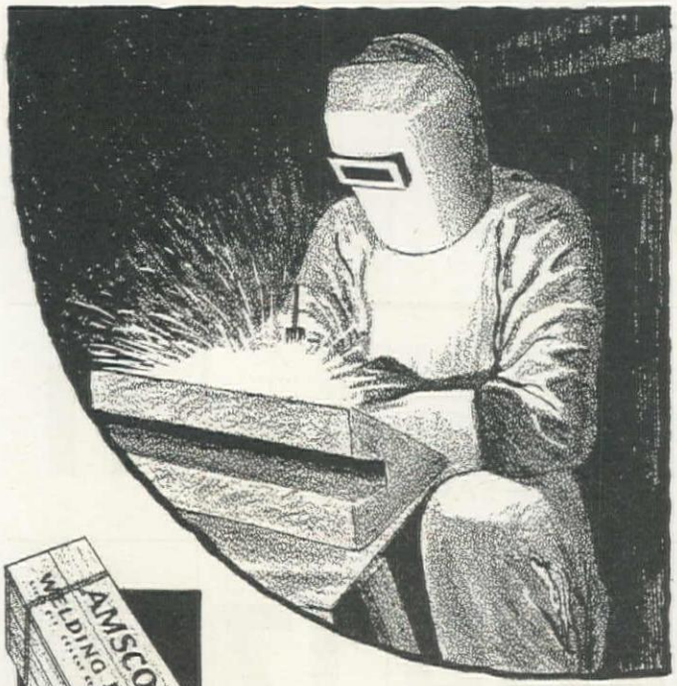
International Harvester Industrial Tractors and Power Units are distributed by J. D. Adams Co., Los Angeles and San Francisco, Calif.; O. S. Stapley Co., Phoenix, Ariz.; Ronstadt Hardware & Machinery Co., Tucson, Ariz.; H. W. Moore Equipment Co., Denver, Colo.; Howard-Cooper Corp., Portland, Ore., Seattle, Spokane, Wash., Twin Falls, Ida.; The Lang Co., Salt Lake City, Utah.
International Harvester branches at Los Angeles, San Francisco, Portland, Seattle, Spokane, and Salt Lake City.

GROUND make their any weather

PROGRESSIVE operators, whether the job is big or small, know that Firestone Ground Grip Tires give them the super-traction they need—save wear and tear on their equipment, and speed up the work. In addition to their use on buggies, road graders and other earth working equipment they are finding wide use on contractors' trucks and cars, where they must get through regardless of road or weather.

Firestone patented construction features are responsible for the amazing success of the new Firestone Ground Grip Tire. It is easy to see why the massive tread, with its scientifically designed and

REPLACE or RECLAIM?



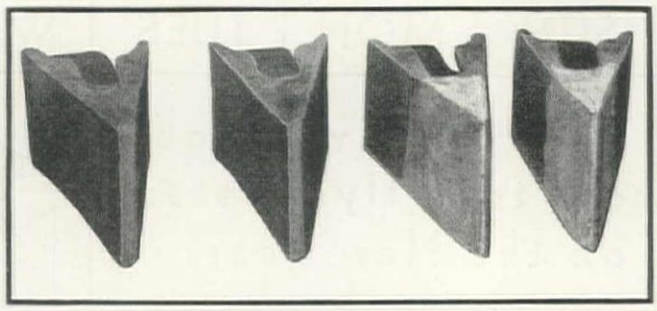
If it's gone beyond economical repair, scrap it and buy a new Amsco Manganese steel casting. If it's cracked or surface worn, repair it or build it up with Amsco welding rods.

AMSCO Nickel-Manganese Steel Welding Rods (U.S. Patent 1,815,464), originally made for our own use, are ideal for repair and reclamation welding. Use them for welding worn or fractured manganese steel castings and to give an air-toughening, work-hardening manganese steel weld to rolled or cast carbon steel.

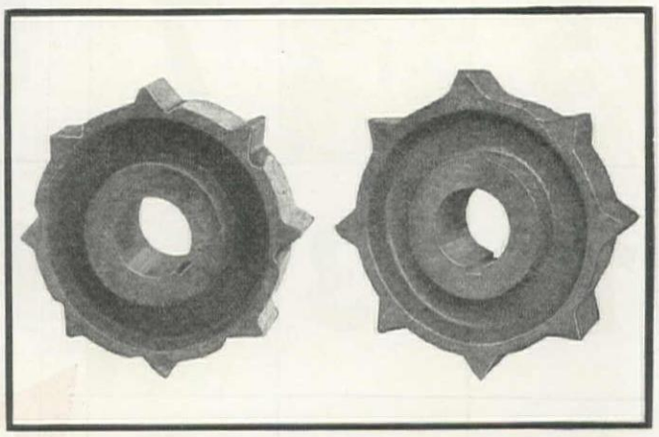
AMSCO No. 459 and No. 217 Hard Surfacing Rods, other exclusive products, are made for hard-facing parts subjected to severe abrasion such as Rolling Mill Guides, Pug Mill Knives, Dipper Teeth, Plow Shares, Screw Conveyor Edges, Pulverizer Hammers, etc. They are easily applied, extremely wear resistant and low in cost. They may be used to surface any ferrous article and also over a nickel manganese steel building up weld.

Users of AMSCO Welding Rods effect big savings in salvaging worn and broken equipment parts, savings frequently approaching 90% of replacement cost. Send for AMSCO Welding Rod Bulletins and confirmation data on the savings others are making!

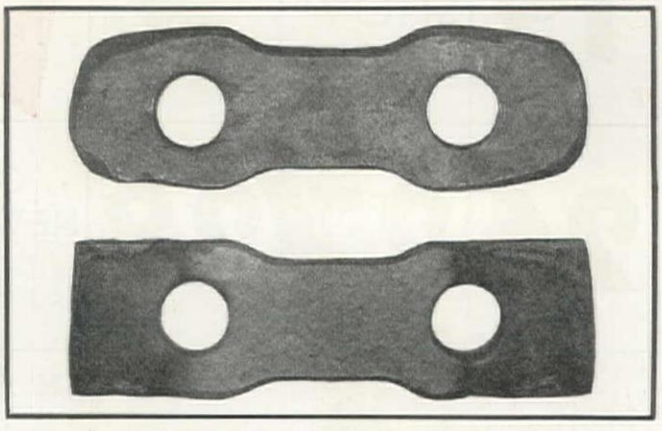
AMSCO Welding Rods are stocked by leading distributors and AMSCO foundries in all logical lengths and sizes, bare and coated.



AMSCO Manganese Steel Dipper Teeth before and after hard surfacing with #459 Rod.



Carbon steel crawler sprocket wheel. Worn and as built up with AMSCO Nickel Manganese Steel Rod.



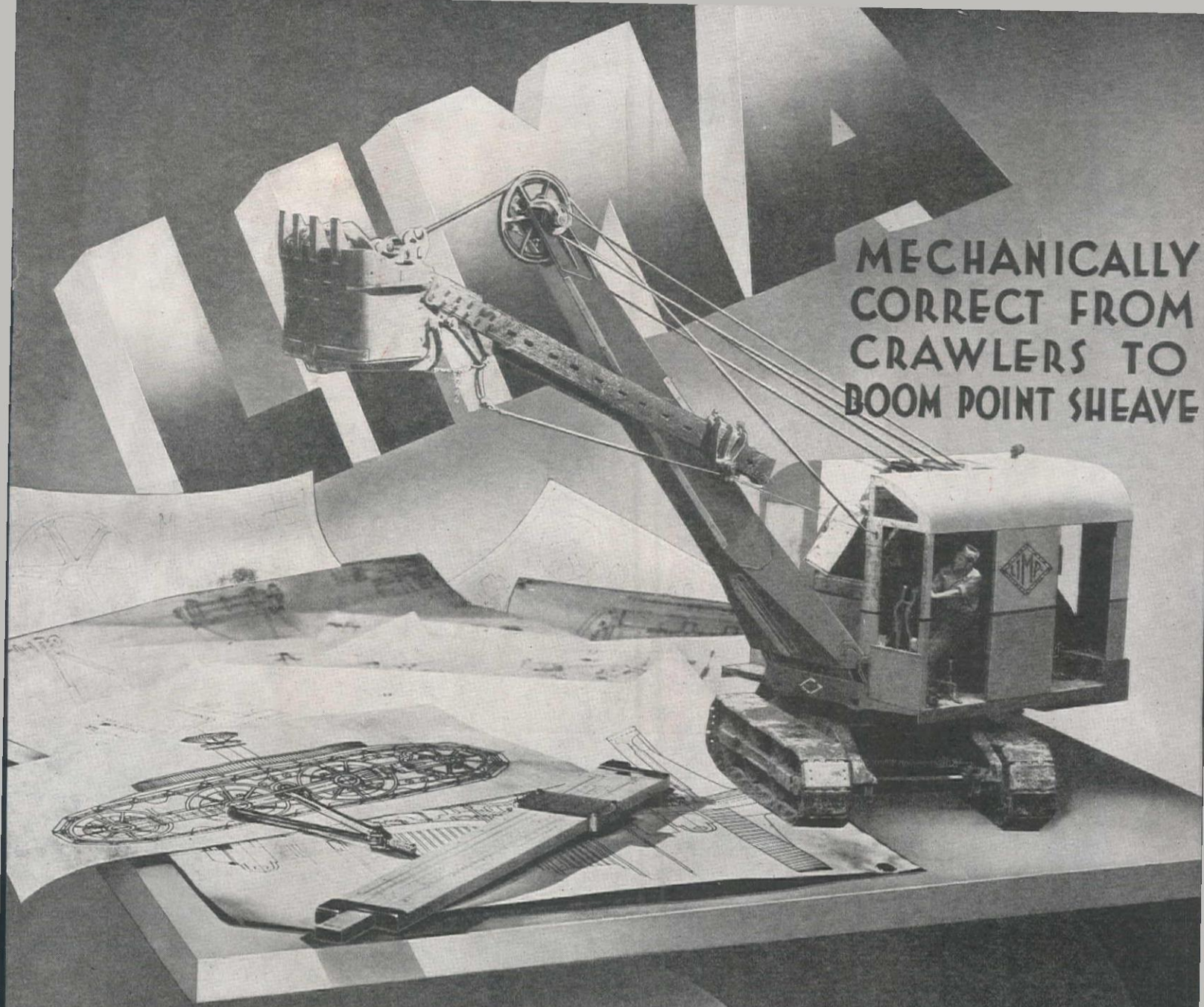
Above, a worn pulverizer hammer. Below, built up with AMSCO Manganese Steel Welding Rod.

AMSCO # 217 Welding Rod, a new hard-facing rod, differs from AMSCO # 459 in giving a much harder deposit, although one that is not quite so tough. Use # 217 for maximum abrasion resistance where no great impact is involved.

If you have never used the AMSCO Rods —send for free samples.

AMSCO
TRADE MARK REGISTERED

AMERICAN MANGANESE STEEL COMPANY
Division of American Brake Shoe & Foundry Company
402 East 14th Street, Chicago Heights, Ill.
Foundries at Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; Oakland, Calif.; Los Angeles, Calif. • Offices in Principal Cities



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

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

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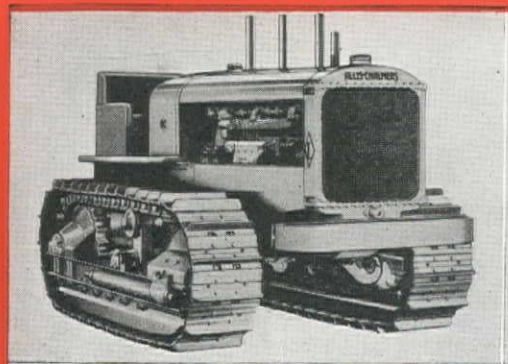
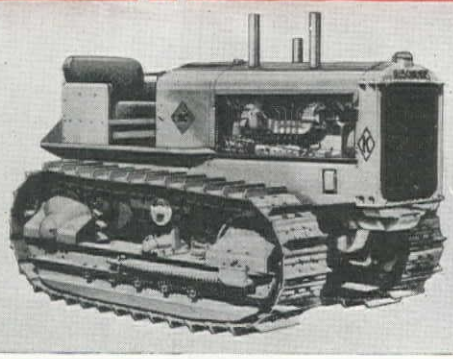
ALLIS-CHALMERS

LINE OF TRACTORS AND ROAD MACHINERY

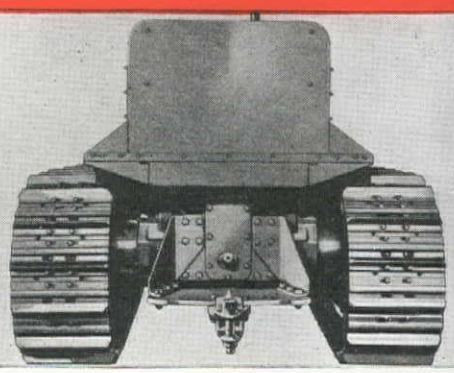
for 1936



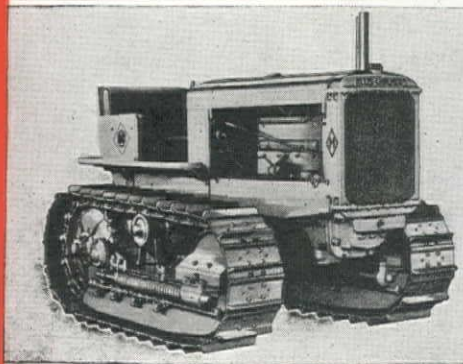
MODELS "L-O" AND "L" OIL & GAS TRACTORS



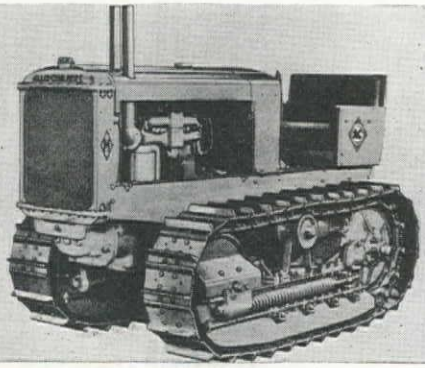
MODELS "K-O" AND "K" OIL & GAS TRACTORS



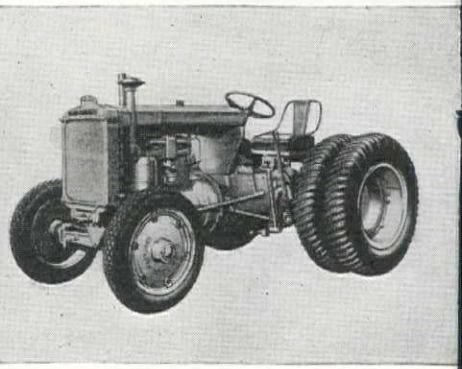
MODEL "WK" AND "WK-O" — WIDE TREAD



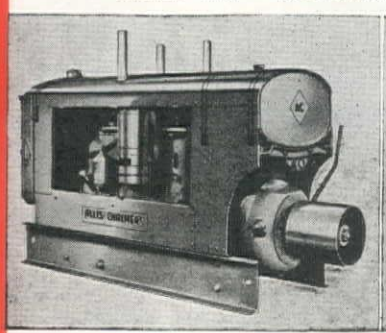
MODEL "WM" — WIDE TREAD



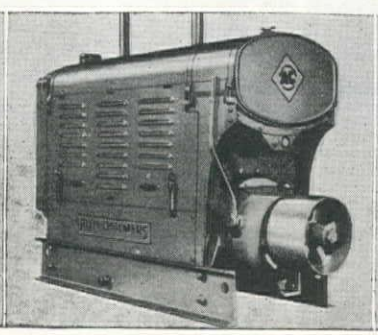
MODEL "M" — STANDARD TREAD



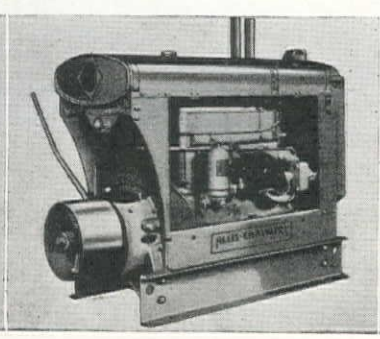
MODEL "IU" INDUSTRIAL TRACTOR



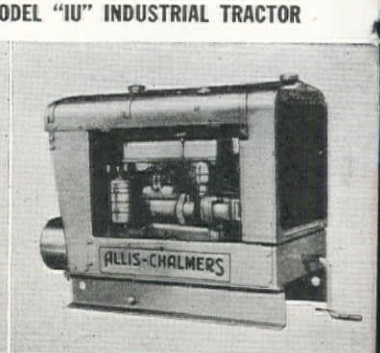
MODEL L-90 POWER UNIT



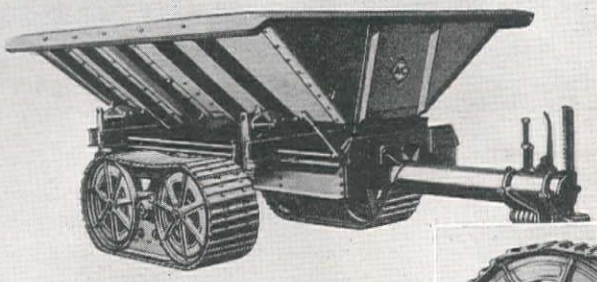
MODEL E-60 POWER UNIT



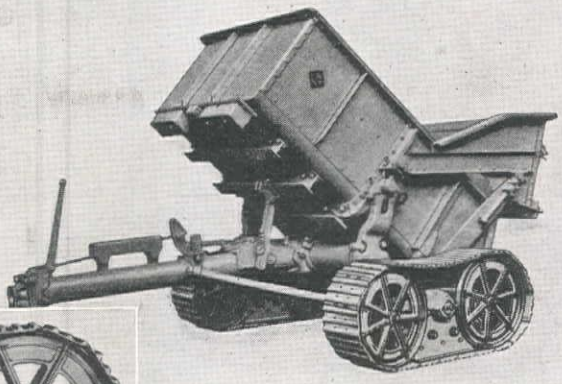
MODEL U-40 POWER UNIT



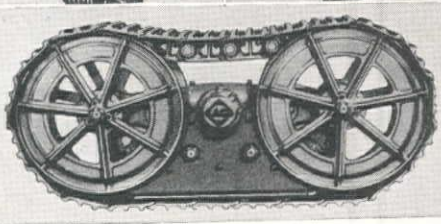
MODEL W-25 POWER UNIT



11 AND 15-YARD 2-WAY WAGON



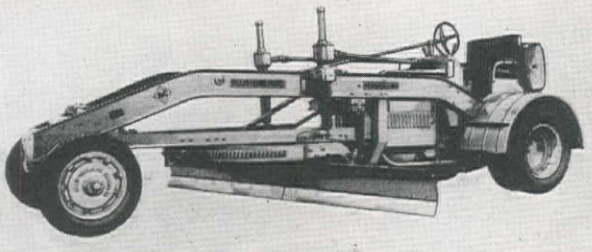
8-YARD GRAVITY DUMP WAGON



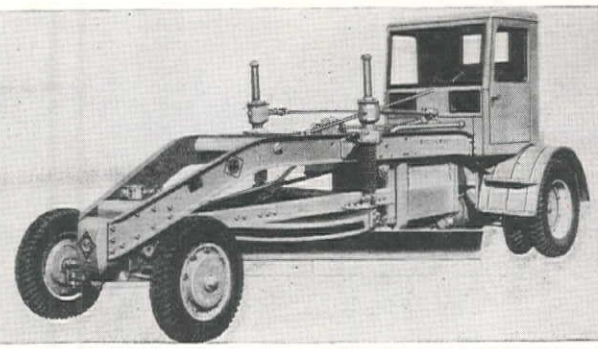
WAGON TRACKS

MODEL "K-T" HAULING UNIT

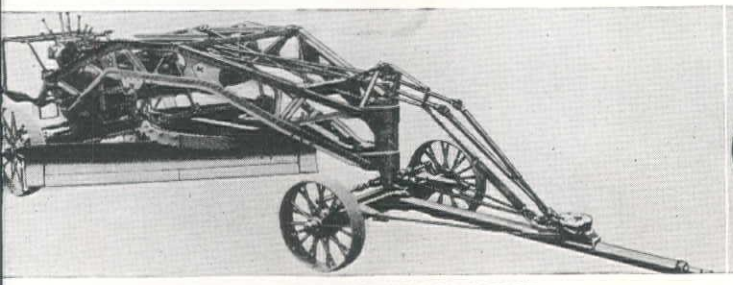
5½-6 AND 7-8 YARD WAGON



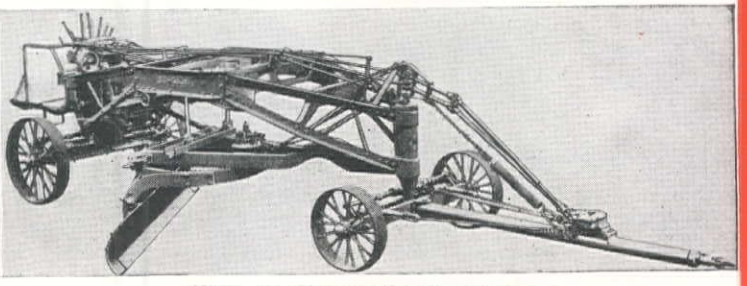
MODEL 42 SPEED PATROL



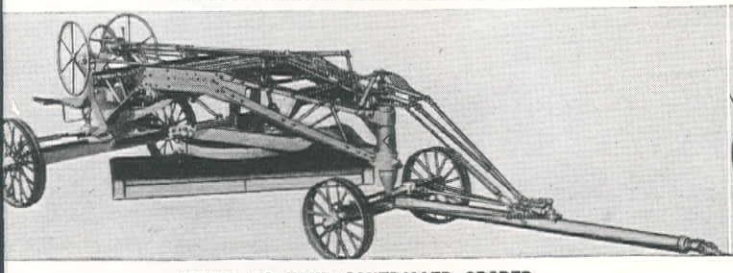
MODEL 54 SPEED PATROL



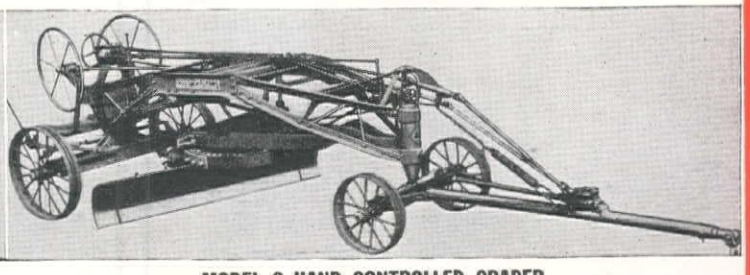
MODEL 14 POWER CONTROLLED GRADER



MODEL 12 POWER CONTROLLED GRADER



MODEL 10 HAND CONTROLLED GRADER



MODEL 8 HAND CONTROLLED GRADER

To those who are more interested in value and performance than in tradition . . . Allis-Chalmers presents its new and better line for 1936. The cost-cutting Models "L" and "L-O" with a new range of speeds. A new model "K" Series with four speeds forward—up to 5.92 miles per hour . . . with 49.58 Drawbar H.P. . . . and new, convenient controls. A new, Model "K-T" Hauling Unit . . . hauls 6 to 8-yard loads from 2½ to 16 miles per hour. An improved line of blade graders and Speed Patrols. An entirely new line of power units. A line of Oil Tractors that operate on Diesel Fuel with the advantage of gasoline engine simplicity. Get more for your money in 1936—investigate the A-C line before you buy.

ALLIS-CHALMERS TRACTOR DIVISION, MILWAUKEE, U.S.A.

Master Electric Vibrator and Generator Sets for Placing and Compacting Concrete

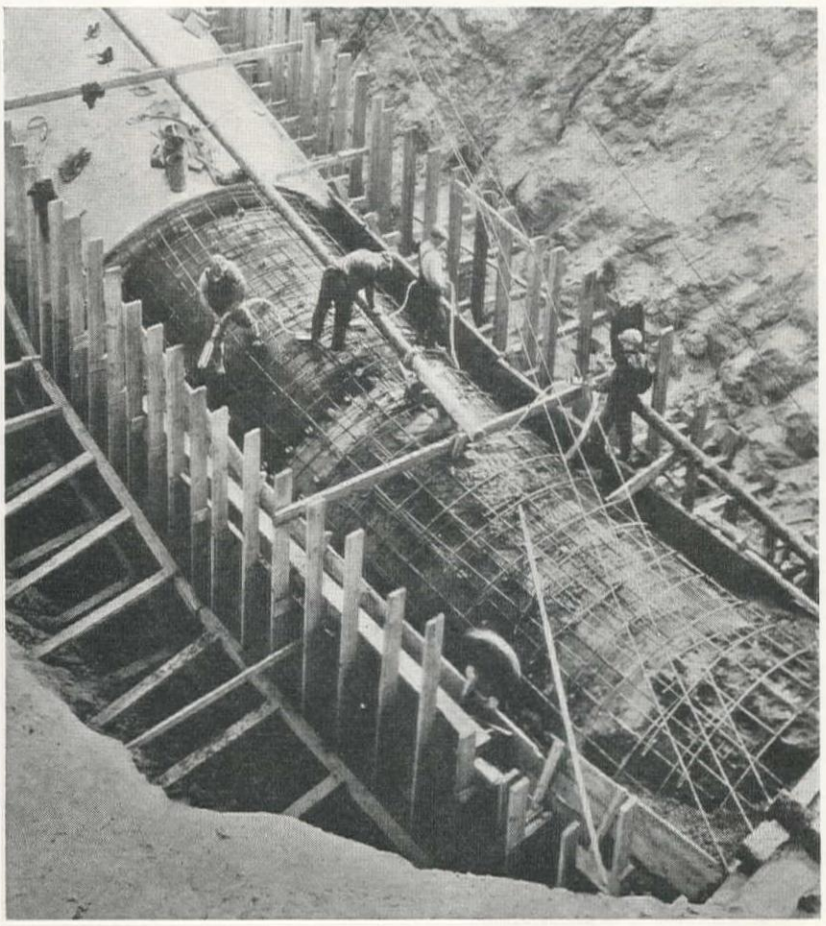
Master Electric Vibrators are built solely and completely by an experienced electrical and mechanical manufacturer of nation-wide reputation—The Master Electric Company of Dayton, Ohio—with 26 Master authorized service stations in the West.

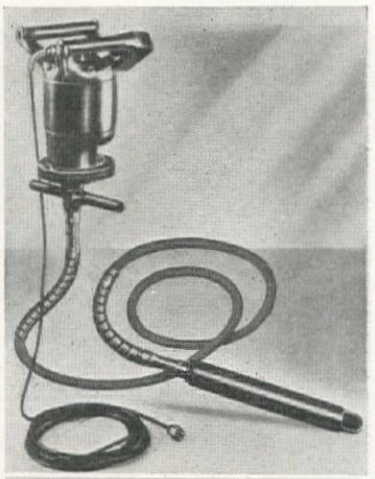
Master Electric Vibrators are modern in design, manufactured of selected materials, made in ten different sizes and types to suit every need.

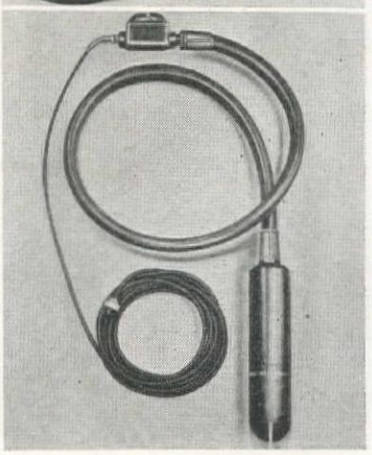
Master Electric Vibrators are the only vibrators designed with Floating Power.

Floating Power insures long life for the vibrator units and a minimum of maintenance, insuring dependable, uninterrupted service.

Master Generator Sets are made in six sizes up to and including 5 K. W.







The First Cost is Low but Master Vibrators are Made to Stand the Gaff

Distributed exclusively in California and Nevada by

EDWARD R. BACON COMPANY . . San Francisco
SMITH BOOTH USHER COMPANY . . Los Angeles

MASTER VIBRATOR COMPANY

DAYTON, OHIO

EDWARD M. ORNITZ, *Pacific Coast Sales Manager*

206 South Spring Street **Los Angeles, California**

When writing to MASTER VIBRATOR COMPANY, *please mention Western Construction News*

HALAFAX TAKES INVENTORY FOR A NEW YEAR OF SERVICE

DISCOVERY. Halafax is a product of new methods and processes of using well-known ingredients that are for the first time successfully blended into safe, practical and economical explosives.

EXPERIENCE. Experience covering a period of more than five full years in processing these ingredients is now a permanent asset for future production in a scientific and efficient manner.

PERFORMANCE. Proof of the superiority of Halafax Explosives was first made certain at our own expense; tons of our products were used under the actual conditions and in all the important fields in which explosives are employed.

ECONOMIES. Because of the comparative lightness of Halafax Explosives in relation to their detonation and fragmentation properties, they do more work at the same cost, as the price per pound is the same as that of other explosives.

STABILITY. Under all conditions of high and low temperatures, no separation after long periods of untouched storage is visible.

PLANT. A new plant of large capacity and with modern equipment is available for steady production.

CUSTOMERS. The clientele of the Company includes experienced users of explosives in every line—mining, quarrying, tunneling, surface construction, logging and agriculture.

FINANCIAL. The Company is stably financed. With these items in our inventory, we feel justified in inviting your interest in Halafax Explosives, and asking you to make your own demonstrations of their many merits.

HALAFAX EXPLOSIVES COMPANY

Write or phone today for a copy of this interesting booklet . . "What is Halafax?"—the story of the development and manufacture of Halafax Explosives.

810 South Spring Street
Los Angeles, Calif.
Phone TRinity 8528

116 New Montgomery St.
San Francisco, Calif.
Phone GArfield 4759

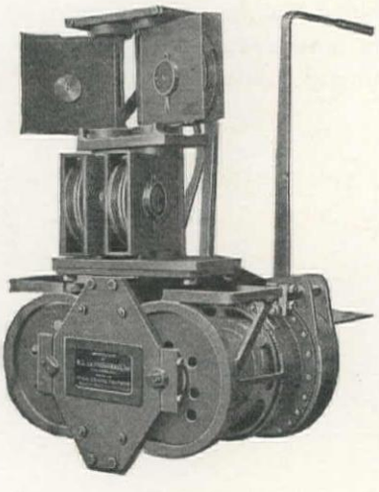
PLANT AND MAGAZINE:
Saugus, Calif.

Above is shown the site of the Halafax Explosives Company near Saugus, California. Several of the individual buildings are completely hidden from each other by large barricades as well as by natural hills and ridges.

When writing to HALAFAX EXPLOSIVES COMPANY, *please mention Western Construction News*

LETOURNEAU FOR GRE

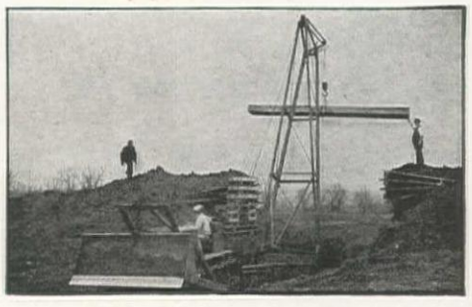
CARRYALL SCRAPER



For profitable earthmoving, LeTOURNEAU offers a complete line of fast-operating, big-capacity equipment.

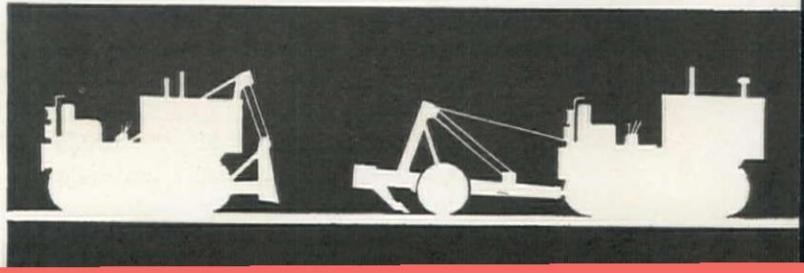
A FASTER BETTER OPERATING METHOD

The cable control of the LeTOURNEAU POWER CONTROL UNIT evolved naturally from the search for a faster, cheaper way of handling earth and rock. Its designer, R. G. LeTourneau, tried such methods of control as hydraulic, electric, and other auxiliary motors; discarded them all as too slow, too complicated, too limited in action and power delivery; adopted mechanical cable control only after extensive job-use proved it definitely a faster, better-operating method. Its speed makes for greater output; its simplicity, for long life and low maintenance cost. In action, trigger-quick, positive, and accurate—the LeTOURNEAU POWER CONTROL UNIT is today the fastest, most efficient method on the market for operating heavy construction equipment. Weather does not affect it.



CRANE

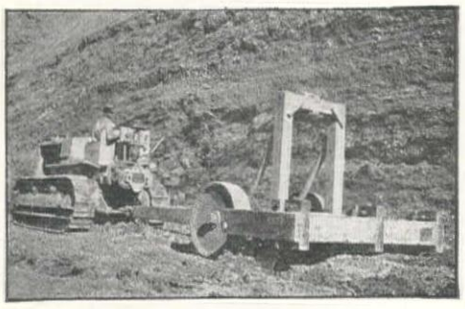
LeTOURNEAU tractor CRANES are made in three boom lengths—20, 30, and 40-foot—for loading and unloading equipment and materials; placing machinery; lifting heavy parts when making repairs and a multitude of other tasks. Made for use with tractors from 20 to 95 h.p. Can be quickly coupled or uncoupled from tractor, making the latter available for other uses.

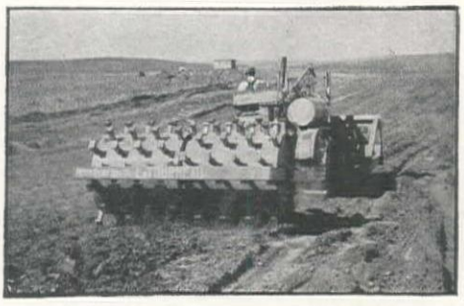


FASTER EARTH MOVING, ATER YARDAGE, MORE PROFIT

ANGLE-DOZER

ROOTER





SHEEP'S FOOT ROLLER

BULL-DOZER

CARRYALL SCRAPERS, in 6, 8 and 12-yard sizes, to operate with 40 to 95 h.p. tractors, for cut and fill work, excavating, grading, finishing, land-levelling, and dam building.

BULLDOZERS and ANGLEDOZERS, with correctly-curved bowl, built to dig, making down pressure unnecessary; with fast, high, powerful lift and low drop; of light, yet stout and rigid construction; made for all size tractors, from 30 h.p. up. ANGLEDOZERS with simple angling adjustment—rigid in all positions.

ROOTERS to break up the toughest of materials. Two sizes: Type "S" with 20″ maximum penetration, and Heavy-Duty with 28″. Both sizes will stand the full pull of the largest tractors.

SHEEP'S FOOT ROLLERS, built to meet exacting Government and State specifications, for compacting highways, reservoirs, dams and embankments.

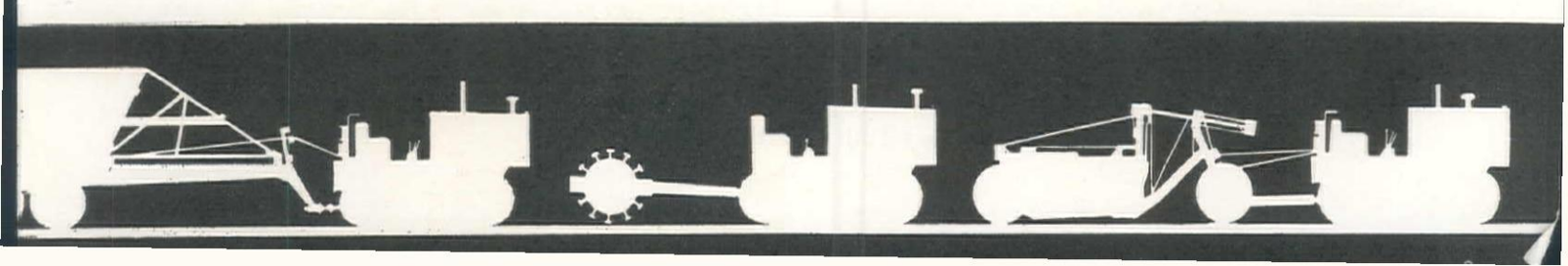
Write us describing your construction problems. Our Engineering Department will gladly consult with you and tell you how other earthmovers are overcoming similar problems by using LeTOURNEAU equipment.

R. G. LeTOURNEAU, Inc.

STOCKTON, CALIFORNIA PEORIA, ILLINOIS

Cable Address: "BOBLETORNO"

Manufacturers of: ANGLEDOZERS, BULLDOZERS, BUGGIES, CARRY-ALL SCRAPERS, CRANES, ROOTERS, SHEEP'S FOOT ROLLERS, POWER CONTROL UNITS, TRAILERS



ALWAYS FIRST!! ALWAYS MODERN!!
First in 1872!! and First Ever Since!!

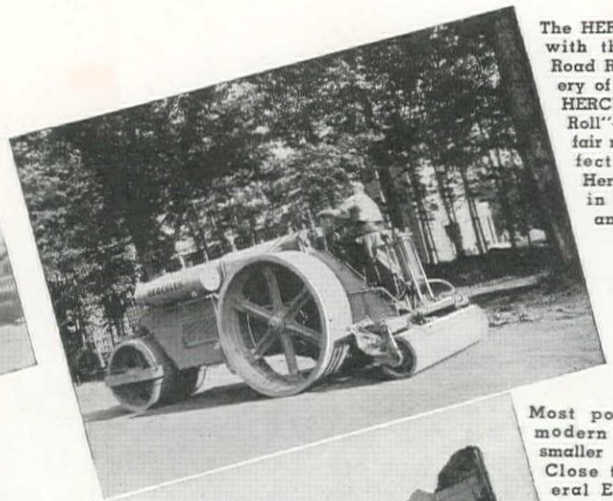
ALWAYS THE LEADER!!
As Well as the Pioneer!!

OSGOOD

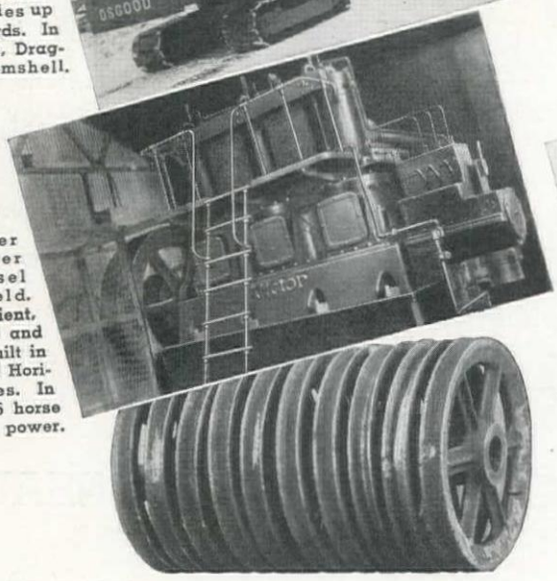
NOW — AS ALWAYS — *LEADS* — IN *NEW*— *MODERN* — AND — *BRILLIANT*

Features in the DESIGN, MATERIALS and CONSTRUCTION of Every Product of Its Own Manufacture, and of Its Wholly Owned Subsidiaries and Associated Companies.

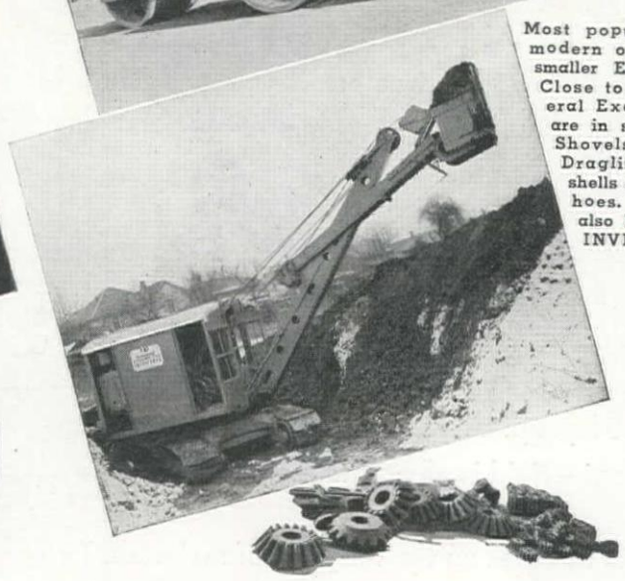
The OSGOOD CHIEF as a Dragline—An example of the new and modern Osgood digging machine. There are also Osgood Commander III, Osgood Conqueror CV, Osgood Victor MV. Capacities up to 2 cubic yards. In Shovel, Crane, Dragline or Clamshell.



The HERCULES Roller with the greatest Road Rolling discovery of all time—The HERCULES "Ironer Roll"—it makes a fair road the "Perfect Highway." Hercules is built in 6-8-10-12-14 and 15-ton sizes.



The Pioneer Prime Mover of the Diesel Engine Field. Simple, efficient, economical and powerful. Built in Vertical and Horizontal Types. In sizes from 25 horse to 200 horse power.



Most popular and modern of all the smaller Excavators. Close to 800 General Excavators are in service as Shovels, Cranes, Dragline, Clamshells and Backhoes. General also builds the INVINCIBLE.

The Commercial Steel Castings Company, Osgood subsidiary, is a large producer of Steel and Iron Castings. This modern Foundry makes castings for the leading Industrials and for the Osgood, Hercules and General Excavator Companies.

The Alloy Cast Steel Company, Osgood Associate, is a producer of Electric Steel Castings in regular carbons and alloys. It manufactures castings for many Road Machinery Builders, including Osgood and the General Excavator Company.

THE OSGOOD COMPANY . . THE HERCULES COMPANY . . GENERAL EXCAVATOR COMPANY . . POWER MANUFACTURING COMPANY . . COMMERCIAL STEEL CASTINGS COMPANY . . ALLOY CAST STEEL COMPANY

MARION, OHIO, U. S. A.

Distributors in All Principal Cities

See the Exhibit of all six Osgood Companies at Road Show, Cleveland, Ohio, Space B-25 January 18th to 24th, inclusive, 1936

When writing to OSGOOD COMPANY, *please mention Western Construction News*

FOR 1936

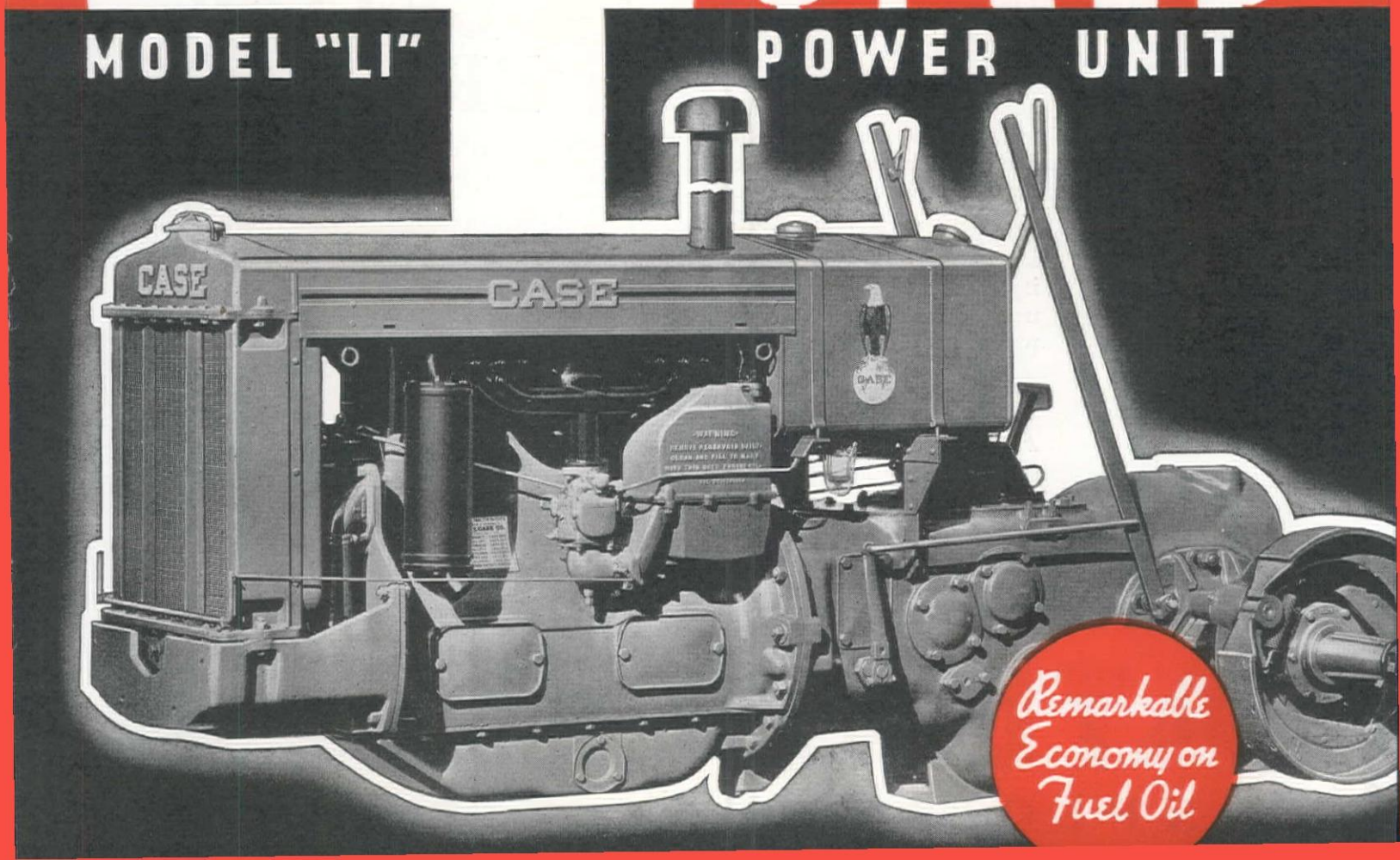
CASE 4 SPEED

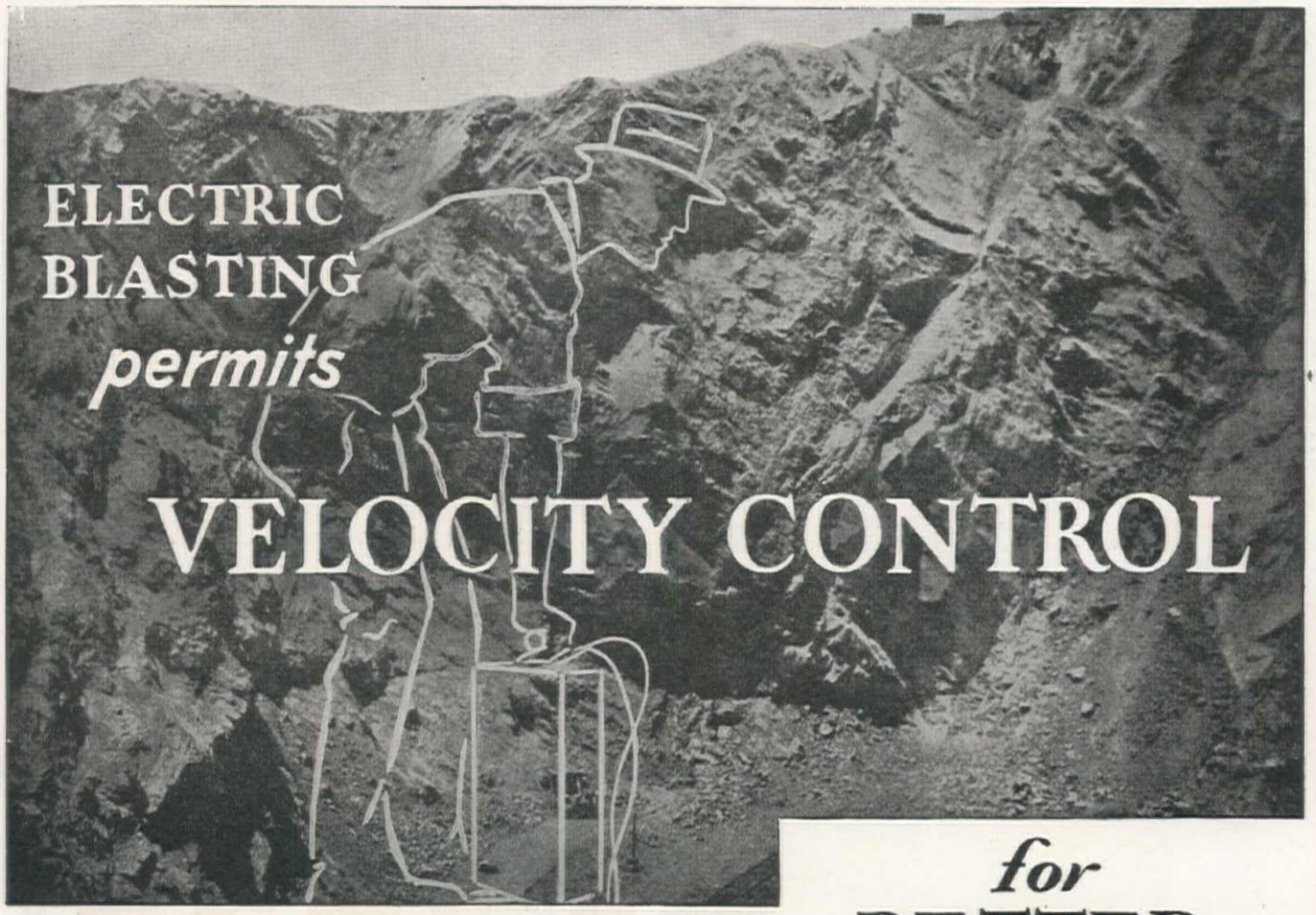
MODEL "LI" POWER UNIT

● Case presents a new and modern power unit with wider speed range, more flexibility and lugging ability, and still better economy on fuel oil or gasoline . . . a modern mate for modern motor patrols and other powered equipment. This new engine with its "flat" torque, and well-nigh perfect governing, gives sustained, controlled power from 600 to 1300 r.p.m. Overlapping speeds from 1¼ to 13½ miles an hour make it possible to adjust the speed to suit the job exactly, cutting down fuel and oil consumption materially. Heavier bearings, stronger rear axle, improved oil seals and exceptional precautions to exclude dust mean minimum maintenance.

Send for specifications on this new power unit. See our exhibit at the Cleveland Road Show.

J. I. CASE CO., Racine, Wis.





for BETTER BREAKAGE

Electric Blasting makes possible the release of the force of an Explosive at normal velocity. The velocity may be selected which will provide better fragmentation, increased tonnage, and lower blasting costs.

Many kinds of rock formations react favorably to the action of low velocity Explosives. Such Explosives are not increased in velocity by the impulse from an electric detonator.

This thought deserves consideration and study by operators.

Atlas provides Electric Blasting Caps, Explosives and Blasting Machines, and suggests methods of using and selecting Explosives.

Consult the Atlas representative.

ATLAS POWDER COMPANY

THE ATLAS DIVISION

Everything for Blasting

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

San Francisco, California
Cable Address—Atpowco
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Los Angeles, Calif. Salt Lake City, Utah Butte, Mont.

Other Offices:

Allentown, Pa.	New York, N. Y.
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ATLAS EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

3/4 Yd. LORAIN·40 Digs 1230 Yards in 9 Hours

PERFORMANCE IS CONVINCING

Unit: ¾ yd. Lorain 40 (illustrated)
Owned by: Geo. Slade, Bridgeton, N.J.
Job: Highway grading and borrow for gravel resurfacing.
Yardage in Job: 10,000 yards.
Degrees of Swing: 45°.
Hours Worked Per Day: 9.
Average Yardage Per Day: 975.
Maximum Yardage Per Day: 1230.
Passes Per Minute: 3 to 4.
Disposal of Material: To Trucks (3 cu. yd. capacity).
Statement: "The Lorain-40 is a d—— good shovel and the slickest thing out in the ¾ yd. size machine for moving dirt. No complaints whatever." (Signed) Geo. Slade.

Such performance is typical of Lorain 40-37-30's everywhere. Check it for yourself with these California owners:

A. E. Fowler, Santa Ana (L-30)
Price Co., Santa Monica (L-30)
Los Angeles Harbor Commission (L-30*)
Jack Shields Crane Service (L-37*)
Pacific Crane & Rigging, L. A. (2-L-30,* 1-L-37*)
Metropolitan Water District (2-L-37)
Kiss Crane Service, L. A. (L-37*)

* Indicates Motor Truck Mounting.

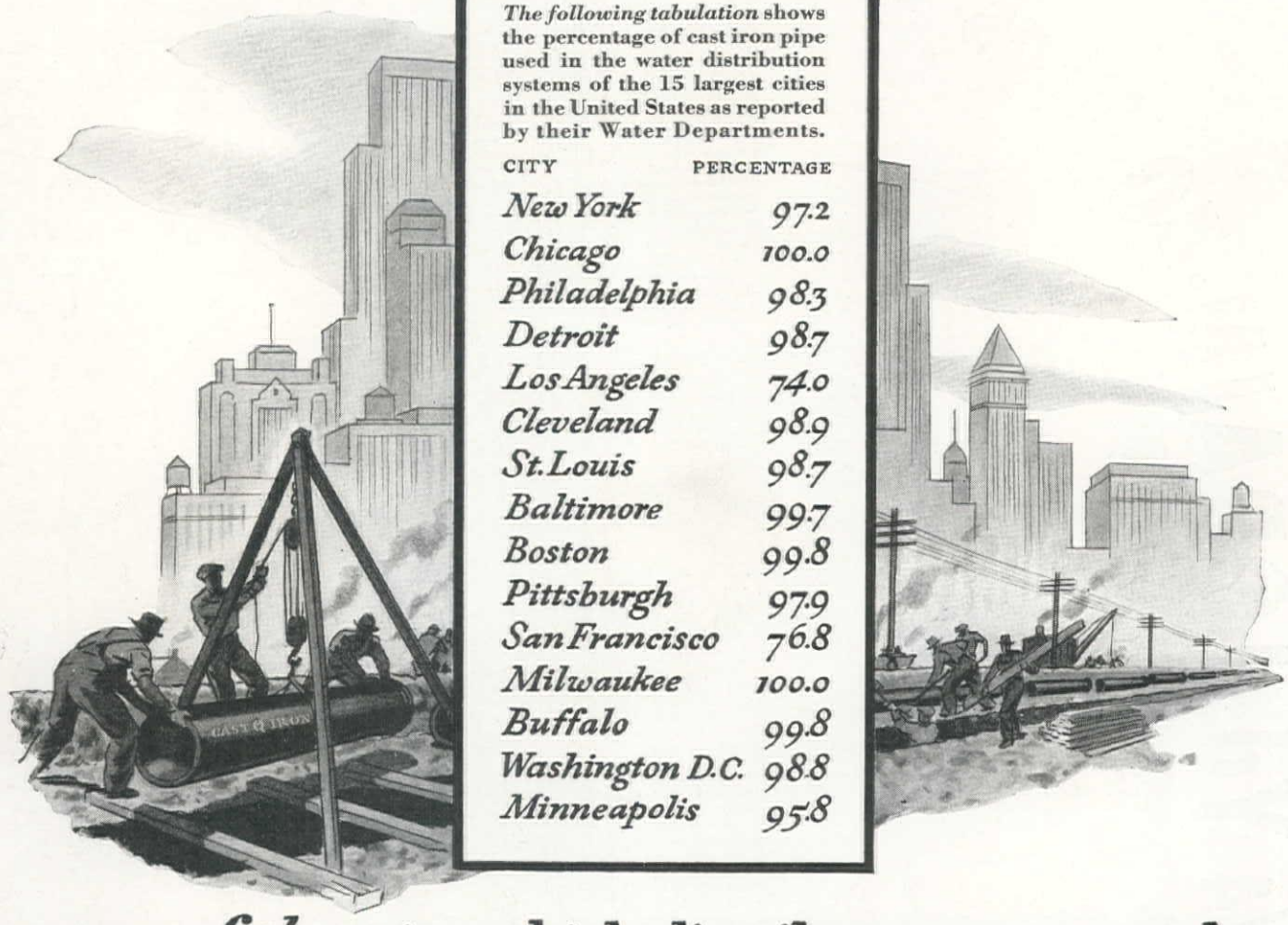
Lorain 40-37-30's are the new idea in small units. Capacity by Stability and Strength, not Weight—and they're proving everywhere the correctness of their new design by big-production, money-making performance. May we send you details?

U N I V E R S A L

LORAIN · 40 · 37 · 30

THE UNIVERSAL CRANE CO., 355 Fremont Street, San Francisco — Distributors: THE RIX COMPANY, Los Angeles; HALL PERRY MACHINERY CO., Butte; FEENAUGHTY MACHINERY CO., Portland, Seattle, Spokane; ASSOCIATED EQUIPMENT CO., LTD., San Francisco, Calif.; McCHESNEY-RAND EQUIPMENT CO., Santa Fe, N. Mex.; AMBLER-RITER, Salt Lake City; H. W. MOORE EQUIPMENT CO., Denver.

Let's look at the record



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

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

95% of the pipe which distributes water to the 24 million residents of our 15 largest cities *is Cast Iron Pipe*

WHY does New York City with 4600 miles of water distribution mains—Chicago with 3700 miles—Boston with 1000—and the 12 other largest cities in the United States—depend almost exclusively on cast iron pipe for water distribution mains? The answer is ultimate and unquestioned economy. A cast iron pipe line can be relied on to continue in service for generations after the bonds issued to pay for it shall have been retired. Cast iron pipe is the standard material for water mains. It costs less per service year and least to maintain. Its useful life is *more than a century* 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.

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

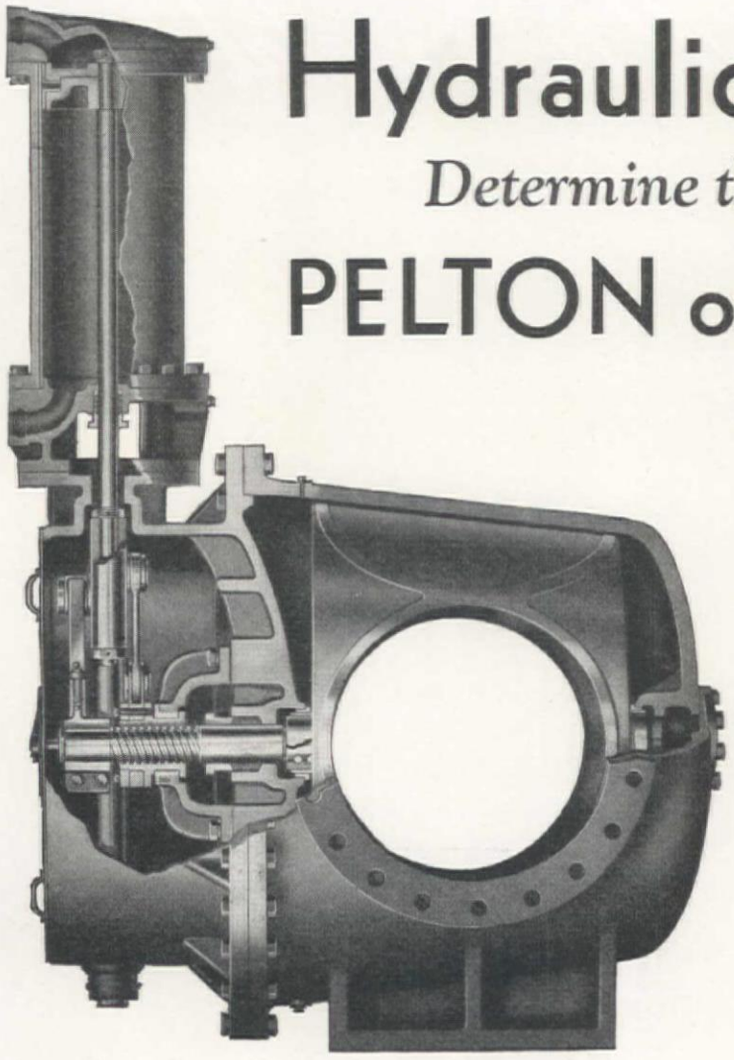
TRADEMARK REG.

U.S. SUPER-de LAVAUD PIPE

CAST WITHOUT CHILL IN A METAL MOLD

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

Foundries and Sales Offices throughout the United States



Hydraulic Conditions

Determine the Selection of....

PELTON or CHAPMAN

Water Works VALVES

Three Distinct Types Available from One Engineering Source

Illustrating the Cone Type Valve with Automatic Control

THE recent engineering affiliation between this company and the Chapman Valve Mfg. Co. has created an unprecedented situation, one in which either of the three leading types of automatic water works valves may be procured from either company—with the selection based strictly on engineering considerations.

This page deals with the Cone valve as manufactured by the Chapman Company, offered in eleven standard sizes from 6″ to 36″ and in special sizes as required. It is designed as a stop and check valve for pump service, for pressure regulation under specific limitations, for altitude valve service, for free discharge installations where throttling is not required, and for special manually-operated gate valve services.

This outstanding product is well known for its simple and rugged construction, and for its straight bore design, which assures minimum loss of head. Ask Pelton engineers for full particulars.

THE PELTON WATER WHEEL COMPANY

HYDRAULIC ENGINEERS

120 Broadway, New York
2929 Nineteenth Street, San Francisco
Paschall Station, Philadelphia

Exclusive Western Representatives for Baldwin-Southwark Corp., De La Vergne Engine Co., Cramp Brass & Iron Foundries Co., Woodward Governor Co., and Chapman Valve Manufacturing Co.

PELTON

When writing to PELTON WATER WHEEL COMPANY, *please mention Western Construction News*

"Think . . . you're going to invest a lot of money in Water Meters . . . you want to protect that money . . . you don't want a lot of obsolete meters on your hands a few years from now . . . I've found it pays to buy Quality in Water Meters . . . Quality that gives you sturdy, simple, true-running accurate meters . . . meters in which the Interchangeability of parts wipes out depreciation . . . and they should be backed by a record of actual service—"

—in brief

Trident

and *Lambert* WATER METERS

Made and Sold . . . . OVER 6 Million!

Precision-gauging for the future

Years from now you'll appreciate

what this man is doing today. He's not trusting the cutting accuracy of the machine in the construction of the meter main casing.

•

No . . . he's gauging. He's testing the diameter and depths of the different sizes of main casings—with gauge after gauge!

•

He's *making certain* that, if you want to put in a new gear train or disc chamber, 5, 10 or 20 years from now—*it will fit exactly.* In other words, your *new interchangeable* part will be exactly right for your *old meter.* What a saving!

•

That's one way of telling you about the quality of Trident and Lambert Water Meters—of which a type for every service is made by the NEPTUNE METER CO., (Thomson Meter Corp.), 50 West 50th Street (Rockefeller Center), New York City . . also . . Neptune National Meters, Ltd., Toronto, Canada.

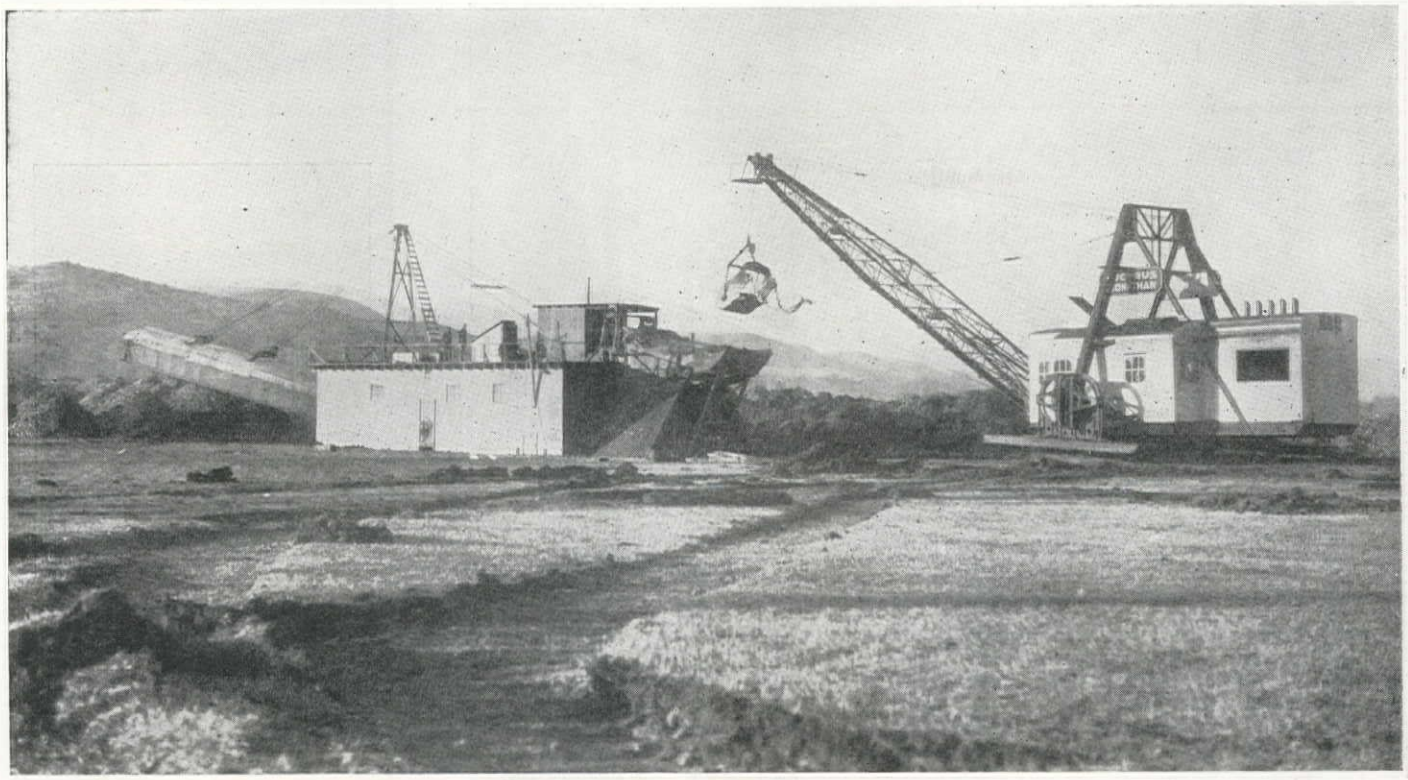
Pioneers in Meter Progress

Yesterday

TODAY

Tomorrow

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



This 4 yard *ESCO* bucket paid for itself in 4 days

. . . If interested write us for particulars . . .

"If EVERY contractor knew what every ESCO *owner knows."*

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Write for "BUCKET BOOK 77"

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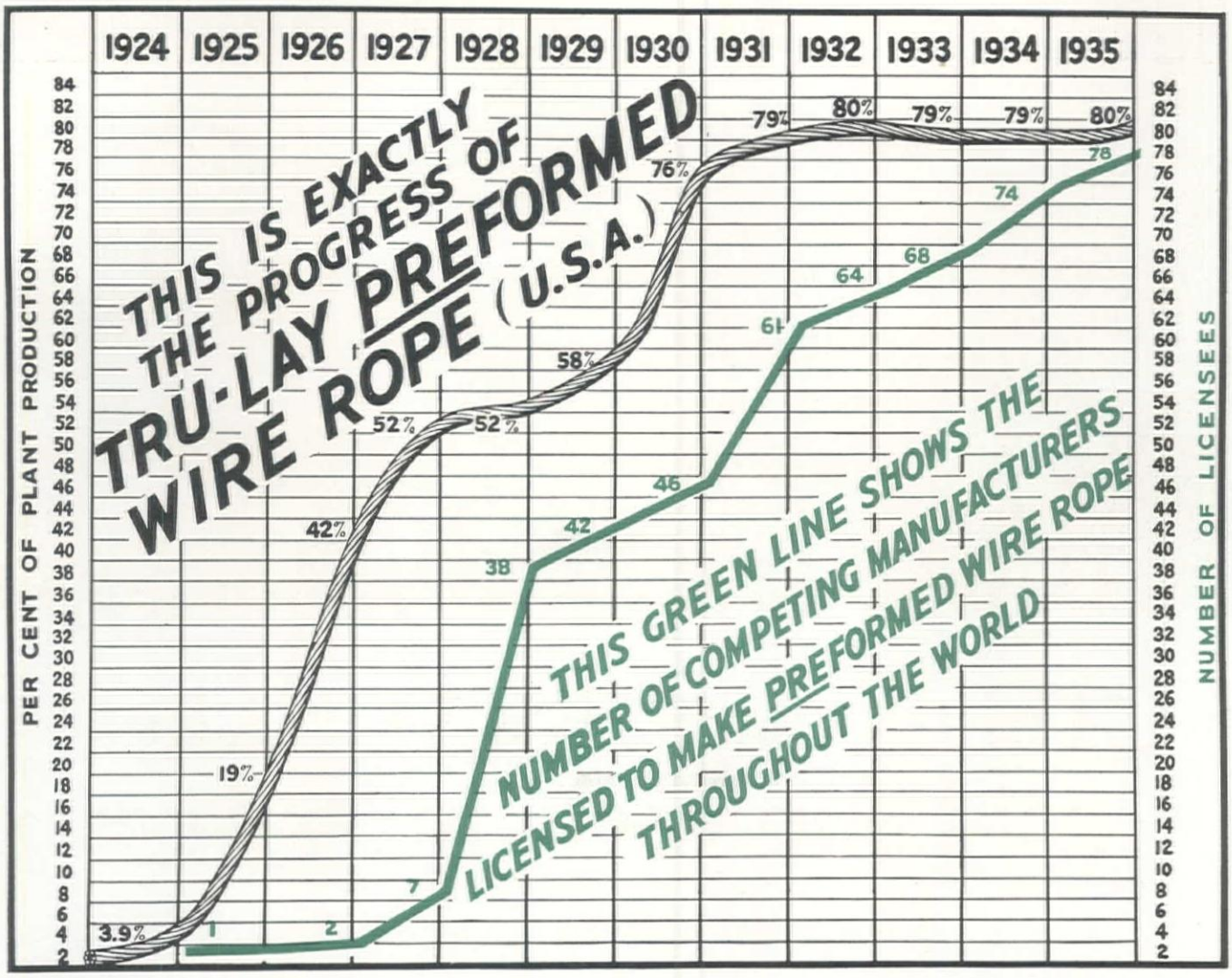
WM. A. JENKINS
1701 15th Street, Denver, Colo.

WE WELCOME 1936



●We started making TRU-LAY Preformed Wire Rope in 1924. It was a better rope than had ever been made before. But we had to meet the competition of fixed buying habits; long established standards for wire rope service; the inborn prejudice against anything radically new.

But TRU-LAY Preformed proved itself such a superior rope that today the manufacturers responsible for over 95% of the wire rope production in the United States are licensees under our exclusive preforming patents. They too, *now,* make and sell preformed wire rope. And *that* is new competition for us. Tougher competition. By licensing them we have admitted our keenest competition to our own exclusive field of action.

But we are glad for this new, and tougher, competition. *First:* it is the most convincing acknowledgment of the superiority of preformed wire rope. *Second:* it adds momentum to the swing toward preformed. *Third:* it keeps us on our toes to see that production and service are maintained at the highest standard on our own TRU-LAY Preformed. . . . For—with this new and licensed competition, we've *got* to make TRU-LAY Preformed the best rope of all.

We welcome 1936 . . . the year in which we will prove our "metal" to wire rope users—the quality of our product and the efficiency of our Engineering and Production Departments which the entire industry throughout the world has acknowledged.

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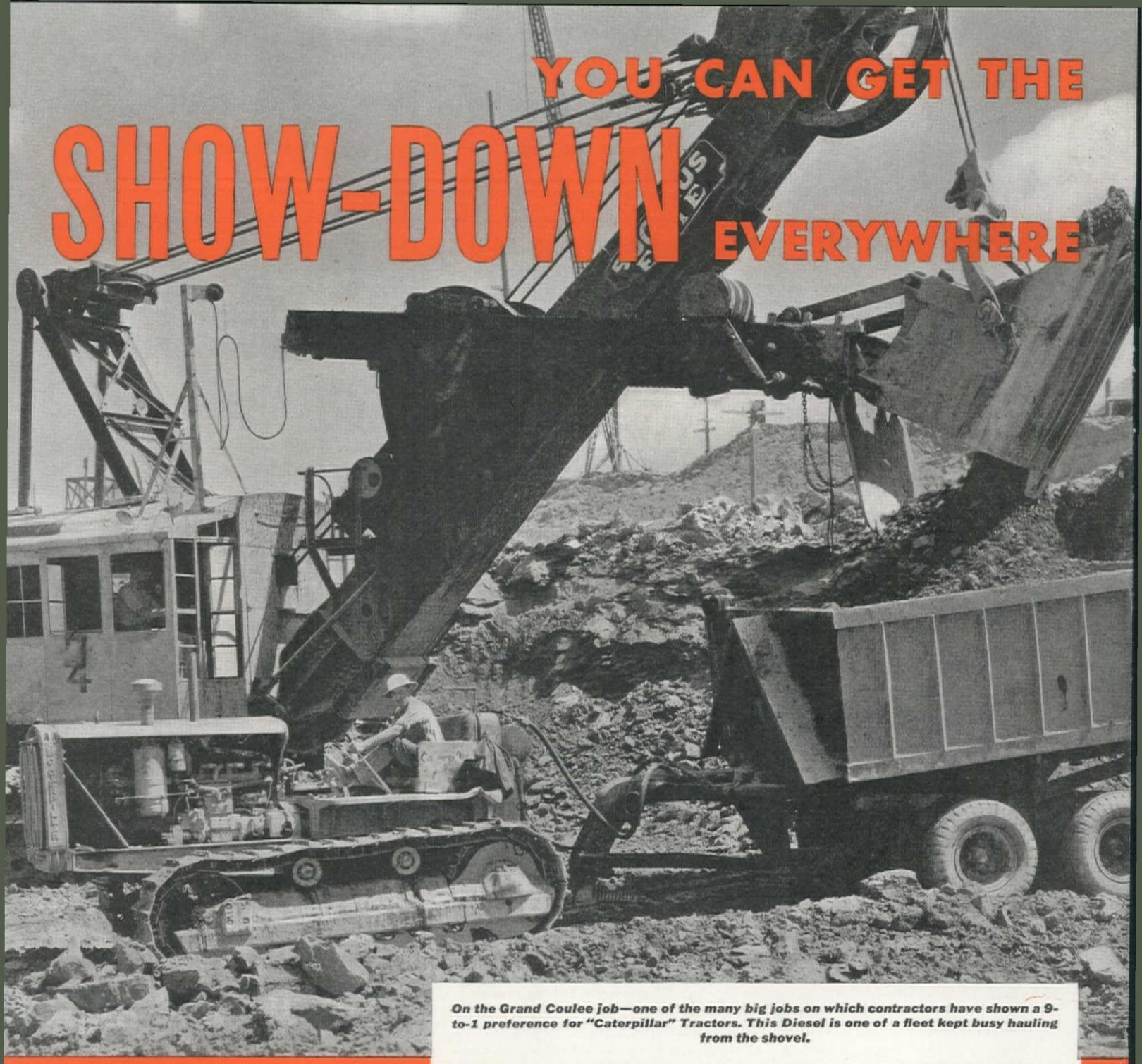

On the Grand Coulee job—one of the many big jobs on which contractors have shown a 9-to-1 preference for "Caterpillar" Tractors. This Diesel is one of a fleet kept busy hauling from the shovel.

Wherever there's dirt to be moved—or any one of a hundred other jobs to be done—there's where you'll learn the "Caterpillar" SHOW-DOWN. You'll see "Caterpillar" Tractors, the 9-to-1 preference on the country's biggest construction jobs. You'll hear talk of the new records for low costs that are being made by "Caterpillar" Diesels. And you'll get the rest of the SHOW-DOWN—the proof of low maintenance costs—from owners who have run their "Caterpillar" Diesels 6000, 8000 hours and more. See your dealer for details of this modern power. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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D I E S E L

WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER

January, 1936 — Vol. 11, No. 1

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

Ten Years Old

Western Construction News is ten years old with this issue. It has grown up during a decade of unprecedented construction activity and growth in the eleven western states—its field of service. Today, more than 8,000 readers, the engineers and contractors who are carrying out these vast projects, look to the publication for information on methods, practice and costs, and for general news of civil engineering construction activity in the West. The fact that almost 7,000 western engineers and contractors and their staffs now subscribe to *Western Construction News* is a recognition of service rendered, as well as an indication of the need for a paper devoted exclusively to their problems. Why do these westerners require a publication of their own? The answer lies in the distinct regional character of the West in the field of civil engineering, with regional problems, methods, personnel, practices and costs, and these subjects cannot be adequately covered by publications compassing a wider area. It is not enough for a publication in this field to catch and interpret western tempo; there is solid work to be done. The editorial obligation of *Western Construction News* is to help its readers to work more efficiently and effectively. So the publication is dedicated to service—dedicated to the service of its readers. It will continue to be the working tool of western engineers and contractors.

•

Haste Has Made Waste

REPORTS on the initial efforts to get the construction phases of the WPA program under way are discouraging, but are not unexpected. Credit must go to the engineers on the jobs who have struggled to overcome obstacles of regulations and red tape in an effort to make their work show results, which they know should be easily possible on similar jobs, but their struggles could not cope with the delays and confusion higher up. Relief and construction do not mix. It is possible to provide employment through construction work, as has been ably demonstrated by the relatively efficient operations of the PWA, and the results are a direct stimulant to regular business. But the introduction of the relief element, with the supposed need for eliminating regular construction procedure—open bidding and contract work—immediately turns the emphasis away from progress and results.

On an outstanding WPA project in San Francisco, for example, the start of the force account operations was attended by almost negligible results from obvious lack of organization or coördination. The work began with days when there were men and no equipment, followed by days when there was equipment and no men, with variations to this general idea. Naturally, this extreme situation has gradually been improved with a fair show of system and progress. However, the fact remains that one of the strong arguments advanced by the WPA officials was the delay that would be required to get projects under contract. Concern over initial delay was a faulty approach to a question which should be answered in terms of final results obtained for the public funds. Any contractor could spot the WPA all the time required to put any job under contract and easily demonstrate the logic of the industry's contention that construction work should only be done under the generally accepted contract system.

•

Boulder Dam Medals

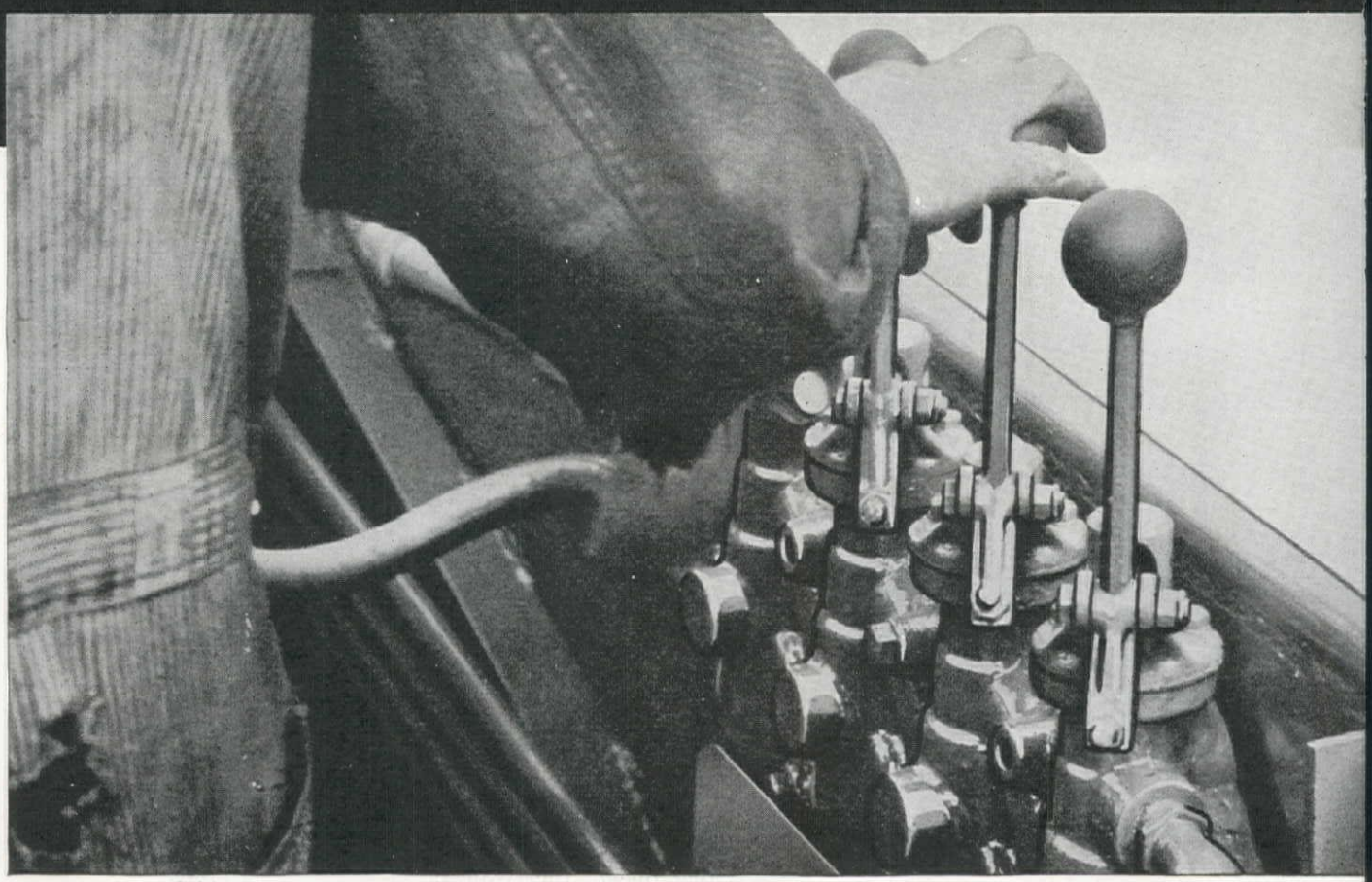
CONSTRUCTION operations are usually conducted at such high pressure and with such emphasis on material accomplishments that there is not much time left for the more human elements of the work. It is refreshing, therefore, when work is laid aside long enough to recognize the service and sacrifice of those who give their best efforts to a job, especially when the project is of outstanding importance. Such a gesture has been made by the directors of the Six Companies Inc. in presenting gold and silver medallions to engineering officials and field and office executives in recognition of their efforts in carrying out the Boulder Dam construction. The names of those receiving the medal appear on another page in this issue. There could well be more of this type of reward and credit in the rush of the construction industry. At heart, engineers, contractors and their staffs are artisans, with pride in their work and the quality and results of their efforts. There is a spot in each which is not reached by monetary rewards and a personal gesture of recognition satisfies a sense of duty well done.

•

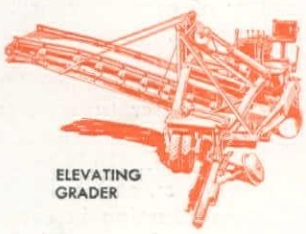
The Longest Tunnel

RECENT press accounts of the holing through of the East Coachella tunnel on the Colorado River Aqueduct refer to it as "the world's longest." The distinction of being the longest, or highest, or largest of anything in the world is always interesting and the claim often worth establishing as a matter of correct record. In the case of tunnels, qualifications which make for fair comparisons are necessary since there are railroad tunnels, mine tunnels, water tunnels, subaqueous tubes, and even cut-and-cover subway construction. In the ordinary sense of the term, at least in civil engineering construction in the West, a tunnel must be driven (as distinct from cut-and-cover) and the length is the distance between portals. In this classification, and from the records available to *Western Construction News*, the record goes to the Coast Range tunnel of the Hetch Hetchy water supply aqueduct of San Francisco which is 25.2 miles long from Tesla portal to the Alameda Creek portal. This compares with the 18.2-mile length of the East Coachella tunnel. Possibly a further search of the records would bring to light another contender and we would be glad to publish new information and comments on this subject from our readers. So far the claims for honors are both Western, which is something of a regional distinction.

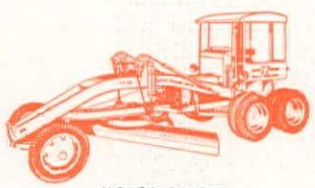
HYDRAULIC



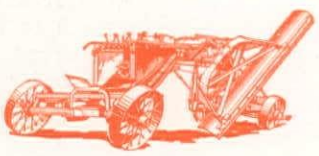
See Our Exhibit at the Cleveland Road Show, January 20-24



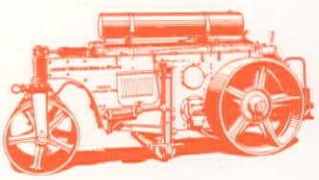
ELEVATING GRADER



MOTOR GRADER

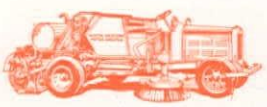


BLADE GRADER

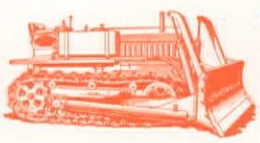


ROLL-A-PLANE

TRAIL CAR



MOTOR SWEEPER



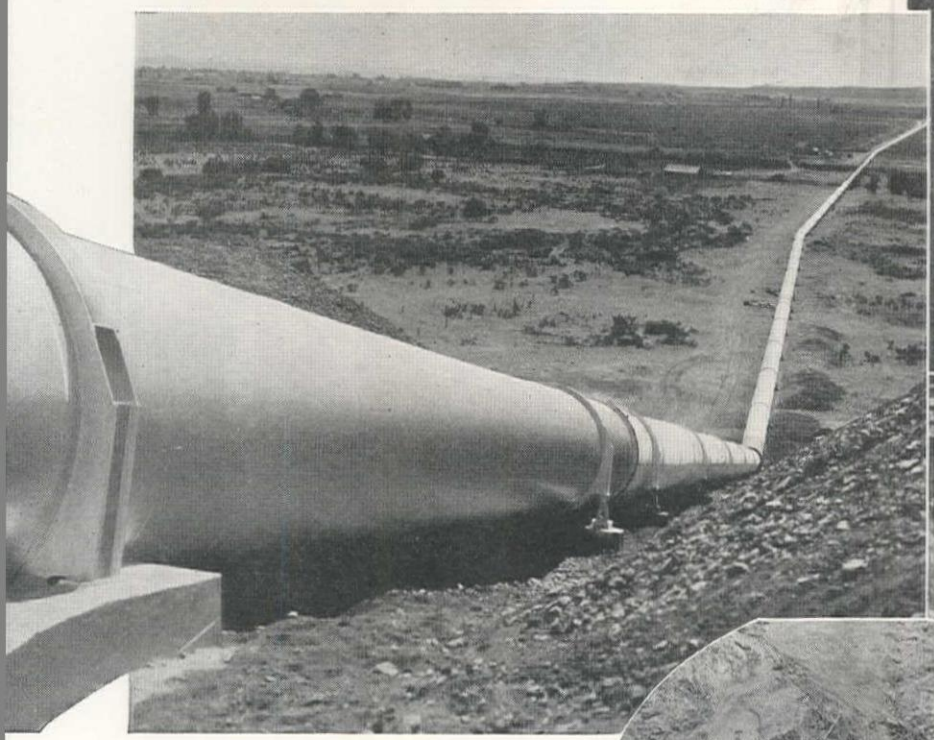
TRAIL BUILDER

12-YARD SCRAPER

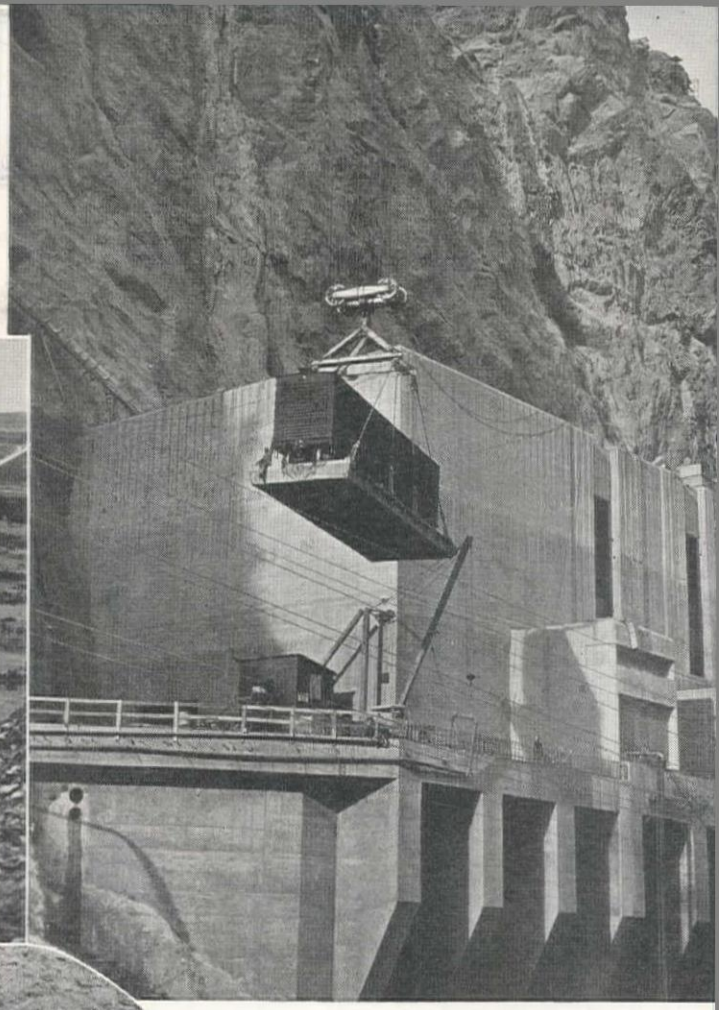
SNOW PLOW

Austin-Western

Western Construction Features Big Jobs



A 80-in. steel siphon 4½ mi. long for a head of 275 ft. across the Malheur River on the Owyhee project in Oregon.

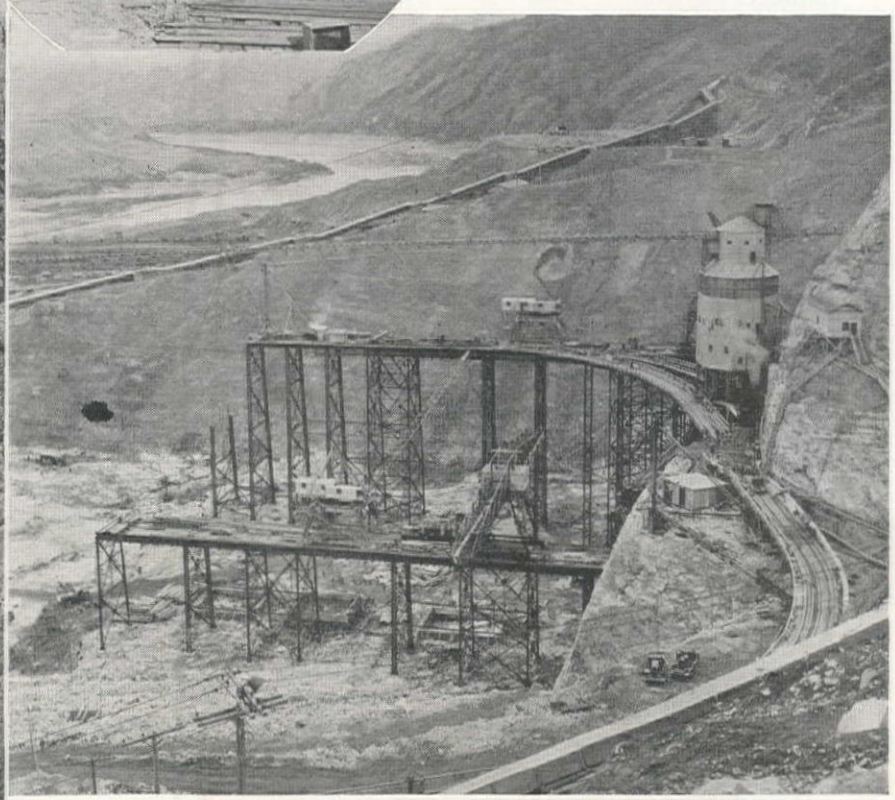


Lowering a box car of electrical equipment by 150-ton cableway to the Boulder Dam powerhouse.

Site of the Seminoe Dam on the North Platte River where a 260-ft. concrete arch is being built for the Casper-Alcova project in Wyoming.

Twin diversion tunnels totaling 3,400 ft. being driven as a preliminary to building the Parker Dam, as the diversion structure for the Colorado River Aqueduct.

Concreting layout at Grand Coulee Dam, showing mixing plant, trestles for concrete trains, derricks to handle the 4-yd. buckets and the first forms in place.



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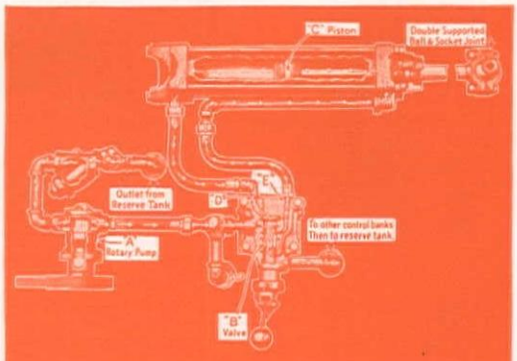

Oil travels from rotary pump A to sliding shaft B, set to divert the oil into the right hand side of the cylinder, above, causing the piston C to move to the left. Movement forces the oil on left of piston to return to valve B. Valve may be shifted to reverse the flow or placed in neutral, locking the oil on either side of the piston at D and E. When flow is stopped at these points a firm wall of oil holds the piston in a vise-like grip, while oil from pump continues to flow freely through the valve.

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Each piece of equipment has more than fifty years of Austin-Western experience back of it. Today, with hydraulic controls adding a plus value to nearly every machine in the line, this added feature clinches the Austin-Western title to leadership in the roadmachinery industry.

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WESTERN CONSTRUCTION NEWS

JANUARY, 1936

Bureau of Reclamation 1936 Plans Include Many Large Projects

Work under way on 23 jobs in the "over $1,000,000" class—$250,000,000 additional work necessary to complete present program

THE END OF 1935 brings to a close the busiest and most constructive year in the history of the Bureau of Reclamation. The year commenced with the bureau actively engaged in the investigation, design and construction of eighteen large projects of which several formed part of the program of the Public Works Administration for the preceding year. Additional allotments under the Emergency Relief Appropriation Act of 1935 totaling $80,000,000 were approved during the year by the Works Progress Administration for twelve new projects and for the continuation of work on projects previously started.

The year closes with the bureau at work on twenty-three projects in the "one million dollar and over" class. For these the funds spent and available approximate one-quarter of a billion dollars with a similar sum required in the future if they are to be completed as planned. The work varies from such huge developments as the Central Valley Project in California, the Columbia Basin Project in the Northwest and the Boulder Canyon Project in the Southwest down to such small projects as the Bull Lake and Taylor Park dams which will provide additional storage for existing reclamation developments.

The increased amount of work handled by the bureau has brought together at Denver one of the largest engineering organizations in the country. With the clerical and legal help required for handling the contracts and including certain field engineers who work from the Denver office, the staff totals 750. At Denver are also located the materials testing laboratories of the Bureau; these include concrete, earth mechanics, hydraulic, structural model testing and paint laboratories.

A brief review of the work and plans on the various projects of the Bureau of Reclamation follows:

Gila Project, Arizona.—ERA allotment, $2,000,000. During the latter half of 1935 a start was made on the development of 150,000 acres of land in southwestern Arizona as the first unit of the $23,000,000 Gila Valley project. After considerable field work had been done and bids advertised for construction on the tunnels and main canal, work on the project was suspended at the request of the Department of Agriculture pending further investigations as to the suitability of the land for general farming. R. B. Williams is construction engineer.

Salt River Project, Arizona.—ERA allotment, $3,500,000. The experience of recent years has shown that additional storage is required to carry this project over cycles of subnormal runoff. The allotment will provide an additional 200,000 ac. ft. of storage capacity by the building of the Bartlett Dam, a multiple arch structure 70 ft. high and 950 ft. long on the Verde River. Bids will be taken early in the year. Considerable work will also be done on improving the spillways of the Roosevelt, Mormon Flat, Horse Mesa and Stewart Mountain dams and in rebuilding Mormon Flat power house. E. C. Koppen is engineer.

Boulder Canyon Project, Arizona-California-Nevada.—PWA allotment, $38,000,000; direct appropriation $14,000,000. During 1935, Boulder Dam was practically completed by Six Companies Inc., as far as the concrete work is concerned. At present, fabricating of the penstocks has been completed in the field shops of the Babcock and Wilcox Co. and erection in the tunnels is about half finished. The power house is complete structurally, as are also the

On December 5 Governor Martin of Washington dumped the first bucket of concrete in the Grand Coulee Dam. The Governor is shown at work earning the 75c check paid him by the MWAK Co.

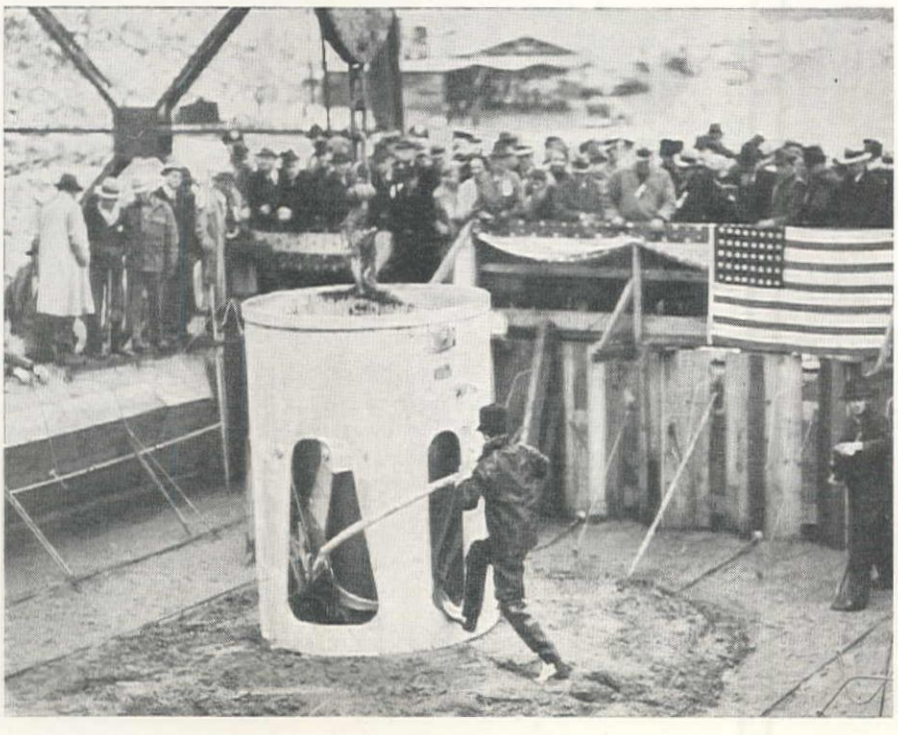


TABLE OF BUREAU OF RECLAMATION PROJECTS AND FUNDS

State	Project	NIR/PWA Allocation	ERA Allocation	Construction Features
Arizona	Gila		$ 2,000,000	Canals, pumping plants.
Arizona	Gila Valley	$ 75,000		Investigations.
Arizona	Salt River		3,500,000	Storage dam, enlargement of spillways.
Arizona	Verde	150,000		Surveys and investigations (completed).
Arizona	Yuma	120,000		Drainage in Valley Division.
Ariz.-Calif.	All-American Canal	9,000,000	13,000,000	All-American Canal, Imperial diversion dam.
Ariz.-Calif.	Colorado River Indian	25,000		Investigation for proposed project.
Ariz.-Calif.	Parker Dam	(1)	(1)	(1) Funds advanced by Metropolitan Water District.
Ariz.-Nev.	Boulder Canyon	38,000,000		Boulder dam and power plant.
Ariz.-Nev.	Boulder Canyon Industrial Survey	25,000		Industrial survey of territory tributary to Boulder Dam power plant.
California	Central Valley		15,000,000	Friant and Kennett dams, canals, etc.
Colorado	Denver Office	20,000		Additional office quarters.
Colorado	Grand Lake-Big Thompson Transmountain	150,000		Investigation on transmountain diversion.
Colorado	San Luis	35,000		Drainage investigations.
Colorado	Uncompahgre-Taylor Park	2,000,000		Taylor Park dam.
Colorado	Uncompahgre-Rehabilitation	325,000		Rehabilitation of carriage and distribution systems.
Colorado	Uncompahgre-Tunnel Lining	400,000		Relining and repair of Gunnison tunnel.
Idaho	Boise	40,000		Drainage in Notus division and Boise-Kuna district.
Idaho	Boise-Arrowrock		600,000	Repairs to Arrowrock dam.
Idaho	Boise-Payette Division		1,000,000	Canal system.
Idaho	Minidoka-Gooding Division	30,000		Completion of distribution system.
Idaho	Upper Snake River Storage	2,000,000		Island Park dam and reservoir.
Montana	Bitter Root	100,000	200,000	Rehabilitation of irrigation works.
Montana	Buffalo Rapids	20,000		Investigations.
Montana	Chain Lakes	1,000,000		Storage dam and reservoir.
Montana	Frenchtown	180,000	60,000	Canal system.
Montana	Milk River	65,000		Canal and siphon reconstruction, laterals and small structures
Montana	Sun River	600,000	715,000	Canals and laterals and completion of storage works.
Nebraska	North Platte Valley	50,000		Survey of water supply for proposed irrigation works.
Nevada	Humboldt	2,000,000		Rye Patch dam and reservoir and purchase of water rights.
Nevada	Truckee Storage	1,000,000		Storage dam and reservoir.
New Mexico	Caballo Dam	2,500,000		Caballo Dam.
New Mexico	Carlsbad		1,000,000	Alamogordo dam.
N. M.-Texas	Rio Grande	200,000		Drainage and lateral construction.
N. M.-Texas	Rio Grande Rectification	100,000		Rio Grande rectification.
Oregon	Burnt River		500,000	Unity dam to furnish supplemental water supply.
Oregon	Deschutes	65,000	500,000	Wikiup reservoir and dam, diversion tunnel and control works.
Oregon	Grande Ronde	10,000		Investigation of damsite on Grande Ronde River.
Oregon	Stanfield	100,000		Rehabilitation of existing irrigation works.
Oregon	Umatilla River Surveys	10,000		Survey of Umatilla River watershed.
Oregon	Vale	1,000,000	340,000	Agency Valley dam and extension of canal and laterals.
Ore.-Calif.	Klamath	61,000	135,000	Dikes Tule Lake division and drainage Main division.
Ore.-Idaho	Owyhee	5,000,000	500,000	Completion of irrigation works.
So. Dak.	Belle Fourche		70,000	Additional drains and replacement of structures.
Texas	Colorado River, Texas		2,000,000	Works for flood control, irrigation and power.
Utah	Hyrum	930,000		Storage dam, canals, etc.
Utah	Moon Lake	1,200,000	240,000	Moon Lake dam and reservoir.
Utah	Ogden River	3,000,000	500,000	Pine View dam and reservoir, pipe line and canals.
Utah	Provo River	1,000,000	2,260,000	Deer Creek dam and reservoir and canal.
Utah	Sanpete	375,000		Diversion works and canals.
Washington	Columbia Basin-Grand Coulee	15,000,000	20,000,000	Grand Coulee dam and power plant.
Washington	Columbia Basin Economic Investigations		250,000	Preparation of topographic and land ownership map and land classification.
Washington	Yakima-Kittitas Division	60,000		Completion of Kittitas division.
Washington	Yakima-Roza Division		4,000,000	Diversion dam, main canal, tunnels and siphons.
Washington	Yakima-Storage Division		280,000	Parapet wall and spillway gates at Cle Elum dam.
Wyoming	Casper-Alcova	7,000,000	8,000,000	Alcova diversion dam, Seminoe storage dam.
Wyoming	Riverton		1,000,000	Bull Lake dam and reservoir.
Wyoming	Shoshone-Willwood Division	30,000		Drainage, Willwood division.
Wyoming	Shoshone-Heart Mtn. Division		1,500,000	Heart Mountain division—canals and laterals.
Various	Administrative Expenses		1,500,000	Administrative expenses of Washington and Denver offices, etc.
Various	Colorado River Investigations		250,000	Continuation of investigations in Colorado River Basin.
Various	Secondary and Coöperative Investigations		250,000	Secondary and coöperative investigations to determine economic and engineering feasibility of proposed and existing irrigation projects.

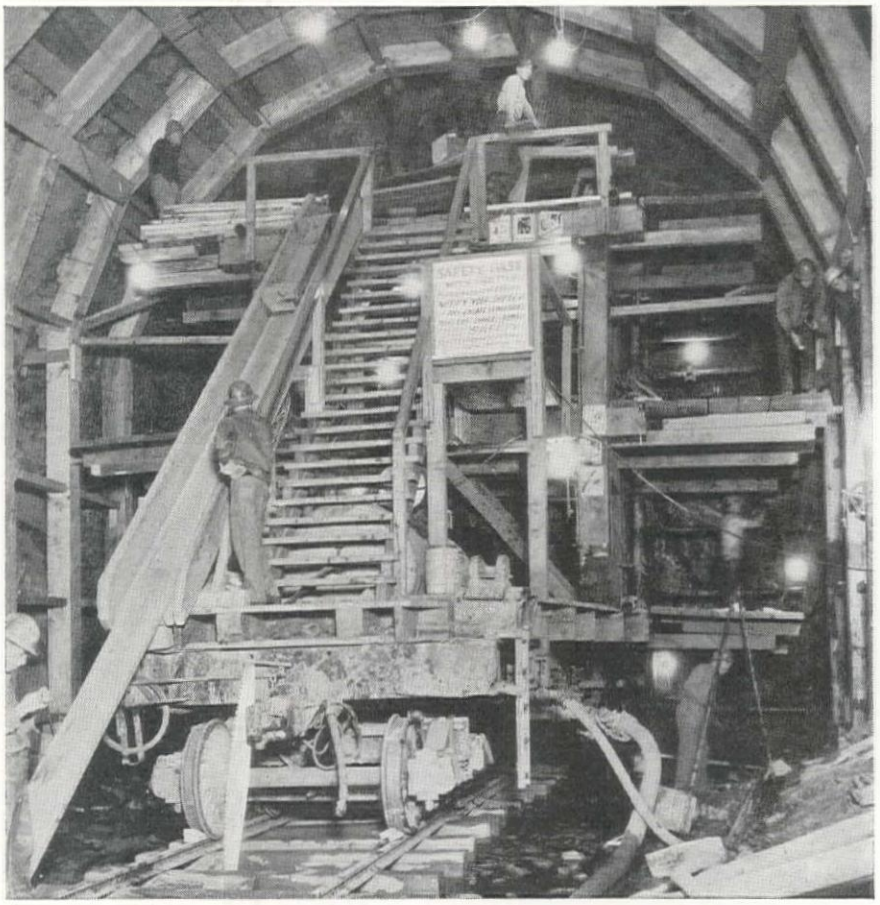
foundations of the outdoor switching station. By July, it is expected to have five generating units under trial operation. Later in the year work on the installation of two additional units which have already been purchased will be begun. No additional major construction contract remains to be let on this project. The completion of the dam ahead of schedule prevented a water shortage in the Imperial District this past summer which was another season of subnormal runoff on the Colorado River. Ralph Lowry is construction engineer.

Parker Dam, Arizona-California.—(Funds advanced by Metropolitan Water District.) An injunction by the State of Arizona prevented the anticipated progress being made on Parker Dam during 1935. Nevertheless the roads and diversion tunnel are well started and as the dispute is now settled the contractor should make rapid progress. This dam, 40 mi. below Needles on the Colorado River is unique because most of the structure will be buried, bedrock being 235 ft. below the river bed, whereas the flow line is only 80 ft. above. Pouring of the foundation concrete is expected to begin near the end of the year. E. A. Moritz is construction engineer.

All-American Canal, Arizona-California.—PWA allotment, $9,000,000, ERA allotment, $13,000,000.

Imperial Dam with its attached desilting works incorporates many original features, the result of a large amount of experimental research. The dam on a previous foundation of sand and silt is of the hollow buttressed type, supported on a heavily reinforced concrete mat resting on piles and provided with elaborate drains, pile cutoffs and filtering provisions to control underflow. Practically the entire job has recently been placed under contract. In December the contract for the dam and desilting works was awarded to a combination of Morrison-Knudsen, Utah Construction Co. and Winston Bros. Co. for $4,374,240; the mechanical equipment for the desilting works was awarded earlier to The Dorr Co. for $564,800, and the four 20 x 75-ft. roller gates to the Dravo Contracting Co. at $101,400. The construction contractor is immediately starting to cast the large number of concrete piles required for the foundation. By cofferdaming both sides of the river it is expected that it will be possible to start pouring foundation concrete by July.

Canal.—Practically all of the 80 mi. of the All-American Canal is now under active construction, the last contract for the 4 mi. of levee section at its head being awarded during December to Geo. Pollock Co. for $629,580. During the year additional contracts will cover nine large wash structures, two heavy steel bridges and a number of minor structures. R. B. Williams is construction engineer on both the Imperial diversion dam and the All-American Canal.



Drilling Rig for Parker Dam Tunnels

In driving the 3,400 ft. of 29-ft. (finished) diameter tunnels for diversion of the Colorado River during the construction of the Parker Dam, this drilling jumbo is being used. Contract for the project is held by Six Companies Inc. on a bid of $4,239,834. Completion of the diversion tunnels will be followed by the building of earthfill diversion dams.

Central Valley Project, California.—ERA allotment, $15,000,000. The Central Valley Project of California is the result of long range planning by the state with a view to the ultimate complete development of its water resources. The project embraces an area averaging 100 mi. wide and 800 mi. long drained by the Sacramento River in the north and by the San Joaquin River in the south. It includes the development of streams for navigation and regulation and the utilization of available waters for production of power, flood control, irrigation, domestic supply and salt water control. In general, it may be said that the scheme involves the use of the waters available from districts of abundant rainfall in the north for the benefit of the central and southern section where there is excellent land but deficient water supply. Walker R. Young is construction engineer.

The initial expenditures and construction operations are reviewed in some detail on another page in this issue.

Klamath Project, California-Oregon.—PWA allotment $61,000, ERA allotment $135,000. A small amount of work on canals, laterals and drains is planned which will be performed by government forces. B. E. Hayden is superintendent.

Uncompahgre Project, Colorado.—PWA allotment, $2,725,000. Winter has closed down work on the Taylor Park Dam. As the dam foundation is now stripped and the diversion tunnel is nearly completed, rapid progress is expected when work is resumed in the spring. Work is also in progress by contract and by government forces on the rehabilitation of the irrigation system in the Uncompahgre Valley. A. A. Whitmore is construction engineer on the Taylor Park Dam and C. B. Elliott is engineer on the distribution system in construction.

Grand Lake-Big Thompson Diversion, Colorado.—PWA allotment for investigation $150,000. A number of parties were in the field last season on this project, which contemplates the transmountain diversion of water from the Colorado River Basin for use in the irrigated valleys of Northern Colorado. The studies will not be completed for another year. Porter J. Preston, senior engineer, Denver office, is in charge.

Boise Project, Idaho.—PWA allotment $40,000; ERA $1,600,000. Bids have been opened and contract will soon be let for raising Arrowrock Dam 5 ft. and for repairing the spillway. Contracts will also soon be awarded for the construction of four tunnels on the Payette Division. Some additional earthwork and canal struc-

tures will be advertised on this division during the year. R. J. Newell is construction engineer.

Upper Snake River Storage, Idaho.—PWA allotment $2,000,000. Storage of 114,000 acre-feet is being provided by Island Park earth and rockfill dam, construction of which is now in progress. Contracts covering gates and metal work will be let early in the year. Investigations are being made of several other sites in the same watershed to develop an additional 15,000 acre-feet of storage. H. A. Parker is construction engineer.

Bitter Root Project, Montana.—PWA allotment $100,000; ERA allotment $200,000. This project involves the rehabilitation of various structures such as flumes, siphons and the reservoir outlet. The work is being handled by the Bitter Root Irrigation District. N. W. Blindauer is engineer-manager of the District.

Frenchtown Project, Montana.—PWA allotment $180,000; ERA allotment $60,000. This project involves the construction of a small diversion dam with canals and laterals for 8,000 acres. Work is in progress and additional small contracts will be let during the year. J. W. Taylor is resident engineer.

Sun River Project, Montana.—PWA allotment $600,000; ERA allotment $715,000. Additional storage is required on this project which will be obtained by the installation of gates on the Gibson Dam as originally planned increasing the storage from 91,000 to 105,000 acre-feet. The canals and laterals of the Greenfields Division will be completed. A certain amount of drainage work is to be done. Specifications will shortly be available. A. W. Walker is superintendent.

Humboldt Project, Nevada.—PWA allotment $2,000,000. The Rye Patch Dam, a 333,000 cu. yd. earth embankment , is 50% complete. All important contracts on this project have been let and the work is expected to be completed during the current year. L. J. Foster is construction engineer.

Truckee Storage, Nevada.—PWA allotment $1,000,000. It is planned to develop 40,000 acre-feet of storage on the Little Truckee River. The Boca site is being considered for a small earth dam but final decision has not yet been made. L. J. Foster is construction engineer.

Carlsbad Project, New Mexico.—ERA allotment $1,000,000. Bids were opened December 21 for the construction of Alamogordo Dam and contract will soon be awarded. This dam, which is of the earth and roçkfill type, 135 ft. high, 1,600 ft. long and containing 1,660,000 cu. yd. of fill, is situated on the Pecos River. Specifications covering the various gates and trashrack structures required will soon be issued. L. E. Foster is superintendent.

Caballo Dam, New Mexico.—PWA allotment $2,500,000. Specifications covering this earth and rockfill dam containing about 1,200,000 cu. yd. will be issued during January. This dam is being built by the Bureau for the International Boundary Commission to provide flood control and river regulation and it will also make the development possible of firm power at Elephant Butte Dam. Other contracts to be let include 900,000 lb. of metal work in gates and trashracks, 1,500,000 lb. of reinforcing steel and 900,000 lb. of steel sheet piling.

Burnt River Project, Oregon.—ERA allotment $500,000. The contract for the Unity Dam, a small earth structure (160,000 cu. yd.), was let in the fall. The dam provides 25,000 acre-feet of supplemental storage for lands now irrigated. C. H. Spencer is construction engineer.

Deschutes Project, Oregon.—PWA allotment $65,000; ERA allotment $500,000. Investigations for this project are under way but plans for construction have not yet been worked out. C. C. Fisher, engineer, is in charge of investigations.

Vale Project, Oregon.—PWA allotment $1,000,000; ERA allotment $340,000. The bulk of this work was the construction of the Agency Valley earth dam which is now practically complete. C. C. Ketchum is superintendent.

Owyhee Project, Oregon-Idaho.—PWA allotment $5,000,000; ERA allotment $500,000. The construction of the principal features of this project has been largely completed. In 1936 a number of additional small canal and lateral contracts will be let. R. J. Newell is superintendent.

Colorado River Project, Texas.—ERA allotment to Bureau $2,000,000; advanced by Lower Colorado River Authority $4,000,000. This is a $20,000,000 flood control, power and rice irrigation project on the Colorado River near Austin, Texas, which is being designed and constructed by the Bureau as agent for the Lower Colorado River Authority. The principal features are the partially completed Hamilton Dam and power plant near Bernet, Texas, the Arnold Dam and power plant and a large flood control dam to be located at some point above Austin. The Hamilton Dam will be completed by government forces and work on this feature is now in progress. A large number of steel gates will be required to control the river. Contracts for the steel work will be issued during the year. All features except Hamilton Dam will be constructed by contract and specifications for construction as well as for materials and supplies will be issued from time to time. H. P. Bunger is construction engineer.

Hyrum Project, Utah.—PWA allotment $930,000. This project is practically completed. D. J. Paul is resident engineer.

Moon Lake Project, Utah.—PWA allotment $1,200,000; ERA allotment $240,000. The Moon Lake Dam, an earthfill structure, is under contract. Considerable work remains to be done on canals and laterals. E. J. Westerhouse is construction engineer.

Ogden River, Utah.—PWA allotment $3,000,000; ERA allotment $500,000. Pine View Dam, an earth and rockfill structure containing 252,000 cu. yd., will provide supplemental irrigation storage and additional water for the City of Ogden. Most of the major features are under contract. Additional contracts will be let early in the year for the construction of the north and south canals. J. R. Iakisch is construction engineer.

Provo River Project, Utah.—PWA allotment $1,000,000; ERA allotment $2,260,000. The principal feature of this project is an earth and rockfill dam on the Provo River 150 ft. high and containing 2,200,000 cu. yd. of embankment. Considerable canal work is also involved. Beginning of construction is dependent upon the consummation of repayment contracts with the interests to be benefited. E. O. Larson is engineer.

Sanpete, Utah.—PWA $375,000. Little work is contemplated on this project during the coming year except the completion of tunnel construction under contracts previously let. E. O. Larson is engineer.

Columbia Basin, Washington.—PWA allotment $15,000,000; ERA allotment $20,000,000. Approximately 10% of the rock and 85% of the earth excavation has been completed for the Grand Coulee high dam and the initial pouring of the foundation concrete has commenced. The foundation for the high dam, which is the only work being done under existing allotments, will carry the dam to only about 100 ft. above the present river bed, yet this work alone will require the placing of over 4,000,000 cu. yd. of concrete. In connection with the dam foundation enough of the future powerhouse will be poured so that no future major cofferdaming operation will be necessary. The power house as at present laid out contemplates eighteen 147,000 h.p. turbines.

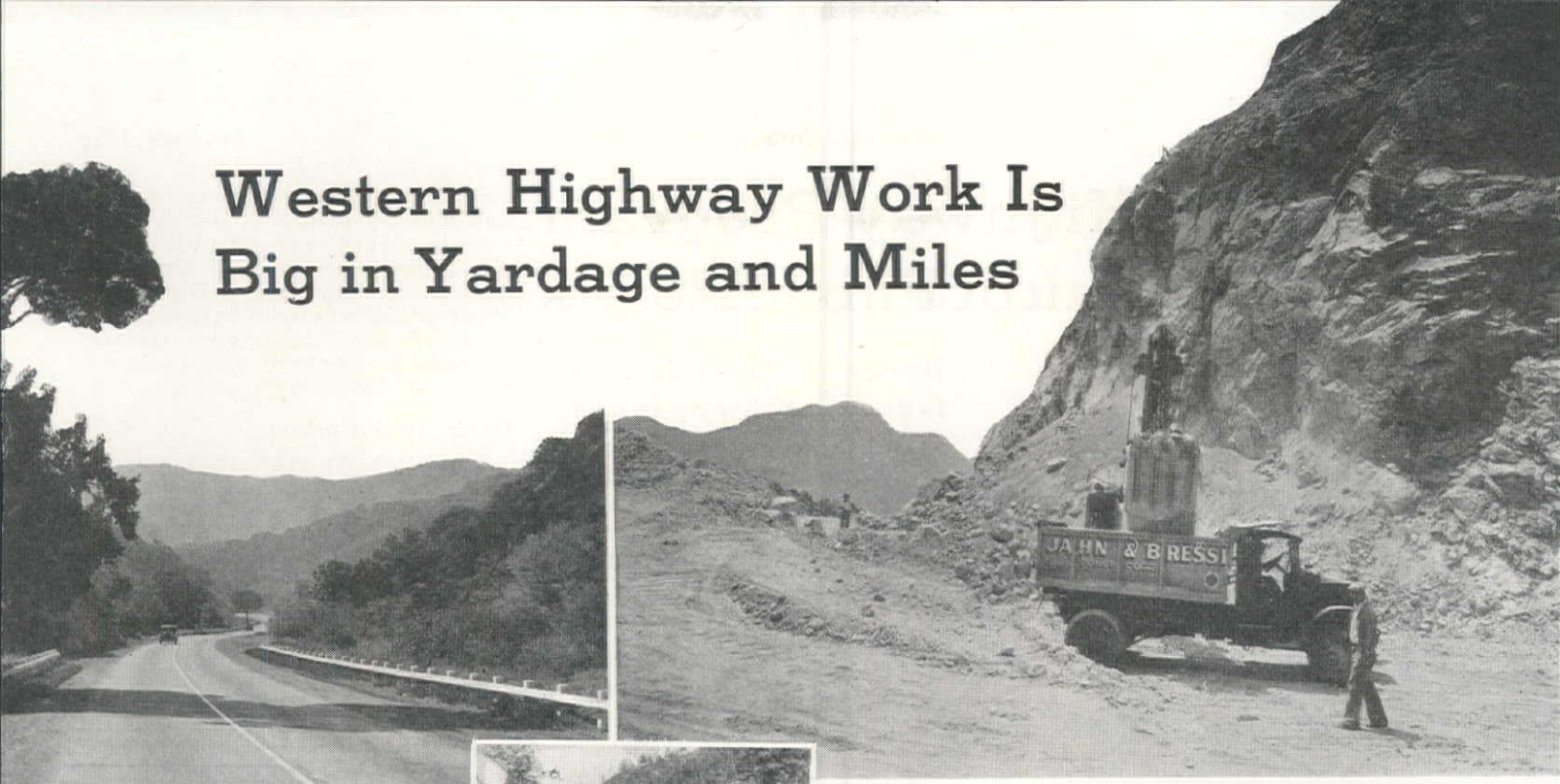
No new major contracts for this project are contemplated during the coming year. F. A. Banks is construction engineer.

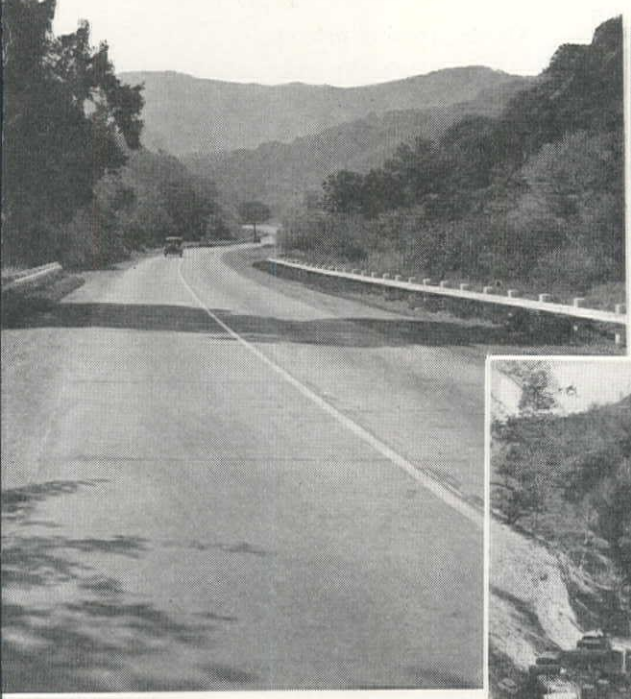
Yakima-Roza Project.—ERA allotment $4,000,000. During January contracts will be let for four large tunnels forming part of the Yakima-Roza main canal. Specifications for earthwork and canal structures and for a small diversion dam will be issued during the year. C. E. Crownover is construction engineer.

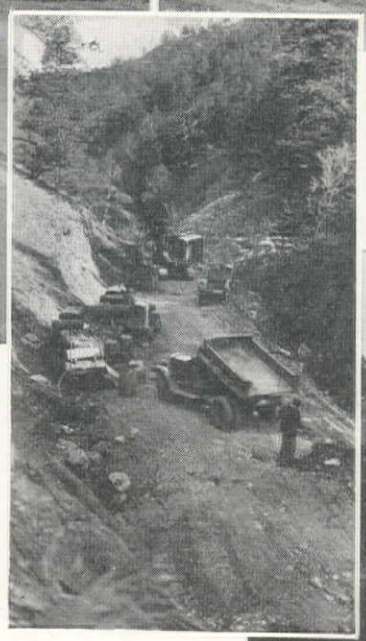
Shoshone Project—Heart Mountain Division, Wyoming.—ERA allotment, $1,500,000. Three tunnels, totalling three miles in length will be placed under contract in the near future. Additional canal and structure work on this project will be advertised during the year. W. F. Kemp is construction engineer.

Organization.—Operations of the Bureau of Reclamation are under the general direction of Elwood Mead, commissioner, with headquarters in Washington, D. C. Engineering work is under the supervision of R. F. Walter, chief engineer, S. O. Harper, assistant chief engineer, and J. L. Savage, chief designing engineer.

Western Highway Work Is Big in Yardage and Miles







Highway design in California (above) includes long curves, easy grades, center stripes and protective devices. The new biennial budget for the state is $21,545,000 with an additional $20,000,000 of federal funds.

In Washington, mountain work (right, inset) with heavy excavation and crowded working space is the general rule.

Rock cuts (above) are frequent on California highway work, involving heavy yardage, requiring extensive equipment. Excavation per mile will continue to increase as more highway routes are brought up to modern standards. For earth fills (below), the usual equipment consists of tractor-drawn carts and scrapers which move dirt and consolidate the dumped material at the same time.

In 1935, Wyoming oil-treated 498 miles of highway and graded 230 miles. Structures built by the highway department included 71 treated timber bridges. With a state system of 3,538 miles, Wyoming has only 34 miles of higher type pavement. Long distances and relatively small funds result in emphasis on oil-treating, of which the picture below is an excellent example.

Washington highway program, under direction of Lacey V. Murrow, is featuring re-alignment (below), and improvement to meet modern standards.

Western Highway Program of the Bureau of Public Roads

Review of the 1935–1936 federal highway funds spent, obligated and available for the eleven western states, including national forests and parks

DURING the years 1933-1935 the federal highway funds have been augmented by appropriations made to alleviate unemployment. These funds, administered under the law by the Bureau of Public Roads, exclusive of National Forest and National Park Highway funds, have been available during 1935 for highways in the eleven Western States as follows:

	Available During 1935	Obligated to Dec. 1 1935	Expended to Dec. 1 1935	Unobligated Balance Available for Add'l Projects Dec. 1 1935
Pub. Wks. Hwy. Funds (1934) (Balance $400,000,000 National Recovery Funds)	$ 5,744,000	$ 5,341,000	$ 4,991,000	$ 403,000
Pub. Wks. Hwy. Funds (1935) (Balance $200,000,000 National Rec. Funds)	32,154,000	31,244,000	27,062,000	910,000
Fed. Lands Hwy. (1935) Balance $2,500,000 Fund	2,134,000	1,934,000	1,527,000	200,000
Fed. Lands Hwy. (1936) $2,500,000 Appropr. Hayden-Cartwright Act	2,396,000	1,207,000	295,000	1,189,000
Fed. Aid Funds (1936) $125,000,000 Appropr. Hayden-Cartwright Act	23,478,000	12,725,000	3,196,000	10,753,000
Works Prog. Hwy. Funds (Emerg. Relief Appr. Act app. April 8, 1935)	35,078,000	15,853,000	653,000	19,225,000
Works Prog. Gr. Cross. Funds (Emergency Relief Appr. Act, April 8, 1935)	26,404,000	11,362,000	102,000	15,042,000
TOTALS	$127,388,000	$79,666,000	$37,826,000	$47,722,000

It will be noted that on Dec. 1, 1935, approximately $89,560,000 of these funds were unexpended, and $47,722,000 unobligated; that is, not assigned to projects for which plans have been approved. At the present rate of placing this work under way, most of this money will be obligated in a short time. As many of the contracts require winter prosecution of the work, expenditures within the next few months will alleviate unemployment to a marked degree during the ordinarily slack winter season.

The following tabulation gives the amounts of the above funds, which were apportioned to the eleven states in the Western Region:

State	Works Program Hwy. Funds	Works Program Gr. Cross. Funds	1936 Fed. Aid Funds	1935 Fed. Lands Funds	1936 Fed. Lands Funds	Total
Ariz.	$ 2,569,841	$ 1,256,099	$ 1,781,347	$ 355,080	$ 362,971	$ 6,325,338
Calif.	7,747,928	7,486,362	4,756,959	245,040	243,481	20,479,770
Colo.	3,395,263	2,631,567	2,288,811	92,144	94,585	8,502,370
Idaho	2,222,747	1,674,479	1,531,162	131,682	130,622	5,690,692
Mont.	3,676,416	2,722,327	2,560,449	137,901	138,448	9,235,541
Nev.	2,243,074	887,260	1,595,501	542,125	553,135	5,821,095
New Mex.	2,871,397	1,725,286	1,999,299	201,542	193,670	6,991,194
Oreg.	3,038,642	2,334,204	2,044,633	170,861	174,331	7,762,671
Utah	2,067,154	1,230,763	1,410,752	283,061	265,345	5,257,075
Wash.	3,026,161	3,095,041	1,949,957	41,244	42,140	8,154,543
Wyo.	2,219,155	1,360,841	1,559,444	197,230	197,131	5,533,801
Totals	$35,077,778	$26,404,229	$23,478,314	$2,397,910	$2,395,859	$89,754,090

In addition to these funds, there have been authorized for appropriation, under the provision of the Hayden-Cartwright Act the sum of $125,000,000 Federal Aid funds and $2,500,000 Federal Lands funds for the fiscal year ending June 30, 1937. These funds will not be available until appropriated by Congress, and apportioned by the Secretary of Agriculture.

In programming Works Program highway funds, consideration is being given to the respective county relief case loads. Under the regulations, not less than 25% of the funds must be applied to projects on secondary roads outside of municipalities and metropolitan areas and not included in the Federal Aid or state highway systems; and not less than 25% of the funds must be applied to projects within municipalities or metropolitan areas. As of Dec. 1, 1935, 80% of the Works Program highway funds have been programmed, providing for approximately 450 projects, estimated to cost an average of $62,000 each.

Grade crossing program

The Works Program grade crossing funds are programmed for projects located on the various railroads: (1) approximately in the proportions of the mileages operated by the respective railroads in each state, and (2) with respect to the relative traffic hazards at the grade crossings of each railroad. The regulations require that not less than 25% of the funds be applied to projects located on secondary or feeder roads and efforts have been made to allot a minimum of 30% to 35% of the funds to projects within municipalities or metropolitan areas. The programs submitted to date by the eleven western states include 206 grade crossing elimination structures estimated to cost an average of $106,000 each, 15 projects for the elimination of grade crossings by highway relocations estimated to cost an average of $117,000 each and 55 installations of grade crossing protection devices.

The prime consideration in the expenditure of the Works Program funds is the relief of unemployment. The law itself, and the Executive Order of the President, dated May 20, 1935, in addition to prescribing the conditions under which labor on these projects is to work, requires that preference in employment of labor be given to those on the public relief rolls. Rules and regulations under which Works Program funds are to be expended include the following major requirements, with respect to the employment of labor, and working conditions, for all Works Program highway projects:

1. The U. S. Employment Service must certify all persons to work on the projects, except those in executive, administrative, supervisory or highly skilled positions and preference must be given to qualified persons from the public relief rolls.

2. Labor is divided into skilled, intermediate and unskilled groups, and a minimum wage rate is established for each group. The tabulation gives the minimum wage rates established:

State	Unskilled	Intermediate	Skilled
Arizona	$ .50	$ .62½	$1.00
California	.60	.68	1.00
Nevada	.62½	.70	.90
Washington	.50	.75	1.20
Oregon	.50	.75	1.20
Montana	.60	.75	1.00
Wyoming	.55	.65	.80
Colorado	.50	.60	.90
New Mexico	.40	.60	.90
Idaho	.50	.60	.75
Utah	.50	.60	.75

3. Maximum hours of work on ordinary projects are set at 130 hours per month.

The regulations under which Works Program grade crossings funds are expended provide for conditions of employment similar to those on the highway projects, except that no minimum man hours of employment may be required.

The rules and regulations provide for two alternate methods of approving the Works Program highway projects. Section 6 sets up a yardstick of a maximum expenditure from federal funds of $1,400 per man year for all projects. Section 23 permits an alternate plan whereby each state may guarantee its full quota of employment to persons from the U. S. Employment Service. Labor to fulfill this quota may be employed on Works Program highway projects, Federal Aid projects, Federal Lands projects and state projects. All of the western states have entered into Alternate Plan Agreements with the Secretary of Agriculture for the expenditure of Works Program highway funds.

The states that include in the special provisions of the contracts for construction the requirement that the contractor employ a definite, reasonable number of man hours of labor from the U. S. Employment Service, include also a clause providing a penalty for any deficiency in the amount of such labor employed.

Works Program grade crossing projects, which require a relatively high percentage of materials and a low percentage of labor cost, were exempted from the requirement for a definite amount of employment and are not included in the alternate plan. Correspondingly, labor utilized on these projects is not eligible for credit to the state's quotas of employment.

Highway planning

More than three million miles of public highways exist in the United States, of which no adequate study has been made on a national basis. Highway transportation is of major importance in the economic and social life of our country, yet basic data is lacking for the formulation of an intelligent plan for the development of our highway systems. Recognizing this need, federal funds have been made available for such study in an amount of 1½% of Works Program, National Recovery funds, and 1936 federal funds and programmed in the western states approximately as follows:

States	1935 Pub. Wks.	Fed. Aid 1936	W. P. Highway	W. P. Gr. Cross.	Total
Arizona	.....	$ 26,720	$ 38,548	$ 18,841	$ 84,109
California	.....	.....	116,219	112,295	228,514
Colorado	.....	34,332	50,929	39,474	124,735
Idaho	.....	22,967	33,341	25,117	81,425
Montana	$56,546	38,407	55,146	40,835	190,934
Nevada	.....	23,932	33,646	13,308	70,886
New Mexico	.....	29,989	43,071	25,879	98,939
Oregon	.....	30,669	45,580	35,013	111,262
Utah	.....	20,000	31,007	17,300	68,307
Washington	.....	29,249	45,392	46,426	121,067
Wyoming	.....	.....	33,287	20,412	53,699
Totals	$56,546	$256,265	$526,166	$394,900	$1,233,877

A preliminary analysis of the essentials of such a field study has been made and formation of highway planning organizations has been begun. Technicians from the Bureau are to be assigned to collaborate with the highway planning organizations of the states.

The policy of requiring a minimum expenditure for roadside improvement and landscaping, which was initiated during the past few years, has been continued under the current appropriations. In addition to formal planting and landscaping, attention is being given to roadside beautification during the first stages of construction by planning architectural treatment of structures, rounding of slopes, preserving trees and shrubs, fitting alignment and grades to the landscape, and avoiding landscape scars. The regulations require a minimum expenditure of 1% of the Works Program highway funds amounting to $350,780 in the western region, for the appropriate landscaping of parkways or roadside on a reasonably extensive mileage. In addition, a minimum of 1% of the state's apportionments, of regular Federal Aid funds must be used for this purpose.

National Forest highways

The Hayden-Cartwright Act of June 18, 1934, made available on July 1, 1935, a total of $7,000,000 for the construction of highways in the National Forest throughout the country. Apportionments to the eleven western states, totaling $5,733,056 are given in the following tabulation:

Arizona	$ 419,453
California	1,017,952
Colorado	526,264
Idaho	735,550
Montana	576,332
Nevada	131,537
New Mexico	294,338
Oregon	954,042
Utah	239,010
Washington	523,812
Wyoming	314,766
Total	$5,733,056

Similar authorization of Forest funds is expected on July 1, 1936.

Against these funds, together with some balances available from previous appropriations a total of 87 projects estimated to cost $5,705,092 have been programmed. As of November 30, 73 projects estimated to cost $4,927,692 have been advertised and put under construction. There remains, therefore, some 14 projects estimated to cost $777,400 available for progressive lettings up to July 1, 1936.

National Park highways

Under an interbureau agreement the Bureau of Public Roads has been authorized to construct highways in the western parks for the National Park Service to a total amount of $4,977,846. These funds, also authorized under the Hayden-Cartwright Act, have been apportioned to the National Parks as indicated in the following tabulation:

Crater Lake	$ 247,500
Glacier	567,281
Mt. Rainier	563,310
Grand Canyon	140,000
Lassen Volcanic	36,630
Petrified Forest	286,478
Sequoia	198,283
Yosemite	995,500
Carlsbad Caverns	89,100
Rocky Mountain	339,154
Wind Cave	73,340
Yellowstone	1,395,730
Hawaii	45,540
Total	$4,977,846

Similar authorization of Park funds is expected to be available on July 1, 1936.

Against these funds there were programmed a total of 43 projects of which 23, estimated to cost $2,538,166, had been advertised and let to contract as of November 30. There remains, therefore, a total of 20 Park projects to be progressively advertised up to July 1, 1936.

Funds provided for under the Hayden-Cartwright Act are not subject to restrictions as to a definite number of man hours of labor per $1,000. However, the prime objective of relief of unemployment is provided for by restricting the hours of labor to 40 hours per week (48 hours in remote location requiring camps); by specifying minimum rates of pay for the various crafts employed; by requiring that labor so far as available be secured from rolls set up by U. S. Employment Agencies.

On projects advertised subsequent to October 29, minimum rates of pay for the different crafts employed are to be predetermined by the Department of Labor. Previously this requirement had not been applied to highway projects.

Organization

This highway construction program is being administered under the direction of Thos. H. MacDonald, chief of the Bureau of Public Roads. Dr. L. I. Hewes, deputy chief engineer with headquarters at San Francisco, is in charge of the administration of federal highways in the western region. The district engineers of the Bureau in the western region are:

District No. 1—Oregon, Washington, Montana: W. H. Lynch, Portland, Ore.

District No. 2—California, Arizona, Nevada: C. H. Sweetser, San Francisco, Calif.

District No. 3—Colorado, New Mexico, Wyoming: J. A. Elliott, Denver, Colo.

District No. 12—Idaho and Utah: B. J. Finch, Ogden, Utah.

State Highway Programs

Arizona Program Totals $8,700,000

A HIGHWAY and grade separation construction program totaling almost $8,700,000 has been proposed by the Arizona State Highway Department for the fiscal year (July 1, 1935, to June 30, 1936). The different types of construction and sources of funds are shown in the accompanying table. In this tabulation the grade separations are only summarized as to number of projects and the amount of money coming under the different highway classifications. Further, the summary includes an item of $400,000 which represents present contracts, now under way, carried over from the previous fiscal year.

Summary

WPH Funds	$1,139,000	
WPSS Funds	863,000	
WPSO Funds	642,460	
WPMH Funds	643,000	
WPMS Funds	4,000	$3,291,460
Regular F. A. Funds		2,254,498
Grade Separation Fds.		1,443,000
Maintenance Funds		1,087,000
Betterment Funds		207,000
NRA Funds		400,000
GRAND TOTAL		$8,682,958

T. S. O'Connell is state highway engineer of Arizona, Sid Smyth is deputy state highway engineer and H. C. Hatcher is statistical engineer.

Arizona Highway Projects Under Regular Federal Aid

Location	Conc.	Asphalt	Oil Process	Gravel Surface	Grading	Amount
Holbrook-Lupton			16.8			$218,294
Holbrook-St. John				5.5		125,000
Benson-Douglas			.1			11,443
Benson-Douglas			.8			32,943
Benson-Douglas			10.0			107,000
Ashfork-Kingman				10.8		172,747
Flagstaff-Fredonia				11.2		173,700
Flagstaff-Fredonia				8.6		169,288
Ashfork-Flagstaff						12,654
Globe-Showlow				6.4		249,675
Globe-Showlow					4.5	240,002
Geronimo-Solomonville				.3		15,705
Tempe-Mesa			.5			29,616
Mesa-Superior		.01				10,477
Ashfork-Kingman			23.6			108,788
Winslow Streets			.6			37,982
Winslow Streets			.02			1,250
Globe-Springerville					16.0	260,000
Tucson-Nogales			(1.6)			52,465
Mesa-Casa Grande Ruins						5,362
Prescott-Flagstaff				6.4		135,500
Yuma-Phoenix				1.2		40,000
Survey, Plans						37,570
TOTAL, Regular Fed. Aid		.01	52.4	50.4	20.5	$2,247,461

Arizona Grade Separation Projects

No.	Projects	WPGH	WPGS	WPGM
4	Grade Separations			$495,000
3	Grade Separations	$618,000		
5	Grade Separations		$320,000	
	TOTAL	$618,000	$320,000	$495,000

Colorado Features Small Contracts

THE complete highway program for the State of Colorado during 1936 will not be established until after the January meeting of the Highway Advisory Board.

During 1935, the following construction and maintenance program was carried out, in addition to about $2,000,000 of work carried over from the 1934 program: Forty-three projects were started and completed under jurisdiction of the engineering department and 39 light oiling projects completed by the forces of the maintenance department, consisting of placing 1 to 1½-in. mat. Details of this work included three grading projects 8.6 mi. long, costing $220,000; 27 gravel surfacing projects, 69.3 mi. long, costing $1,300,000; 41 oiling projects, including the maintenance projects, having a length of 460 mi., costing $500,000; one asphalt pavement project, 1.2 mi. long, costing $52,000. Five bridge projects 0.175 mi. long, cost $100,000.

Another group of projects which has been started but will not be completed until 1936 include: Seven bridge and approach projects 1.8 mi. long costing $500,000; 15 gravel surfacing projects 92.9 mi. long, costing $1,500,000; one concrete paving project costing $20,000; two landscaping projects costing $5,000. In a number of cases there are many major structures that are not listed separately. In the above mentioned groups of projects there are 120 such structures.

It will be noted from the number of projects and cost of the work, there were not any outstanding large contracts carried out during 1935, but the work consisted rather of many smaller jobs well scattered over the state. Probably the largest contract was 5 mi. of heavy grading in Mineral County on the east side of Wolf Creek Pass. A gravel surfacing project in Pueblo County, extending about 16 mi. between Pueblo and Florence, was also one of the large contracts.

Chas. D. Vail is state highway engineer of Colorado and O. T. Reedy is senior assistant highway engineer.

Idaho Program

THE Idaho Bureau of Highways will have available $8,209,000 of federal and state funds for expenditure upon highway work of all classes during the fiscal year ending June 30, 1936. For this fiscal year the Federal Government has provided the state with highway funds totaling $5,559,000.

Federal funds for the bureau of highways are:

Works Program—Highways	$2,222,747
Works Program—Grade crossings	1,674,479
Regular Federal Aid (to be matched)	1,531,162
Public Domain Funds	130,622
Total funds supplied by Government	$5,559,010

State funds for the fiscal year ending June 30, 1936, are estimated as $2,650,000 from gasoline tax and motor license fees. These funds are used in matching regular federal aid, for maintenance and for direct state projects.

State funds for matching regular federal aid	$1,023,840
Maintenance	1,200,000
Miscellaneous state highway projects	426,160
	$2,650,000

The total of federal and state funds for the fiscal year is $8,209,000 of which

67.7% is government funds and 32.3% is state funds.

The following is the total state program:

Grading, surfacing, oiling, etc., 75 projects—469 mi.	$4,555,000
Bridges, riprap, reconstruction and relocation—25 projects	426,000
Overhead and undercrossings —20 projects	1,525,000
Railroad grade crossing protection devices—20 projects	44,000
Maintenance of highway system—3,350 mi.	1,200,000
Miscellaneous and allocated..	459,010
Total	$8,209,010

Forty-seven per cent of this program was made possible by the 1935 Emergency Relief appropriations.

After July 1, 1936, there will be available in addition $2,500,000 of federal and matching funds and approximately $400,000 of state funds, a total of $2,900,000.

California Has $21,000,000 State Budget

WITH a series of weekly contract lettings, which have involved many large sized projects and millions of dollars for construction work, the California Highway Commission is rapidly advancing the start on a $21,545,000 biennial state highway budget together with a $20,000,000 program of federal funds. The state budget was approved in September and subsequently the state agreed to underwrite the federal relief funds available for California to secure a better balance between highway construction and relief activity.

The total number of major state highway construction projects to be carried out during the biennial numbers 126 including sixteen jobs on routes through municipalities. Among the major projects to be carried out in the northern part of the state, for which money has been allotted from state funds includes a $220,000 grading and surfacing job between Shasta and Redding, a $270,000 grading and paving job from Richfield to Red Bluff, a $220,000 grading and surfacing job near Santa Cruz, a $425,000 paving and bridge job from Santa Clara to San Jose, a $275,000 grading and paving job at Fresno, a $325,000 grading, paving, and bridge job in Monterey County and an allotment of $500,000 to build the north approach to the Golden Gate Bridge.

In the southern part of the state the larger projects include a $550,000 grading, paving, and bridge job on the Conejo Grade, a $480,000 grading and paving job in San Diego County, a $415,000 grading and surfacing job from Mountain Pass to the Nevada state line in San Bernardino County, and a $440,000 grading and paving job near Fort Tejon in Kern County.

With the $7,500,000 of federal funds allotted to California for grade separation projects, the state will undertake thirty-nine projects in seventeen counties. The majority of this work was placed under contract in December. The state endeavored to select projects to eliminate the most dangerous locations on the highway system, in accordance with the limitations placed on the funds by the Federal Government. The list of projects, as submitted to the Bureau of Public Roads, included fifteen structures on state highways outside of cities, ten separations on state highways within cities, twelve separations on other city streets and two on county roads.

The list of grade separation projects as recommended for construction is shown in the accompanying table.

Project	Railroad	Federal Funds
Subway on Main Street in Salinas	S. P.	$294,350
Subway on Golden State Highway at Famoso	S. P.	203,200
Widening subway south of Red Bluff	S. P.	116,430
Subway on San Leandro Street in Oakland	S. P. & W. P.	372,065
Overhead in Sacramento ("I" Street Bridge Approach)	S. P.	144,580
Subway on Charter Way in Stockton	S. P. & W. P.	268,059
Widening subway in Sacramento	S. P.	54,200
Subway to Bayshore Highway in Santa Clara	S. P.	171,860
Overhead on East Bayshore Highway in Albany	S. P.	352,050
Subway on Almaden Road, San Jose	S. P.	97,770
Rebuilding old overhead in Santa Barbara	S. P.	14,370
Subway on Coast Highway in Soledad	S. P.	150,870
Subway on state highway east of Tracy	S. P.	203,590
Overhead on state highway north of Indio	S. P.	128,800
Bridge and overhead on Figueroa Street in Los Angeles	S. P.	703,900
Overhead on Soto Street in Los Angeles	S. P.	208,580
Subway on Embarcadero Street, Palo Alto	S. P.	221,280
Subway on Main Street in El Centro	S. P.	231,110
Two grade separations at Niles	S. P. & W. P.	388,188
Reconstructing subway on Army Street in San Francisco	S. P.	60,900
Reconstructing overhead in San Francisco	S. P.	57,050
Widening overhead north of Del Mar	A. T. & S. F.	41,640
Reconstructing overhead west of Beaumont	S. P.	104,925
Subway on Foothill Boulevard at Azusa	A. T. & S. F.	249,620
Reconstructing old overhead near Maltby	A. T. & S. F.	16,250
Overhead south of Fresno	A. T. & S. F.	222,960
Overhead near Wilmington	A. T. & S. F.	270,520
Subway on Atlantic Avenue, Los Angeles	A. T. & S. F.	179,800
Subway on state highway at Verdemont	A. T. & S. F.	86,550
Overhead on state highway near Java	A. T. & S. F.	96,040
Subway on state highway at Buena Park	A. T. & S. F.	164,230
Subway on Firestone Boulevard, Los Angeles	P. E.	416,330
Raising tracks at Intersection of Mission Road and Huntington Drive in Los Angeles	P. E.	382,320
Subway under Main and Butte Street Line of Railroad on Soto Street in Los Angeles	U. P.	227,660
Removal of tracks from 12th Street in Oakland	W. P.	50,414
Washington Avenue subway near San Leandro	W. P.	181,575
Subway on Jackson Street in Hayward	W. P.	168,550
Rebuilding subway on Mountain Boulevard in Oakland	S. N.	59,468
Subway on Broadway Ter. near Landvale Dr. in Oakland..	S. N.	124,292

Nevada Program

THE allotment of federal work relief highway funds for the State of Nevada amounts to $2,243,074 for highway construction and $887,260 for grade separations. Programs absorbing all of these funds have been prepared by the Nevada State Highway Department and forwarded to the Bureau of Public Roads for approval. Sixty per cent of the highway projects and 40% of the grade separation projects are already under contract, with the remainder to be under way shortly.

Major subdivisions of the Works Program Highway projects in Nevada include:

Federal aid system projects	$ 464,300
Secondary projects	504,128
Municipal projects	564,000
Outside federal aid system	710,646
Total	$2,243,074

The larger individual grading and graveling projects include:

Geiger Grade (Washoe County)	$299,000
Fallon north to Old River	100,000
Fallon to Stillwater	154,128
Silver City to Virginia City	160,000
Railroad Pass toward Searchlight	100,000

Elko—Dinner Station	120,000
Silver Peak to Blair Junction	100,000

In addition, the program includes a $45,000 bridge project at Elko and two $48,000 bridge projects across the Truckee River at Reno.

The Works Program Grade Crossing projects to be carried out in Nevada are:

Location	Railroad	Estimated Cost
Wendover	Western Pacific	$ 57,804
Deeth	Western Pacific	62,538
Dunphy	Western Pacific	99,416
Fernley	Southern Pacific	40,669
Winnemucca	Southern Pacific	45,667
Winnemucca	Western Pacific	150,000
Las Vegas	L. A. and S. L.	150,000
Reno	Southern Pacific	152,855
Reno	Southern Pacific	110,000
Ely	(Wig-wag device)	5,000
State planning survey		13,308
Total		$887,260

Robert A. Allen is state highway engineer of Nevada, H. D. Mills is assistant state highway engineer and W. T. Holcomb is office engineer.

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Wyoming Program

WYOMING'S highway system comprises 3,538 mi. with about 200 mi. still classified as graded and drained earth, and over 700 mi. are untreated gravel or selected material. The work of the 1935 season has brought the oiled highways up to a total of 2,475 mi. There are but 34 mi. of the higher type pavements: 26 mi. of bituminous concrete and 8 mi. of portland cement concrete. The various kinds of oiled treated surfacing are proving very popular with traffic and hold up with a moderate amount of maintenance.

Construction work contracted during the past year comprises 230 mi. of grading and draining; 113 mi. of surfacing; 498 mi. of oiling, including seal coating; and 147 structures (71 treated timber bridges, 10 steel bridges, 1 concrete span, 2 overhead structures and 63 reinforced concrete culverts). Cost of this work totals over $4,000,000 with nearly a million dollars expended for structures.

In January of 1935, there were only 601 men employed on highway construction, in addition to some 500 employed by the highway department direct in maintenance and other activities. There were 50,000 man hours of employment provided in each of the months of January and February, but as a result of pursuing the policy emphasizing employment, three times as many man hours of employment were provided during the months of August and September, the sharp increase beginning in April and running through to August. This has resulted in an employment in August and September of over 3,250 men, including men employed in regular highway maintenance.

James B. True is superintendent of the Wyoming highway department.

New Mexico Plans 230 mi. of Oiling

FUNDS available for highway and grade separation construction in New Mexico from the federal works program total more than $4,500,000. Many contracts under this program were awarded during December and the remaining projects are listed in the accompanying tabulation.

The regular federal aid funds (money available July 1, 1936) have not been definitely programmed yet, but the tentative plan provides for 230 mi. of oiling, or other bituminous topping, costing $2,600,000, about 73 mi. of grading, structures and base surfacing costing $560,000 and one bridge estimated to cost $100,000.

The highway construction funds available from the works program total $2,871,397 and the individual projects which had not been placed under contract by Jan. 1 are:

NEW MEXICO HIGHWAY CONSTRUCTION FROM THE FEDERAL WORKS PROGRAM

Location	Mileage	Work	Estimated Cost
203-A toward La Ventana	13.7	G. D. & Surf.	$260,000
Mora-Holman	6.3	G. D. & Surf.	90,000
Lamy-Galisteo	4.2	G. D. &. Surf.	60,000
Cerrillos-Madrid	2.3	G. D. & Surf.	47,000
Penasco-N. M. 3	2.1	G. D. & Surf.	45,000
Taos Jct. north	16.2	G. D. & Surf.	110,000
Tularosa north	2.3	G. D. & Surf.	85,612
Jal-Texas Line	8.5	Oiled Surf.	37,000
Carrizozo north	7.0	G. D. & Surf.	100,000
Jal-Teague	8.8	G. D. & Surf.	115,000
Vaughn east	17.3	G. D. & B. C.	145,000
Vaughn-Tor. Co. line	4.1	Gd. & Dr.	55,000
Encino-Guad. Co. line	9.5	Gd. & Dr.	75,000
Espanola-Abiquiu	11.1	Gr. & Dr.	310,000
Raton-Capulin	16.3	Gr. & Dr.	200,000
Rodeo-Lordsburg	1.5	G. D. & B. C. & Top	35,000
Planning Project			43,071
Landscaping			28,714

NEW MEXICO GRADE SEPARATION PROGRAM

The grade separation funds available for New Mexico from the federal works program total $1,725,286. Of this program, the individual structures which had not been put under contract before Jan. 1 are:

Location	Railroad	Structure	Estimated Cost
Albuquerque	A. T. & S. F.	U. P. & Track R.	$434,000
Albuquerque	A. T. & S. F.	Overpass	286,000
Albuquerque	A. T. & S. F.	Underpass	152,007
Near Lamy	A. T. & S. F.	Overpass	41,500
Bernalillo	A. T. & S. F.	Overpass	47,900
Wingate E.	A. T. & S. F.	3 Elim. Reloc.	163,400
Lucy E.	A. T. & S. F.	2 Elim. Reloc.	90,000

NEW MEXICO REGULAR FEDERAL AID PROGRAM

Out of the regular 1936 federal aid program of New Mexico, which totaled $3,165,000, the following major projects remain to be placed under contract after Jan. 1.

Location	Mileage	Character of Work	Total Est. Cost
Guam-Bluewater	7.6	Grade & Base Course	$160,000
Horace U. P.-Acoma Res.	2.8	Grade & Base Course	85,000
Laguna-McCartys	11.0	Grade & Base Course	190,000
Carlsbad-Malaga	15.1	Bitum. Surfacing	90,000
Radium Springs-Hatch	20.2	Recon. & Base Course	245,000
Mescalero-Tularosa	6.8	Grade & Base Course	170,000
Pichacho-Hondo	15.6	Grade & Base Course	245,000
Orogrande-Newman	12.1	Reconst. & Bitum. Surf.	140,000

G. F. Conroy is state highway engineer of New Mexico, F. G. Healy is assistant state highway engineer and R. W. Bennett is office engineer.

Washington Program of $11,740,000

ABOUT 50% of the federal allotment for the State of Washington, amounting to $6,121,200, to carry out the Works Program Highway and Grade Crossing projects under the Emergency Relief Appropriation Act of 1935 were under contract on Jan. 1, 1936. The remainder will be let during the year.

Details for the additional highway construction program for Washington to be undertaken during the year 1936 are not yet available. The following is a brief summary of the revenue available and the percentage of the various types of work to be undertaken under the new program:

The new construction program for the year 1936 will consist of the following types of work: Grading and surfacing with crushed stone, 32%; bituminous treatment, 20%; paving, 15%; bridges and structures, 33%. The actual expenditures during the calendar year 1936 will amount to approximately $12,600,000.

L. V. Murrow is state director of highways for Washington, J. A. Davis is construction engineer and G. H. Porak, engineer of plans and surveys.

Federal aid (construction)		$ 1,900,000
State funds:		
Maintenance	$2,500,000	
Construction (overhead and miscellaneous)	3,200,000	$ 5,700,000
1935 program to be let in 1936:		
U. S. Works Program Highway and Grade Crossing projects	$3,000,000	
Federal aid projects	1,140,000	$ 4,140,000
Total		$11,740,000

Oregon Rushes Contract Letting

OREGON is putting under contract work totaling more than $5,300,000, including a grade crossing program involving the expenditure of about $2,300,000, from the federal works-relief appropriation. The handling of these funds, as in the other western states, will be under the alternate plan which provides for the state underwriting the amount of labor represented by these relief funds.

Contract letting began in November and was rushed during December in accordance with the urge of the Government to get this work under way. Among the larger contracts which had not been let on December 1 were a $435,000 grading and paving contract near East Portland, a $235,000 grading and paving job in Portland, a $227,000 grading and paving job on Foot Hill Blvd. in Portland and a $150,000 surfacing job near Aurora.

With the $2,300,000 of federal funds for Oregon grade separation work, the state planned six projects on the federal aid system, outside of municipalities, with the work totaling $617,000 including a $200,000 job on the Pacific Highway south of Ashland; four separations within municipalities totaling $1,230,000 including $300,000-projects in Pendleton, Oregon City, Salem, and Portland. On the secondary road system nine projects were planned totaling $467,000.

R. H. Baldock is state highway engineer and S. H. Probert is office engineer.

Montana 1936 Program Not Complete

DETAILS of the Montana state highway program for 1936 have not been completed. Efforts have been concentrated on getting the Works Relief Program Projects under contract at the earliest possible date. Incidentally, the work at the headquarters of the highway commission in Helena were seriously hampered by the prolonged period of earthquake disturbance.

The total of federal aid Works Program Highway and Grade Crossing funds for Montana, together with state funds to match the federal aid, is about $11,000,000. Of this amount, the highway department expected to have about half of it under contract on Jan. 1, 1936, with the remainder to be put under contract during the spring.

The other highway construction program in prospect for the state is the coming regular federal aid allotment, authorized but not appropriated. If this federal program goes through as contemplated it would provide about $2,500,000 for highway construction in Montana.

D. A. McKinnon is state highway engineer of Montana and E. B. Donohue is assistant state highway engineer.

Summary of 1935 Contract Awards

THE YEAR 1935 saw a steady climb, month by month, in total of awards of engineering construction work throughout the eleven western states; starting in January with $9,000,000, the rise culminated in December with a total of $44,254,286; the largest single month of awards during the past three years, excepting the months when the Grand Coulee Dam, the San Francisco-Oakland Bay Bridge and the Golden Gate Bridge were awarded.

The grand total of awards for 1935 was $254,457,134; slightly under the total for 1934 and a few millions above 1933.

The construction industry during 1935 saw: the Boulder Dam practically completed; nearly all Metropolitan Water District contracts progressing at a rapid rate; completion of the two bridges across San Francisco Bay promised for 1936 or early in 1937; marvelous progress being made on Bonneville, Grand Coulee, and Fort Peck dams; the first contract on the Central Valley Water Project called for bids; and, by far the most important, thousands of smaller contracts on all types of engineering construction work, giving all contractors the opportunity to do "some bidding."

The general trend of "bid prices" during the year was decidedly upward: common excavation at $1.33 and $1.70 per cu. yd. were bid on successful contracts. Such prices were occasioned, in most instances, by "man hours of labor" required under federal regulations.

Differentials between engineer's estimates and contractors' bid prices have grown smaller and in many cases the old order was reversed, i. e., the contractor is asking and getting more than the estimates. Contractors' licensing laws and prequalification requirements are now in effect in most of the eleven western states (*Western Construction News*, Nov., 1935).

Contractors should give the utmost in care and thought to details in the preparation of their bids, for 1935 brought out the following: contracts were lost because of (1) bids unsigned; (2) no certified checks or unsigned checks; (3) insufficient checks; (4) no license; (5) received too late; (6) unit prices left out; (7) errors in placing decimal points in unit prices and obvious errors in computing costs.

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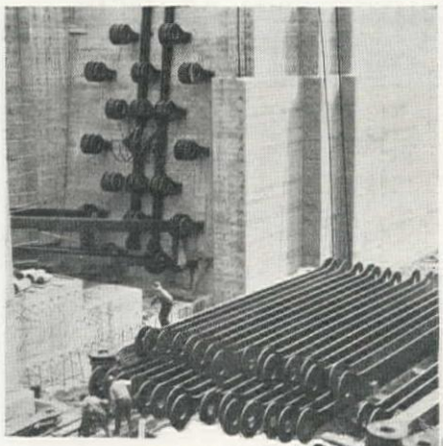
Street Work in Oakland

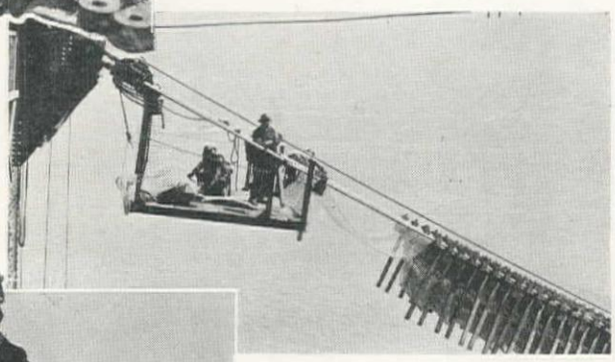
Street work in the City of Oakland, Calif., during 1936 will total about $800,000 according to a recent estimate of Walter N. Frickstad, city engineer. Of this financing, the WPA will provide about $600,000 with the city's portion of the state gas tax providing a further $150,000.

Cable Spinning Procedure

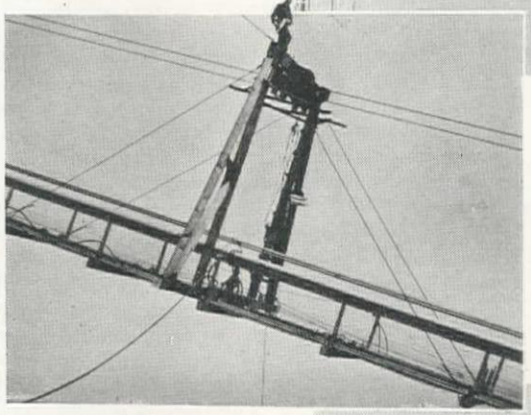
. . . West's First Use of This



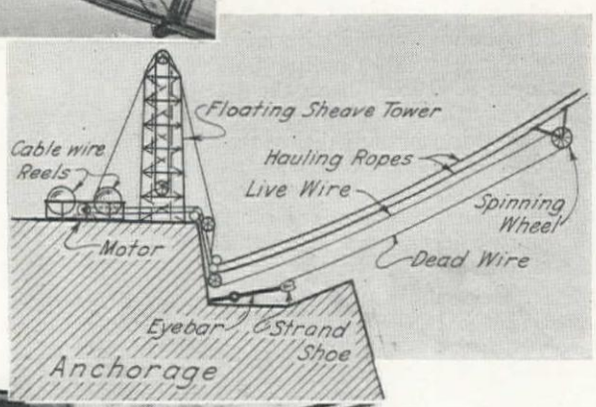
Eyebars (left), which form the connecting links between the anchorage and the strands of cable, being painted prior to placing in position.



Wire mesh flooring (right) for the catwalks being strung on the 2¼-in. wire ropes using 6x8-in. timber floor beams at 10-ft. spacing. These 10-ft. wide footbridges are walkways and also support the cable spinning equipment.



Completed catwalk (left) showing one of the gallows-frames which support the hauling ropes at 230-ft. intervals. These frames rest on the four 2¼-in. cables and are held by guy wires as shown.



Wire from the reels, which hold about 60 mi. each, goes through the tower where a floating sheave maintains a constant tension, then in a loop around the spinning wheel it is pulled across the span by the hauling rope. The "dead wire" is the end fast to the strand shoe and the "live wire" is the one from the reel.

Arriving at the anchorage (left), the loops of wire are taken off the spinning wheel and placed around the strand shoe, and others placed on the wheel for the return trip.

Each series of strands (right) is spun above the cable to permit adjusting, before lowering into position.

CONSTRUCTION of the parallel wire cables for the western portion of the San Francisco-Oakland Bay Bridge was officially started by Governor Frank F. Merriam on June 15, 1935. More than half a century has passed since the first cable was built by this procedure, but it was not until the present day that circumstances brought a similar job west of the Ohio River.

The cables of the San Francisco-Oakland Bay Bridge are each made up of 17,464 galvanized medium-carbon steel wires averaging .196 in. in diameter. The process of manufacture and particularly the cold drawing of this wire produces a material which readily meets the required ultimate strength of 220,000 lb. per sq. in. The wire is manufactured in lengths of about 3,800 ft. and shipped in coils to the reeling plant in South San Francisco. At this plant the coils are spliced together and the wire wound on 6-ft. diameter welded steel reels. Each reel carries about 57 mi. of wire and weighs about 18½ tons when loaded.

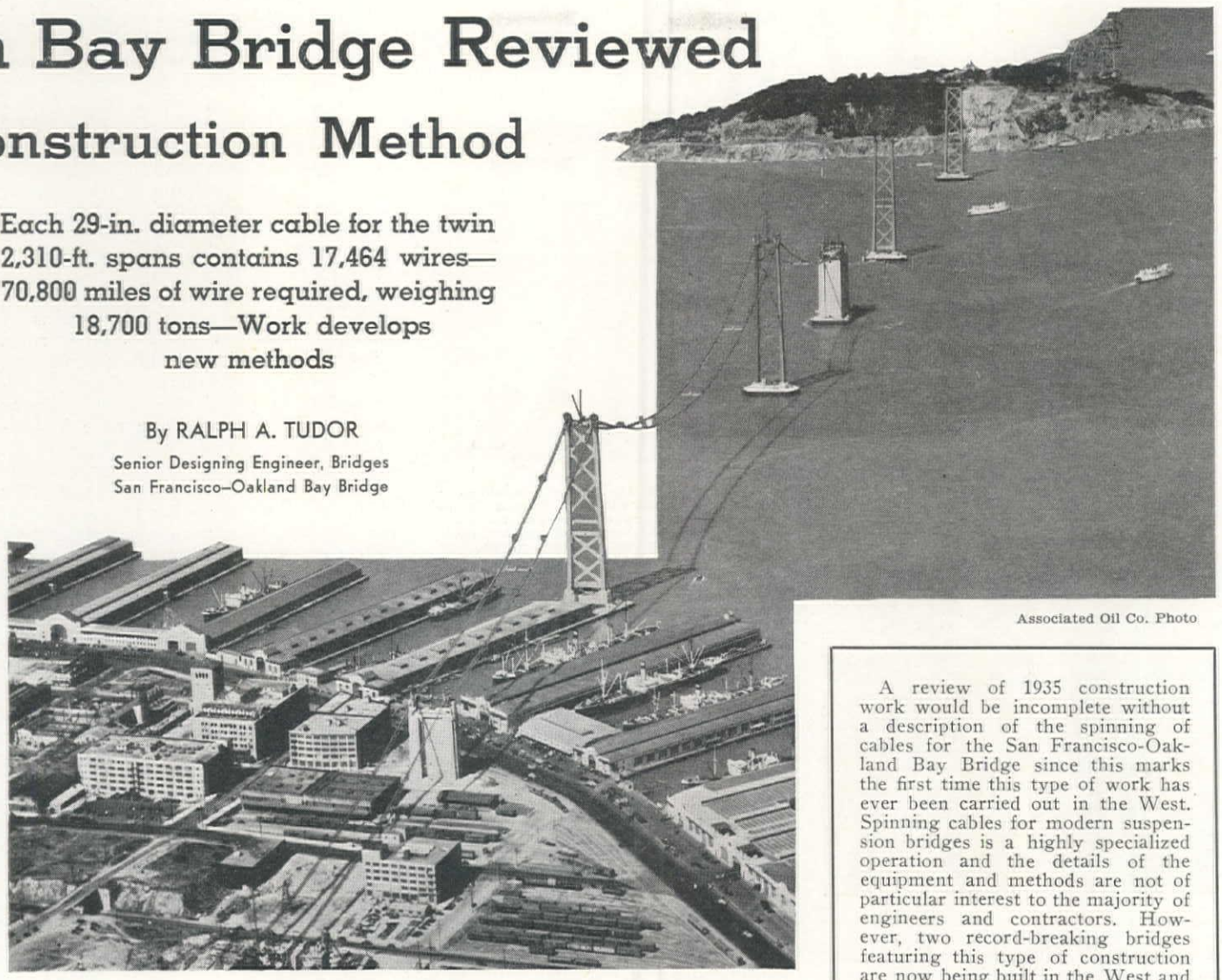
The method of splicing the wires in the reeling plant is interesting. The ends are each beveled so that they may lap, and right hand threads are swedged on the end of one wire and left hand on the other. These threads are deepest at the extreme ends of the wires and grade out to little more than a scratch. Greatest possible net section of the wire is thus maintained. The two wires are then joined by means of a steel sleeve with tapped threads to match those of the wires. By rotating the sleeve the beveled edges of the wires are brought together and effectively locked against unthreading. This joint develops not less than 95% of the strength of the wire and in many cases failure on test occurs beyond the limit of the threads.

on Bay Bridge Reviewed

Construction Method

Each 29-in. diameter cable for the twin 2,310-ft. spans contains 17,464 wires—70,800 miles of wire required, weighing 18,700 tons—Work develops new methods

By RALPH A. TUDOR
Senior Designing Engineer, Bridges
San Francisco–Oakland Bay Bridge



Associated Oil Co. Photo

From the San Francisco anchorage the two suspension spans extend about 9,500 ft. to Yerba Buena Island. The side spans between anchors and towers are 1,160 ft. and the main spans are 2,310 ft. Spinning was completed on the west span first and the equipment then moved to the east side of the central anchorage. Cable spinning started June 15, 1935, and is scheduled for completion in January, 1936.

A review of 1935 construction work would be incomplete without a description of the spinning of cables for the San Francisco-Oakland Bay Bridge since this marks the first time this type of work has ever been carried out in the West. Spinning cables for modern suspension bridges is a highly specialized operation and the details of the equipment and methods are not of particular interest to the majority of engineers and contractors. However, two record-breaking bridges featuring this type of construction are now being built in the West and the readers of *Western Construction News* should be interested in understanding the general procedure involved. Spinning has been completed on the San Francisco-Oakland Bay Bridge and the general steps in the work are reviewed in the following article.—EDITOR.

Prior to the start of actual spinning operations the contractor set up an extensive plant for the purpose. Essentially this plant consists of: (1) the footbridges or catwalks, (2) the wire placing machinery, and (3) the wire adjusting equipment. It is an intricate and, to the layman at least, a rather confounding piece of mechanism. Yet the basic principles developed and used for the Brooklyn Bridge remain to govern. It is only in the details that changes have been made. These details have, however, been so improved that wire is being placed at a more rapid rate than ever before.

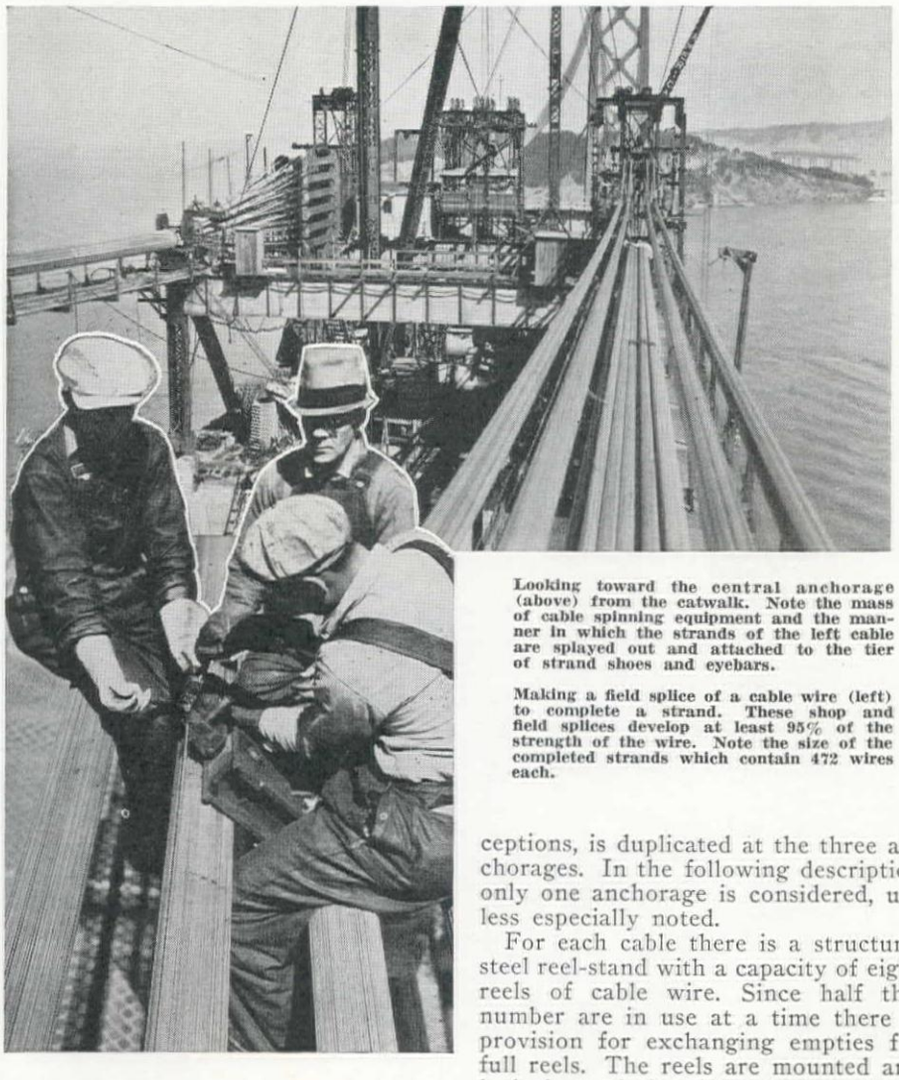
Footbridges

The 10-ft. wide footbridges serve the double purpose of providing walkways for the workmen and supporting the spinning and adjusting equipment. Lightness of construction and freedom from fire hazard are features of these catwalks. Four 2¼-in. wire ropes (later to be used as suspenders) support each walkway. These ropes are prestressed with a load of 200,000 lb., or about one-half their ultimate strength, to remove as much of the initial stretch as possible. They are accurately measured and the ends secured in sockets which are held in spreader beams at the anchorages and the tower tops.

These ropes were placed individually between adjacent supports by means of a 1-in. wire rope messenger cable. This messenger cable led from the drum of a hoisting engine at the base of one support, to the top of that support where it reeved through a 5-ft. diameter sheave and thence swung in a long free curve clear of the water to the top of the next support. Here it reeved through a second large sheave and dropped to the base where it was lashed to the end of one of the 2¼-in. ropes. The latter were wound on reels mounted on a barge.

When the messenger line was hauled in the larger rope followed and was thus swung in place without suffering possible damage from immersion in the salt water of the bay. Prior to placing each rope it was, of course, necessary to tow the messenger line through the water from one support to the other and then lift it in place. When all ropes were in position they were adjusted so that they had the proper sag. This adjustment was made with shims placed ahead of the sockets at the spreader beams. Correctness of the sag was very important since the footbridge had to be low enough to clear the main cable and permit sufficient space for the operation of the squeezing machine, and yet it had to be high enough to permit the workmen to reach the topmost wire in the last strand which is spun 12 or 18 in. above the top of the cable.

The flooring was next placed. This had been previously constructed in 100-ft. lengths in the assembly yard and delivered to the tower tops in bundles where it was attached and slid down the ropes. This flooring consists essentially of 6 x 8-in. timber floor beams bolted under the footbridge ropes at



Looking toward the central anchorage (above) from the catwalk. Note the mass of cable spinning equipment and the manner in which the strands of the left cable are splayed out and attached to the tier of strand shoes and eyebars.

Making a field splice of a cable wire (left) to complete a strand. These shop and field splices develop at least 95% of the strength of the wire. Note the size of the completed strands which contain 472 wires each.

10-ft. intervals. Stretched tightly above these floorbeams and below the ropes is a heavy 2-in. wire mesh which is in turn covered with a smaller ¾-in. wire mesh. The latter is turned upward 18 in. along each side of the walk. In addition there is a wire rope handrail supported by timber posts at each floor beam.

In spite of a few fears felt by querulous landlubbers and ferryboat observers, this flooring has been found entirely satisfactory. It has a certain amount of "give" and of course those on it can see not only over the sides but directly through to the bay below. But even to the uninitiated this is not disturbing.

To prevent possible movement in high winds a storm cable system is used. This consists of two 1-in. wire ropes under each footbridge secured near the base of the towers and curved upward to be near the footbridge cables at the center of the span. Vertical steel ropes at frequent intervals secure the storm cables to the footbridge. Steel cross bridges between the two footbridges at about 600-ft. intervals contribute to the general stability of the system.

Wire placing machinery

The extensive equipment used for placing wires, with a few important exceptions, is duplicated at the three anchorages. In the following description only one anchorage is considered, unless especially noted.

For each cable there is a structural steel reel-stand with a capacity of eight reels of cable wire. Since half this number are in use at a time there is provision for exchanging empties for full reels. The reels are mounted and locked on shafts which carry a large diameter brake drum against which operate a pair of external contracting shoes. The shaft is also attached to a clutch and gear arrangement which permits the application of rotating power at the discretion of an operator. This power is supplied by an air motor at the rear of the stand.

The wire is led from the top of the reel to the top of a structural steel framework 57 ft. high known as a floating-sheave tower. There is a set of two 5-ft. diameter sheaves at the top of this tower for each of the four wires coming from the reel-stand. Directly below these sheaves are four other double sheaves of the same diameter. The lower sheaves are set in a weighted frame which runs in a vertical track and may thus "float" up and down during spinning. The wires are reeved through these sheaves and are finally led through deflector sheaves out along the cable.

Forgetting for the moment what becomes of the wires after it leaves the anchorage, the operation of the unreeling equipment is outlined. When a wire is first started on its trip along the footbridge the reel from which it comes is not moving. The first few feet of wire hauled comes from lifting the floating sheave in the tower. When the operator at the rear of the reel-stand sees this sheave move upward, he applies power from the air motor to the reel and accelerates it to the proper speed, or until the sheave ceases to move upward. If he speeds the reel up too much or if for some reason they stop pulling wire along the walk the floating sheave immediately starts downward and automatically actuates the brake on the reel. In this manner wire is always fed out at the proper speed and a constant tension is maintained.

The actual hauling of the wires along the footwalk is accomplished with a 4-ft. diameter double-grooved spinning wheel which is secured by means of a goose-neck yoke to a hauling rope. There is nothing at all complicated about this rope and wheel and it resembles, in many ways, the ordinary overhead cableway. The rope is supported at intervals of about 230 ft. along the footwalk by timber gallows-frames which carry the supporting sheaves. A set of similar sheaves placed on the arc of a circle serve to deflect the ropes over the tops of the towers. The goose-neck connection of the yoke supporting the spinning wheel permits passage of these sheaves.

At each anchorage the hauling rope is reeved to pass around a 7-ft. diameter driving wheel geared to an electric motor. In addition, the rope passes over a floating sheave which is counterweighted to provide a constant tension. The hauling rope is endless and supports two spinning wheels so that when one is moving west the other travels east.

Cable spinning

In spinning, a loop of cable wire is placed in a groove of the spinning wheel. The lower wire of this loop is "dead" and is secured to the anchorage. The upper wire is "live" and is the one which comes through the floating sheave tower from the reel. As the wheel is moved along the footbridge it pulls this loop with it to the far anchorage. Here it is lifted off and placed around the proper strand shoe. A distinct innovation in this equipment is the use of double grooved spinning wheels carrying two loops of wire at each crossing rather than the customary one. With two wheels moving in opposite directions four loops or eight wires are simultaneously placed along the cable at each operation.

The spinning wheels move at an average rate of about 4 m.p.h. A cowbell is secured to each wheel and serves as a warning to the workmen as it approaches.

At each gallows-frame along the footbridge and at other convenient points, control switches are provided so that the spinning equipment may be stopped should the necessity arise. It is only possible to start it from the main controls at the center anchorage.

Wire adjusting equipment

At intervals along the floor of the footbridge there are sets of small hooks and 6-in. diameter ball-bearing mounted flanged wheels. As soon as the spin-

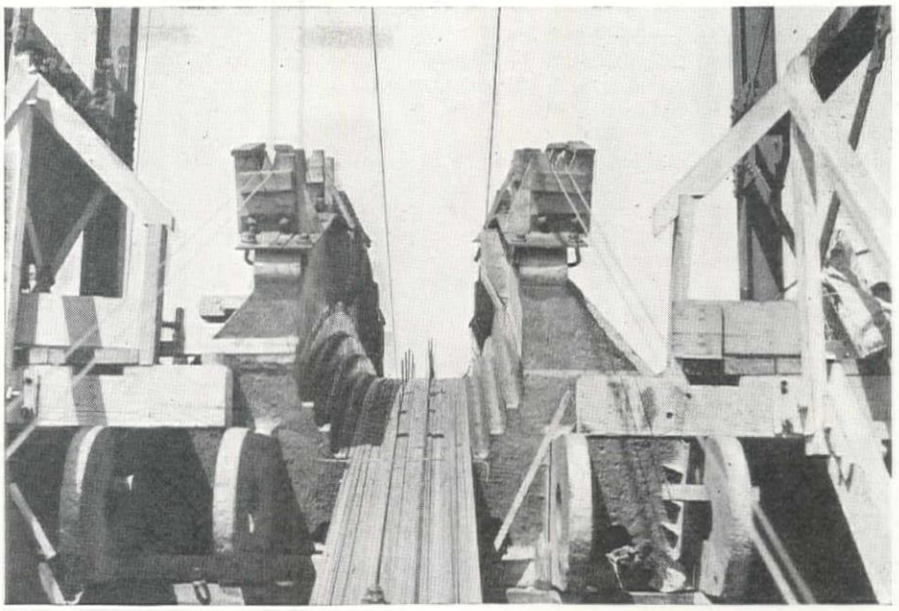
ning wheel passes these points, workmen place the dead wires under the hooks and the live wires under the wheels. This effectively prevents swinging of the wires and the spinning wheel and also keeps the wires properly sorted at all times.

Adjustment of the wires into the main cable is the key to the entire work. It is the time controlling element and it is upon this operation that the efficiency of the cable itself depends. As soon as the spinning wheel passes a tower one of the dead wires is released from the hooks along the footbridge in the span just passed. An operator attaches a "come-along" to the wire on the far side of the cable saddle. This "come-along" can be hauled in or slacked off by means of an electically driven winch resting on the footbridge. The winch operator is directed by electric signal from the adjustor at the middle of the span. The wire is first pulled high above the previously adjusted wires, and is then slacked off so that it falls parallel to those already adjusted.

The first few wires of each strand are adjusted to a guide wire which has been accurately surveyed for correct sag. This guide wire is then removed and the remaining wires of the strand adjusted to those already in place. The amount to slack-off or pull-in is signaled to the winch operator by the adjustor and the time consumed is remarkably short. When the adjustment is correct the wire is clamped on the side of the support away from the span in which the adjustment was made. The operators in the next span are then signaled to proceed with their adjustment. The dead wire adjustments are thus "chased" across the bridge and the live wires are followed back.

As the wires are adjusted they are kept tied together in their respective strands with binder twine. When a strand is completed these strings are cut and the strand combed out to detect any wires which may be unreasonably high or low. Of those strands completed thus far the total spread of such a released strand (excepting only a few outlaw wires) has not exceeded 15 in. and it is generally about 9 in. The few bad wires are cut and spliced to correct sag. The strand is then compacted by air-operated tongs and seized at 5-ft. intervals with thin metal bands.

The first four (bottom) strands are spun in their correct final location. Subsequent strands are spun about 12 in. high at the midpoints of each span to insure that these wires are not being supported by those previously placed. As these strands are completed the strand shoes at the anchorages are moved forward to drop the strands into their proper position. This adjustment is controlled by hydraulic jacks.



Cable being spun in the cast steel saddle at the top of one of the towers. This spinning of the cables directly in permanent position at the saddles is a new procedure developed on this project.

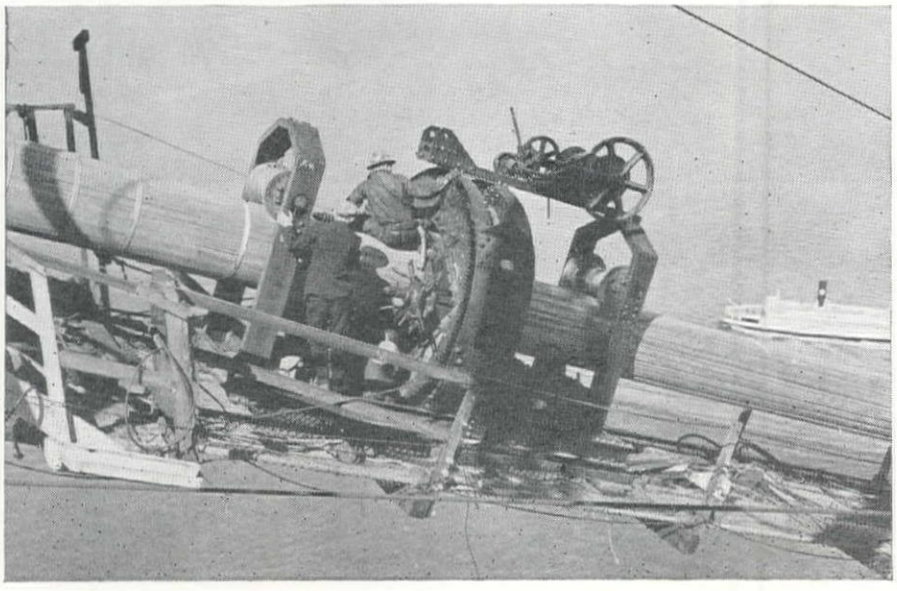
In distinction to the usual practice the contractor is spinning the wire directly in the saddles at the towers.

The equipment has been designed to place wire at a very rapid rate and it has been found possible on a good day to average about one trip of the spinning wheels every 20 min. The entire operation depends upon the efficiency of the wire adjusting crews.

It was originally planned to operate 24 hr. per day but this has been found to be impracticable. However, the heavy wind experienced almost every afternoon during the fall months interfered so greatly with adjusting the wires that a 21-hr. day was adopted. The 3-hr. shut-down has been used for adjusting and repairing equipment.

Exactly four months after the first wire was started on its way by Governor Merriam, the last wire of the two western cables was adjusted into place. In the meantime the footbridges for the eastern cables had been erected. The reel-stands, floating-sheave towers, and other spinning equipment that had been at the San Francisco anchorage were then transferred to Yerba Buena Island. The gallows frames, hauling ropes with their spinning wheels, signal equipment, etc., were moved to the east footbridges, and cable spinning for that portion of the structure proceeded.

Compacting machine which squeezes the cables with six 75-ton jacks into final circular shape 28¾ in. in finished diameter. The bands are placed every 5 ft. and the machine travels along the top of the cable on the rollers.



Compacting

Compacting of the cables follows immediately after the completion of spinning. For this operation a 7-ton machine is used. The principal element is a heavy structural steel collar that completely encircles the cable. Within it are six 75-ton capacity screw jacks, operating radially toward the center of the cable. On the end of each jack is a shoe curved to fit the cable, and which overlaps the shoes of the adjacent jacks. All six jacks are operated together by a chain drive from a single air motor. They move inward simultaneously and equally, and insure a perfectly round cable. As a part of

the compacting machine there is a device which places a band of several turns of wire, and thus holds the cable after the jacks are released. These bands around the cable are placed at about 5-ft. intervals.

The cast steel cable bands, over which the suspender ropes are looped, are placed after the compacting. The final operations will be those of wrapping the cable between these bands with a tightly placed spirally wound wire, and then painting.

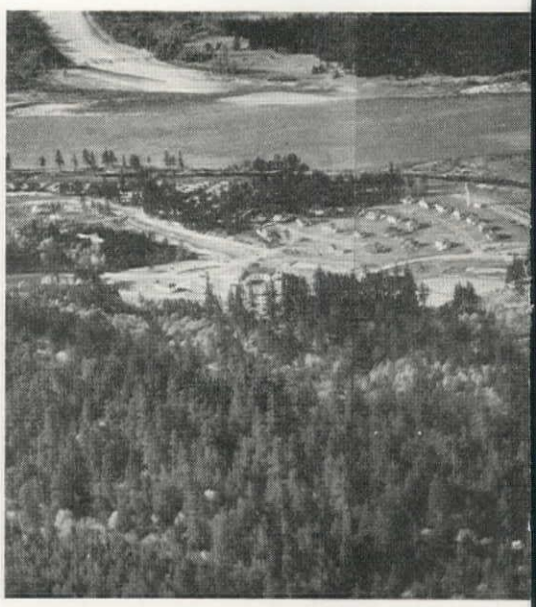
The administrative and engineering personnel of the California Toll Bridge Authority has been published in previous issues of the *Western Construction News*.

Construction of the cables is part of the general contract for the entire superstructure of the San Francisco-Oakland Bay Bridge held by the Columbia Steel Co. Ambrose Diehl is president and E. J. Schneider is contract manager. The American Bridge Co. is in direct charge of cable work with C. H. Garner, general manager of erection and H. C. Hunter western erecting manager.

Bridge Inspection Trip

Construction operations on the San Francisco-Oakland Bay Bridge were inspected by a group of Columbia Steel Co. and Moore Drydock Co. officials, together with several guests, on December 13. Under the guidance of E. H. Schneider, contracting manager for the Columbia Steel Co., the party of about twenty-five visited various features of the work on the Bay in the cruiser of J. H. Moore, president of the Moore Drydock Co. The Columbia Steel Co. holds the contracts for steel superstructure and the cables of the bridge and the Moore Drydock Co. built the caissons for the deep piers.

Those included in the group who were directly interested in the construction operations included: A. N. Diehl, president of the Columbia Steel Co., and E. J. Schneider, contracting manager; J. H. Moore, J. H. Moore, Jr., and other officials of the Moore Drydock Co.; A. J. Cleary, City Administrator of San Francisco; R. W. Lea of the Hammond Lumber Co., and H. W. Flye of the Aluminum Co.



Completion Dates Announced for San Francisco-Oakland Bay Bridge

In November, 1936, highway traffic will be moving across the San Francisco-Oakland Bay Bridge, according to a report made at the end of the year by C. H. Purcell, chief engineer of the project. This completion date, for the vehicular part of the structure, will finish the world's longest bridge ahead of schedule.

At the close of 1935 about $40,000,000 had been expended on the project and during 1936 the remaining expenditures to an estimated total of $61,600,000 will be made, leaving a $15,000,000 estimate for the work on the interurban system, provided the negotiations with the railroads and the RFC are successful. During the first year the bridge is expected to handle six million vehicles.

The schedule for completion on the various units of the structure follows:

West Bay distribution viaducts—completed April 1.

Toll building and distribution structure in Oakland—completed July 1.

Cantilever structure over east channel—closed March 7.

Paving on the west bay structure—completed May 7.

Yerba Buena Island, including completion of the tunnel and all work on the island—June 1.

Suspension spans—on the west span the floor system will be hung from the cables by March 15 and the floor completed by April 15. On the east suspension span next to the island, the cables, which are now nearing completion, will have the decks hung in position by June 15, the floor system completed by July 15 and all paving finished on September 15.

The entire bridge structure, exclusive of railway facilities, will be paved by September 15 and cleared up ready for traffic in November, 1936.

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Work to Go Ahead

Work will be resumed on the Payette division of the Boise project in Idaho, according to a report from the Bureau of Reclamation. Work was temporarily halted recently because of a report that insufficient unemployed labor was available in the vicinity of the construction.

"In view of the fact that a recanvass of the labor situation discloses that adequate labor is available within a reasonable transportation radius of the project," Secretary Ickes said, "work will be resumed."

An allotment of $1,000,000 was made from work relief funds to the Bureau of Reclamation for construction of irrigation work on the Payette division, for which water storage previously had been provided.

The Bureau called for bids on construction of four tunnels of the Black Canyon conduit, which will be the main canal for the division, on December 2. Award of the contract was delayed pending a survey of the employment situation in Emmett, Pocatello and surrounding communities.

1935 Progress At Schedule

THE BONNEVILLE project continues to make consistent progress and has kept abreast or ahead of schedule at all times since diamond drilling contract No. 1 was started in October, 1933. At the present rate of construction, June, 1937, should see the final testing out of the first units of electrical generating equipment. The successive steps in this development, to date, may be broadly summed up as: (1) excavation and unwatering of the power house cofferdam between Bradford Island and the Oregon shore; (2) building of a sand and gravel plant in Portland, preparing materials there from the Willamette and Columbia River slough and transporting them by train 40 mi. to a modern aggregate and batching plant on Bradford Island; (3) building of the power house substructure; (4) excavation and building of the navigation lock; (5) simultaneous railroad relocations on each side of the river, involving the construction of a major concrete viaduct; (6) construction of the south cofferdam for the main spillway dam with excavation, preliminary unwatering and subsequent flooding at high water; (7) final unwatering, completion of excavation and concrete placing.

At present, concrete is being placed in the south end of the main dam, using an aggregate and batching plant on the Washington shore and transporting concrete across the main channel on a 2,000-ft. cableway. Initial work on the fishways has started. In the meantime, the Oregon shore near the project has been landscaped with lawns and shrubs around the permanent employees' homes and community buildings.

PANORAMA OF BONNEVILLE PROJECT

Contractors and U. S. Engineers' townsites are at the extreme left. In the center is the navigation lock, almost complete, with the powerhouse structure immediately at the right. Lock and powerhouse are protected by earth cofferdams. At the right is the south half of the main dam behind the timber crib cofferdam. On the far bank is the camp and the concreting plant of the Columbia Construction Co., contractor on the main dam. Concrete is placed by cableway across the north channel.

on the Bonneville Dam Rate for All Contracts

Review of work shows navigation lock about complete, railroad relocation well advanced, powerhouse to be roofed by May, 1936, and concreting under way in the main dam

Contracts which have been awarded since the last tabulation in *Western Construction News*, July, 1935, are listed in the accompanying table.

Railroad relocation

The railroad relocation on the Washington shore for the S. P. & S. was completed last summer and the tracks placed in use. The O. W. R. & N. work on the Oregon side, a more extensive project, is still in progress. This new line, 3.95 mi. long shortens the old line by .31 mi., cuts out adverse grades and eliminates much of the original curvature. It was divided into two contracts; the original Orino, Bell & Malcom Co. contract from Moffatt Creek to the "big" cut about ½ mi. above the lock is completed. This included the Tanner Creek viaduct, Tooth Rock tunnel, and some excavation east of the cut for the Eagle Creek bridge approach.

The second contract, was let to Orino, Birkemeier & Saremal Co. This includes the deep-cut excavation involving about 380,000 cu. yd. of unclassified material and the riprapping of Ruckel slide as outstanding features. May or June, 1936, is the date set for completion of this work.

Construction of asphaltic concrete paving (permanent roads, etc.)	$ 29,640
Designing, manufacturing and installing one 4,000 k.w. generator (Electric Machinery Mfg. Co.)	61,473
Furnishing and erecting gantry cranes, steel gates, etc., for main spillway dam (Columbia Steel Co.)	1,109,447
Construction and installation steel intake gates and draft tubes, stop-log sections, etc., of powerhouse (Worden-Allen Co.)	130,280
Construction and installation of lock operating equipment (Pacific Coast Steel Corp.)	398,298
Construction of asphaltic concrete paving (Warren Northwest, Inc.)	6,850
Construction and installing powerhouse gantry cranes and lifting beams (Star Iron & Steel Co.)	95,261
Probing and drilling (R. S. McClintock)	10,303
Drilling (Lynch Bros., Inc.)	6,920
Construction of powerhouse superstructure and fish ladder (General Construction Company and J. F. Shea Co., Inc.)	1,160,307
Total	$3,008,779

Work on the navigation lock is further advanced than on any other feature at Bonneville. Plans were changed, as previously reported, in the middle of the job to make the locks navigable for deep sea vessels, adding $1,200,000 to the contract. This resulted in some delay, but the concrete work was scheduled for completion in December.

Temporary wooden gates are being installed with stoplogs at the lower sill. The stoplogs will function at the present as a gate, but later will act only as an emergency dam in case any repairs are necessary to the permanent gates. Early in 1936, temporary navigation of the locks will be possible, to pass existing traffic on the river, when operations on the north side cofferdam are started which will close the main stream.

Powerhouse superstructure

On the powerhouse superstructure, the first unit of which will house two main and one service generators, work has started in pouring an inner front wall. The house will be roofed by May, 1936, after which the foundations for the generators and operating floor will be constructed. At present concrete placing is under way in the draft tubes for the three generating units. Delivery of the speed rings cannot be made until June, 1936, and by that time the cranes in the superstructure will be ready to handle them. The rest of the power house substructure openings will be closed with stoplogs in the lower gate grooves, until such time as the other generating units are added.

Main spillway dam

Concrete placing started in the south cofferdam area Sept. 16, 1935, and 159,-

000 cu. yd. of mass concrete had been poured in the dam to Dec. 6. The aggregate and mixing plant for this work, together with the 2,020-ft. cableway, were described in the July, 1935, issue.

The mass concrete is placed in blocks 60 ft. wide between construction joints. Transversely, the blocks extend 97 ft. down stream from the axis of the dam, to a longitudinal joint; then 67 ft. farther to another longitudinal joint connecting with the 6-ft. thick apron. The apron extends another 77½ ft., laid directly on rock. Upstream from the axis, the dimensions of the blocks are variable. There is about 225,000 cu. yd. of mass concrete in the south half of the channel.

Present plans call for the removal of the cofferdam by the end of January and the Columbia Construction Co. expects to construct the second unit of the cofferdam before next high water; ahead of schedule.

Practically every type of fishway has been considered because the size of the river, height of the dam, forebay and tail water range, character of the great salmon runs to be accommodated, taken together, have no precedent: Several lifts at each end of the main dam; fish ladders at each end of the main dam; double lift at the south end of the powerhouse; fish ladder at north end of powerhouse; utilization of navigation locks as fishway; by-pass from mouth of Tanner Creek below the dam, up through the grounds to forebay.

The lifts are built on the principle of navigation locks, each 20 ft. wide by 30 ft. long. Inside the chambers, latticed floors (elevators) are to be raised by motors, from the tail race level to forebay. About a 20-minute cycle for filling and emptying a lift is anticipated. One fish ladder is to be located on the Washington side, one on the Bradford Island end of the main dam and one on the Bradford Island end of the powerhouse. The last two will have a common outlet into the powerhouse forebay. These will be gravity ladders of the stepped type.

The fish ladders use the same fish "collecting" system as the lifts, a gated by-pass leading from the collecting chamber of the lift into the entrance of the ladder. Both ladders and lifts will not be operated simultaneously.

The pair of lifts at the end of the powerhouse will be similar to those on the main dam and will discharge into the pool above the powerhouse. There is also provided here an entrance from the fishway into the navigation locks, which may also be utilized as a fish lift on a much larger scale, if need be.

Finally, distinct from the other methods, is a by-pass starting from the mouth of Tanner Creek (immediately below the locks and powerhouse), passing up through the old fish hatchery, through the government property at the south end of the project and connecting with the pool above the powerhouse. This can be made into a miniature river, stepped in easy stages, about 40 ft. in width and carrying about 5 sec. ft. of water when in use.

Program for Beginning Construction On the Central Valley Project

Allocation of $15,000,000 for the $170,000,000 water development and conservation plan in California will result in starting construction on two large dams, extensive railroad relocation, and three long canals

WITH the $15,000,000 allocation of federal funds for the start on the California Central Valley Project re-allocated for specific features of the development, active construction work on this $170,000,000 program for statewide water conservation, irrigation, flood control, hydroelectric power, and navigation improvement enters the stage of active construction during January. The project is being carried out under the direction of the U. S. Bureau of Reclamation, in accordance with the general program adopted by the state after a decade of engineering study. The first active construction will probably be on the extensive railroad relocation work which is necessary to remove the main line track of the Southern Pacific Railway from the site of the reservoir to be flooded by the building of the Kennett Dam. This work will probably be followed by preliminary operations on the two major dams, as soon as exploration work and design studies have been completed. In the meantime, field work may be actively under way along the several canal routes.

Allotment of federal funds, according to an announcement by Secretary Ickes on December 10, were made by President Roosevelt for the following features of the program:

1. Excavation and preparation for building Kennett Dam on the Sacramento River....$ 500,000
2. Beginning relocation and reconstruction of the railroad to be flooded by the Kennett reservoir 5,000,000
3. Construction of the Contra Costa Canal..... 2,500,000
4. Purchase of water rights in the San Joaquin Valley..... 2,000,000
5. Construction of Friant Dam 3,500,000
6. Beginning construction of the Madera Canal..... 500,000
7. Beginning construction of the Friant-Kern Canal..... 1,000,000

In each of these projects the allotted sum constitutes funds for only the beginning of the work, with the possible exception of the Contra Costa Canal which has previously been estimated to cost about $2,500,000, for a 120-sec. ft. capacity. The total estimated cost of the Central Valley Project is $170,000,000.

The original allotment for $20,000,000 did not specify definite projects, containing only the general requirement that the funds be expended on units which could be completed and placed in operation by July, 1937. The subsequent change in the allotment was based on the fact that the entire project has been studied and programmed as a comprehensive unit and the present funds can be made to fit into the ultimate development of the California State Water Plan.

The State Water Plan, including the present Central Valley Project, has been developed during the past decade after comprehensive engineering and economic studies by the Division of Water Resources, Department of Public Works, under the active direction of Edward Hyatt, state engineer. Mr. Hyatt has also been active in presenting the program before federal authorities at Washington to secure the present national financing. The general features of the project have been reviewed in *Western Construction News* on several occasions and it is not considered necessary to describe the program again. The following outline relates directly to the present plans for active construction work under the available financing.

Present activity

Following the approval of federal funds for the start of this major pro-

gram, the Secretary of the Interior appointed Walker R. Young, who was concluding more than five years of work as construction engineer on Boulder Dam, as construction engineer on the Central Valley Project. Mr. Young has established offices in Sacramento, as the headquarters of the Bureau of Reclamation activity for the project.

A consulting board for this project was appointed by Secretary Ickes, composed of: Charles H. Paul, consulting engineer, Dayton, Ohio, chairman; Dr. W. F. Durant, Stanford University; Dr. Charles P. Berkey, Columbia University, New York; Roy B. Meikle, chief engineer, Modesto-Turlock Irrigation District.

This board met and spent five days (Dec. 15-20) in the field going over all construction sites where work will be carried out under the present program. The board was accompanied by Mr. Young, J. L. Savage, chief designing engineer, Bureau of Reclamation, and several representatives of the state engineer's office. Plans for the project are now being studied by Bureau of Reclamation at Denver.

The following brief review of the individual features for which preliminary financing is provided in the present allocation is based on the estimates and plans of the state program, subject to further studies. Reference to the present plans for these various units is based on information available on Dec. 24.

Kennett Dam

Preliminary survey work is already under way at the Kennett Dam site located on the Sacramento River about 13 mi. above Redding. Present surveys are for the purpose of further design studies, including final location, and for possible sites for a construction camp. According to preliminary designs this dam would be of gravity concrete type with a height of 420 ft. above low water and would contain more than 3,000,000 cu. yd. of concrete. The storage of almost 3,000,000 ac. ft. would be available for irrigation, power, and navigation improvement in accordance with the general plan.

Removal of the main line of the Southern Pacific Railroad from its present location in the Sacramento River Canyon through the dam and reservoir sites is the major preliminary construction feature. This work will involve building of about 32½ mi. of new line requiring 5,000,000 cu. yd. of excavation, about 6 mi. of tunnel, and several bridges including a major structure across the Sacramento River. This work has been estimated to cost about $20,000,000 for which the present allocation of $5,000,000 is available for starting the work.

Relocation of the state highway does not involve such extensive construction because the present route south of Pitt River is above the reservoir water line and out of the canyon at the dam site. The highway north of Pitt River will require relocation and a bridge, possibly in conjunction with a railroad bridge, will be required at the Pitt River crossing.

Power development at the site, according to original plans, would include an installed capacity of 275,000 kva. with a further installation of about 40,000 kva. at the Keswick afterbay dam, if this structure is subsequently added to the present program. Transmission lines for delivering this power to Northern California load centers are not included in the program for early construction.

Contra Costa Canal

This 50-mi. canal ranging from 120 to 20 sec. ft. in capacity would extend along the south shore of Suisun Bay from near Knightsen to Martinez with terminal deliveries to Walnut Creek and vicinity. The purpose of this canal is to provide a fresh water supply to communities, irrigation districts, and industries in the upper San Francisco Bay area, or to increase their existing supplies. At the present time, the river and bay waters in this vicinity, during the low flow periods in some years, are too saline for industrial or municipal use. This project would include more than 500,000 cu. yd. of excavation, 5,000,000 sq. ft. of concrete lining, a large number of highway crossings and several pumping plants. The construction program for the present planned capacity could be carried out with the allocated fund of $2,500,000.

The first work to be done on this undertaking would be a survey of the canal route and an investigation into the requirements and desires of the organizations to be benefited by the canal. Construction of the canal would depend upon the arrangements to be made for the distribution and use of the water.

Friant Dam

The Friant Dam on the San Joaquin River, about 1 mi. above Friant, according to the state plan, is provided to store flood waters for delivery into a canal running north to the Chowchilla River and another extending south to Bakersfield. The proposed structure would be a concrete gravity dam about 250 ft. high above low water containing 1,300,000 cu. yd. of concrete and storing 400,000 ac. ft. in the reservoir, of which 270,000 ac. ft. would be effective for delivery to the canals.

Present preliminaries at this site include survey work extending present studies for location and design.

Although the Friant Dam originally included the installing of a small power plant, to utilize the head on the reservoir, a subsequent economical review of this project by the state resulted in the elimination of the power plant feature, based principally on the fact that the requirements for irrigation, within a period of about fifteen years would practically eliminate the supply which would be available for power generation.

Madera and Friant-Kern Canals

The Madera Canal extending about 35 mi. north from the Friant Dam into Madera County will have a capacity varying from 1,500 to 500 sec. ft. and would require more than 1,000,000 cu. yd. of excavation, almost 8,000,000 sq. ft. of canal lining and many incidental structures. This canal would deliver a gravity supply of water to existing irrigated and producing lands which are now deficit in water supply.

The Friant-Kern Canal would extend about 150 mi. south from the Friant Dam to Kern River, with a capacity of from 3,000 to 1,500 sec. ft. This project, according to original plans, would involve about 11,500,000 cu. yd. of excavation, 65,000,000 sq. ft. of concrete lining and many incidental structures including two tunnels and several siphons.

No field work has been started on these features under the recent allotment of $1,500,000 for the two canals. However, preliminary work followed by contract letting would not require much time and construction could be gotten under way with little delay, working from several points on the canal routes.

General plan

Briefly, the general program of water conservation and multiple use provided by the Central Valley Project in California includes the following features:

(1) Provides supplemental water for existing agricultural areas in the upper San Joaquin Valley which have always been deficient in irrigation water and continually threatened with such serious water shortages as to necessitate abandonment of these lands; (2) reduction in flood menace on the Sacramento River by the storage created by Kennett Dam, with accompanying increase in flow during the summer to improve navigation on the Sacramento River and provide salinity control in the delta region, now threatened by the ruin of large areas of rich agricultural land with the encroachment of salt water from the bay; (3) provision of fresh water supply for communities and industries along Suisun Bay from Antioch to Bay Point; (4) production of power at Kennett Dam.

By state law, the carrying out of this project was placed in the hands of a State Water Authority, created by the act, consisting of the attorney general, state controller, state treasurer, director of finance, and director of public works, the last as chairman. The state engineer is executive officer for this authority. Edward Hyatt, state engineer, has been in direct charge of preparing plans and supervising studies for this state water program. Several months ago the State Water Authority reached an agreement with the Bureau of Reclamation by which the federal bureau would take charge of the project and carry out the construction work.

Colorado Aqueduct Progress Presented in Tabulations

Summary shows less than 10 miles of tunnel to be driven—About 70 miles remain to be lined—Most of conduit excavation has been completed

DURING 1935 construction operations along the far-flung line of the Colorado River aqueduct, being built by the Metropolitan Water District of Southern California, have continued to move at a fast rate. The type of construction work on the tunnels and the conduits is considered to be generally understood by the readers of *Western Construction News*, having been described in detail by previous articles. The most direct means of reviewing the progress on the various units of the project is through the statistics presented in the accompanying table, which indicate the amount of work completed on the individual contracts, and the force account work, up to Nov. 30.

In addition to the units listed in this table of progress, the following contracts have been completed: Mecca Pass tunnels No. 1, 2 and 3 (Morrison-Knudsen Co.), 1.13 mi.; Whitewater tunnels No. 1 and 2 (West Construction Co.), 1.94 mi.; Hayfield tunnel No. 2 (Shofner & Gordon), 1.03 mi.; Little Morongo siphon (United Concrete Pipe Co.); Fan Hill conduit and siphon (force account); conduit schedule No. 20-C (Griffith Co.).

On the distribution tunnels the following progress has been made by the contractors: West Construction Co. has driven 13,956 ft. out of a total of 40,910 ft. in Monrovia tunnels No. 1, 2 and 3. Dixon, Bent Bros. & Johnson have driven 7,883 ft. out of 8,096 ft. in Monrovia No. 4, and the same organization has only 3,069 ft. left in the 17,644-ft. total for the Pasadena tunnel. On the 6,450-ft. Sierra Madre tunnel the J. F. Shea Co. has driven 2,146 ft. These figures are up to Nov. 30, and on that date lining operations had not been started on any of the distribution tunnels. There is a total of 82,838 ft. of distribution tunnels to be lined.

Construction of the Colorado River

RECORD OF TUNNEL DRIVING AND LINING ON ALL MAIN AQUEDUCT TUNNELS

(PROGRESS FIGURES TO NOVEMBER 30, 1935)

CONTRACTOR	TUNNEL	Length in Feet	EXCAVATION IN FEET — Total to Nov. 30	EXCAVATION IN FEET — Remaining	LINING IN FEET — Arch or Invert	LINING IN FEET — Total to Nov. 30	LINING IN FEET — Remaining
WALSH CONSTRUCTION CO.	COLORADO RIVER	5,482	5,482	0	Arch	5,475	7
					Invert	0	5,482
	COPPER BASIN No. 1	705	705	0	Arch	696	9
					Invert	0	705
	COPPER BASIN No. 2	11,568	11,568	0	Arch	6,113	5,465
	WHIPPLE MOUNTAIN	(32,238)	(32,238)	(0)		0	(32,238)
	East from Adit	18,336	18,336	0			
	West from Adit	13,903	13,903	0			
WINSTON BROTHERS	IRON MT. (E. PORTION)	(23,587)	(23,068)	(519)		0	(23,587)
	East from Shaft	9,844	9,325	519			
	West from Adit	13,902	13,902	0			
UTAH CONSTRUCTION CO.	IRON MT. (W. PORTION)	16,172	16,172	0		0	16,172
WINSTON BROTHERS	COXCOMB (From E. Portal)	17,795	16,384	1,411		0	17,795
BRODERICK & GORDON	E. EAGLE (From W. Portal)	9,442	7,772	1,670		0	9,442
	W. EAGLE (E. PORTION)	(15,845)	(15,845)	(0)		0	(15,845)
	East from Adit	7,871	7,871	0			
	West from Adit	7,974	7,974	0			
L. E. DIXON & BENT BROS.	W. EAGLE (W. PORTION)	10,649	10,649	0	Arch	7,664	2,985
HUNKIN & CONKEY CON. CO.	HAYFIELD No. 1	9,733	9,733	0	Arch	9,723	10
					Invert	9,723	10
J. F. SHEA CO., Inc.	COTTONWOOD	20,105	20,105	0	Arch	20,105	0
					Invert	20,105	0
HAMILTON & GLEASON	BERNASCONI	6,220	6,220	0	Arch	6,220	0
					Invert	6,220	0
DRAVO CONTRACTING CO.	VALVERDE	(38,015)	(37,081)	(934)			
	East Portal to Shaft 3	21,415	21,415	0	Arch	16,125	21,890
	West from Shaft 3 / East from Adit	12,067	8,964 / 3,103	0	Invert	9,446	28,569
	West from Adit	4,533	3,599	934			
	TOTALS Ft.	217,556	213,022	4,534	Arch	72,121	145,445
	Miles	(41.21)	(40.36)	(0.86)	Invert	45,494	172,062
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA:	EAST COACHELLA	(96,605)	(95,280)	(1,325)		(6,715)	(89,890)
	East Portal to Fargo Adit	32,130	32,130	0	Arch	5,610	26,520
	West from Fargo Adit / East from Berdoo Adit	31,024	14,076 / 15,623	1,325		0	31,024
	Berdoo Adit to West Portal	33,451	33,451	0	Arch	1,105	32,346
	1000 PALMS No. 1 (From West Portal)	16,058	15,447	611		0	16,058
	1000 PALMS No. 2	3,838	3,838	0	Arch	3,832	6
	WIDE CANYON No. 1	14,305	14,305	0	Arch	14,245	60
	WIDE CANYON No. 2	848	848	0	Arch	848	0
	SEVEN PALMS (From East Portal)	4,810	4,810	0	Arch	3,421	1,389
	(From West Portal)	11,920	11,920	0		0	11,920
	LONG CANYON (From East Portal)	15,295	12,680	2,615		0	15,295
	BLIND CANYON	6,848	5,580	1,268		0	6,848
	MORONGO No. 1	5,712	5,364	348		0	5,712
	MORONGO No. 2	1,820	0	1,820		0	1,820
	SAN JACINTO	(67,563)	(26,538)	(41,025)		0	(67,563)
	Cabazon Shaft to East Portal	8,553	4,630	3,923			
	West from Cabazon Shaft / East from Potrero Shaft	43,511	7,600 / 1,955	33,956			
	West from Potrero Shaft / From West Portal	15,499	3,770 / 8,583	3,146			
	TOTALS Ft.	245,622	196,610	49,012	Arch	29,061	216,561
	Miles	(46.52)	(37.24)	(9.28)	Invert	0	245,622

aqueduct by the Metropolitan Water District is under the general direction of F. E. Weymouth, general manager and chief engineer. J. L. Burkholder is assistant general manager and Julian Hinds is assistant chief engineer. James Munn is general superintendent. The division engineers are: Div. 1, R. E. Booth; Div. 2, W. E. Whittier; Div. 3, John Stearns; Div. 4, B. C. Leadbetter; Div. 5 and 6, J. B. Bond; distribution system, R. B. Diemer.

RECORD OF CANAL, CONDUIT AND SIPHON PROGRESS TO NOVEMBER 30, 1935

Schedule No.	CONTRACTOR	FEATURES	Length in Feet	EXCAVATION—Feet Nov. 30	EXCAVATION—Feet Remaining	CONCRETE—Feet Nov. 30	CONCRETE—Feet Remaining	BACKFILL—Feet Nov. 30	BACKFILL—Feet Remaining
1	AQUEDUCT CONSTRUCTION CO.	Conduit and Siphons	22,025	12,072	9,953	3,425	18,600	1,710	20,315
2	BARRETT & HILP & MACCO CORP.	Conduit and Siphons	30,569	15,533	15,036	106	30,463	0	30,569
3		Canal and Siphons	40,849	37,054	3,795	4,951	35,898	0	12,695
4	JAHN & BRESSI CONSTRUCTION CO.	Canal and Siphons	53,218	31,200	22,018	0	53,218	0	3,075
5		Canal and Siphons	53,588	47,410	6,178	42,518	11,070	600	3,420
6	WOOD AND BEVANDA	Siphon	15,520	0	15,520	0	15,520	0	15,520
7	BARRETT & HILP & MACCO CORP.	Canal and Conduit	27,727	21,410	6,317	15,134	12,593	9,375	2,975
8	WOOD AND BEVANDA	Canal and Siphons	49,559	48,060	1,499	46,745	2,814	4,779	3,111
9	UTAH CONSTRUCTION CO.	Canal, Conduit and Siphons	47,449	27,220	20,229	14,969	32,480	178	6,107
10	AQUEDUCT CONSTRUCTION CO.	Canal and Siphons	41,505	36,850	4,655	21,466	20,039	480	4,410
11		Canal, Conduit and Siphons	44,507	0	44,507	0	44,507	0	10,462
12	THREE COMPANIES, Inc.	Conduit and Siphons	33,446	31,780	1,666	10,821	22,625	8,085	25,361
13	AQUEDUCT CONSTRUCTION CO.	Canal, Conduit and Siphons	33,270	0	33,270	0	33,270	0	4,075
14	THOMPSON-STARRETT CO.	Conduit and Siphon	32,366	19,969	12,397	7,941	24,425	4,630	27,736
15		Conduit and Siphons	35,849	0	35,849	0	35,849	0	35,849
16		Conduit and Siphons	19,359	0	19,359	0	19,359	0	19,359
17	M. W. D.—FORCE ACCT.	Conduit and Siphons	22,119	5,306	16,813	157	21,962	0	22,119
18	J. F. SHEA CO., Inc.	Conduit and Siphons	27,564	710	26,854	0	27,564	0	27,564
18J	MORRISON-KNUDSEN CO.	Siphons	9,811	7,030	2,781	5,370	4,441	3,170	6,641
19	J. F. SHEA CO., Inc.	Conduit and Siphon	37,464	0	37,464	0	37,464	0	37,464
20		Siphons	18,618	18,353	265	17,767	851	4,450	4,168
20 A & B	GRIFFITH COMPANY	Siphons	14,585	705	30	0	735	0	735
21	(Outlet Channel Unlined)	Siphons	735	9,660	4,925	8,444	6,141	6,950	7,635
22		Siphon	7,229	0	7,229	0	7,229	0	7,225
23		Conduit and Outlet Channel	38,699	22,600	16,099	20,133	13,016	17,900	15,249
	TOTALS		757,630	392,922	364,708	219,947	532,133	72,307	353,843

Yardage in Fort Peck Dam Already Sets World Record

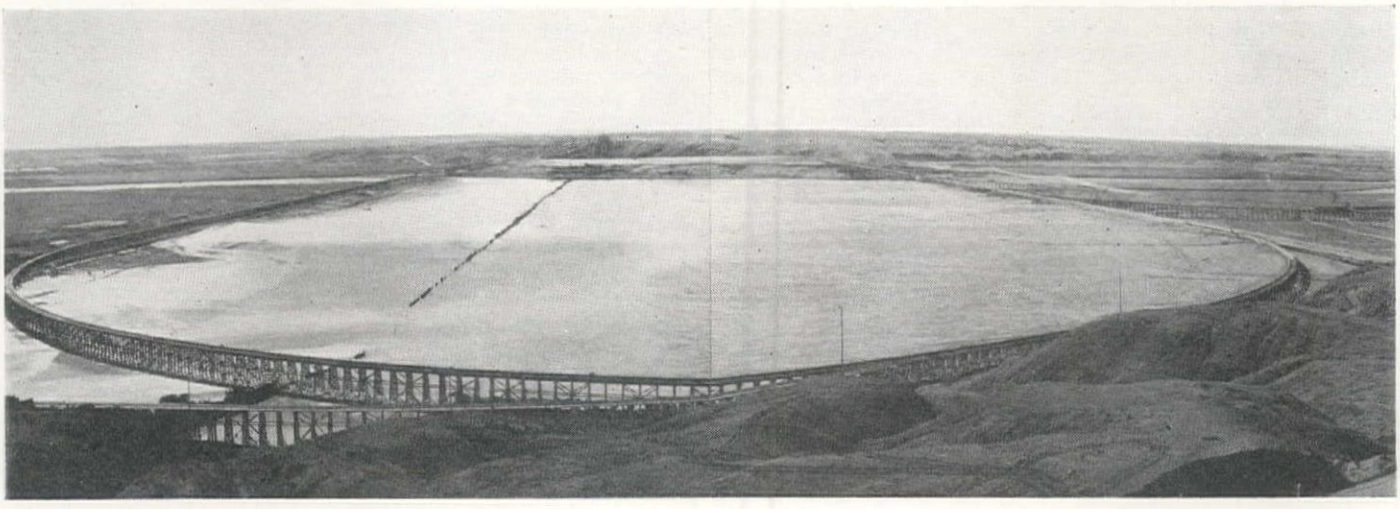
With about 20% of the hydraulic fill placed in the structure, the dam has now more volume than any other of this type—Progress reviewed

DURING the construction season of 1935 on the Fort Peck project the dredges placed more than 20,000,000 cu. yd. of hydraulic fill in this record-breaking structure, already making it the largest earth-fill dam in the world although only about 20% of the fill has been placed. With the passing of the second anniversary of the start of work on this project on October 23, the records show continuous and accelerating progress.

Since October, 1933, the following has been accomplished:

The damsite has been completely cleared; 37 mi. of railroad were built, 3 mi. of it on trestle construction; a steel bridge across the river was erected; a 288-mi. electric power line with substations at either end and a far-flung distribution system at the job was completed; a network of roads and streets, modern gas, water and sewerage systems were installed in the construction city; dredges, boosters, barges, pontoons and derricks were built; a modern town complete in all essential details was brought into being and occupied; the 300-ac. base of the dam was stripped of top-soil and gumbo, a continuous steel membrane cut-off wall of sheet piling was driven to bedrock for a distance of 9,000 ft. across the valley; four large tunnels which will divert the river around the eastern end of the dam and control the release of water from the future reservoir were started; coarse gravel and boulders were hauled in and placed to form stable toes along the upstream and downstream edges of the dam;

Looking across the Fort Peck Dam and the pool formed by hydraulic operations. The line of steel sheet-pile cutoff can be seen above the pool surface. Railroad trestle totals about 3 miles on this project.



warehouses, shops, oil depots, a refrigerating plant, a locomotive engine house, garages, a laundry, a testing laboratory and three central concrete mixing-plants were built; the spillway was started.

Status of Construction

Spillway.—Martin Wunderlich started work Nov. 14, 1934, and finished Sept. 22, 1935, having moved 2,535,945 cu. yd. of excavation. On the $7,133,000 contract of the Massman Construction Co., work started Dec. 2, 1934, and came to a winter shut down Dec. 5, 1935, after moving 9,732,312 cu. yd. Erection of central mixing plant, cement silos and overhaul of shovels, trucks and tractors were continued until Dec. 20, 1935.

Addison-Miller, Inc., started work May 13, 1935, and temporarily shut down operations Nov. 31. During this period this contractor moved 193,279 cu. yd. of shale; bored and placed 237 concrete piles 5 ft. in diameter and up to 40 ft. in depth; poured 56,771 cu. yd. of concrete in channel lining and gate structure including the use of 5,325,839 lb. of steel; sprayed 12,740 squares of bituminous paint, one coat; placed 8,189 lin. ft. of tile drains; put in 2,067 cu. yd. of gravel fill and 5,479 cu. yd. of boulder riprap.

Tunnels.—The Mason-Walsh Construction Co. completed four pilot tunnels from the vicinity of the shafts to the outlet ends, and finished the headwalls and channel lining at the lower portals. Concrete poured during the year totaled 98,000 cu. yd.

All eight pilot shafts were completed the latter part of 1934. Enlargement excavation was begun 1935 and carried down for about two-thirds of the depth. Excavation for the shaft foundations was initiated during 1935 and completed with the exception of the bases of the main shafts. Placing of concrete and plate steel lining was started and is still under way, 5,000 cu. yd. of concrete and 200,000 lb. of plates having been placed.

Construction of the headwall across the inlet portals was started in 1935 and twelve of seventeen sections of the wall have been completed. Enlargement of the four pilot tunnels is being made from the lower portals. About 5,000 ft. of excavation have been made to the 32-ft. diameter, of which about 4,000 ft. was lined with concrete during 1935. This work continues to be vigorously prosecuted.

Building the dam.—The hydraulic fill method is being used to build the world's largest earth-fill dam. During the early months of 1935 the dredging plant and auxiliary boats were completed. There are four 28-in. units electrically powered, each unit is composed of a floating dredge, a floating booster and a land booster. Dredges and floating boosters each have two pumps in series; land boosters have one pump, making five 28-in. pumps in series each powered by a 2,500 h.p. motor.

The 1935 dredging season started April 21 and ended at October 31. In 1934, 843,000 cu. yd. were placed in the dam during the digging of the first winter harbor. The 1935 season added 20,898,700 cu. yd. to make a total of 21,742,000 cu. yd. now in place. From June 1 until shutdown, the fill was built up continuously day and night at an average rate of 4,700 cu. yd. per hour. The total material now in the dam is greater than the Gatun Dam at Panama which is reported to contain 21,146,000 cu. yd. The Fort Peck dam is now the world's largest earth-fill dam although only slightly over one-fifth of the fill has been placed.

Miscellaneous items.—At the end of 1934 only the portion of the steel sheet pile cutoff wall in the flood plain between the west bank of the river and the base of the west abutment had been driven. The remainder of the work was completed in Nov., 1935. A total of 17,390 tons of steel sheet piling was required for this work.

The government railroad which ended at the spillway was extended 5 mi. to the upstream face of the dam during the fall months of 1935.

By Jan. 1, 1935, about 400,000 cu. yd. of gravel for the toes of the dam had been placed. The remainder of the contract for 2,600,000 cu. yd. was received and placed by November. Since then 140,000 cu. yd. have been received on a second contract.

Glacial boulders gathered from the surface of the fields in Valley and Phillips counties were brought to the dam for use as riprap on the reservoir face. A total of 273,632 cu. yd. were placed during the summer of 1935.

Employment on Fort Peck project during 1935:

January	5,072	July	6,584
February	5,322	August	6,559
March	5,350	September	7,110
April	6,223	October	7,029
May	6,868	November	5,963
June	6,740	December	4,409

Concrete Placing Started On Grand Coulee Dam

Rapid progress on project includes moving of 12,137,000 cu. yd. of excavation during 1935—Program for 1936 calls for concentration on concrete placing and building of cross-river cofferdams

PLACING of the first concrete in the Grand Coulee Dam on December 6 was the outstanding construction event of 1935 and an important milestone in the progress of the Pacific Northwest. The ceremonies marked the conclusion of preliminary work that had been executed with speed and vigor and the beginning of actual construction of the world's largest dam and power plant of 2,646,000 h.p. ultimate capacity. The reservoir will make possible a water supply for 1,200,000 acres of rich farm land in north central Washington.

In the presence of more than one thousand citizens from all sections of the Northwest, Governor Clarence D. Martin of Washington, enrolled and dressed as a concrete worker, pulled the lever releasing the concrete in the first bucket lowered from the trestle into the forms for what is known as Block 16-G. The governor continued to work for an hour, tripping nine concrete buckets and operating an electric vibrator. When called to the platform by E. F. Banker, chairman of the Columbia Basin Commission and of the celebration, Governor Martin was presented by Tom Walsh, president of the Mason-Walsh-Atkinson-Kier Co., with a check for seventy-five cents for his work. Following a talk by Governor Martin, there were several short addresses by officials, including James O'Sullivan, secretary of the Columbia Basin Commission and Frank A. Banks, construction engineer, representing the Bureau of Reclamation, who gave a full description of the project and expressed complete satisfaction with the progress made by the contractors.

Outline of project

The Columbia Basin Commission released the following facts and statistics regarding the project:

Up to Dec. 1, 1935, the United States had expended approximately $19,500,000 on the project. The investment by contractors has been about $24,000,000. The preliminary work consisting of camps, bridges, railroads and highways, aggregate and concrete plants, transmission lines, two cofferdams, and the excavation of about 16,000,000 cu. yd. of overburden, has practically been completed.

Employment on the project has fluctuated between 3,000 and 4,000 men, giving support to communities in the vicinity of the damsite having a population of 10,000. Approximately $15,000,000 has been expended to date in the purchase of supplies, material and equipment for the project, and these purchases have been made in practically every state in the union.

The Mason-Walsh-Atkinson-Kier Co., which has the contract for the construction of the foundations of the Grand Coulee Dam and power plant,

estimated to cost $63,000,000, began work in October, 1934. On December 1, the gross earnings of this company on the project amounted to nearly $14,000,000. On that date it had completed 44% of its contract while only 24% of its contract time had elapsed. This company expects to complete the foundations of the dam and power plant by January, 1938. For this purpose, it is installing at Grand Coulee two concrete mixing plants having a total capacity, under average conditions, of 12,000 cu. yd. per day and a maximum capacity of 15,000 cu. yd. per day. When the contract of this company is completed, the foundations of the dam and power plant will be carried to an average height of 50 ft. above the level of low water in the Columbia River.

When completed to full height, at an additional cost of $60,000,000, the Grand Coulee Dam will be 450 ft. high above the average level of bedrock, 450 ft. thick at the base, and 4,300 ft. long on the crest. It will contain, with foundations, 11,000,000 cu. yd. of concrete. With full power development the cost of the dam and power plant will be $175,000,000.

The completed dam will form a lake in the Columbia River 151 mi. long. By drawing down this reservoir 80 ft. in winter time, when the Columbia River is running low, the 5,028,000 ac. ft. of useful storage released will double the prime power of the river at four damsites between the Grand Coulee Dam and the Snake River, and add 50% to the prime power at four damsites, including Bonneville, below the Snake River. This storage will also materially benefit navigation by increasing the depth of the river during low water period.

When the irrigation project is undertaken, it will be necessary to install at the edge of the reservoir in the vicinity of the Grand Coulee Dam a gigantic pumping plant. Present plans call for the installation of twenty 800 sec. ft. pumps capable of delivering 16,000 sec. ft. of water into the Grand Coulee, an average pumping lift of 310 ft. These pumps will be driven by flood-water or secondary power. The flow of the Columbia River is very large in summer when the water is needed for irrigation and for pumping into the Grand Coulee. These pumps will discharge into a canal about 2 mi. long, and this canal will empty into the proposed Grand Coulee lake, which will be 25 mi. in length. From this lake, the water will be drawn off by gravity for the irrigation of 1,000,000 acres, and 200,000 acres additional will be served by pumping from the canals. The total cost of the irrigation project, including the pumping system, is estimated at $218,000,000.

It is estimated that the revenues from the sale of Grand Coulee power will pay for the dam and power plant and one-half the cost of reclamation within fifty years after the completion of the dam, and that the total investment required in the project will, therefore, not exceed $260,000,000. The cost of the water to the settler is estimated at $88 per acre, payable over a period of forty years, with an annual maintenance charge of less than $3.19 per acre.

Construction Progress During 1935

The past year was a period of intense construction activity at Grand Coulee Dam. On Jan. 1, 1935, the MWAK Co. had completed most of the preliminary preparations, which were necessary before actually beginning work on the construction of the dam. Mason City, was about completed and employees were moving in. A 60-in. belt conveyor had just been built and put in operation to haul the spoil from the west side excavation to Rattlesnake Canyon. Work was beginning on the west cofferdam.

For the first three months in 1935, building the steel sheet pile cofferdam on the west side was a major phase of construction. Time was an important element in its construction, since it has to be completed before the spring high water to protect the west side excavation. It was finished ahead of schedule, and is considered a world's record in this type of construction.

Excavation was carried on throughout the year and a total of 12,137,462 cu. yd. of common excavation was moved. Of this total, 8,849,634 cu. yd. were moved on the west side of the river, with 7,737,623 cu. yd. handled by the belt conveyor system and 595,697 cu. yd. trucked. On the east side, 2,104,432 cu. yd. were excavated with a belt conveyor system and 1,699,728 cu. yd. were trucked. Before the spring high water, all excavation on the east side was moved by trucks. Following high water, a timber trestle was built across the river and a conveyor extended to connect the east pit conveyor system with the main line of the west side conveyors.

A wooden cofferdam was built on the east side to protect the area to be excavated and to allow work to continue longer into the flood season. However, this east cofferdam is a temporary structure and will be flooded by high water. There is yet about 1,500,000 cu. yd. of common excavation to be moved and most of this will be moved during 1936, after the river diversion.

In preparing the west abutment and foundation, for concrete, nearly 230,000 cu. yd. of rock was excavated and placed on the tailrace as riprap. Practically all riprap is in place on the west tailrace. Common excavation has just been completed on the east side and rock work begun. Approximately 25,000 cu. yd. of rock has been removed and placed on the tailrace for riprap. It is estimated there is yet about 1,000,000 cu. yd. of rock to be excavated for the foundation and east abutment of the dam.

In the spring of 1935, the MWAK Co. built a combination railroad and highway bridge across the Columbia River, and connected it to the government railroad with about ½ mi. of track. This connection was built mostly through rock cut, and included a 200-ft. tunnel through solid rock.

During the spring and summer, the contractor designed and built a million dollar aggregate plant at the damsite to supply the concreting materials for the dam. This plant has a raw stock capacity of 2,500 tons per hour. In the summer and fall, a mixing plant was built on the west abutment to furnish concrete for the west half of the dam. It has a capacity of 320 cu. yd. per hour. To connect the mixing plant with the aggregate storage piles, a 3,500-ft. suspension bridge, carrying a conveyor belt was built across the river. Eight cement silos and a compressor plant were built about ½ mi. above the dam. These are connected to the mixing plant by an 11-in. pipe line, through which cement will be conveyed by air.

On the west side of the river, bedrock has been prepared for concrete and about 15,000 cu. yd. of concrete have been placed. Much time and construction effort has been expended in the preparation of block 40 for concrete. Block 40 is the furthest block east that can be poured behind the west cofferdams.

Government activity at the damsite during 1935 includes the completion of the construction railroad into the dam area, building a steel highway bridge across the Columbia River, completion of a series of drainage tunnels in the granite downstream from the west abutment, the construction of the government warehouse and the completion of the government's model town.

The major difficulty encountered in the work at the damsite during 1935 was earth slides. In every instance, this situation has been satisfactorily dealt with and the work has gone on. An unusually low high water season and good weather were helpful factors in 1935.

Looking forward into 1936, another year of concentrated construction is in view, but it will not be as varied as in the past year. The 1936 program calls for the construction of two cross-river cofferdams, the diversion of the river, assembling the east mixing plant and construction trestles, pouring nearly 3,000,000 cu. yd. of concrete and the excavation of about 1,500,000 cu. yd. of earth and 1,000,000 cu. yd. of rock.

●

Complete Aqueduct Tunnel

Final notice of completion of the Bernasconi tunnel has been filed with the Metropolitan Water District by Hamilton & Gleason Co., following the placing of the last concrete lining on Nov. 17. This tunnel was driven for a contract price of $412,055 and is 6,220 ft. long. It was driven from one portal. Harry S. Stocker was general superintendent, succeeding J. H. King.

Some Recent Large Western Contracts

Contracts in the $50,000-or-over class which were awarded in the eleven western states during October, November and December, not including materials. The number of contracts over $10,000 totaled more than 700, including a large number of small sewer and waterworks awards.

ARIZONA

Pleasant Hasler Const. Co.	Dam	$ 650,000
Lee Moor Contr. Co.	Surfacing	198,519
Lee Moor Contr. Co.	Grad. and surf.	158,804
Ken Hodgman & Pearson & Dickerson	Grad. and surf.	124,526
Packard Contracting Co.	Grading	51,498
T. A. Allen Const. Co.	Channel & stilling basin	75,634
J. A. Casson	Grad. and surf.	91,894
Skousen Brothers	Grad. and surf.	136,666
Pleasant-Hasler Const. Co.	Grad. and surf.	187,874
Vinson & Pringle	Canal lining	147,400
Borderland Construction Co.	Grad. and surf.	142,409
All Arizona Engineering Co.	Grad. and surf.	70,709
R. C. Tanner	Grad. and surf.	102,847
Morrison-Knudsen Co., Inc., Utah Const. Co. & Winston Bros.	Imp. Dam & Desilting Works	4,374,240
George Pollock Co.	Canal excavation	700,987
W. E. Hall	Grad. and surf.	132,863
Packard Const. Co.	Grad. and surf.	101,573
Arizona Sand & Rock Co.	Grad. and paving	113,614
Allied Bridge & Const. Co.	Spillway channels	150,723
Pearson & Dickerson	Grading	141,960
H. J. Hagen	Grading	174,486
Fraser Davis Co.	Siphon structures	489,527

CALIFORNIA

De Luca & Son	Swimming Pool	59,494
R. E. Hazard & Sons	Grad. and surf.	151,293
Geo. R. Curtis Paving Co.	Grad. and paving	116,452
Consolidated Rock Products Co.	Concrete aggregate	128,000
C. O. Sparks	Grad. and paving	116,866
Mundo Engineering Co.	Grade separation and paving	154,922
California Gunite Co.	Gunite canal lining	72,554
Gogo & Rados	Sewerage system	71,021
Stone & Webster Engrg. Corp.	Steam powr pl'nt	1,800,000
American Dredging Co.	Dredge fill	172,313
D. McDonald	Earth embankment	92,020
J. F. Knapp	Undergrade cross.	359,932
Union Paving Co.	Grad. and paving	178,696
Hanrahan Wilcox Co.	Grad. and paving	247,253
J. H. Pomeroy Co.	Replac. magazine	117,000
P. L. Burr	Water system	58,620
American Concrete & Steel Pipe Co.	Pipe line	1,968,633
United Concrete Pipe Co.	Pipe line	1,127,786
Winston Bros. & Wm. C. Crowell	Intake & pumping plant bldgs.	1,731,781
American Concrete & Steel Pipe Co.	Concrete pipe	83,416
Mittry Bros. Const. Co.	Grad. and surf.	466,036
Byerts & Dunn	Overhead crossing	51,838
Geo. J. Bock	Grad. and surf.	80,512
Sharp & Fellows Contr. Co.	Overhead crossing	202,941
B. G. Carroll	Overhead crossing	105,829
Daley Corporation	Grad. and surf.	97,129
T. E. Connolly	Tunnel	64,860
Union Paving Co.	Grad. and surf.	66,712
Griffith Co.	Grad. and paving	342,975
J. F. Knapp	Overhead crossing	249,281
Hanrahan Co.	Grad. and paving	434,428
A. J. Raisch	Undergrade cross.	70,766
Harms Bros.	Grad. and surf.	127,322
Granfield, Farrar & Carlin	Grad. and surf.	77,586
Lord & Bishop	Sewer system	54,900
Union Paving Co.	Grad. and surf.	147,771
Lindgren & Swinerton	Overhead crossing	223,255
Hemstreet & Bell	Grad. and surf.	146,014
Union Paving Co.	Grad. and surf.	104,233
Pacific Crane & Rigging Co.	Laying oil line	50,000
MacDonald & Kahn Co., Ltd.	Tunnel	59,995
MacDonald & Kahn Co., Ltd.	Diversion dam	213,968
A. G. Raisch	Paving	52,571
Healy Tibbitts Const. Co.	Wharf	66,720
Healy Tibbitts Const. Co.	Bulkhead wharf	101,400
Western Pipe & Steel Co.	Steel tanks	234,330
John Strona	Undergrade cross.	146,122
Geo. Herz & Co.	Undergrade cross.	60,808
Basich Brothers	Overhead crossing	54,142
R. E. Campbell	Grad. and surf.	332,995
J. F. Shea Co., Inc.	Concr. pipe lines	2,319,462
Macco-Robertson Co.	Oil pipe line	200,000
R. E. Campbell	Grad. and bridge	61,182
Oswald Bros.	Grad. and surf.	51,208
Mundo Engineering Co.	Undergrade cross.	104,729
Basich Bros.	Grad. and surf.	130,717
Dimmitt & Taylor	Grad. and surf.	62,278
Shofner & Gordon	Undergrade cross.	106,024
A. W. Kitchen	Wharf	206,747
Gogo & Rados	Sewage system	51,433
Eaton & Smith	Undergrade cross.	132,213
A. Teichert & Son	Grad. and surf.	67,255
Peninsula Paving Co.	Grad. and surf.	197,656
A. Teichert & Son	Grad. and surf.	177,031
Oswald Bros.	Grad. and surf.	94,078
Southern Calif. Roads Co.	Grad. and surf.	67,509
R. R. Bishop	Overhead crossing	184,766
Peninsula Paving Co.	Undergrade cross.	87,161
Biasotti, Willard & Biasotti & Rocca & Co.	Undergrade cross.	267,421
Paul J. Tyler & Lord & Bishop	Undergrade cross.	155,187
Pacific Bridge Co.	Grad., surf., and const. bridge	162,973
F. O. Bohnett	Undergrade cross.	249,108
Lindgren & Swinerton	Undergrade cross.	103,386
Griffith Co.	Grad., paving and bridge	295,611
C. F. Fredrickson & Sons	Grad. and surf.	79,235
N. M. Ball Sons	Undergrade cross.	91,790
N. M. Ball Sons	Grad. and surf.	60,856
Union Paving Co.	Grad. and surf.	85,187
Barrett & Hilp	Undergrade cross.	152,897
Bodenhammer Const. Co.	Undergrade cross.	149,371
A. Teichert & Sons	Grad. and surf.	131,857
Union Paving Co.	Grad. and bridge	67,523
Biasotti, Willard & Biasotti	Grad. and bridge	146,939
M. H. Golden	Air station	259,664
Healy Tibbitts Const. Co.	Sewer extension	334,259
Gogo & Rados	Storm drain	118,500
Lindgren & Swinerton	Piers, bulkheads, etc.	219,140
Union Paving Co.	Water pipe lines	68,575
C. W. Wood & M. J. Bevanda	Canal lining	180,027
Lord & Bishop	Grading, surf. and bridge	55,835
Guy F. Atkinson	Grad. and bridge	355,762
Clinton Construction Co.	Overhead crossing	578,420
L. E. Dixon Co.	Undergrade cross.	241,661
Griffith Co.	Overhead crossing	116,864
Oscar Oberg	Undergrade cross.	154,942
Peter J. McHugh	Installing water mains	96,300
Raymond Concrete Pile Co.	Pile foundation	71,578
Sharp & Fellows	Grading, surf. and timber trestle	129,848
O. H. Chain	Harbor extensions	185,297

COLORADO

Owen Baab & Thorkildsen	Surfacing	139,830
Driscoll Const. Co.	Tunnel and roads	60,884
Thompson Mfg. Co.	Steel siphons	164,006
Peter Seerie	Flumes, etc.	111,000
Inland Const. Co.	Surfacing	53,050
Larson & Krantz	Surfacing	181,714
Platt Rogers, Inc.	Surfacing	146,830
Western Paving Contr. Co.	Paving	66,654
W. A. Colt & Son	Grading	59,245
R. L. Hanes	Surfacing	119,292
Geo. W. Condon	Bridge	63,737
F. J. Kirchhof Const. Co.	Power plant	90,970

H. J. Gardner	Surfacing	106,619
H. C. Lallier C. & E. Co.	Surfacing	70,541
Busselle & Douglas	Flumes and piers	96,845
J. B. Claybaugh	Surfacing	69,748
Henry Shore	Bridge	59,427
M. E. Carlson	Bridge	145,214
Driscoll Const. Co.	Surfacing	133,175
Garner Bros. Co.	Surfacing	69,121
Lock Joint Pipe Co.	Water pipe line	96,580
Dutton, Kendall & Hunt, Inc.	Reservoir and settling basins	274,949
Driscoll Const. Co.	Canal	81,950
F. M. Kenny	Bridge	51,498
Monaghan & Kenney	Surfacing	83,636
Driscoll Construction Co.	Grad. and surf.	78,792
Peter Seerie	Flumes, canals, etc.	146,133
Blanchard Bros.	Surfacing	313,425
E. H. Honnen Construction Co.	Bridge	79,278
E. H. Honnen Construction Co.	Bridge	109,891

IDAHO

Olof Nelson	Grad. and surf.	144,671
Western Construction Co.	Grad. and surf.	70,121
Max J. Kuney	Earth dam	478,838
F. J. Konen	Bridge	92,528
Tony Marrazzo	Grad. and surf.	114,427
Triangle Construction Co.	Grad. and surf.	116,378
Olof Nelson	Grad. and surf.	83,371
A. O. Thorn	Grading	52,142
W. C. Burns	Grad. and surf.	52,161
Hoops Construction Co.	Viaduct	54,796
Morrison-Knudsen Co.	Irrigation ditches, etc.	183,165
A. O. Thorn	Grad. and surf.	73,394
Carl Nyberg	Grad. and surf.	55,863
Olof Nelson	Overpass	90,248
Colonial Construction Co.	Overpass	88,483
Nic Burggraf & J. W. Brennan	Grad. and bridge	57,446
Olof Nelson	Grad. and surf.	75,236
Moser & Hill	Viaduct	83,584
A. B. Carscallen	Overhead crossing	53,621
Quinn-Robbins Co., Inc.	Grad. and surf.	63,738
Western Construction Co.	Grad. and surf.	55,970
W. C. Burns	Grad. and surf.	63,602
Robinson Construction Co.	Grad. and surf.	65,593
T. E. Connolly, Inc.	Raising dam	395,040
Triangle Construction Co.	Grad. and surf.	63,645
W. C. Burns	Grad. and surf.	145,744

MONTANA

S. J. Groves & Son	Rock & earth dam	82,731
Tomlinson-Arkwright Const. Co.	Grad. and surf.	66,914
J. C. O'Connor	Surfacing	73,675
T. G. Rowland	Overpass	85,440
J. C. Boespflug	Overpass	58,673
Portland Bridge Co.	Bridge	198,325
Threet Bros.	Grad. and surf.	50,545
Lobnitz Bros.	Grad. and bridge	114,265
J. L. Shiely Co.	Aggregate & sand	554,140
Inland Const. Co.	Grad. and surf.	142,470
Thos. Staunton	Grad. and surf.	101,576
J. A. Gudgel Sons, Inc.	Grad. and surf.	61,757
W. P. Roscoe	Bridge	119,095
Prahl & Sawtelle	Bridge	63,345
Inland Construction Co.	Viaduct	55,417
James Crick	Viaduct	111,864
Clifton & Applegate	Overpass	78,025
Inland Construction Co.	Grading	70,989
J. C. Maguire	Surfacing	115,219
Lawler Corporation	Overpass	84,579
McNutt Bros.	Grading	114,964
Barnard-Curtiss Co.	Grading	82,110
McNutt Bros.	Grading	99,586
Fred B. Dudley	Viaduct	82,189
Threet Bros.	Grad. and bridge	64,737
McNutt Bros.	Grad. and surf.	80,655
M. J. Kiely & Son	Grad. and paving	78,913
Callison & Dolvin, Inc.	Grad., surf., and bridges	119,497
Tomlinson-Arkwright Const. Co.	Grad. and surf.	55,659
Inland Const. Co.	Overpass	84,503
Woodward Construction Co.	Overpass	75,256
J. L. McLaughlin	Dam	202,146
J. L. McLaughlin	Canal	99,237
J. L. McLaughlin	Dam	159,233
Inland Construction Co.	Dam	231,945
Max J. Kuney Co.	Dam	51,221
James Crick	Canals	216,837
A. Lalande	Grad. and surf.	52,919
Prahl & Sawtelle	Grad. and surf.	168,964
J. C. O'Connor	Grad. and surf.	101,259
S. Birch & Sons Construction Co.	Grad. and surf.	59,896
Lobnitz Bros.	Grad. and surf.	101,259
Tomlinson-Arkwright Const. Co.	Grad. and surf.	104,416
J. C. McLaughlin	Viaduct	96,863
Lease & Leighland	Underpass	121,206
Nolan Bros.	Bridge	92,797
Lawler Corp.	Bridge	139,394
J. C. Maguire Construction Co.	Viaduct	59,243

NEVADA

Gibbons & Reed	Grad. and surf.	65,425
Gibbons & Reed	Overpass	53,138
Fredrickson & Watson & Jones & King	Grad. and surf.	219,669
Dodge Construction, Inc.	Grad. and surf.	123,532
Dodge Construction, Inc.	Overpass	86,755
Isbell Construction Co.	Grad. and surf.	116,700
Pacific Construction Co.	Surfacing	61,451
George French, Jr.	Surfacing	84,546
Isbell Construction Co.	Grad. and surf.	56,898
Utah Construction Co.	Grad. and surf.	159,007
Nevada Rock & Sand Co.	Grad. and surf.	180,004
Pacific Construction Co.	Grad. and surf.	83,860
Pacific Construction Co.	Grad. and surf.	82,602

NEW MEXICO

Armstrong & Armstrong	Grad. and surf.	79,791
George W. Orr	Grad. and struc.	107,320
Cook & Ransom	Grad. and surf.	139,125
Wheeler & Silver	Grading	51,937
Hayner & Burn	Grad. and bridge	76,189
Skousen Brothers	Grad. and surf.	103,078
B. R. Carrico	Grad. and culvert	58,395
Capitol Construction Co.	Grad. and surf.	89,572
Henry Thygeson	Grad. and surf.	87,338
Henry Thygeson	Grading	196,890
Walter H. Denison	Grading	79,393
A. O. Peabody	Grad., surf. and bridge	267,460
Dudley Stone Prod. Co.	Grad. and surf.	92,598
Dudley Stone Prod. Co.	Grad. and surf.	80,360
Brown Bros.	Grad. and overpass	52,565
Hallett Construction Co.	Dam	1,132,547
Armstrong & Armstrong	Grad. and surf.	178,699
Ernest W. Everly	Grad. and surf.	109,167

OREGON

General Const. Co. & J. F. Shea Co.	Bonneville powerhouse, superstr., etc.	1,160,300
Fred H. Slate	Grading	345,730
Fisher Brothers	Grad. and surf.	119,742
Joplin & Eldon	Bridge	87,415
Harold Blake	Grading	125,012
Berke Brothers, Inc.	Grading	81,227
Dunn & Baker	Grading	104,319
Newport Construction Co.	Grad. and surf.	122,416
E. C. Hall	Grad. and surf.	160,059
West Coast Construction Co.	Water system	60,000
Brent Sturgill Co.	Canal excavation	53,639
Oregon Contracting Co.	Grad. and surf.	85,885
Babler Bros.	Grad. and surf.	107,952
Myers & Goulter	Grading	108,165
Edlefsen-Weygandt Co.	Grad. and surf.	86,460
Oregon Contr. Co. & T. Arentz	Bridges	55,793
Joplin & Eldon	Bridge	64,884
Parker Schram Co.	Bridge	142,371
McNutt Brothers	Grading	101,898
Jacobsen-Jensen Co.	Grad. and paving	119,296
Edlefsen-Weygandt Co.	Underpass	64,849
James Crick	Grading	123,244
Parker-Schram Co.	Dock and terminal	219,501
F. C. Dillard	Water system	63,891
J. A. Terteling & Sons	Dam	273,989
Ek & Lind	Sewage system	98,221
Itschner & Rigdon	Grading	89,142
Tom Lillebo	Bridge	62,818
J. A. Terteling & Sons	Tunnels	292,415
Berke Bros., Inc.	Undercrossing	158,765
Harold Blake	Bridge	74,185
R. O. Dail & Warren Bros.	Surfacing	53,375

Homer G. Johnson	Grad. and surf.	134,574
Kern & Kibbe	Sewerage System	125,621
Dunn & Baker	Sewerage system	76,831
General Construction Co.	Channel improvements	96,710

UTAH

American Concrete & Steel Pipe Co.	Pipe line	331,653
F. B. Bothwell	Grad. and surf.	61,142
Christensen & Gardner, Inc.	Bridge	106,979
Eddington & Olsen	Underpass	109,319
E. K. Ferguson	Water system	50,000
W. W. Clyde & Co.	Surfacing	82,422
J. A. Terteling & Sons	Irrig. canals and lining	424,978

WASHINGTON

Paine-Gallucci, Inc.	Paving	122,267
Halleran Brothers	Grad. and surf.	92,575
Siems-Spokane Co.	Grad. and surf.	256,428
Puget Sound Machinery Depot	Pipe line	126,703
Erickson Paving Co.	Grad. and surf.	91,670
Allen & Govan, Inc.	Grad. and bridge	79,327
Steel Tank & Pipe Co.	Pipe line	217,050
American Concrete & Steel Pipe Co.	Pipe line	102,723
F. H. De Atley & Company	Grad. and surf.	154,693
Chas. A. Power	Undercrossing	158,475
J. H. Collins & Co.	Overhead crossing	67,772
Elliott & Co., Inc.	Grad. and surf.	99,465
Rumsey & Company	Bridges	376,727
Peter P. Gjarde	Concrete viaduct	553,505
Standard Asphalt & Paving Co.	Stockpiling cr. rock	121,016
Triangle Construction Co.	Grad. and surf.	98,982
N. Fiorito, Inc.	Paving	106,320
C. L. Creelman	Undercrossing	176,763
Max J. Kuney Co.	Surfacing	56,484
Washington Asphalt Co.	Surfacing	70,590
Angeles Gravel & Supply Co.	Bridges	114,856
L. R. Flori Company	Cooling system—Gr. Coulee Dam	110,230
Tacoma Dredging Co.	Pier repairs	84,931
General Construction Co.	Bridge	66,990
Morrison-Knudsen Co.	Tunnels	993,840
Elliott & Co., Inc.	Grad. and surf.	203,763
S. H. Steffenson	Trestle	63,686
F. R. Hewett	Surfacing	110,556
N. A. Degerstrom	Grad. and surf.	109,904
MacRae Bros.	Bridge	109,455
F. J. Parker	Pipe line	121,314
Puget Sound Const. Co.	Power house	437,475
American Concrete & Steel Pipe Co.	Pipe line	107,715
N. Fiorito	Grad. and paving	53,945
James H. Coyne	Water system	54,098
Northwest Construction Co.	Trunk sewer	123,522
Arcorace & Coluccio	Trunk sewer	226,317
J. H. Collins & Co.	Paving	56,745
E. J. Templeton	Paving	60,886
D. Nygren	Undercrossing	56,938
D. Nygren	Overcrossing	99,442
Puget Sound Bridge & Grading Co.	Bridge	92,823
R. O. Dail & Warren Bros.	Grad. and surf.	55,870
Walker Construction Co.	Grad. and surf.	95,895
F. R. Hewett	Surfacing	110,556
N. A. Degerstrom	Grad. and surf.	109,904
Malcolm & Bell	Undercrossing	97,308
General Construction Co.	Dredging	52,338

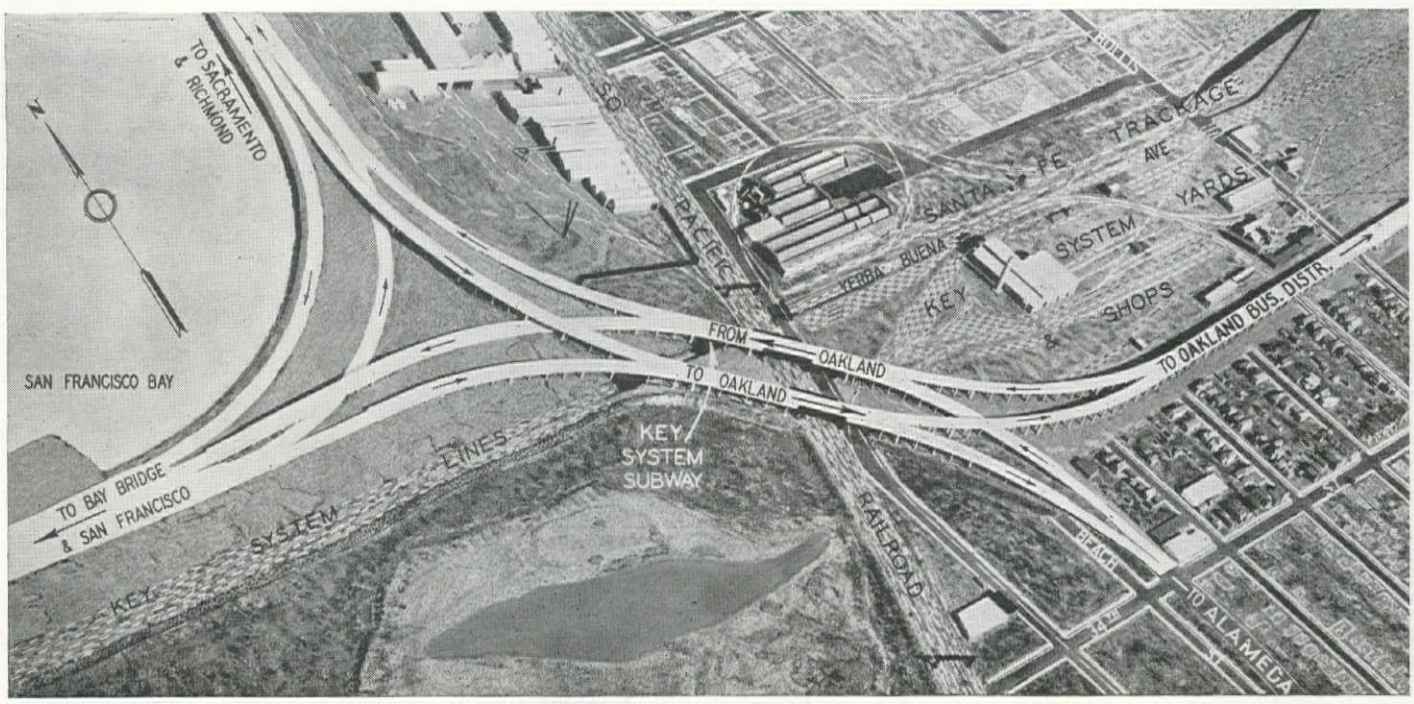
WYOMING

Taggart Const. Co.	Grad. and surf.	114,040
Peter Kiewit Sons	Grad. and surf.	104,749
J. J. Dooling	Grad. and surf.	55,170
Peter Kiewit & Sons	Grad. and surf.	128,812
W. W. Clyde & Co.	Grad. and surf.	155,790
Peter Kiewit & Sons	Bridges	72,431
D. M. Guilford	Grad. and surf.	71,079
A. H. Read Company	Grad. and surf.	101,197
Leach Brothers	Grad. and culverts	169,025
Blanchard Brothers	Grading	78,339
A. H. Read Company	Surfacing	57,895
W. E. Callahan Const. Co., and Gunther & Shirley	Tunnels	794,948
Morrison-Knudsen Co., Inc., Utah Const. Co., & Winston Bros.	Dam	2,759,804
S. J. Groves & Sons	Dam	653,397
Utah Construction Co.	Tunnels	614,509
Taggart Construction Co.	Irrigation canal	104,876
W. W. Clyde & Co.	Grading & bridges	229,095

How Traffic Will Get On and Off the Oakland End of the Bay Bridge

To distribute the vehicular traffic at the Oakland end of the San Francisco-Oakland Bay Bridge, a complicated highway approach is now under construction. This approach includes a braided road-way, eliminating cross traffic, and provides lanes from the bridge to various traffic centers of the East Bay area.

The contract for the structure is held by Barrett & Hilp. The design of the structure was described in Western Construction News in February, 1935, and unit bids in May.



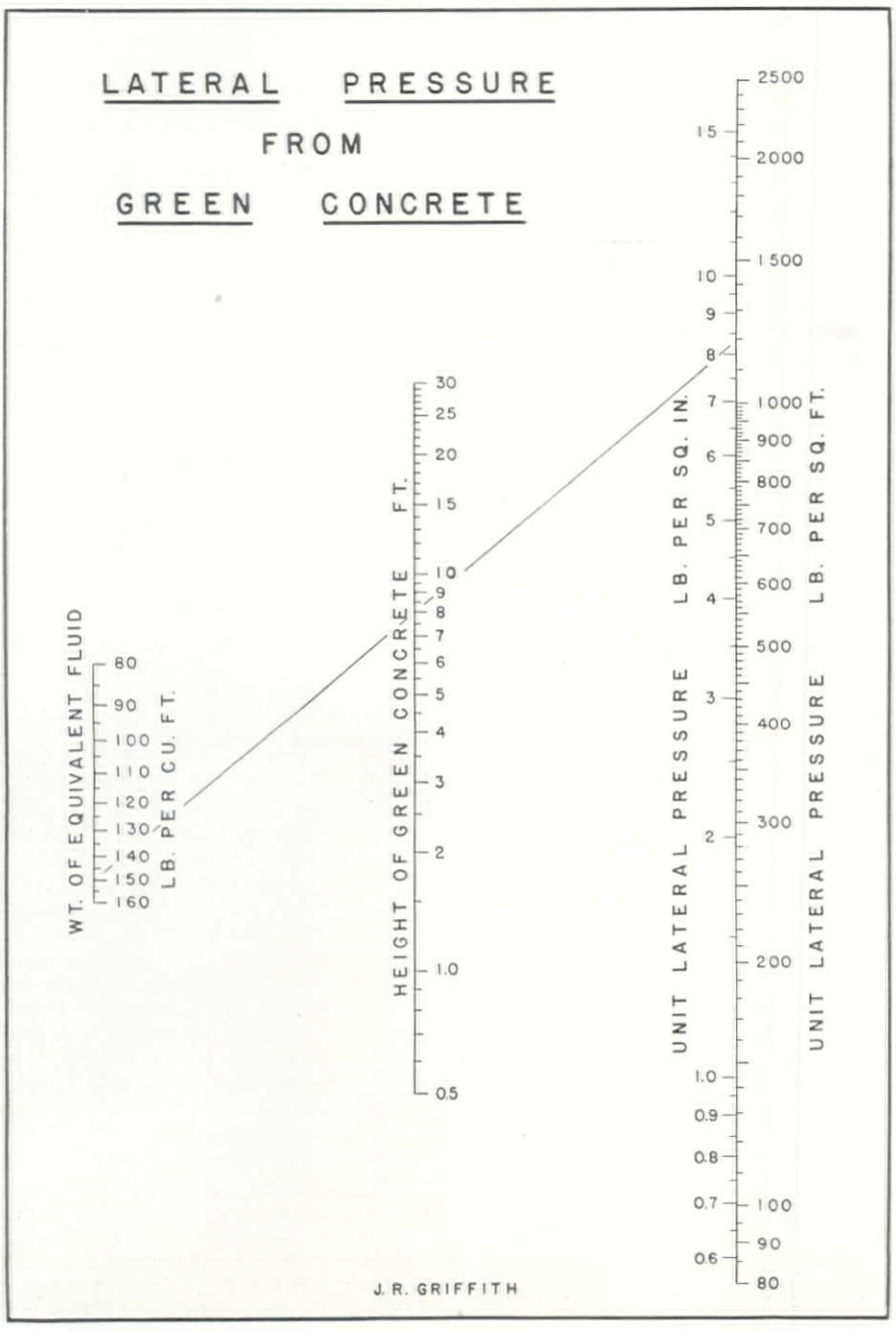
Construction Design Chart

IV....Pressure from Fresh Concrete

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

AFTER reading various technical articles on lateral pressure from green concrete, one is apt to be more confused than ever. Each method of determination starts with the assumption that concrete may be reduced to terms of an equivalent fluid in order to compute the lateral pressure. Beyond that assumption, there is little agreement. One authority found pressures which indicated an equivalent fluid weighing 80 lb. per cu. ft. At the other extreme is to be found a recommended value of 152 lb. per cu. ft. Many values between these extremes are to be found in actual use.

Major Shunk[1] derived an equation, based on actual field observations, involving temperature of the concrete and rate of pouring. E. B. Smith[2] used still more variables in his equation for the lateral pressure. While slump, rate of pour, temperature, and many other variables, are probably factors affecting the lateral pressure, they are difficult to determine ahead of time when designing the forms.



L. W. Teller[3] has reported one of the most recent studies of the question. He found a pressure equal to an equivalent fluid of 150 lb. per cu. ft. His pressure observations were taken while pouring 12 ft. columns 8 x 24 in. in section. When a mechanical vibrator was attached to the form, a straight line pressure-depth relation was found for the full 12-ft. height. When the concrete was consolidated by hand spading, this same straight line relation was found up to a height of about 5 ft.; thereafter the pressure tapered off at a slower rate reaching a maximum value at a little over 7 ft.

Two explanations might be advanced, either one of which could account for Teller's results. Possibly the vibrator prevented initial set in the lower concrete strata so that the effect of the full head of concrete was realized. On the other hand, perhaps there is an arching action, broken down by the vibrator, similar to that found when granular materials are stored in deep bins. In a circular wheat storage bin the maximum lateral pressure is found at a depth equal to about four diameters. Perhaps it is a combination of both which affects the lateral pressure of concrete.

As to the question of depth of concrete to use, I am afraid each case will have to be decided individually by the designer. Teller found that up to the limit of his test, 12 ft., the pressure varied directly with the depth when the forms were vibrated. In some deep forms of appreciable length, if the rate of filling is slow enough, it is conceivable that initial set might easily affect the lateral pressure. When in doubt as to the rate of pour, it would seem that the use of the full depth would be justified. Those who have seen a large beam side pushed out with the accompanying confusion, and delay, would certainly consider a conservative attitude as good insurance.

The accompanying chart has been constructed to include the full range of equivalent fluid values to be found in actual practice. Since recent tests seem to indicate values of from 145 to 150 lb. per cu. ft., a value of 150 will be used in future charts.

A single straight line intersecting all scales is necessary for the solution of this chart. As seen from the solution line shown, a height of 8 ft., with an equivalent fluid of 150 lb. per cu. ft. will produce a pressure of 1,200 lb. per sq. ft. or 8.3 lb. per sq. in. Checking this by computation we have

$$P = w\,h = 150 \times 8 = 1{,}200 \text{ lb. per sq. ft.}$$

$$\text{or } P = \frac{1{,}200}{144} = 8.34 \text{ lb. per sq. in.}$$

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1 *Engineering News*, Sept. 9, 1909.
2 *Engineering News-Record*, April, 1920.
3 *Public Roads*, March, 1931.

On the reverse side of the medallion (shown slightly enlarged) appear the names of the member organizations of Six Companies Inc. and, below, the name and title of the individual.

Six Companies Inc. Presents Medallions To Officials and Staff on Boulder Dam

Services of Bureau of Reclamation personnel and members of the contractors' own organization are recognized in the award of medals which commemorate the completion of Boulder Dam

TO COMMEMORATE the completion of Boulder Dam, and in recognition of the services rendered by those who served on the project in the office or in the field, the Six Companies Inc., has recently presented medallions to about eighty in the engineering and contracting organizations. Under authorization of the board of directors, each medal was accompanied by a personal letter from Harry W. Morrison, president of Six Companies Inc., recognizing and citing the particular service which the individual rendered in the carrying out of the project.

Twenty-six gold and fifty-four silver medallions were struck, after which the die was destroyed. The list of men to whom the medals were presented, and the capacity in which each served, follows:

Gold Medallions

Dr. Elwood Mead—Commissioner, Bureau of Reclamation.
R. F. Walter—Chief Engineer, Bureau of Reclamation.
S. O. Harper—Assistant Chief Engineer, Bureau of Reclamation.
John L. Savage—Chief Designing Engineer, Bureau of Reclamation.
John C. Page—Chief of Engineering Section, Washington Office, Bureau of Reclamation.
Walker R. Young—Construction Engineer, Bureau of Reclamation.
Ralph Lowry—Field Engineer, Bureau of Reclamation.
William H. Wattis (deceased)—President, Director.
Edmond O. Wattis (deceased)—President, Director.
Warren A. Bechtel (deceased)—President, Director.
Harry W. Morrison—President, Director.
Henry J. Kaiser—Director, Chairman Executive Committee.
Alan MacDonald (deceased)—Vice-President, Director.
Stephen D. Bechtel—Vice-President, Director, Member of Executive Committee, Managing Director Office Administration.
Charles A. Shea—Secretary, Director, Member of Executive Committee, Managing Director of Construction.
Felix Kahn—Treasurer, Director, Member of Executive Committee, Managing Director of Boulder City.
Henry J. Lawlor—Director, Member of Executive Committee.
Lester S. Corey—Director.
Philip Hart—Director.
Kenneth K. Bechtel—Director, Assistant Treasurer.
Warren A. Bechtel, Jr.—Director.
Guy LeRoy Stevick—Director, Chairman Bonding Committee.
Frank Modglin—Director.
Paul S. Marrin—Chief Counsel.
Sidney M. Ehrman—Chief Counsel.
Frank Crowe—General Superintendent.

Silver Medallions

A. H. Ayers—Chief Engineer.
Bernard Williams—Assistant Superintendent.
J. F. Reis—Administration Manager.
Thomas M. Price—Superintendent Sand and Gravel Plant.
J. P. Yates—Engineer.
B. W. Goodenough—Engineer.
George Havas—Engineer.
Clay Bedford—Superintendent of Transportation.
Edgar F. Kaiser—Superintendent of Excavation.
Floyd Huntington—Superintendent of Tunnel.
Leigh Cairns—Superintendent of Spillway.
Sheldon Modglin — Superintendent of Power House.
Charles Williams — Superintendent of Camp Construction.
C. A. Bacon—Superintendent of Structural Steel.
Aubrey L. Reid — Superintendent of Pumps.
Anthony Bous—Master Mechanic.
C. A. Harris—Chief Electrician.
William Ellis—"Powder Monkey."
C. J. Seymour—Safety Engineer.
George Compton—Safety Engineer.
Arthur Donaldson—Engineer.
Frank Bryant—General Foreman on Dam.
Ed. Wattis—General Foreman on Dam.
Carl Collett—General Foreman on Dam.
Fred A. Soderberg—General Foreman of Powerhouse.
Tom Regan—Tunnel Foreman.
George Backley—Rock Wall Foreman.
E. L. Baker—Carpenter Foreman.
B. A. Peters—High Scaling Foreman.
Ira Carpenter—Mixing Plant Foreman.
William Fudge—Foreman.
Olaf Haugan—Foreman.
Dave Williams, Cableway Foreman.
Herbert Murner—Reinforcing Steel Foreman.
Frank Bachman—Grout Foreman.
George Mahlan—Shop Foreman.
Hugh McGonigle — Superintendent of Warehouse.
Wales Haas (deceased)—Chief Surgeon.
Richard O. Schoffield—Chief Surgeon.
Harold Anderson—"Mulligan Boss."
Leon N. Kahn—Manager Boulder City Stores.
W. E. Waste—Manager of Purchases.
E. T. Kibler—Purchasing Agent.
W. N. Nosman—Purchasing Agent.
E. H. McAdams—Employment Director.
E. J. Brockman—Director of Insurance Department.
Dan Costello (deceased)—Manager of Insurance Department.
Glenn Bodell—Chief Investigator.
Elmer Baker—Auditor.
S. D. Raudenbush—Cost Keeper.
Frank Zeller—Paymaster.
Merritt Butler—Camp Superintendent.
A. R. Olds—Manager of Sales Department.
G. G. Sherwood—Secretary to Executive Committee.

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Wyoming Projects

Applications from irrigation districts in Wyoming for works totaling $1,735,933 have been filed with the PWA and are being studied by F. C. Williams, state PWA engineer of Wyoming. The work would involve ten dams ranging in cost from $512,727 to $12,000.

Largest item on the list is an application by the Black Forks Water Users' Association in Uinta County for financing of a $512,727 dam and reservoir project. The Beaver Creek Irrigation District in Weston County is seeking about $500,000 and the Gooseberry Irrigation District in Washakie County has made application for $352,727.

The Grass Creek Irrigation District in Hot Springs County is asking financing for a $130,000 dam on Buffalo Creek. In addition there are five other applications for financing on projects with costs averaging about $50,000 each.

Northern California Chapter, A. G. C.

ANNOUNCING the largest membership in its history, the Northern California Chapter of the Associated General Contractors of America held its 17th annual convention in San Francisco, Dec. 14. The meeting included a day of business sessions followed by the annual dinner dance attended by about seven hundred members and guests including Gov. Merriam and state and federal highway officials. Important subjects discussed at the business session included: the recurring day labor problem, new business taxes, gas tax diversion, and service to members.

The meetings were presided over by President A. B. Ordway, who sketched the activities of the past year, at the opening of the meeting, and indicated some of the problems for 1936. A detailed review of the chapter activities was presented by Floyd Booe, secretary-manager. Mr. Booe prefaced his remarks by stating that conditions during the past year or so had necessitated the association's directing its principal activity toward the preservation of the industry as a whole rather than the direct servicing of individual members. However, subsequent reports indicated that the chapter was rendering effective service to local contractors who are members.

Reporting for the membership committee, B. F. Modglin, chairman, presented figures showing a substantial increase in membership during the current year with the chapter now having a larger enrollment than at any other time in its history.

The perennial subject of the diversion of highway funds came up for considerable discussion and reports by those in close touch with the subject. The situation is particularly acute in California at the present time because of measures which will appear on the November state ballot designed to permit voting for the repeal of the state sales tax and income tax. It was pointed out that if the voters repeal the state sales tax the legislature will be hard pressed for revenues and will undoubtedly endeavor to appropriate some of the state highway funds for general purposes.

In accordance with a recommendation submitted by the board of directors, the chapter voted to eliminate the section in the by-laws which relates to special assessments on chapter members.

The meeting of the board at which the officers for 1936 will be selected will be held in January.

L. E. Murphy Dies

L. E. Murphy, president and principal owner of the A. L. Young Machinery Co. of San Francisco, passed away suddenly Dec. 20, 1935, at the age of 49. He was well known in the construction equipment business of the Pacific Coast and was greatly admired, not only by the construction men but also by his competitors for his frankness, sincerity and honesty in his business dealings. Mr. Murphy had just been elected president of the Western Construction Equipment Dealers and Distributors Association of San Francisco for 1936. He leaves a widow and four children. The business of the A. L. Young Machinery Co. will be carried on by his brother, Thomas I. Murphy.

A. G. C. Chapters in the West

Annual meetings of the other chapters of the Associated General Contractors, officers and plans for 1936 will be reviewed in the next issue.

Engineers Pass Examination

ALTHOUGH the total number taking the written examinations given by the California State Board of Registration for Civil Engineers on October 24 and 25 was less than on previous occasions, 49% of the candidates successfully passed, establishing a record from a percentage standpoint.

Those taking the written examination in civil engineering design and construction who passed and have been granted certificates are: Lester M. Snyder, San Francisco; Robert A. Sutherland, Oakland; Franklin Winch, Los Angeles; Joseph Sheffet, Pasadena; Rex J. Allan, Los Angeles; M. W. Gewertz, Los Angeles, and R. A. Wagner, Los Angeles.

Those taking the examination for authority to use the title "Structural Engineer" who passed, and have been issued a permit to use such title are: Frank Tiara, West Hollywood; Willy H. Rabe, Ventura; Howard Kegler, San Francisco; Gerald Q. Thacker, Berkeley; Chas. H. Fork, Los Angeles; and Walter H. Pinkham, Los Angeles.

Personally Speaking . . . . .

Carl D. Forsbeck, city engineer of Tacoma, Wash., has been elected president of the Tacoma Engineers Club.

Andrew W. Simonds, engineer for the Bureau of Reclamation, was recently transferred from Boulder, Colo., to the Denver office.

John R. Sutherland, assistant engineer of the Bureau of Reclamation, has been transferred from the Hyrum project in Utah to the Upper Snake River project in Idaho and assigned to the duty of office engineer.

Stevens & Koon, consulting engineers of Portland, Ore., have been retained by Dayton, Wash., to prepare plans for a sewage disposal system, ordered by the state and partly financed by WPA funds.

W. A. Alexander, formerly of Pocatello, Idaho, has been assigned as resident engineer on a PWA sewer extension project at Pocatello.

M. C. Hinderlider, state engineer of Colorado, now on a vacation trip to Panama and Cuba, plans to inspect TVA construction operations on his return. During his absence the state engineer's office is in charge of C. C. Hezmalhalch, deputy state engineer.

R. J. Tipton, consulting engineer of Denver, has been appointed to conduct a survey of the Williams Fork diversion project for the City of Denver. This diversion is in connection with the new sewage disposal project of Denver. The cost of the diversion project would be about $1,600,000 and would involve a three-mile tunnel.

C. P. Weaver, for three years superintendent in the operations division of the Colorado River Aqueduct project, has been made transmission line engineer on the new Boulder Dam-Aqueduct transmission line and telephone system. This transfer in the organization of the Metropolitan Water District engineering staff is completed by the announcement that **B. H. Martin** has been appointed to succeed Mr. Weaver. Prior to joining the staff of the Metropolitan Water District, Mr. Weaver was employed for about twenty years on various projects of Stone & Webster.

New Equipment to Be Exhibited for 1936

FWD Exhibits Streamlined Road Maintainer Unit

A streamlined FWD (four-wheel drive) road maintainer will be the main feature of the exhibit of the Four Wheel Drive Auto Company of Clintonville, Wis., at the National Road Show, Cleveland, Ohio, January 20 to 24. Beauty and utility are combined in the unit. Although designed and constructed particularly for road maintenance and highway construction use, beauty is added through the eye-pleasing lines of the streamlined fenders, hood, and cab.

The engine develops 85 B. H. P. The wheelbase is 148 in. and on the frame is mounted a 2½ yard dump body. Located transversely under the center of the truck is an electric hydraulic spring scraper with a ten-foot blade. Six forward speeds and two reverse are provided by a sliding gear type transmission. This arrangement gives three maintaining speeds and three hauling or road speeds. Safety and dependability are further assured through the added traction of four-driving wheels, shatterproof glass in cab, and four-wheel hydraulic brakes—booster-operated.

The unit can be used for grading with the underbody blade; as a power unit to haul trailers, ditch graders, mowing machines, and other specialized equipment; to haul loads such as snow fence, gravel and construction equipment; also as a power unit for pushing a snow plow.

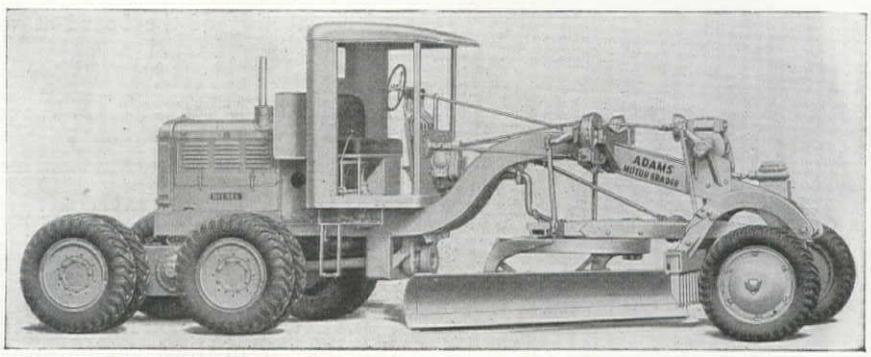
New Adams Grader

At the A. R. B. A. Road Show J. D. Adams Co. will present to the public view for the first time what are known as Adams heavy-duty motor graders Nos. 50 and 51. These new machines are identical excepting the power units. No. 50 is powered by an International six-cylinder gasoline engine developing 59 h.p., and Model 51 (illustrated here) is powered by the International Diesel engine developing 57 h.p.

The frame and drawbar design is the all-welded, box-type construction recently introduced in the new-type Adams leaning wheel graders. As in the case of the leaning wheel graders the manufacturer claims that this construction not only affords strength and rigidity but greatly improves visibility of the blade and permits a wider range of blade adjustments than is possible with other designs.

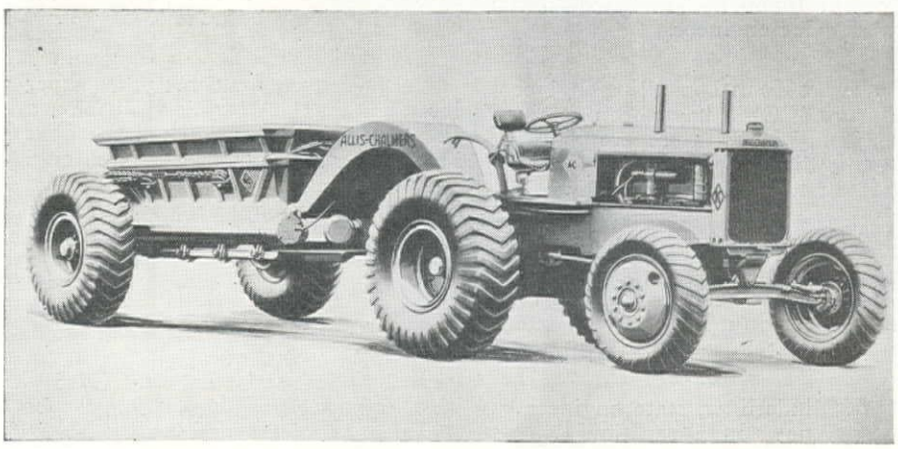
The new machines have five forward speeds each of which is variable by a governor control so that practically any speed can be obtained from 1 to 15 miles per hour. This flexibility permits operating the machine at the proper speed for any job. Either machine may be had with 12, 14 or 16 ft. blade, with or without scarifier, and with dual-tired, two-wheel drive on the rear or tandem drive with four or eight-drive wheels.

Those not attending the show may obtain descriptive folder on these new machines by addressing J. D. Adams Co., San Francisco and Los Angeles.



Allis-Chalmers Shows New Hauling Unit

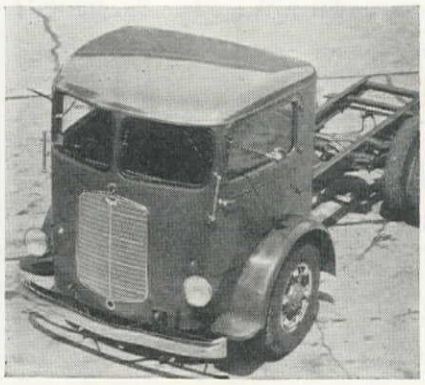
The new Model "K-T" hauling unit, which moves six to eight-yard loads at speeds ranging from 2½ to 16 miles per hour, will be one of several features of the Allis-Chalmers exhibit at the Cleveland Road Show. Allis-Chalmers has planned an exhibit of twelve units of tractors and road machinery.



Heading the A-C display of tractors will be the new Models "L-O" and "L" oil and gas tractors with a new range of speeds and new controls. The new Models "K-O" and "K" tractors, with a top speed of 5.92 miles per hour, increased power and new controls, will be shown for the first time at a major exhibition.

Four sizes of graders, the 14-foot Power Controlled Leaning Frame Model 14, the 12-foot Power Controlled Model 12, also the new Models 10 and 8, are to be shown. Another feature will be the new Allis-Chalmers line of power units.

The Model "K-T" hauling unit will be in action to demonstrate ease of dumping and winding. An action display will also demonstrate the leaning frame feature and wide range of blade position on the Model 14 grader.



Mack Announces New Styling

Modernly-styled streamlined coupe cabs with integral all-metal roof construction feature the new and improved versions of Mack's CH and CJ Traffic Type trucks—the Mack cab-over-engine models. An outstanding development is the use of a roll-out powerplant which permits the withdrawal of the powerplant as a unit through the front, thereby providing increased engine accessibility. The new trucks also have shorter wheelbases for given platform lengths, made possible by further setting back of the front axle.

In keeping with modern design, the new cabs present a gracefully sloping front sheet and windshield, which together with a smooth radiator grille, permit a harmonious blending with streamline body types now so popular. Of all-metal construction, the roof is built integral with the cab, a construction that parallels the most advanced automobile body design and represents a distinct departure in motor truck cab construction.

Special attention has been paid to ease of entrance and exit. Doors are unusually wide and are conveniently hinged at the rear. A wide, easy-mounting step is located at the front of the fender at bumper height, and in addition there is a step tread atop the fender. The windshield is divided vertically in two sections, arranged in a shallow V and slanted to prevent reflection. Each section is hinged at the top, thus allowing each one to be opened or closed independently of the other.

Driver comfort has been one of the main considerations in the design of the new cabs. The driver's seat is easily adjustable. Seats and back cushions have deep springs and are covered with genuine leather.

A feature of the de luxe cab is an instrument board with clock-type instruments illuminated by indirect lighting. By merely pressing a button, the driver is able to instantly determine from the gasoline gage just how much oil there is in the crankcase. Other cab appointments include automatic windshield wipers, rear-view mirrors, dome light and coat hooks.

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Rex Improved Mixers

The Chain Belt Co., Milkaukee, has struck a new note in the design and construction of their 1936 models of REX Construction Equipment. The former unattractive complexity of mixers, moto-

UNIT BID SUMMARY . . .

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

Tunnel Construction . . . . . .

Yakima, Wash.—Government—Tunnels—Yakima Ridge Canal

Contract awarded to Morrison-Knudsen Co., 319 Broadway, Boise, Ida., $993,839 (net) ALL SCHEDS. low to Bureau of Reclamation, Yakima, Wn., for const. Tunnels 1, 2 and 3, Yakima Ridge Canal, Roza Div., Yakima Project, Wn., under Spec. 652. Bids from:

		Sched. 1	Sched. 2	Sched. 3	Totals
(1)	Morrison-Knudsen Co., Boise, Ida.	$129,955	$129,752	$744,132	$1,003,839
(2)	J. F. Shea Co., Inc., Earp, Calif.	144,033	148,638	727,541	1,020,214
(3)	T. E. Connolly, Inc., San Francisco	130,653	138,608	801,966	1,071,228
(4)	S. S. Magoffin, Inc., Adrian, Oregon	149,173	156,503	895,132	1,200,808
(5)	Broderick & Gordon, Denver, Colo.	177,012	182,082	870,813	1,229,908
(6)	Walsh Const. Co., Los Angeles	182,713	196,493	854,237	1,233,444
(7)	A. Guthrie & Co., Inc., & Guthrie McDougall Co.	161,145	171,370	978,760	1,311,275
(8)	L. E. Dixon Co., Bent Bros., Inc., & Johnson, Inc.	191,900	188,815	943,078	1,323,793
(9)	Frazier-Davis Const. Co., St. Louis, Mo.	204,637	209,177	1,003,278	1,417,093
(10)	Utah Const. Co., Ogden, Utah	209,462	223,141	1,017,033	1,449,636
(11)	West. Const. Co., Monrovia, Calif.	.....	.....	774,000	.....
(12)	Winston Bros. Co., Minneapolis	.....	.....	929,429	.....
(13)	Malcolm & Bell, Portland, Oregon	166,578	177,078	.....	.....
(14)	Kern & Kibbe, Portland, Oregon	179,282	185,420	.....	.....
(15)	P. L. Crooks & Co., Inc., Portland	184,497	203,297	.....	.....

SCHEDULE 1.—Tunnel No. 1, Station 18 plus 07 to Station 31 plus 70. Bids on:

(A) 1,500 cu. yd. open-cut exc. Cl. 1
(B) 1,500 cu. yd. open-cut exc. Cl. 2
(C) 23,000 cu. yd. open-cut sxc. Cl. 3
(D) 150 cu. yd. backfill
(E) 100 cu. yd. puddle or tamp backfill
(F) 14,200 cu. yd. tunnel excavation
(G) 15,000 lb. furn. & inst. perm. stl. tun. sup.
(H) 5 MFBM furn. & erec. perm. tunn. timb.
(I) 40,000 lb. furn. & inst. stl. tun. lin. plates
(J) 400 ft. const. 6" tunnel drain
(K) 150 ft. const. 8" tunnel drain
(L) 100 ft. const. 10" tunnel drain
(M) 85 ft. lay 10" dr. pipe (cem. joints)
(N) 300 cu. yd. concr. (tunnel str. & trans.)
(O) 3,450 cu. yd. concr. (tunnel lining)
(P) 30,000 lb. place reinforcing steel
(Q) 100 lin. ft. drill grout holes not more than 10 ft. deep
(R) 50 lb. plc. grout pipe & connec.
(S) 200 cu. ft. pressure grouting

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(13)	(14)	(15)
(A)	.50	.50	.30	1.00	.50	.33	.50	1.00	.40	.50	.40	1.00	.50
(B)	.50	.60	.30	1.00	.80	.46	.50	1.00	.60	.60	.60	1.00	.50
(C)	1.00	1.25	.80	1.00	1.00	.91	.95	1.00	1.25	1.25	1.00	1.00	.50
(D)	.50	.50	.50	1.00	.50	.32	1.50	.50	.90	.60	1.00	1.00	1.00
(E)	1.00	.50	.50	1.00	.50	.25	.50	.50	.90	.75	1.00	.75	.50
(F)	4.85	5.85	5.60	6.04	8.00	8.35	7.35	9.00	8.00	8.95	6.85	6.56	9.00
(G)	.07	.06	.08	.09	.075	.09	.07	.08	.10	.07	.05	.05	.05
(H)	$100	80.00	60.00	50.00	$100	90.00	85.00	96.00	90.00	80.00	70.00	80.00	70.00
(I)	.075	.06	.055	.09	.06	.08	.08	.08	.12	.07	.05	.06	.05
(J)	1.00	.30	.40	1.00	.75	3.40	1.25	1.00	.90	1.00	1.00	1.00	.50
(K)	1.10	.40	.50	1.00	1.00	3.40	2.00	1.00	1.20	1.00	1.10	1.25	.80
(L)	1.25	.50	.50	1.25	1.25	3.40	2.25	1.00	1.30	1.10	1.25	1.50	1.00
(M)	.50	.75	1.00	2.00	1.00	3.40	2.50	.50	1.50	1.00	1.25	1.00	1.20
(N)	24.00	12.00	14.00	15.00	20.00	15.20	12.00	13.50	24.00	15.00	16.00	15.00	13.00
(O)	6.60	6.35	6.53	7.30	7.75	8.50	6.50	8.00	13.00	12.00	10.00	14.50	10.00
(P)	.025	.02	.02	.03	.02	.01	.02	.01	.02	.02	.03	.02	.03
(Q)	1.00	.35	1.00	1.00	1.00	.35	1.00	.40	.50	1.00	1.50	2.00	1.50
(R)	.15	.05	.20	.50	.30	.13	.25	.25	.30	.25	.25	.15	.50
(S)	1.50	1.50	1.00	2.00	1.00	1.15	2.50	2.00	1.50	1.00	1.50	1.00	2.00

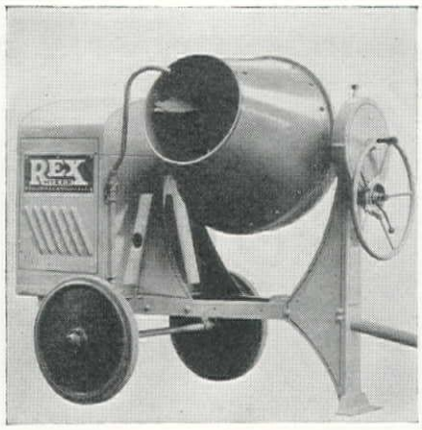
SCHEDULE 2.—Tunnel No. 2, Station 118 plus 52 to Station 134 plus 25. Bids on:

(A) 1,500 cu. yd. open-cut exc. Cl. 1
(B) 1,000 cu. yd. open-cut exc. Cl. 2
(C) 15,000 cu. yd. open-cut exc. Cl. 3
(D) 150 cu. yd. backfill
(E) 100 cu. yd. puddle or tamp backf.
(F) 16,200 cu. yd. tunnel excavation
(G) 15,000 lb. furn. & inst. perm. stl. tun. supp.
(H) 5 MFBM furn. & erec. perm. tun. timber
(I) 40,000 lb. furn. & inst. stl. tunn. lin. plates
(J) 500 ft. const. 6" tunnel drain
(K) 150 ft. const. 8" tunnel drain
(L) 100 ft. const. 10" tunnel drain
(M) 85 ft. lay 10" dr. pipe (cem. joints)
(N) 300 cu. yd. concr. (port str. & transit)
(O) 3,950 cu. yd. concr. (tunnel lining)
(P) 30,000 lb. place reinf. bars
(Q) 100 lin. ft. drill grout holes not more than 10 ft. deep
(R) 50 lb. plc. grout pipe & connec.
(S) 200 cu. ft. pressure grouting

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(13)	(14)	(15)
(A)	.50	.50	.30	1.00	.50	.33	.50	.90	.40	.50	.40	1.00	.50
(B)	.50	.60	.30	1.00	.80	.46	.50	.90	.60	.60	.60	1.00	.50
(C)	.70	1.25	.80	1.00	1.00	.91	.95	.90	1.25	1.25	1.00	1.00	.50
(D)	.50	.50	.50	1.00	.50	.32	1.50	.50	1.00	.60	1.00	1.00	1.00
(E)	1.00	.50	.50	1.00	.50	.25	.50	.50	1.00	.75	1.00	.75	.50
(F)	4.85	5.85	5.60	6.04	7.60	8.35	7.35	8.20	7.50	8.95	6.85	6.20	9.00
(G)	.07	.06	.08	.09	.075	.09	.07	.08	.10	.07	.05	.05	.05
(H)	$100	80.00	60.00	50.00	$100	90.00	85.00	96.00	90.00	80.00	70.00	80.00	70.00
(I)	.075	.06	.055	.09	.06	.08	.08	.08	.12	.07	.05	.06	.05
(J)	1.10	.30	.40	1.00	.75	3.40	1.25	1.00	1.00	1.00	1.00	1.00	.50
(K)	1.25	.40	.50	1.00	1.00	3.40	2.00	1.00	1.10	1.00	1.10	1.25	.80
(L)	1.00	.50	.50	1.25	1.25	3.40	2.25	1.00	1.20	1.10	1.25	1.50	1.00
(M)	.50	.75	1.00	2.00	1.00	3.40	2.50	.50	1.50	.75	1.25	1.00	1.20
(N)	22.00	12.00	14.00	15.00	20.00	15.20	12.00	13.50	25.00	15.00	16.00	15.00	13.00
(O)	6.60	6.35	6.53	7.30	7.75	8.50	6.50	7.50	13.00	12.00	10.00	14.50	10.00
(P)	.025	.02	.02	.03	.02	.01	.02	.01	.02	.02	.03	.02	.03
(Q)	1.00	.35	1.00	1.00	1.00	.35	1.00	.40	.50	1.00	1.50	2.00	1.50
(R)	.15	.05	.20	.50	.30	.13	.25	.25	.30	.25	.25	.15	.50
(S)	1.50	1.50	1.00	2.00	1.00	1.15	2.50	2.00	1.50	1.00	1.50	1.00	2.00

SCHEDULE 3.—Tunnel No. 3, Station 617 plus 72 to Station 715 plus 85. Bids on:

(A) 6,600 cu. yd. open-cut exc. Cl. 1
(B) 1,000 cu. yd. open-cut exc. Cl. 2
(C) 11,700 cu. yd. open-cut exc. Cl. 3
(D) 150 cu. yd. backfill
(E) 100 cu. yd. puddle or tamp backf.
(F) 110,800 cu. yd. tunnel excavation
(G) 150,000 lb. furn. & ins. perm. stl. tunn. supp.
(H) 50 MFBM furn. & erec. perm. tunn. timb.
(I) 80,000 lb. furn. & inst. steel tun. lin. pl.
(J) 3,000 ft. const. 6" tunnel drain
(K) 1,500 ft. const. 8" tunnel drain
(L) 300 ft. const. 10" tunnel drain
(M) 85 ft. lay 10" dr. pipe (cem. joints)
(N) 250 cu. yd. concr. (port. str. & trans.)
(O) 27,600 cu. yd. concr. (tunnel lining)
(P) 29,100 lb. plac. reinforcing steel
(Q) 200 lin. ft. drill grout holes not more than 10 ft. deep
(R) 100 lb. plac. gr. pipe & connections
(S) 400 cu. ft. pressure grouting



mixers, and pumps has given way to simplicity, enclosed gears, and a tendency toward stream-lining. The addition of sheet steel and gear cases strengthen and improve the operation of this equipment.

The new machines which have joined the line of REX Construction Equipment consist of a 7-S two wheel end discharge (illustrated); a 10-S two wheel end discharge mixer; a newly designed 28-S; three new models of REX Moto-Mixers and Agitators, and two new and improved models of REX Speed Prime Pumps. The new two wheel, high speed trailer types—10-S and 7-S are built for mobility and maneuverability; both are compact and light in weight. The towing tongue is retractable and the frames of these mixers are reinforced by tubular cross-members which defeat the torsional strains encountered in high speed towing. All 1936 models are furnished with the new and improved Rexometer (batchmeter) as optional equipment.

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Dodge Announces 1936 Trucks

Featuring "fore point" load distribution, hydraulic brakes, and new styling, Dodge division of Chrysler Corporation announces a new series of trucks and commercial cars for 1936. This new line will consist of the following chassis models: One-half, three-quarter, one, one and one-half (in two series), two, three, and four ton models. Specially built custom Airflow models also will be offered.

Among the important innovations marking this new line of trucks is the "fore

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(A)	.22	.35	.30	.50	.50	.28	.50	.30	.40	.50	.25	.30
(B)	.22	.60	.30	1.00	.80	.41	.50	.76	.60	.60	.40	.45
(C)	.55	1.00	.80	2.00	1.00	.91	.95	.76	1.20	1.00	1.00	1.50
(D)	.50	.50	.50	1.00	.50	.32	1.50	.50	1.00	.60	.30	1.00
(E)	1.00	.50	.50	1.00	.50	.25	.50	.50	1.00	.75	.25	.60
(F)	4.70	4.85	5.43	6.04	6.15	5.86	6.90	6.50	6.70	6.70	5.45	6.10
(G)	.07	.06	.08	.09	.075	.10	.07	.078	.10	.07	.07	.09
(H)	$100	80.00	60.00	50.00	$100	90.00	85.00	96.00	90.00	80.00	55.00	$100
(I)	.075	.06	.055	.09	.06	.08	.08	.079	.12	.07	.07	.11
(J)	1.00	.30	.40	.75	.75	3.40	1.25	.92	1.00	1.00	1.00	.60
(K)	1.10	.40	.40	.75	1.00	3.40	2.00	1.00	1.20	1.00	1.25	.85
(L)	1.25	.50	.50	1.00	1.25	3.40	2.25	1.00	1.40	1.10	1.75	1.15
(M)	.50	.75	1.00	1.50	1.00	3.40	2.50	.50	2.00	1.00	1.50	1.00
(N)	20.00	12.00	14.00	15.00	20.00	15.20	12.00	13.50	25.00	15.00	15.00	13.00
(O)	6.60	5.50	5.89	6.00	5.15	5.25	6.00	6.50	7.30	8.30	4.60	7.16
(P)	.025	.02	.02	.025	.02	.01	.02	.01	.02	.02	.015	.02
(Q)	1.00	.35	1.00	1.00	1.00	.35	1.00	.40	.50	1.00	.60	2.00
(R)	.15	.05	.20	.50	.30	.13	.25	.25	.30	.25	.24	.50
(S)	1.50	1.50	1.00	2.00	1.00	1.15	2.50	1.50	1.50	1.00	1.90	2.00

Dam Construction . . . . . .

Carlsbad, New Mexico—Government—Earth and Rock Fill, Almagordo Dam

Hallett Construction Co., Crosby, Minnesota, $1,132,547, low, to Bureau of Reclamation, Carlsbad, New Mexico, for construction of the Almagordo Dam. Bids from:

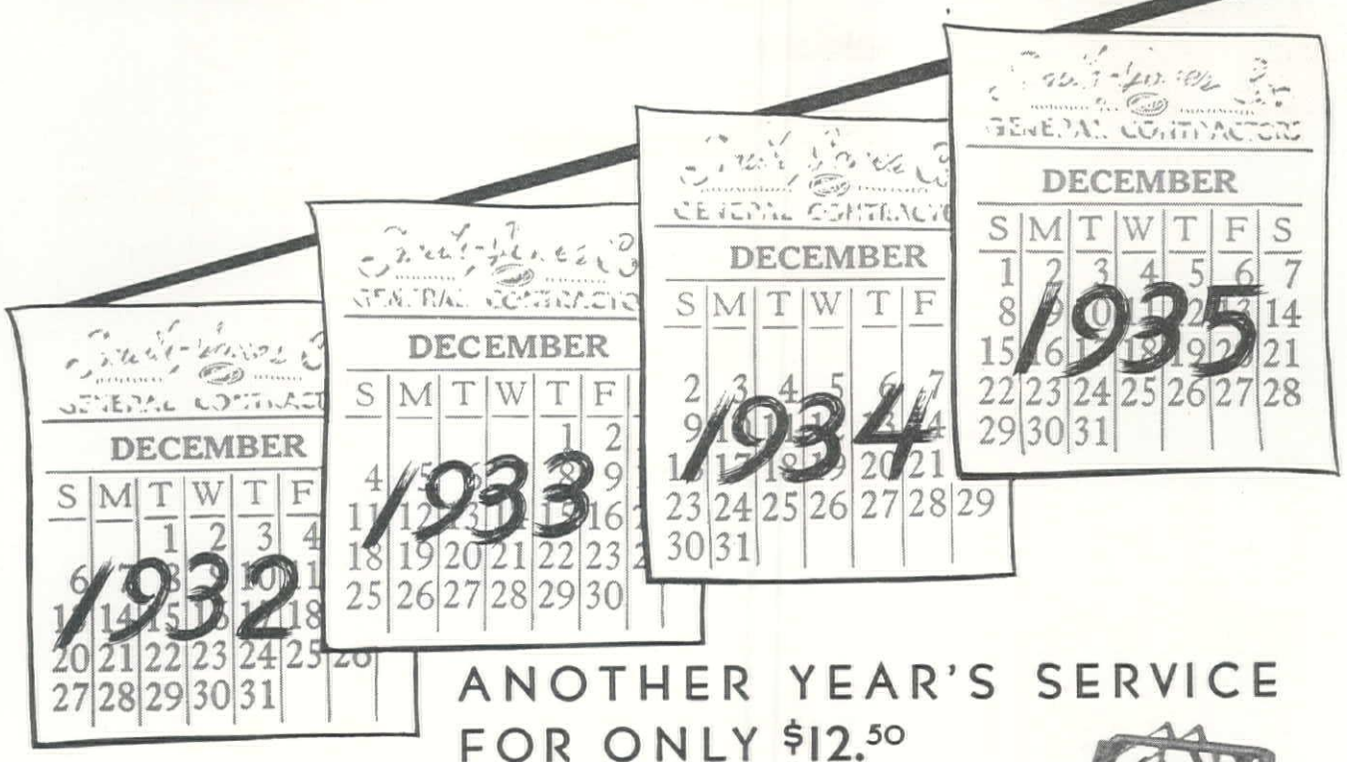
(A) Hallett Construction Co. $1,132,547
(B) Mittry Bros. Const. Co. 1,144,000
(C) Macco Const. Co., Clearwtr. 1,231,849
(D) Martin Wunderlich Co. 1,243,380
(E) S. J. Groves & Sons Co. 1,252,310
(F) Hinman Bros. Const Co., Denver 1,293,880
(G) Hardwich & Co., St. Louis 1,340,890
(H) W. E. Callahan Const., Dalles.... $1,345,675
(I) Ed. H. Honnen Const. Co. 1,368,355
(J) Utah Const. Co., S. F. 1,498,400
(K) Three Co.'s, Inc., Denver 1,518,294
(L) Geo. W. Condon, Omaha, Neb. 1,637,065
(M) Frazer Davis Const., St. Louis.... 1,777,212

Bids received on:

(1) Lump sum, diversion of river
(2) 60,000 cu. yd. exc. strip. borrow pits
(3) 150,000 cu. yd. exc. com. strip. embankm.
(4) 15,000 cu. yd. exc. rock strip. embankm.
(5) 28,000 cu. yd. exc. com. spillw. & tunnel
(6) 175,000 cu. yd. exc. rock spillw. & tunnel
(7) 4,200 cu. yd. exc. all outlet tunnel
(8) 3,400 cu. yd. exc. common toe drains
(9) 2,000 cu. yd. exc. rock toe drains
(10) 1,550,000 cu. yd. exc. common borrow pits
(11) 47,000 cu. yd. exc. rock borrow pits
(12) 9,000 cu. yd. backfill
(13) 1,400,000 cu. yd. earth fill embankm.
(14) 260,000 cu. yd. rock fill down stream
(15) 50,000 cu. yd. riprap upstream
(16) 3,200 cu. yd. dump riprap spillw. chan.
(17) 1,800 lin. ft. const. 12" sewer pipe
(18) 2,400 lin. ft. const. 8" sewer pipe
(19) 900 lin. ft. const. 6" sewer pipe
(20) 1,400 lin. ft. const. 4" sewer pipe
(21) 600 lin. ft. const. 4" sewer pipe
(22) 3,000 lb. inst. cast ir. pipe drain
(23) 300 lin. ft. drilling weep holes
(24) 180 cu. yd. porous concrete
(25) 5,800 lin. ft. drill grout holes
(26) 8,000 lin. ft. same, 25-50
(27) 2,000 lin. ft. same, 50-100
(28) 4,000 lb. install group pipe
(29) 14,000 cu. ft. pressure grouting
(30) 6,500 lin. ft. drill holes, anchor
(31) 2,800 cu. yd. conc. embankm. cutoff
(32) 1,150 cu. yd. conc. tunnel inlet
(33) 230 cu. yd. concrete trashrack
(34) 1,150 cu. yd. conc. tunnel lining
(35) 450 cu. yd. conc. gate chamber
(36) 4,300 cu. yd. conc. floor spillw.
(37) 7,100 cu. yd. conc. spillw. exc. flr.
(38) 600 cu. yd. conc. parapet & curb
(39) 1,600,000 lb. pl. reinforcing bars
(40) 1,400 lin. ft. inst. met. stl. strips
(41) 25,000 lb. furn. & inst. stl. tun. liner
(42) 1,200 sq. yd. specl. fin. concrete
(43) Lump sum, const. needle valve house ex.
(44) 43,000 lb. instl. trashrack metal
(45) 145,000 lb. install slide gates
(46) 15,000 lb. install control appart.
(47) 180,000 lb. install outlet pipes
(48) 108,000 lb. install needle valves
(49) 12,000 lb. inst. metalwork radial gt.
(50) 50,000 lb. inst. struc. steel bridge
(51) 17,000 lb. inst. metal stairways
(52) 7,500 lb. instl. pipe handrails
(53) 12,000 lb. inst. misc. metalwork
(54) 550 lin. ft. inst. metal cond.
(55) Lump sum, inst. elec. conductors, etc.

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)
(1)	$33,600	$20,000	$10,000	$18,000	$5,000	$2,000	$30,000	$11,500	$40,000	$25,000	$5,700	$5,000	$20,000
(2)	.27	.23	.14	.20	.20	.20	.15	.22	.30	.20	.14	.30	.60
(3)	.34	.26	.45	.23	.40	.40	.40	.60	.80	.40	.31	.50	.85
(4)	.97	.90	1.50	.80	1.50	1.50	2.00	1.80	.70	1.00	3.15	3.00	1.25
(5)	.34	.30	.20	.30	.75	.50	.60	.36	.20	.60	.56	.40	.40
(6)	.77	.65	.90	.80	.95	.90	.60	.85	.80	1.30	1.75	1.15	1.10
(7)	11.40	7.00	12.00	10.00	10.00	12.00	15.00	10.00	12.00	11.00	15.00	15.00	12.00
(8)	.34	.30	.15	1.00	.40	.60	1.00	2.00	.20	.70	.85	.40	.30
(9)	1.94	2.50	4.00	3.00	5.00	5.00	5.00	8.00	1.50	2.50	6.25	5.00	12.00
(10)	.21	.25	.25	.23	.24	.25	.19	.28	.28	.34	.26	.40	.35
(11)	.65	.55	.70	.70	.95	.80	.80	.80	.90	.70	1.35	.65	1.10
(12)	.58	.40	.70	.50	.50	.90	.60	.75	.60	.40	.48	1.00	.50
(13)	.06	.08	.06	.12	.09	.09	.09	.08	.06	.085	.10	.10	.22
(14)	.19	.10	.14	.20	.10	.125	.40	.18	.20	.18	.20	.20	.10
(15)	.32	.30	1.00	.40	.25	.15	1.25	.50	.30	.45	.20	.50	.25
(16)	1.29	.20	1.00	.20	.50	.50	1.50	1.60	.20	.60	.21	.50	.40
(17)	.90	.70	.80	.70	1.00	1.00	.60	.80	1.00	.80	.45	.60	.30
(18)	.70	.60	.40	.60	.75	1.00	.60	.75	.60	.70	.45	.60	.30
(19)	.21	.25	.25	.23	.24	.25	.19	.28	.28	.34	.26	.40	.55
(20)	.70	.50	.25	.50	.50	.70	.60	.65	.40	.50	.45	.50	.30
(21)	2.00	1.50	1.00	1.20	1.00	1.00	.75	.90	1.00	.60	.10	.50	.15
(22)	.06	.20	.04	.10	.02	.06	.10	.08	.03	.03	.10	.05	.02
(23)	1.29	2.00	.40	1.00	.50	1.00	1.00	1.00	1.00	.60	.35	1.50	3.00
(24)	5.10	10.50	6.00	10.00	9.00	15.00	10.00	11.00	8.00	7.00	13.30	7.00	6.00
(25)	.25	.60	.55	1.20	.50	1.00	.75	1.00	2.00	.80	.40	1.50	.40
(26)	1.00	1.00	.70	1.50	1.00	1.25	1.00	1.75	2.40	2.10	2.50	1.85	.75
(27)	1.50	2.25	3.40	2.00	1.00	2.50	1.50	1.75	3.00	2.50	2.50	2.50	1.50
(28)	.13	.15	.10	.15	.10	.10	.15	.15	.10	.10	.25	.15	.08
(29)	.50	1.50	.90	1.00	.50	.80	1.00	1.00	1.50	1.20	1.10	1.00	.75
(30)	.58	.60	1.00	1.00	1.00	.60	.70	1.00	1.00	.90	.20	.75	.75
(31)	9.19	11.50	9.00	14.00	11.00	20.00	18.00	9.50	12.00	12.50	11.80	13.20	17.00
(32)	14.92	15.00	16.30	17.00	15.00	24.00	24.00	14.00	12.00	16.00	15.00	15.00	25.00
(33)	30.00	18.00	20.40	25.00	17.00	30.00	24.00	22.00	25.00	24.00	19.00	18.00	32.00
(34)	36.00	16.00	18.30	14.00	20.00	20.00	28.00	14.00	16.00	18.00	25.00	16.00	16.00
(35)	33.40	20.00	27.20	16.00	20.00	21.00	24.00	16.00	15.00	20.00	15.00	26.00	27.00
(36)	6.04	10.50	9.80	9.00	10.00	12.00	10.00	9.00	10.00	8.00	10.00	7.00	6.00
(37)	9.67	13.50	14.00	13.00	14.00	12.00	14.00	12.00	14.00	14.00	13.50	13.50	15.00
(38)	19.97	11.50	20.00	15.00	12.00	12.00	20.00	13.00	13.00	14.00	10.50	17.00	22.00
(39)	.02	.015	.015	.02	.015	.015	.015	.02	.015	.0175	.013	.02	.015
(40)	.65	.20	.35	.25	.50	.20	.50	.30	.10	.30	.17	.40	.40
(41)	.10	.10	.07	.07	.08	.12	.15	.08	.07	.08	.12	.10	.10
(42)	1.16	.50	.70	.50	.50	.60	1.00	.40	1.00	.60	.45	.50	.65
(43)	$432	$600	$150	$2,000	$2,500	$500	$2,500	$2,600	$500	$3,000	$1,170	$500	$1,000
(44)	.03	.02	.04	.02	.04	.04	.02	.02	.025	.02	.035	.02	.02
(45)	.04	,03	.02	.02	.05	.03	.03	.03	.03	.02	.04	.03	.05
(46)	.13	.10	.07	.06	.05	.10	.05	.10	.10	.04	.09	.08	.07

FULLER-KINYON PUMPS *for* LONG-LIFE SERVICE



ANOTHER YEAR'S SERVICE FOR ONLY $12.50

FULLER-KINYON Portable Pumps can "take it". Years of contact with the construction field and experience in the manufacture of heavy equipment, has only served to confirm our policy that materials and workmanship of the finest quality should at all times be built into Fuller equipment.

The proof of such "built in" construction is shown in a statement made just recently by a contractor who purchased a Fuller-Kinyon Pump in 1932.

> "This machine has unloaded nearly 500 cars of cement with cost for repairs about $50.00." He said he had never had any trouble with the machine and added that it was the *most dependable piece of equipment* they had in their plant.

It will pay you to investigate this modern method of unloading bulk cement from either box cars or barges, regardless of the size of the jobs you are bidding on, since this piece of equipment need not be discarded upon the completion of one contract but can very easily be moved from one job to another at very little expense. Many of these machines are now serving their fourth to sixth job.

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

Chicago: 1118 Marquette Bldg.
San Francisco: 564 Market St.

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.

FULLER COMPANY
CATASAUQUA, PA.

Send me literature on Portable Pumps

NAME _____

FIRM _____

ADDRESS _____ P-1

point" load distribution, through which the load is shifted forward in relation to the axles. This insures stability, a minimum of over-all length, more nearly equalized wear on brakes and tires.

Emphasized for 1936 is economy in both operation and maintenance. Fuel and oil economy have been developed through six major mechanical features. They are: Aluminum alloy pistons, four piston rings, full-length water jackets, valve-seat inserts, spray-cooled exhaust valve seats, and special oil cooling.

A wide range of axle ratios, coupled with three, four and five speed transmissions, and several wheelbase lengths, permit these trucks to meet almost any transportation requirement.

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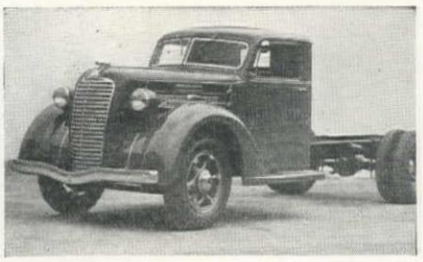


New Diamond T Line for 1936

In announcing the new line of 1936 models, which range from one and one-half to four tons capacity, Diamond T Motor Car Company stresses a development of its well-known streamline style as well as advances in load distribution, spring suspension, vibration elimination, driver comfort and increased ease of handling. The performance record of current Diamond T engines, clutches, transmissions, axles, and brakes, it is stated, makes it inadvisable to make any important changes in these major units.

The Diamond T Hercules engines are continued in substantially the same alignment as to size and power with relation to truck models as heretofore. A new four-point rubber engine mounting has been developed. Newly developed precision type main bearings are now standard equipment on the entire Diamond T line. Engines have been moved forward in the frame to a position well over the front axle, providing greater payload space for a given wheelbase.

Improvements have been achieved in both the construction and appearance of the Diamond T de luxe cab. The Vee-type windshields now have a slope of 30 degrees instead of 11 degrees. Concealed regulators are employed. Adjustable cushions are of greater depth and finer quality for increased comfort. All cabs are now 60 in. wide, with an increase of 2½ in. in cowl width, also providing ample room for three men. A commodious steel tool compartment is conveniently located below the cab door.

Frames in general have been increased in section. Heavier cross-members have been re-designed and gussets added. A progressive principle is employed in the selection of the frame stock.

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)
(47)	.03	.04	.015	.03	.03	.03	.04	.02	.015	.02	.035	.02	.05
(48)	.04	.03	.015	.02	.04	.03	.03	.03	.03	.02	.045	.03	.03
(49)	.05	.05	.03	.03	.05	.05	.05	.04	.02	.04	.035	.05	.02
(5$)	.03	.02	.03	.03	.04	.03	.02	.02	.02	.02	.03	.015	.03
(51)	.04	.07	.07	.02	.05	.04	.10	.04	.10	.02	.035	.05	.04
(52)	.04	.05	.04	.04	.05	.05	.10	.04	.10	.08	.18	.05	.07
(53)	.04	.10	.07	.04	.10	.06	.10	.15	.10	.05	.035	.05	.15
(54)	.52	.40	.35	.40	.10	.50	.40	.30	.20	.20	.20	.50	.75
(55)	$627	$505	$500	$500	$2,000	$250	$2,000	$2,000	$500	$200	$460	$500	$2,000

Vale, Ore.—Government—Unity Dam—Burnt River Project

Contract awarded to J. A. Terteling & Sons, 2223 Fairview Ave., Boise, Ida., $273,989, by Bureau of Reclamation, Vale, Ore., for const. the Unity Dam, Burnt River project, Oregon, under Spec. 633. Bids from:

(1) J. A. Terteling & Sons.....$273,989
(2) Myers & Goulter, Seattle..... 290,567
(3) Guthrie-McDougall Co..... 313,924
(4) Barnard-Curtiss Co., Minneapolis.... 328,245
(5) P. L. Crooks & Co., Inc., Portland 329,871
(6) Utah Const. Co., Ogden.....$332,470
(7) Morrison-Knudsen Co., Boise..... 341,852
(8) Malcolm & Bell, Portland..... 358,648
(9) Megarry Bros., Bain, Minn..... 392,011
(10) Orino, Berkemeier & Saremal..... 546,242

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
L. S. diversion and care of river	$2,000	$5,000	$5,000	$2,500	$100	$5,000	$6,000	$6,200	$15,000	$15,000
5,000 cy. exc. strip bor. pits	.20	.20	.15	.36	.20	.20	.20	.25	.20	.30
25,000 cy. exc. strip embankm.	.50	.55	.85	.45	.80	.50	.52	.70	.80	.75
110,000 cy. com. exc. (spillway)	.30	.27	.40	.48	.40	.55	.43	.42	.35	.75
16,500 cy. rock exc. (spillway)	.80	.70	1.00	.88	1.00	1.05	.85	1.00	1.50	1.25
1,700 cy. com. exc. (tunn. inlet)	.75	.50	.50	.55	.50	.50	.50	.50	.75	.75
150 cy. rock exc. (tunn. inlet)	1.50	2.00	2.50	.90	2.00	1.00	2.00	2.50	2.00	1.00
2,500 cy. excv. (tunn. & shaft)	$10	7.50	8.00	9.50	$10	$10½	$11	9.00	13.00	10.00
28,000 cy. com. exc. (drains & trench)	.50	.55	1.00	.52	.50	.45	.60	.63	1.00	1.50
1,000 cy. rock exc. (dr. & trench)	1.00	2.00	2.50	2.70	3.00	1.15	3.50	6.00	3.50	2.00
250 cy. rock exc. (wall ftg.)	5.00	3.00	2.50	5.50	6.00	4.00	7.50	6.00	10.00	4.00
120,000 cy. com. exc. (borrow pits)	.30	.35	.35	.37	.32	.35	.42	.45	.20	.50
18,500 cy. rock exc. (borrow pits)	.80	.80	.60	.37	.80	1.00	.42	1.00	.50	1.50
12,000 cy. backfill about struc.	.50	.50	.35	1.00	.50	.60	.80	1.00	.75	1.00
137,000 cy. earthfill in embkm.	.10	.10	.10	.14	.12	.12	.12	.10	.25	.35
22,000 cy. rockfill (downstr. slope)	.25	.30	.24	.37	.30	.30	.40	.30	.50	1.50
5,000 cy. riprap (upstr. slopes)	.30	.30	.50	.48	.40	.50	.50	.30	1.50	3.00
2,200 cy. dumped riprap (spw. chan.)	.50	.50	.50	1.00	.30	.50	1.50	.30	2.00	1.50
185 ft. 4" sewer dr. (uncem. jts.)	.50	.50	1.35	.80	.40	.60	1.00	1.30	1.50	1.00
800 ft. 6" sewer dr. (uncem. jts.)	.50	.50	1.50	.90	.50	1.00	1.25	1.30	2.00	1.25
800 ft. 6" sewer dr. (in gravel)	.50	.50	.40	.90	.70	.40	.75	.80	.50	1.00
300 ft. 8" sewer dr. (in gravel)	.50	.50	.90	.75	.60	.50	.75	1.00	1.00	1.50
650 ft. 12" sewer dr. (in gravel)	.75	.60	.80	.80	.80	.70	1.00	1.00	1.50	2.00
160 ft. 18" sewer dr. (in gravel)	$1	.80	1.10	1.00	1.00	1.20	1.50	1.20	3.00	4.00
300 ft. drill weep holes (tunn.)	1.00	1.00	1.50	.75	1.00	1.00	.50	1.50	2.00	1.50
200 ft. drill weep holes	1.00	1.00	1.00	.60	1.00	1.00	.50	1.50	2.00	1.00
300 ft. drill gr. holes to 25'	1.00	1.50	1.50	1.00	1.00	1.20	1.25	1.50	2.00	2.00
1,400 ft. drill gr. holes 25 to 50'	1.50	2.00	2.35	2.20	1.50	2.00	1.75	2.00	2.00	2.50
1,500 lb. inst. gr. pip & ftgs.	.10	.15	.15	.105	.20	.15	.10	.10	.20	.20
2,000 cu. ft. pressure grouting	1.00	1.50	1.00	2.00	1.50	1.25	1.50	1.50	1.00	2.00
300 ft. drill holes for bars	1.00	1.00	1.00	1.00	1.00	1.50	1.00	1.00	1.00	1.00
300 cu. yd. conc. (cutoff wall)	5.00	$12	$11	18.00	3.00	9.00	$17	$10	10.00	15.00
80 cu yd. conc. (str. & transit.)	$15	$18	$12	20.00	$20	$17	$22½	$20	25.00	25.00
725 cu. yd. conc. (tunn. & shaft)	$12	$15	$15	16.50	$22	$12½	$16½	$18	20.00	20.00
130 cu. yd. conc. (chamb. lining)	$15	$15	$11	20.00	$20	$15	$25	$18	20.00	25.00
75 cu. yd. conc. (tunn. plug)	$12	$15	$11	20.00	$20	8.00	$17½	$18	20.00	20.00
15 cu. yd.conc. (control house)	$20	$30	$15	30.00	$40	$25	$30	$35	25.00	25.00
140 cu. yd. conc (walls)	$12	$14	$12	23.00	$15	$11	$20	$17	20.00	20.00
580 cu. yd. conc. (sidewall spw.)	$12	$14	$12	12.00	$15	$12	$14	$17	16.00	16.00
1,150 cu. yd. conc. (spilw. walls)	$15	$14	$12	12.70	$15	$14	$14	$16	16.00	18.00
1,050 cu. yd. conc. (spilw. floor)	8 00	$12	7.50	8.60	$15	8.00	$10	7.00	14.00	15.00
1,050 cu. yd. conc. (gate struc.)	15.00	$14	$12	13.90	$15	$20	$14	$20	16.00	20.00
500,000 lb. place reinf. bars	.015	.02	.02	.018	.02	.02	.025	.02	.02	.025
500 ft inst. metal stops	.20	.50	.20	1.10	.30	.50	.50	.10	.50	.20
32,000 lb. stl. tun. lin. pl. (fur. & ins.)	.10	.08	.10	.10	.10	.08	.10	.10	.10	.15
200 sq. yd. spec. fin. concr. surf.	.25	1.00	.75	1.10	.75	.50	1.00	1.00	2.00	.50
L. S. const. control house	$400	$500	$250	$540	$500	$1,000	$750	$450	$2,000	$300
15,750 lb. inst. trashrack metw.	.02	.03	.03	.033	.05	.02	.02	.02	.02	.03
56,700 lb. inst. slide gates, etc.	.04	.04	.04	.043	.05	.03	.03	.04	.04	.03
12,000 lb. inst. control aparat.	.05	.06	.12	.043	.10	.05	.05	.04	.10	.03
77,000 lb. inst. radial gates, etc.	.02	.04	.03	.033	.05	.02	.03	.04	.04	.03
14,000 lb. inst. met. stairway	.05	.06	.06	.05	.05	.05	.06	.05	.06	.05
2,200 lb. inst. pipe handrails	.05	.10	.10	.045	.10	.10	.10	.10	.10	.03
51,700 lb. inst. 14" outl. pipe & ftg.	.03	.03	.03	.043	.05	.02	.03	.04	.03	.04
8,500 lb. inst. misc. met. work	.05	.10	.10	.045	.10	.05	.06	.05	.10	.10
250 ft. inst. met. cond. 1½"	.20	.20	.25	.25	.40	.20	.50	.20	.50	.30
L.S. inst. elec. conductor, etc.	$500	$500	$300	$275	$500	$400	$300	$300	$2,000	$500

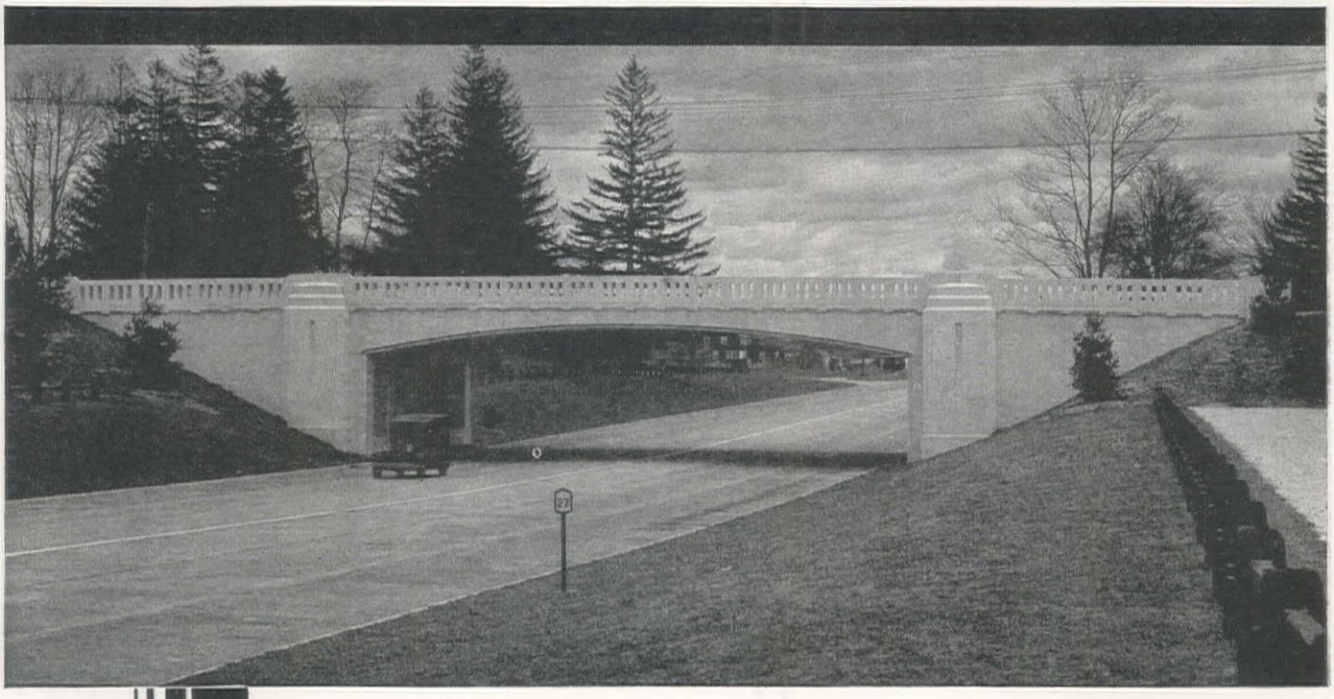
Riverton, Wyo.—Government—Earthfill—Bull Lake Dam

Contract awarded to S. J. Groves & Sons Co., 510 Wesley Temple Bldg., Minneapolis, Minn., $653,397 by Bureau of Reclamation, Riverton, Wyo., for const. the Bull Lake Dam, Riverton project, Wyo., under Spec. 658. Bids from:

(1) S. J. Groves & Sons Co.....$653,397
(2) Morrison-Knudsen Co., Inc..... 666,535
(3) Martin Wunderlich Co..... 707,230
(4) Geo. W. Condon Co., Omaha..... 712,495
(5) E. H. Honnen Const. Co..... 738,990
(6) Mittry Bros. Const. Co., L. A..... 776,802
(7) Megarry Bros., Baine, Minn.....$779,195
(8) Edw. Peterson & Lawlor Corp..... 779,455
(9) David H. Ryan, San Diego..... 796,895
(10) Hinman Bros. Const. Co., Denver.. 808,115
(11) Stevens Bros., St. Paul..... 927,235
(12) Winston Bros. Co., Minneapolis.... 997,424

Bids received on:

(A) L. S. diversion and care of river
(B) 1,300 cu. yd. exc. (strip deposit)
(C) 40,000 cu. yd. com. exc. (strip bor. pits)
(D) 48,000 cu. yd. com. exc. (strip embkm.)
(E) 119,000 cu. yd. com. exc. (structures)
(F) 1,300 cu. yd. rock exc. (struc. & embkm.)
(G) 20,000 cu. yd. com. exc. (embkm. toe dr.)
(H) 500 cu. yd. rock exc. (embk. toe dr.)
(I) 713,000 cu. yd. com. exc. (bor. pits to embk.)
(J) 7,000 cy. rock exc. (bor. pits to embk.)
(K) 7,300 cy. backfill about struc.
(L) 642,000 cy. earthfill in embankm.
(M) 139,000 cy. rockfill (down str. slope)
(N) 43,600 cy. riprap (upstream slope)
(O) 2,300 cy. dumped riprap (channels)
(P) 1,500 cy. screen. grav. (spillw. floor)
(Q) 200 ft. const. 18" sewer pipe dr.
(R) 1,900 ft. const. 12" sewer pipe dr.
(S) 2,600 ft. const. 8" sewer pipe dr.
(T) 1,000 ft. const. 6" sewer pipe dr.
(U) 100 ft. const. weep holes
(V) 180 MFBM fabr. & dr. timb. sheet piling
(W) 164,000 lb. drive steel sheet piling
(X) 1,370 cy. concr. (outlet works, etc.)
(Y) 2,550 cy. concr. (outlet conduit)
(Z) 4,400 cy. concr. (outl. works stilling basin & spillway)
(AA) 1,000 cy. concr. (spillw. gate str.)
(BB) 35 cy. concr. (control house)
(CC) 1,300 cy. concr. (parapet & curb wa.)
(DD) 1,790,000 lb. place reinf. bars
(EE) 300 lb. inst. grout pipe, ftg., etc.
(FF) 50 cu. ft. pressure grouting
(GG) 1,000 ft. inst. met. seal strips
(HH) 1,200 sq. yd. spec. fin. conc. surface
(II) L. S. const. control house
(JJ) 65,000 lb. inst. trashrack metalwork
(KK) 335,000 lb. inst. slide gates, etc.
(LL) 14,000 lb. inst. control apparatus
(MM) 69,000 lb. inst. radial gates, etc.
(NN) 63,000 lb. erect str. steel bridge
(OO) 14,000 lb. inst. met. spiral stairw.
(PP) 4,000 lb. inst. pipe handrail
(QQ) 6,000 lb. inst. misc. metalwork
(RR) 200 ft. inst. elec. metal conduit
(SS) L. S. inst. elec. conductors, etc.



Rigid Frame Concrete Bridge carrying Deer Park Avenue (county road) over Sunrise Highway Extension at Babylon, N. Y. Anita Construction Co., New Hyde Park, N. Y., Contractor. Skew Span 67.57 feet. Span not skewed 67.5 feet. 30-foot roadway and two 5-foot sidewalks.

THE RIGID FRAME CONCRETE BRIDGE OUTSTANDING AS A SOUND, ACCEPTABLE WORK RELIEF PROJECT!

BOTH the spirit and the letter of the labor requirements of the 1935 Emergency Relief and Appropriation Act are fully met by grade crossing separation with rigid frame concrete bridges.

Because of natural economy of design and construction they permit . . .

. . . maximum hand labor per job
. . . maximum number of permanent projects from funds available
. . . maximum use of local materials

In addition the community appreciates a benefit which fills a real need for all citizens—which means so much usefulness, safety, permanence, beauty and so little future maintenance expense.

Write for "Analysis of Rigid Frame Concrete Bridges"—modern design methods in practical, simple form.

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Dept. O 1-1, 903 Seaboard Bldg., Seattle, Wash.

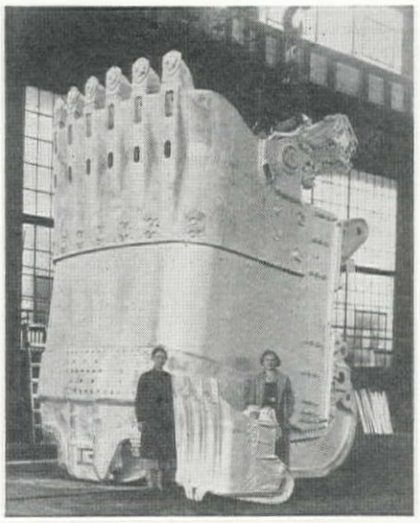
Please send free copy of "Analysis of Rigid Frame Concrete Bridges."

Name.....

Address.....

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

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



World's Largest Bucket

Thirty-two cubic yards (level full) at one bite, is the record of the world's largest power shovel dipper, recently developed by the Marion Steam Shovel Company, pioneer excavator builders, Marion, Ohio.

Comparative statistics reveal one dipper load would fill the average kitchen measuring 9 x 12 x 9 inches high. It would take thirty-two wagonloads of dirt to fill this dipper. It would accommodate thirty-two men, standing up, comfortably. Two complete dippersful from this monster would fill the average railroad coal car.

The major problem in developing this larger dipper was to increase its capacity without making it necessary to resort to a larger shovel. This was accomplished by building the dipper of a light-weight metal alloy, which gave the required additional capacity without affecting the wearing qualities.

•

New Byers Models

A man can push with one hand on the dipper of a shovel and crane and swing around the entire upper deck weighing 17,000 pounds. This will greet the eyes of spectators at the National Road Show at Cleveland when they see the new Byers Model "62" ½ yard shovel exhibited for the first time. This feature is possible due to a more extensive use of roller bearings. The Model "62" utilizes 32 Timken roller bearings with the result that both the vertical and horizontal swing shafts, the deck shafts, also the swing, crowd and travel clutches operate with a minimum of friction in roller bearings.

The manufacturer states that this roller bearing construction provides a faster start on swings and cuts 20 to 30% off the swinging time required.

Another feature of the Model "62" is that only three main assemblies and one shaft assembly in the lower deck are required to perform all hoisting, swinging, crowding, traveling and steering operations. No additional machinery other than drum lagging is needed to operate shovel, clamshell, dragline or trencher attachments. The shovel is furnished with independent cable or chain crowd. With

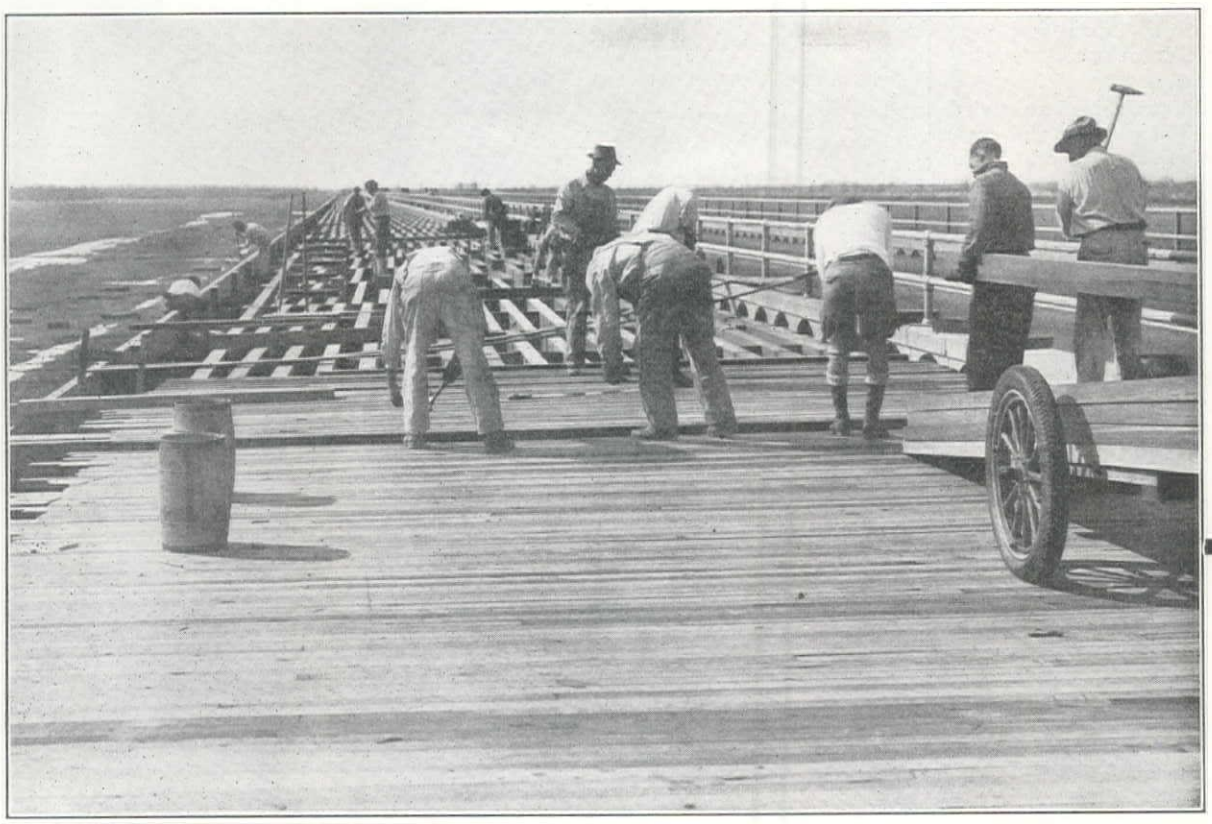
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(A)	$2,500	$2,500	$2,500	$3,000	$5,000	$4,800	$8,000	$500	$9,300	$5,000	$10,000	$7,300
(B)	.15	.20	.15	.50	.20	.24	.50	.15	.23	.15	.25	.54
(C)	.30	.25	.20	.45	.20	.25	.30	.25	.31	.37	.25	.42
(D)	.30	.30	.15	.35	.32	.22	.30	.25	.38	.48	.25	.42
(E)	.30	.45	.30	.30	.30	.40	.25	.50	.38	.56	.40	.50
(F)	4.00	1.00	1.50	1.00	.90	1.50	2.50	1.00	1.17	1.50	1.25	1.25
(G)	.30	.30	.25	.20	.20	.40	.50	.50	.46	.53	.30	.58
(H)	4.00	1.50	1.00	3.00	2.00	2.50	2.50	1.00	1.55	2.70	2.00	1.25
(I)	.25	.20	.26	.25	.47	.23	.25	.32	.35	.41	.25	.51
(J)	4.00	.70	.50	.80	1.25	.80	1.00	.35	1.00	2.50	2.00	1.35
(K)	.30	.35	.50	.50	.60	.80	.50	.40	.17	.95	.50	.50
(L)	.09	.08	.08	.075	.08	.10	.10	.01	.077	.11	.10	.1325
(M)	.65	.70	1.00	.75	.25	1.10	1.25	.50	.92	.40	1.60	.47
(N)	.90	.90	1.00	1.50	.25	1.15	1.25	.75	.92	.40	2.00	1.40
(O)	.90	1.25	1.00	2.00	.20	.90	1.50	.75	.92	.80	2.00	1.40
(P)	1.50	2.00	1.00	2.00	1.50	1.80	1.00	1.50	1.55	1.50	1.00	4.00
(Q)	.60	1.20	1.00	1.00	1.00	1.00	2.00	1.00	.77	1.50	1.00	1.80
(R)	.60	.85	.60	.60	1.00	.90	1.00	1.00	.62	1.05	.75	1.60
(S)	.50	.70	.50	.60	.90	.70	.70	1.00	.62	.85	.60	1.20
(T)	.50	.80	.50	.80	.80	.70	.50	1.00	.55	.40	.60	1.10
(U)	1.50	1.00	1.25	1.00	1.00	.80	3.00	1.00	.31	1.00	.75	.85
(V)	80.00	60.00	50.00	50.00	40.00	50.00	50.00	$100	46.50	80.00	60.00	$110
(W)	.02	.05	.04	.02	.0125	.02	.02	.10	.0465	.02	.025	.035
(X)	14.00	18.00	16.00	20.00	18.00	24.00	15.00	30.00	14.50	17.00	23.00	18.75
(Y)	10.50	14.00	17.50	17.00	14.00	15.00	13.00	35.00	17.50	13.00	16.00	20.50
(Z)	8.50	14.00	13.00	11.00	13.00	14.00	12.00	20.00	12.10	13.50	16.00	15.00
(AA)	10.00	17.00	14.00	16.00	18.00	15.00	16.00	18.00	15.50	13.50	25.00	16.50
(BB)	15.00	35.00	30.00	30.00	25.00	30.00	25.00	15.00	46.50	30.00	35.00	30.00
(CC)	10.50	14.00	13.00	9.00	15.00	16.50	16.00	16.00	18.60	12.00	17.00	16.50
(DD)	.015	.017	.015	.02	.016	.02	.015	.01	.015	.0175	.02	.023
(EE)	.10	.25	.50	.30	.10	.20	.20	.20	.15	.20	.25	.24
(FF)	3.00	2.50	2.50	1.00	2.00	3.00	2.00	10.00	7.50	10.00	5.00	1.35
(GG)	.20	.30	.40	.25	.20	.20	.50	.20	.31	.50	.25	.45
(HH)	.75	.50	.40	.50	1.00	.60	.70	.30	.54	.60	1.00	1.00
(II)	$1,000	$500	$500	$750	$500	$550	$1,000	$300	$775	$600	$1,000	$1,200
(JJ)	.02	.03	.015	.015	.025	.03	.02	.05	.026	.02	.02	.02
(KK)	.02	.03	.02	.03	.03	.03	.04	.03	.02	.03	.025	.03
(LL)	.08	.10	.03	.10	.10	.08	.10	.07	.031	.05	.025	.05
(MM)	.08	.03	.03	.02	.03	.05	.04	.04	.0225	.03	.025	.03
(NN)	.0175	.04	.015	.02	.02	.03	.03	.05	.0225	.025	.025	.06
(OO)	.05	.05	.03	.04	.10	.05	.04	.05	.0225	.05	.025	.13
(PP)	.05	.10	.04	.04	.10	.04	.10	.10	.0225	.08	.10	.08
(QQ)	.08	.10	.10	.04	.10	.12	.10	.10	.03	.08	.04	.10
(RR)	.50	.40	.40	.50	.20	.50	.30	.25	.16	.25	.50	.35
(SS)	$500	$300	$500	$1,000	$500	$250	$500	$200	$310	$400	$100	$650

Ogden, Utah—Government—Earthwork, Canal Lining, etc.—Ogden River Project

J. A. Terteling & Sons, 2223 Fairview Ave., Boise, $424,978, SCHED. 1 & 2, low, to Bureau of Reclamation, Ogden, Utah, for constructing earthwork, canal lining, and structures Ogden-Brigham Canal, Sta. 587 to Sta. 1260, SCHED. 1, and South Ogden Highline Canal, Sta. 10 to Sta. 335, SCHED. 2, Ogden River Project, Utah, under Spec. 659. Bids from:

		SCHED. 1	SCHED. 2	Totals
(1)	J. A. Terteling & Sons, Boise	$317,125	$107,853	$424,978
(2)	Utah Const. Co. & Morrison-Knudsen Co., Inc.	384,111	.....	.....
(3)	Barnard-Curtiss Co., Minneapolis, Minn.	.....	113,699	.....
(4)	J. C. Maguire Const. Co., Butte, Montana	451,053	144,139	595,192

	SCHEDULE 1				SCHEDULE 2			
	Quant.	(1)	(2)	(4)	Quant.	(1)	(3)	(4)
Cy. canal excavation, Class 1	148,000	.30	.39	.70	66,000	.32	.265	.70
Cy. canal excavation, Class 2	23,000	.30	.39	.70	1.900	.32	.40	.70
Cy. canal excavation, Class 3	9,000	1.25	.39	.70	2,000	1.25	1.50	.70
Sta. yd. overhaul	5,000	.10	.05	.20	5,000	.10	.20	.20
Cy. struc. excavation, Class 1	12,000	.50	1.40	1.25	4,000	.60	.60	1.25
Cy. struc. excavation, Class 2	2,000	.50	1.40	2.00	500	.60	.90	2.00
Cy. struc. excavation, Class 3	1,000	1.25	1.40	2.00	500	1.25	.90	2.00
Cy. drain. chann. & dike excav., Class 1	6,200	.40	.40	.60	300	.50	.30	.60
Cy. drain. chann. & dike excav., Class 2	600	.40	.40	1.00	50	.50	.30	.60
Cy. drain. chann. & dike excav., Class 3	500	1.25	1.25	1.00	50	1.25	.30	.60
Cy. compacting embankment	6,000	.40	.65	.50	3,000	.50	.70	.50
Sq. yd. prep. founda. in rock excav.	500	.50	.75	.80	1,000	.50	.75	.80
Sq. yd. trim canal section in earth	84,000	.20	.30	.25	31,000	.20	.285	.20
Cy. backfill about structures	53,000	.20	.30	.50	6,000	.25	.25	.40
Cy. puddle or tamp backfill	2,000	.50	.50	.60	2,000	.50	.60	.50
Cy. concrete in structures	3,700	$20	$28	$23	360	$22	$20½	$23
Cy. concrete in combination sections	450	$18	$23	$23	260	$20	22.30	$23
Cy. concrete in canal lining	6,750	$14	$14	$17	2,640	$16	17.00	$17
Lb. place reinforcing steel	787,000	.03	.025	.025	214,000	.03	.035	.025
Sq. yd. dry-rock paving	400	2.00	2.50	1.00	100	2.00	2.25	1.00
Sq. yd. grouted paving	200	3.00	3.50	3.00	20	3.00	3.00	2.00
Cy. riprap	100	3.00	3.00	2.50	100	3.00	3.35	2.00
Lin. ft. lay 12" concrete pipe	340	.75	1.00	1.00	160	.75	.60	1.00
Lin. ft. lay 15" concrete pipe	44	1.00	1.00	1.00	48	1.00	.70	1.00
Lin. ft. lay 18" concrete pipe	558	1.00	1.25	1.00	268	1.00	.90	1.00
Lin. ft. lay 21" concrete pipe	28	1.25	1.25	1.00	16	1.00	.90	1.00
Lin. ft. lay 24" concrete pipe	384	1.25	1.75	2.00	2,104	1.25	1.40	2.00
Lin. ft. lay 30" concrete pipe	497	1.50	2.00	2.50	383	1.25	1.90	2.50
Lin. ft. lay 36" concrete pipe	837	1.50	2.25	3.00	628	1.50	2.25	3.00
Lin. ft. lay 12" corr. metal pipe	90	.50	.40	.50	50	.50	.45	.50
Lin. ft. lay 18" corr. metal pipe	60	.50	.50	.75	90	.50	.65	.75
Lin. ft. lay 24" corr. metal pipe	....	....	....	....	40	.75	.85	1.00
Lin. ft. lay 30" corr. metal pipe	....	....	....	....	40	.75	1.20	1.50
Lin. ft. lay 36" corr. metal pipe	....	....	....	....	40	1.00	1.40	2.50
M ft. BM erect timber in structures	48	$25	$35	$30	28	$25	22.00	$30
Lin. ft. erect No. 120 metal flumes	405	2.00	2.50	8.00	....	....	....	....
Lin. ft. erect No. 132 metal flumes	59	3.00	2.50	8.00	....	....	....	....
Lin. ft. const. 4" underdr. (uncem. joints)	100	.50	.75	.50	300	.50	.30	.45
Lin. ft. const. 6" underdr. (uncem. joints)	100	.50	.75	.65	100	.50	.35	.65
Lin. ft. const. 8" underdr. (uncem. joints)	100	.50	.75	.80	100	.50	.40	.80
Lin. ft. lay 4" drain pipe (cemented jts)	100	.50	.75	.65	.....	....	....	....
Lin. ft. lay 6" drain pipe (cemented jts)	200	.50	.75	.80	600	.50	.40	.65
Lin. ft. lay 8" drain pipe (cemented jts)	100	.50	.75	.95	100	.50	.45	.95
Lb. erect structural steel	41,700	.05	.05	.05	.....	....	....	....
Lin. ft. remove & replace 12 & 6" woodst. pipe	.....	....	....	....	400	.50	.65	1.00
Lb. inst. gates and gate hoists	7,000	.05	.08	.05	3,000	.05	.06	.05
Lb. inst. blowoff valves & connections	17,500	.05	.08	.05	3,000	.05	.06	.05
Lb. inst. miscell. metalwork	4,500	.05	.15	.10	1,000	.05	.10	.10



Yolo Causeway...

Each Redwood Timber Marked For QUALITY

Each of the 215,470 pieces (5,655,000 ft. B.M.) of Redwood timber and 3,449 Redwood piles shipped for the 1932 widening of Yolo Causeway, bore the grade mark, Association Trademark and Inspector's number, as evidence of rigid inspection before shipment.

DEN • ST
CR 1

The exacting requirements of material for engineering uses need the most careful quality control. This need is met by the Redwood industry through the Inspection Bureau of the California Redwood Association. Each Structural Grade Redwood timber is rigidly inspected for suitability, as well as for compliance with the written specifications, by one of the Bureau's staff of able and experienced Redwood inspectors. Each piece is marked for positive grade identification. ¶ Secure this assurance that the timber in your structures will be strong and durable throughout the whole section of each piece by specifying Structural grades of California Redwood. It will give you long life, the minimum maintenance cost, and low annual cost.

California Redwood Association

405 Montgomery Street, San Francisco

NATURALLY DURABLE CALIFORNIA REDWOOD

simplified chain crowd it is unnecessary to take off or put on additional machinery (except split chain drum sprocket) when making changes.

This Model "62" has a modern styled, larger cab with sliding doors and more windows for visibility. A low cost, pneumatic tired, roller bearing mounted trailer capable of speeds of 30 to 35 miles an hour is available for moving Model "62." It can be loaded or unloaded by two men in 10 minutes.

Bear Cat Junior

Byers Machine Co. of Ravenna, Ohio, will show a new shovel light enough to transport on a heavy-duty truck. This ⅜ cubic yard shovel, the Bear Cat Junior, attains light weight through a balance of machinery to eliminate all dead counterweight and a freedom from crawler mechanism beneath the machinery deck.

All operations of traveling, steering from both crawlers, swinging, independent crowding and hoisting are accomplished through only three operating shaft assemblies on the fully-enclosed machinery deck. The travel shaft is located on the machinery deck; there are no shafts below the main frame. A 3-speed transmission between the motor and take-off gear provides three travel speeds and two operating speeds, for ordinary or light digging. The gear-driven swinger can be positively locked to prevent swinging while traveling. All machinery is protected by an automobile type of hood enclosure and motor hood can be locked to prevent theft of gasoline and accessories. The motor is a 4 cylinder, slow-speed, industrial type, developing 30 h.p. The manufacturer states that it only uses 10 gallons of gasoline per day in steady digging.

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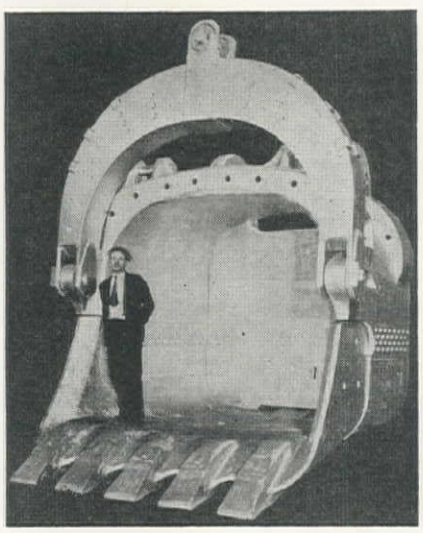


Amsco Makes Composite Part Aluminum Dipper

By proper designing and the employment of aluminum alloy and high-tensile rolled steel for parts not subjected to the heaviest abrasion, the American Manganese Steel Co. are producing composite

San Francisco, Calif.—City—Moccasin Diversion Works

Contract awarded to MacDonald & Kahn Co., Ltd., Financial Center Bldg., San Francisco, $213,968. PROP. "A," by Public Utilities Comm., S. F., for const. the Moccasin Diversion Works, under H. H. W. S. Contract No. 156. Bids from:

(1) MacDonald & Kahn Co., Ltd.....$213,968
(2) L. E. Dixon Co., L. A..... 226,524
(3) Healy Tibbitts Const. Co..... 232,595
(4) Morrison-Knudsen Co., L. A.....$254,850
(5) Barrett & Hilp, S. F..... 274,415
(6) Case Const. Co., Alhambra..... 275,215

	(1)	(2)	(3)	(4)	(5)	(6)
1,500 cu. yd. common exc. for dam	2.95	2.27	2.00	2.00	1.50	4.10
2,500 cu. yd. rock exc. for dam	2.95	5.57	3.00	4.00	6.00	4.10
5,000 cu. yd. com. exc. for conduit	2.95	2.27	2.00	.80	2.50	6.15
3,000 cu. yd. rock exc. for conduit	2.95	5.27	3.00	2.50	6.50	6.15
1,500 lin. ft. drill grout holes	1.50	1.00	.50	1.00	2.00	1.00
500 lin. ft. fur. & inst. grout pipes	.70	.50	.50	1.00	.75	.75
70 ea. make grout pipe connections	3.70	2.00	5.00	4.00	3.00	2.50
1,000 cu. ft. pressure grouting	1.85	1.25	2.00	1.25	3.50	2.00
3,700 cu. yd. "A" concrete	10.50	12.67	16.00	16.00	15.00	12.75
75 cu. yd. "B" concrete	26.00	15.00	34.00	30.00	30.00	37.00
500 cu. yd. "C" concrete	10.00	10.00	12.00	17.00	10.00	14.00
4,500 bbl. Portland cement	2.80	2.68	3.00	3.00	3.50	3.25
45,000 lb. reinforcing steel	.065	.05	.05	.07	.06	.06
1,720 ft. div. conduit, monolithic type	61.50	61.75	65.00	77.00	75.00	71.50
3,900 lb. galv. pipe handrailing	.16	.20	.15	.20	.40	.30
2,000 lb. copper water stops	.70	.30	.30	.60	.75	.40
38,000 lb. structural steel	.10	.08	.08	.10	.09	.13
1,000 lb. steel hardware	.75	.50	.10	.50	1.00	.60
600 lb. galv. steel wire rope	.30	.75	.20	.50	1.00	.80

Pipeline Construction . . . . . .

Los Angeles, Calif.—Precast Concrete Pipeline

Contract awarded to J. F. Shea Co., Inc., Mecca, Calif., $1,107,032, SCH. 6P, and $1,212,430, SCH. 7P, by Metropolitan Water District, Los Angeles, for precast concrete pipelines and appurtenant works of the Colorado River Aqueduct distribution system between Sta. 1436-00 and Sta. 3009-18 of the Opper Feeder, under Spec. 134. Work is located in the counties of SAN BERNARDINO and LOS ANGELES, and comprises approx. 10.84 mi. of pipeline construction between the City of Ontario, Calif., and a point about 1 mi. north of San Dimas, Calif. Bids from:

	Sched. 6P	Sched. 7P
(1) J. F. Shea Co., Inc.	$1,107,032	$1,212,430
(2) American Conc. & Steel Pipe Corp., L. A.	1,147,378	1,274,088
(3) Jahn & Bressi	$1,179,500	$1,255,245
(4) Wood & Bevanda	1,195,833	1,231,428
(5) United Conc. P.	1,197,322	1,267,575

SCHEDULE 6P—Construction of precast concrete pipe for Upper Feeder, between Sta. 00 and 1709-30—length 27,348 ft.

	(1)	(2)	(3)	(4)	(5)
330,000 cu. yd. exc. for pipe, vert. trench	.53	.67	.75	.88	.67
36,000 cu. yd. exc. for pipe, side slope	.45	.45	.40	.35	.67
1,000 cu. yd. exc. for structures	1.00	1.00	1.00	1.00	1.00
205,000 cu. yd. backfill	.25	.31	.20	.25	.28
2,000 cu. yd. concr. in struc. reinf.	19.50	15.00	15.00	12.50	16.00
250 cu. yd. concr. in struc. plain	16.00	20.00	10.00	10.00	15.00
600 cu. yd. concr. in anchors	10.00	10.00	10.00	10.00	8.00
12,500 cu. yd. concr. in cradle	5.00	4.60	4.50	4.50	4.70
27,348 ft. precast concrete pipe	16.33	16.00	17.50	17.25	17.42
390,000 lb. plac. reinf. steel in struc.	.01	.01	.01	.01	.02
7,700,000 lb. furn. and place reinf. steel	.038	.039	.038	.035	.039
7,000 lb. same, thimbles for M. H.	.15	.20	.20	.20	.30
40,000 lb. install miscell. metal	.05	.04	.03	.03	.04
400 ton mi. hauling steel	.10	.40	.40	.20	.50
30,000 ton mi. hauling cement	.20	.07	.10	.10	.20

SCHEDULE 7P—Construction of precast concrete pipe for Upper Feeder, betw. Sta. 1709-30 and 2009-18—length 29,878 ft. spilw. 166'.

321,000 cu. yd. exc. for pipe, vert. tr.	.53	.73	.75	.80	.70
58,000 cu. yd. exc. for pipe, slide slope	.45	.45	.40	.35	.70
4,200 cu. yd. exc. for structures	1.00	1.00	1.00	1.00	1.00
206,000 cu. yd. backfill	.25	.33	.20	.25	.27
2,650 cu. yd. conc. in struc. reinf.	19.50	15.00	15.00	12.50	16.00
150 cu. yd. conc. in struc. plain	16.00	20.00	10.00	10.00	14.00
1,100 cu. yd. conc. in anchors	10.00	10.00	10.00	8.00	8.00
11,500 cu. yd. conc. in cradle	5.00	4.70	4.50	4.50	4.70
29,878 lin. ft. prec. concr. pipe	17.33	16.90	17.50	17.10	16.87
500,000 lb. plac. reinf. steel in struc.	.01	.01	.01	.01	.02
8,000,000 lb. furn. and pl. reinf. steel	.038	.039	.038	.035	.039
7,000 lb. furn. inst. same, thimbles, M. H.	.15	.20	.20	.20	.30
80,000 lb. install miscell. metal	.05	.04	.03	.02	.04
1,150 lin. ft. relocate and recond. 10" pipe	1.25	2.50	1.00	1.00	.50
1,630 lin. ft. same, 2" iron pipe main	.75	1.50	2.00	1.00	.30
300 ton mi. hauling steel	.10	.40	.40	.20	.50
17,000 ton mi. hauling cement	.20	.10	.10	.10	.15

STIPULATIONS: J. F. Shea Co. will accept all or none; Jahn and Bressie will accept one Schedule only; Wood and Bevanda will accept one Schedule only; and United Concrete Pipe will accept one Schedule only.

Sewer Construction . . . . . .

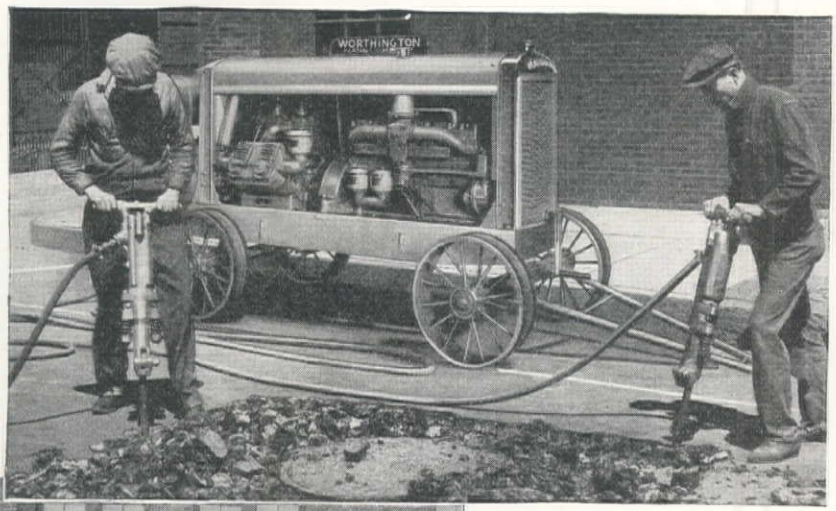
San Francisco, Calif.—City—Reinforced Concrete

Contract awarded to Healy Tibbits Const. Co., 64 Pine St., S. F., $334,259, by Dept. of Public Works, San Francisco, for constructing the Alemany Sewer Extension, Section D1, under Spec. D. P. W. 18,900. Bids from:

(1) Healy Tibbits Const. Co.....$334,259
(2) MacDonald & Kahn Co., Ltd..... 343,803
(3) Eaton & Smith, S. F..... 363,209
(4) Pacific Bridge Co., S. F.....$389,706
(5) Union Paving Co., S. F..... 408,767

	(1)	(2)	(3)	(4)	(5)
3,152 ft. compart. 8' 6" x 11' R. C. sewer	83.00	80.60	80.65	92.00	103.50
23 manholes	40.00	70.00	60.00	40.00	60.00
182 ft. 10" vitr. underdrain covered with concr. OR embedded in broken rock	1.25	1.00	1.10	1.00	2.00
6,304 ft. 12" vitr. underdrain, same as above	1.50	1.25	1.50	1.25	2.50
145,000 lin. ft. piles below cut-off	.40	.50	.63	.60	.40
182 lin ft. 3' x 4' 6" reinf. concrete sewer	20.00	40.00	36.00	20.00	38.00
50 lin. ft. 10" vitr. culvert connection	8.00	6.00	1.25	2.00	2.30

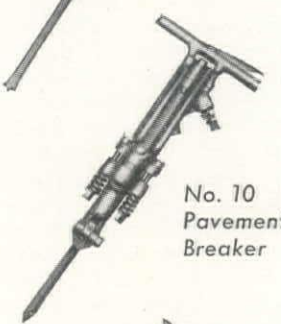
KEEP THE JOB MOVING with



WORTHINGTON PORTABLE COMPRESSORS and CONTRACTORS TOOLS

- Under any operating condition... on road and highway construction... pavement breaking operations... trench digging... *they'll get the job done —on time—profitably.*
- Advanced features found in no other line.
- A nation-wide dealer organization and 24 district offices to serve you.

No. 36 Rock Hammer



No. 10 Pavement Breaker

No. 9 Clay Digger

No. 8 Backfill Tamper

Literature on request

A. C. HAAG & COMPANY, Portland
STAR MACHINERY COMPANY, Seattle
GENERAL MACHINERY COMPANY, Spokane
WESTMONT TRACTOR & EQUIPMENT CO., Missoula
GARFIELD & COMPANY, San Francisco
COLLIER TRACTOR & EQUIPMENT COMPANY, Reno
GARLINGHOUSE BROTHERS, Los Angeles
CONTRACTORS EQUPT. & MACHY. CO., San Diego
VANDERCOOK COMPANY, Sacramento
BURTON BROTHERS, Rosamond
ARIZONA MACHINERY COMPANY, Prescott

AMERICAN ROAD BUILDERS' ASSN. 1902 MANUFACTURER

See the Worthington Exhibit at the Road Show, Cleveland, January 20 to 24... Booths H-10 and H-11, near main entrance and meeting rooms.

THE WORTHINGTON COMPANY, Incorporated
SEATTLE SAN FRANCISCO LOS ANGELES

A-36216

WORTHINGTON

type power-shovel dippers of unusually light weight.

This new type dipper in the larger sizes can weigh less than half of the solid all-cast type, thus allowing increase in shovel capacity without a corresponding increase in power used.

Dippers of this composite design have a top casting of manganese steel, of complete double wall construction, with integral bases and bail connections. The bottom casting, likewise of manganese steel, is also double walled at the back where the dipper stick is connected.

It is not pretended that these composite dippers will stand the same abuse that an all-manganese steel dipper of the same capacity can undergo, but for medium work where a plate- or cast-steel dipper affords sufficient structural strength, the AMSCO composite dipper will show economy by reason of the impact and wear resistance of the exposed manganese steel parts.

●

New International Two-Speed Axle Models

International Harvester Company has announced the addition of three new models to its line of motor trucks, each of which features two-speed axle construction, providing eight forward and two reverse speeds. With this construction all the advantages offered by both the high-speed and low-speed axle ratios are combined in one unit. The new models are the CS-30, CS-35, and CS-35-T.

With the International two-speed rear axle models, the truck owner has both speed and power, combined and available in one unit. The low-gear axle ratio enables heavy loads to be hauled up steep hills and over rough roads, while the high-gear axle ratio allows high speeds on level roads or with light loads. A simple movement of the shifting lever, and the driver changes to either low-speed or high-speed operation instantly and silently without stopping the truck. This two-speed rear axle is available in both the 5.14 to 1-7.15 to 1 and the 6.16 to 1-8.57 to 1 axle ratios.

The Model CS-30 is available in two wheelbases—133 and 157 inches, while the Model CS-35 is offered in 136, 160, and 175-inch wheelbases. The six-wheeler Model CS-35-T is built in two wheelbases—168 and 180 inches.

●

Announce New P & H Shovel

At the 1936 Road Show, the Harnischfeger Corporation of Milwaukee will exhibit an entirely new excavator, the Model 765, which embodies advanced engineering ideas to speed up the digging cycle in a machine of 2 cubic yard capacity. The 765 is one of the new series of P & H 700 machines, a line which has been completely redesigned to take advantage of the recent developments in alloy steels and arc welded construction for strength with less weight. Emphasis has been laid upon cutting off all unnecessary pounds. Although the 765 is also available with gas, this model is powered by a Fairbanks-Morse 4-cyl. Diesel engine rated

Cody, Wyo.—Supply Canal

Taggart Const. Co., Cody, Wyoming, $104,876 low to Greybull Valley Irrigation District, Cody, Wyo., for construction of the Supply Canal (exclusive of structures) leading from the Diversion Dam in the Greybull River to the Sunshine Reservoir. Canal is 9.3 mi. long and is located 45 mi. from Cody, Wyoming. Bids from:

(1) Taggart Const. Co., Cody.....$104,876
(2) Morrison-Knudsen Co., Boise..... 114,945
(3) S. J. Groves & Sons, Minneapolis....$121,314
(4) Stevens Bros., St. Paul..... 126,785

	(1)	(2)	(3)	(4)
500,000 cu. yd. excav. in embankment	.155	.12	.17	.18
95,000 cu. yd. compact earthfill	.21	.30	.24	.25
8,100 cu. yd. excav. core banks	.26	.45	.34	.35
22,000 cu. yd. excav. earth lining	.16	.90	.38	.35
10,000 cu. yd. excav. roadway and small ditches	.18	.30	.24	.25

River and Harbor Work. . . . .

Portland, Ore.—Government—Rock Riprap—Columbia River

Contract awarded to General Const. Co., 3840 Iowa Ave., Seattle, and 503 Henry Bldg., Portland, Oregon, $96,740 by U. S. Engineer Office, Pittock Block, Portland, Ore., for clearing land, excavating and removing material and placing rock riprap for backwater channel improvement in Columbia River between Bonneville and Cascade Locks, Oregon, under Invit. No. 694-36-157. Bids received on:

(1) 6 acres clearing
(2) 64,000 cu. yd. rock excavation
(3) 152,000 cu. yd. unclass. excavation
(4) 13,000 cu. yd. rock riprap

	(1)	(2)	(3)	(4)	Totals
General Const. Co., Seattle and Portland	100.00	.75	.29	.31	$ 96,710
Kern & Kibbe, Portland, Oregon	200.00	.76	.40	.85	121,690
Colonial Const. Co., Spokane, Wn.	300.00	.75	.45	.40	123,400
J. A. Lyons, Portland	300.00	.75	.45	.60	126,000
Malcolm & Bell, Portland, Oregon	150.00	.80	.45	.50	127,000
Myers & Goulter, Seattle, Wn.	500.00	.82	.42	.70	128,420
Goodfellow Bros., Inc., Wenatchee, Wn.	250.00	1.05	.34	.85	131,430
Guy F. Atkinson Co., San Francisco	170.00	.65	.55	.50	132,720
Columbia Const. Co., Bonneville	350.00	1.07	.38	.65	136,790
Consolidated Highway Co., Inc., Portland	600.00	.94	.44	.55	137,790
Guthrie-McDougall Co., Portland	200.00	1.15	.38	.50	139,060
Orino, Birkemeier & Saramel, Bonneville	200.00	.60	.60	1.00	143,800
Wren & Greenough, Portland	500.00	1.00	.50	.25	146,250
M. S. Ross, Olympia, Wn.	100.00	1.00	.60	.75	165,550
P. L. Crooks & Co., Inc., Portland	500.00	1.00	.70	1.00	186,400
Engineers' estimate	300.00	1.10	.61	.72	174,280

Bridges and Culverts . . . . . .

Sacramento, Calif.—State—Under-grade Crossing—San Joaquin County

Contract awarded to Biasotti, Willard & Biasotti, 40 West Clay St., Stockton, and Rocca & Co., 15 Fourth St., San Rafael, $267,421, by Calif. Div. of Highways, Sacramento, for undergrade crossing under S. P. & W. P. R. R. at Charter Way in Stockton, consist. of reinf. conc. abutments with steel superstructure & 0.21 mi. grade & conc. pav. roadway in SAN JOAQUIN COUNTY, CALIF. Bids from:

(1) Biasotti, Willard & Biasotti and Rocca & Co. $267,421
(2) Union Paving Co., S. F..... 279,991
(3) C. W. Caletti, San Rafael..... 282,194
(4) Bodenhamer Const. Co., Oakland....$285,250
(5) Paul J. Tyler, Oroville, and Lord & Bishop, Sacramento..... 289,064
(6) MacDonald & Kahn Co., Ltd., S. F. 310,201

	(1)	(2)	(3)	(4)	(5)	(6)
43,000 cu. yd. rdwy. excavation	.60	.55	.52	.75	.50	.61
10,000 cu. yd. struct. excavation	.60	1.00	.82	1.00	1.25	1.25
10,000 statian yd. overhaul	.01	.02	.01	.03	.01	.04
1,600 cu. yd. remove pavement & struct.	1.25	2.50	1.50	2.50	1.00	4.00
15,000 sq. yd. subgrade (pavement)	.15	.10	.11	.15	.20	.13
1,620 tons mineral aggregate (plant mix surf.)	3.90	2.50	5.00	4.00	4.00	4.00
81 tons liquid asphalt SC-2 (plant mix surf.)	5.00	11.00	15.00	15.00	15.00	10.00
10 tons liquid asphalt SC-1A (prime coat)	16.70	12.50	20.00	20.00	20.00	15.00
3,850 tons asphalt concrete	5.00	4.00	5.50	5.00	4.75	5.00
250 sq. yd. asphaltic paint binder	.10	.05	.10	.15	.10	.13
940 cu. yd. A concrete (pavement)	9.70	10.00	9.75	9.00	10.50	11.00
5,380 cu. yd. A concrete (structure)	12.50	14.00	13.50	14.00	17.00	16.70
85 cu. yd. F concrete (railing)	80.00	60.00	40.00	40.00	60.00	45.00
1,300 ea. pavement dowels	.35	.30	.25	.40	.30	.30
500,000 lb. reinforcing steel	.0428	.045	.045	.045	.044	.045
310,000 lb. structural steel	.068	.075	.075	.05	.064	.06
540,000 lb. fabricated structural steel	.0537	.06	.065	.06	.0525	.0652
7,500 lb. cast iron catch basin cover & frame	.07	.10	.09	.15	.10	.12
29,500 ft. furn. treated Doug. Fir piles & test piles	.57	.65	.54	.60	.60	.70
352 ea. drive treated Doug. Fir piles & test piles	12.00	14.00	14.00	15.00	11.00	16.00
656 lin. ft. 8" corr. metal pipe	1.25	1.75	1.50	1.00	1.00	1.50
10 lin. ft. 18" corr. metal pipe	2.00	2.50	2.50	2.00	2.00	2.50
2,150 lin. ft. 6" std. drain pipe	.18	.25	.25	.50	.20	.20
120 cu. yd. rock filling material	2.70	1.50	2.50	1.50	2.75	4.00
112 lin. ft. 4" vit. pipe	.25	.30	.30	.40	.30	.40
890 lin. ft. 6" vit. pipe	.35	.50	.40	.50	.35	.50
110 lin. ft. 8" vit. pipe	.50	.70	.50	.60	.40	.60
1,200 lin. ft. 18" vit. pipe	1.55	1.75	1.80	2.00	2.50	2.00
436 lin. ft. 8" plain conc. pipe	.80	.75	.30	.60	.50	1.20
58 lin. ft. 14" plain conc. pipe	2.25	1.00	.60	1.50	1.15	1.50
510 cu. yd. A conc. curbs & gutters	10.66	13.50	18.00	14.00	15.00	15.00
130 cu. yd. A conc. (sidewalks)	11.30	13.50	16.00	14.00	15.00	14.00
250 lin. ft. 6" cast iron pipe	1.15	1.00	1.05	1.00	1.00	1.40
104 lin. ft. 8" cast iron pipe	1.75	1.65	1.40	1.75	1.50	2.00
1,107 lin. ft. 12" cast iron pipe	2.75	2.75	2.40	2.80	2.60	3.00
46 lin. ft. 15" cast iron pipe	4.00	4.50	3.30	3.80	4.50	5.00
3 ea. lampholes	3.00	25.00	9.00	50.00	15.00	60.00
2 ea. brick manholes (4' sanitary)	.75	75.00	65.00	75.00	75.00	70.00
6 ea. brick manholes (5' sanitary)	.75	85.00	1.75	75.00	75.00	60.00
3 ea. brick manholes (4' storm water)	.75	85.00	1.75	75.00	75.00	60.00
2,200 lb. copper strips	.50	.45	.30	.50	.40	.40
1 lot electrical equipment	$4,000	$5,000	$3,680	$4,500	$3,500	$4,000
1 lot pumping equipment	$4,000	$1,750	$1,676	$2,000	$2,000	$3,000
1 lot miscellaneous work	$5,000	$2,000	$2,984	$1,000	$1,000	$1,000

at 130 h.p. at 900 r.p.m. for burning the cheaper grades of fuel oil.

Among the other exhibits at the Harnischfeger booth will be a new P & H 150-ampere welder mounted on an automotive type trailer with pneumatic tires. This unit is designed primarily for field service. A small air-cooled gasoline engine is direct-connected to the generator to deliver high electrical efficiency.

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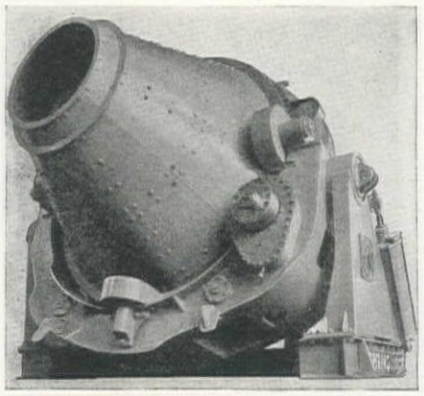

Two New Koehring Models

Koehring Company, Milwaukee, Wis., reported progress during 1935, through the development of new equipment, as well as improvements.

Outstanding among the developments is the 4-yard Concentric Zone Tilting Mixer developed for Grand Coulee. These mixers are charged and discharged through the same opening. The drums have only one opening 38 in. in diameter; utilizing a great portion of the drums for mixing. The cradle, drum and power unit are tilted as one unit which is suspended on pedestals on either side of the main frame. Tilting to the discharge position and return to mixing position is accomplished by means of two pneumatic air rams. This mixer can also be had in the 2-yard size.

The Koehring T-7 Trail-Dump has been added to the line of dirt-hauling equipment. This is a tractor type unit with a 7-yard heap capacity wagon having a high travel speed of approximately 20 miles per hour. The important feature is the "automatic hand" which dumps the load instantly, and automatically.

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Portland Machinery Dealers Entertain Employees

Nearly 200 members of firms belonging to the Portland Machinery Dealers' Association were present at the third annual party held at the Laurelhurst Club, in Portland, December 27. Dancing and general entertainment were the features of this meeting. C. P. Cramer, secretary-treasurer of the Association, reports that among those present were D. I. Cooper, president, and Donald J. Feenaughty.

Street and Road Work. . . . . .

Carson City, Nev.—State—Grading and Gravel Surfacing—Storey and Lyon Counties

Contract awarded to Nevada Rock & Sand Co., Reno, $180,004, by Nevada State Highway Comm., Carson City, Nevada, for 5.19 mi. grade and grav. surface betw. Virginia City and Silver City, Rt. 17, Sec. B and A2, in STOREY and LYON COUNTIES, Nev. Bids from:

(A) Nevada Rock & Sand Co. $180,004
(B) Pacific Const. Co., Reno 206,323
(C) Utah Const. Co., Ogden, Utah $208,695
(D) Engineers estimate 182,071

		(A)	(B)	(C)	(D)
2	ea. remove buildings	175.00	500.00	30.00	50.00
600	lin. ft. remove water pipe	.25	1.00	.10	.50
70	lin. ft. remove flume	2.00	5.00	.20	.50
L. S.	remove timbers	400.00	200.00	$1,000	300.00
139,200	cu. yd. roadway excavation	.90	1.00	1.15	.90
112,062	sta. yd. overhaul	.02	.02	.02	.02
20,300	cu. yd. select borrow	.50	1.00	.50	.75
1,000	cu. yd. struc. excavation	1.50	2.00	1.50	1.50
5.19	mi. subgrade	100.00	100.00	100.00	100.00
5.19	mi. finish roadway	200.00	100.00	150.00	200.00
9,660	tons cr. grav. or stone surface	1.00	1.00	1.00	1.00
420	cu. yd. "A" concrete	40.00	40.00	30.00	35.00
24	cu. yd. "B" concrete	40.00	30.00	30.00	35.00
45,460	lb. reinforcing steel	.07	.10	.09	.07
60	cu. yd. cement rubble masonry	20.00	10.00	10.00	15.00
1,000	lin. ft. 18" corr. metal pipe	3.00	2.00	1.80	2.50
256	lin. ft. 24" corr. metal pipe	4.00	3.00	2.80	3.50
500	lin. ft. 3" water pipe	1.00	2.00	.70	1.75
400	lin. ft. 4" water pipe	1.25	2.50	.90	2.00
1	ea. move pipe culvert headwall	20.00	10.00	15.00	10.00
170	ea. monuments	3.00	5.00	3.00	4.00
L. S.	building	300.00	$1,000	250.00	150.00
1,400	lb. castings	.20	.10	.15	.20
2	ea. tunnel portals	100.00	100.00	200.00	25.00
L. S.	move wooden bin	100.00	100.00	10.00	10.00

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

Contract awarded to Peninsula Paving Co., 9 Main St., S. F., $197,656, by Calif. Div. of Highw., Sacramento, for 7.7 mi. grad. and cr. run base and pl. mix surf. betw. 1.5 mi. E. of Bella Vista and Diddy Hill, SHASTA COUNTY, Calif. Bids from:

(1) Peninsula Pav. Co., S. F. $197,656
(2) Hemstreet & Bell, Marysville 199,045
(3) Union Paving Co., S. F. 217,404
(4) A. Teichert & Son, Inc., Sac. $228,172
(5) Dunn & Baker, Kl. Falls (irreg.) 189,859

		(1)	(2)	(3)	(4)	(5)
30	acres clearing and grubbing	150.00	100.00	500.00	100.00	300.00
3,205	M gallons water	1.50	1.00	1.00	1.50	1.00
191,000	cu. yd. roadway excavation	.46	.45	.47	.57	.35
1,800	cu. yd. struc. excavation	1.10	1.50	1.50	1.75	1.00
600	cu. yd. ditch and channel excavation	.80	.75	.80	1.00	1.00
605,000	sta. yd. overhaul	.005	.01	.01	.01	.01
26,000	cu. yd. imported selected material	.55	.65	.60	.60	.85
407	sta. finish roadway	5.00	5.00	8.00	5.00	10.00
18,800	tons crusher run base	1.40	1.70	1.50	1.73	1.25
105	tons liq. asph. SC-2 (prime coat)	17.00	18.00	20.00	20.00	18.00
10,600	tons miner. aggreg. (plant mix surf.)	2.15	1.90	1.80	1.95	2.50
560	tons liq. asph. MC-5 or MC ext. hvy. pl. mix	25.00	20.00	26.00	25.00	20.00
63	tons liq. asph. MC-3 (seal coat)	25.00	24.00	30.00	26.00	25.00
575	tons sand (seal coat)	3.00	3.00	4.00	3.00	1.50
9,800	lb. reinf. steel (struc.)	.06	.06	.08	.05	.06
132	cu. yd. "A" concrete (struc.)	23.00	24.50	25.00	25.00	24.00
142	lin ft. 12" corr. metal pipe	1.20	1.25	2.00	1.50	1.50
1,762	lin. ft. 18" corr. metal pipe	1.75	1.65	2.50	2.00	1.90
426	lin. ft. 24" corr. metal pipe	2.60	2.50	3.50	3.00	2.75
118	lin. ft. 30" corr. metal pipe	3.25	3.25	4.00	4.00	3.75
74	lin. ft. 36" corr. metal pipe	5.00	4.50	6.00	5.50	5.00
94	lin. ft. 42" corr. metal pipe	6.25	5.50	7.00	6.00	6.00
64	lin. ft. 48" corr. metal pipe	7.75	7.00	9.00	7.50	7.50
154	lin. ft. clean and salv. corr. metal pipe	.50	.50	1.00	.50	1.00
94	ea. culvert markers	2.25	2.50	3.00	2.50	2.50
121	ea. monuments	3.00	3.00	3.00	3.00	3.50

Carson City, Nev.—State—Gravel Surfacing—Elko County

Contract awarded to Utah Const. Co., Ogden, Utah, $159,007, by Nevada State Highway Comm., Carson City, Nevada, for 26.07 mi. cr. grav. or stone surface betw. 26 mi. S. of Wells & Wells, Rt. 13, Sec. B3, ELKO COUNTY, NEV. Bids from:

(1) Utah Const. Co., Ogden, Utah $159,007
(2) George French, Jr., Stockton 159,793
(3) Nevada Rock & Sand, Reno 163,709
(4) W. W. Clyde & Co., Springville 170,122
(5) Isbell Const. Co., Reno $177,516
(6) Peninsula Pav. Co., S. F. 180,044
(7) Gibbons & Reed Co., S. L. C. 180,208
(8) Engineers estimate 188,061

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
36	acres clear & grub	8.00	10.00	15.00	15.00	25.00	15.00	20.00	10.00
7,747	lin. ft. remove fence	.02	.02	.02	.03	.03	.03	.02	.02
74	lin. ft. remove culv. pipe	1.00	.50	1.00	.50	1.00	.50	.50	.75
110,060	cu. yd. roadway excavation	.22	.22	.22	.24	.25	.20	.25	.25
66,168	sta. yd. overhaul	.02	.02	.02	.02	.02	.02	.02	.02
126,505	cu. yd. select borrow	.30	.30	.30	.37	.35	.35	.40	.38
28,741	cu. yd. imported borrow	.25	.25	.30	.325	.32	.30	.35	.30
1,552	cu. yd. struc. excavation	1.00	.75	1.00	.90	1.00	1.00	.80	1.00
26.07	mi. subgrade	75.00	50.00	$100	80.00	$100	$100	75.00	$100
26.07	mi. finish roadway	$100	$100	$100	$100	$100	$175	$100	$100
101,360	tons cr. gr. or stone surf.	.50	.50	.50	.46	.515	.55	.48	.60
59	cu. yd. "A" concrete	28.00	25.00	25.00	25.00	30.00	30.00	30.00	30.00
200	cu. yd. "B" concrete	25.00	25.00	25.00	25.00	30.00	29.50	25.00	28.00
10,536	lb. reinforcing steel	.07	.06	.06	.08	.07	.06	.07	.06
13,454	lb. structural steel	.07	.07	.08	.07	.10	.10	.09	.07
0.37	MFBM untr. Douglas fir	80.00	90.00	$100	$100	$100	$125	$100	90.00
11	MFBM redwood	$110	$100	$110	$120	$115	$130	$110	$120
4,478	lin. ft. 18" corr. met. pipe	1.75	1.75	2.00	1.75	1.90	2.00	1.70	1.85
1,284	lin. ft. 24" corr. met. pipe	2.75	2.50	3.00	2.75	2.80	3.00	2.60	2.50
152	lin. ft. 30" corr. met. pipe	3.50	3.50	4.00	3.50	3.50	3.50	3.35	3.50
190	lin. ft. 36" corr. met. pipe	5.00	5.00	5.00	5.00	5.50	5.00	5.20	5.00
114	ea. monuments	2.50	3.00	3.00	3.00	3.50	2.50	3.00	3.00
31,444	lin. ft. const. fence	.09	.12	.15	.11	.17	.12	.15	.12
7,747	lin. ft. reconst. fence	.04	.10	.05	.03	.04	.10	.08	.10
4,142	M gallons water	1.25	1.50	1.00	1.50	1.00	2.00	1.75	1.50

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 . . . . .

CALLS FOR BIDS

10,400 lin. ft. welded steel pipe OR steel cylinder conc. protected pipe (El Capitan Pipeline) for La Mesa, Lemon Grove and Spring Valley Irrigation Dist. Bids to Jan. 28th.

32,478 lin. ft. welded steel pipe OR steel cylinder conc. protected pipe (El Capitan-Lakeside Pipeline) for San Diego, Calif. Bids to January 28th.

Iron Mt. Pumping Plant Bldgs. & appurtenant work for Metropolitan Water Dist., L. A. Bids to January 14th.

BIDS RECEIVED

Earth and rock fill Almagordo Dam for U. S. Bureau of Reclamation, Carlsbad, N. M., Hallett Const. Co., Crosby, Minn., $1,132,547 low.

Earthwork, canal lining and structures on Ogden Brigham & Co. Ogden Highline Canals for Bur. of Reclamation, J. A. Terteling & Sons, Boise, $424,978 low.

Raise the Arrowrock Dam for Bur. of Reclamation, T. E. Connolly, S. F., $395,040 low.

Overhead crossing at Figueroa St., L. A., for Calif. Div. of Hgwys., Clinton Const. Co., S. F., $578,420 low.

Undergrade crossing at Mission Rd., L. A., for Calif. Div. of Hgwys., L. E. Dixon Co., L. A., $241,661 low.

2.2 mi. grade and steel bridge betw. Camp Bonita and Follows Camp for Calif. Div. of Hgwys., Guy F. Atkinson, S. F., $355,762 low.

CONTRACTS AWARDED

13.739 mi. grading, surfacing, etc., on Tongue River Rd. No. 1, and Sec. D of Miles-City Broadus Rd. for Montana Hgwy Comm. to Prahl & Sawtelle, Miles City, $168,964.

Reinf. steel for U. S. Engr. Office, L. A. to L. A. Iron & Steel Co., L. A., $721,656.

300,000 bbl. mod. Portland cement for All American Canal by Bur. of Reclamation, Denver to Riverside, Southwestern and California Portland Cement Co.'s, L. A., $660,270.

16.9 mi. grading, struc., and surfacing on U. S. Hgwy. Rt. 389 for New Mexico Hgwy. Dept. to Armstrong & Armstrong, Roswell, $178,699.

Grade separation, and 2.2 mi. grad. and pave at Famosa for Calif. Div. of Hgwys. to Griffith Co., L. A., $295,611.

Precast conc. pipeline, Colorado River Aqueduct, Sta. 1436 to 3009 by Metropolitan Water Dist., L. A., to J. F. Shea Co., Mecca, $2,319,462.

16.937 mi. grad., surf. and const. bridges betw. Santa Rosa and Tucumcari by New Mexico Hgwy. Engr. to A. O. Peabody, Las Cruces, $267,460.

Bull Lake Dam at Riverton, Wyo. for Bur. of Reclamation to S. J. Groves and Sons Co., Minneapolis, $653,397.

Tunnels 1, 2 and 3, Shoshone Proj., Wyo. by Bur. of Reclamation to Utah Const. Co., Ogden, $614,509. Tunnels 1, 2 and 3, Yakima Ridge Canal, Wn., by Bur. of Reclamation to Morrison-Knudsen Co., Boise, $993,-839.

Undergrade crossing at Charter Way, Stockton, for Calif. Div. of Hgwys., to Biasotti, Willard & Biasotti & Rocca & Co., $267,421.

Undergrade crossing at Salinas by Calif. Div. of Hgwys. to F. O. Bohnet, Campbell, $249,108.

Unity Dam, Oregon, by Bur. of Reclamation to J. A. Terteling & Sons, Boise, $273,989.

Siphon structures, All American Canal by Bur. of Reclamation to Frazier Davis Co., St. Louis, Mo., $489,527.

Overhead crossing near Tracy by Calif. Div. of Hgwys. to Lindgren & Swinerton, S. F., $223,255.

Alemany Sewer Ext. by Dept. of Public Works, S. F., to Healy Tibbetts Const. Co., S. F., $334,259.

Imperial Dam, Boulder Canyon Proj. by Bur. of Reclamation to Morrison-Knudsen Co., Utah Const. Co. & Winston Bros., S. F., $4,374,240.

Seminoe Dam & Power Plant, Casper-Alcova Proj. by Bur. of Reclamation to Morrison-Knudsen Co., Utah Const. Co., & Winston Bros., S. F., $2,759,804.

96.6 mi. canals and 86 bridges by Central Nebr. Public Power & Irrig. Dist., Hastings, Nebr. to Haas, Doughty & Jones, S. F., Morrison-Knudsen Co., & J. A. Terteling & Sons Co., Boise, $622,529.

5 mi. earthwork on All American Canal by Bur. of Reclamation, Yuma to Geo. Pollock Co., Sacramento, $700,987.

Units 3, 4, 6 and 7, Henderson St. Trunk sewer by Bd. of Public Works, Seattle to Arcorace & Coluccio, Seattle, $226,317.

2.6 mi. grading and surfacing betw. Luitwieler and La Mirada Aves., L. A. by Calif. Div. of Hgwys. to R. E. Campbell, L. A., $322,995.

Overhead crossing at Wilmington by Calif. Div. of Hgwys. to Sharp and Fellows Constr. Co., L. A., $202,941.

22 mi. 10-inch steel pipeline by Industrial Fuel Supply Co., L. A., to Macco-Robertson, Clearwater, $200,000.

Tunnels 3, 4, 5 and 6, Casper-Alcova Proj., Wyo., by Bur. of Reclamation to W. E. Callahan Const. Co., Gunther & Shirley, L. A., $794,948.

Reservoir and settling basins, West Side Filter Plant by Bd. of Water Comm., Denver, to Dutton, Kendall & Hunt, Inc., Denver, $274,949.

Upriver Station control works and powerhouse by City Council, Spokane, to Puget Sound Const. Co., Seattle, $437,475.

3.1 mi. grading and surfacing on County Rd. Winesap North by Director of Hgwys., Olympia, Wn., to Elliott & Co., Inc., Seattle, $203,736.

Ship & Barge dock and terminal by Port Comm., The Dallas, Ore., to Parker-Schram Co., Portland, $219,501.

Street and Road Work. . . . . .

BIDS RECEIVED

LOS ANGELES, CALIF.—Guy F. Atkinson Co., Russ Bldg., San Francisco, $355,762 low to Calif. Div. of Highways, L. A., for 2.2 mi. grading and a steel stringer bridge in San Gabriel Canyon, betw. Camp Bonita and Follows Camp in LOS ANGELES COUNTY, Calif. 12-19

NEWS SUMMARY

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

LOS ANGELES, CALIF.—Sharp & Fellows Constr. Co., 108 W. 6th St., L. A., $129,848 low. to Calif. Div. of Highways, L. A., for 10.9 mi. grad. and tr. with liq. asph. and const. timber pile trestle betw. 10 mi. W. of Indio and Indio in RIVERSIDE COUNTY, Calif. 12-27

SACRAMENTO, CALIF.—Union Paving Co., Call Bldg., S. F., $67,523 low to Calif. Div. of Highways, Sacramento, for 6.3 mi. grad. and const. bridge betw. St. Helena and Larkmead Station, NAPA COUNTY. 12-11

SACRAMENTO, CALIF.—Union Paving Co., Call Bldg., S. F., $85,187 low to Calif. Div. of Highways, Sacramento, for 3.1 mi. grad. and rdmix surf. on select matl. base and const. timb. bridge betw. Bear Valley and 1 mi. North of Willow Creek in SAN BENITO COUNTY. 12-11

CONTRACTS AWARDED

PHOENIX, ARIZ.—To Pearson & Dickerson, 202 N. Central Ave., Phoenix, $141,960 by Ariz. Highway. Comm. for 3½ mi. grad., etc. at Prescott Natl. For. boundary 22 mi. NE of Prescott on Prescott-Jerome Highway, YAVAPAI COUNTY. 12-7

PHOENIX, ARIZ.—To H. J. Hagen, Globe, Ariz., $174,486 by Arizona State Highway Comm., Phoenix, for 3.2 mi. grading and draining on the Globe-Springerville Highway, beginning 3.8 mi. NE. of the Gila-Navajo County line in NAVAJO COUNTY, FA 105-D. 12-12

LOS ANGELES, CALIF.—Awards as follow by Calif. Div. of Highways, L. A., for: (1) SAN BERNARDINO COUNTY—To Geo. J. Bock Co., 1120 Las Palmas, Hollywood, $80,512 for 2.5 mi. grad. and roadmix surf. betw. 1 mi. NW. of Lake Arrowhead and Lake Arrowhead Dam. (2) SAN BERNARDINO COUNTY—To Basich Bros., 20550 Normandie Ave., Torrance, $130,917 for 4.7 mi. grad. and roadmix surf. tr. applied betw. west boundary and Rt. 59. 12-18

LOS ANGELES, CALIF.—To Daley Corp., 4430 Boundary St., San Diego, $97,129 by Calif. Div. of Highway, L. A., for 2.4 mi. grad. and roadmix surf. tr. betw. West Casitas Pass and E. Casitas Pass, VENTURA COUNTY, Calif. 12-12

LOS ANGELES, CALIF.—To R. E. Hazard, P. O. Box 1438, San Diego, $28,456 by Calif. Div. of Highways, L. A., for 5.4 mi. plant mix surf. placed betw. 1.4 mi. S. of Thermal and junction with Rt. 26, in RIVERSIDE COUNTY, Calif. 12-12

LOS ANGELES, CALIF.—To Sully Miller Contracting Co., 1500 W. 7th St., Long Beach, Calif., $44,651 by Calif. Div. of Highways, L. A., for 2.9 miles grading, surfacing with imported borrow, select material and bituminous armor coat between Bay Blvd. and Bolsa-Chica Road on Bolsa Avenue in ORANGE COUNTY, Calif. 12-12

LOS ANGELES, CALIF.—To Southwest Pav. Co., Roscoe, $18,529 by Calif. Div. of Highways, L. A., for 0.6 mi. asph. conc. paving betw. San Fernando Road and Central Ave. in Glendale, LOS ANGELES COUNTY, Calif. 12-13

LOS ANGELES, CALIF.—To R. E. Campbell, Central Bldg., L. A., $332,-995 by Calif. Div. of Highways, L. A., for 2.6 mi. grading and select base matl. surf. betw. Luitwieler Ave. and La Mirada Avenue, in LOS ANGELES AND ORANGE COUNTIES, Calif. 12-16

LOS ANGELES, CALIF.—To Dimmitt & Taylor, 815 E. 59th St., Los Angeles, $62,278 by Calif. Div. of Highways, L. A., for 2.7 mi. grading and tr. with liq. asph. and const. a timber pile trestle on L. A. County Line to Pipe Line Ave., in SAN BERNARDINO COUNTY, Calif. 12-23

LOS ANGELES, CALIF.—To R. E. Hazard & Sons, P. O. Box 1438, San Diego, $45,505 by Calif. Div. of Highways, L. A., for .98 mi. grading, gravel and roadmix surf. and const. timber bridge between 3 mi. east of Imperial and ½ mi. east of Brawley, in IMPERIAL COUNTY, Calif. 12-28

LOS ANGELES, CALIF.—To R. E. Campbell, 711 Central Bldg., Los Angeles, $61,182 by Calif. Div. of Highways, L. A., for 2.5 mi. grading and a timber bridge betw. Spring St. and Hathaway Avenue on Somerset Ave., in LOS ANGELES COUNTY, Calif. 12-23

LOS ANGELES, CALIF.—To Oswald Bros., 366 E. 58th St., L. A., $51,208 by Calif. Div. of Highways, L. A., for 5.9 mi. grading and surf. with plant mix betw. Somis and Saticoy, in VENTURA COUNTY, Calif. 12-23

OAKLAND, CALIF.—To Heafey Moore Co., 344 High St., Oakland, $27,109 by City Clerk, Oakland, for pav. Middle Harbor Road betw. 1st and Ferro Sts. and betw. Middle Harbor Rd. and Oakland Municipal Garbage Works. 12-3

OAKLAND, CALIF.—To Lee J. Immel, 1031 Evelyn Ave., Berkeley, $13,560 by City Clerk, Oakland, for improving Adeline Street between Aileen St. and Stanford Avenue. 12-11

OAKLAND, CALIF.—To Union Paving Co., Call Bldg., San Francisco, $66,712 (ASPH. CONCR.) by City Clerk, Oakland, for improving Foothill Blvd., between 14th and 23rd Avenues, Oakland. 12-11

OAKLAND, CALIF.—To Ransome Co., 4030 Hollis St., Oakland, $16,320 by City Clerk, Oakland, for improving Telegraph Ave., betw. 40th and 51st Sts., Oakland. 12-23

OAKLAND, CALIF.—To Lee J. Immel, 1031 Evelyn Ave., Berkeley, $31,440 by City Clerk, Oakland, for improving Grove Street, between 1st and San Pablo. 12-26

OAKLAND, CALIF.—To Lee J. Immel, 1031 Evelyn Ave., Berkeley, $49,112 by City Clerk, Oakland, for improving 8th St., betw. Fallon St., and Cypress St., Oakland. 12-26

SACRAMENTO, CALIF.—Awards as follow by Calif. Div. of Highways, Sacramento, for: (1) TULARE COUNTY—To Union Paving Co., Call Bldg., S. F., $147,771 for 6.6 mi. grad. portions surf. with cr. run base and roadmix surf. and por. tr. with liq. asph. by roadmix method betw. Yokohl and 1 mi. N. of Lemon Cove. (2) TUOLUMNE COUNTY—To Union Paving Co., S. F., $104,233 for 3.4 mi. grad. and surf. with roadmix surf. or untr. cr. grav. or stone base betw. Sullivan Creek and 3½ mi. easterly. (3) INYO COUNTY—To Basich Bros. Const. Co., 20550 S. Normandie Ave., Torrance, $16,973 for 2.6 mi. grad. betw. 1.8 mi. N. of Bishop and 1.4 mi. N. of Laws. (4) STANISLAUS COUNTY—To Pacific Bridge Co., 1114 Balfour Bldg., S. F., $162,973 for 3.1 mi. grad. and roadmix surf. tr. applied and const. bridge betw. River Road and 2 mi. W. of Gates Road. (5) BUTTE COUNTY—To E. B. Bishop, Box 325, Orland, $17,092 for 2.9 mi. grad. and untr. cr. grav. or stone surf. betw. 3.4 mi. E. of Butte Creek and Cherokee Canal. 12-18

SACRAMENTO, CALIF.—Awards as follow by Calif. Div. of Highways, Sacramento, for: (1) PLACER COUNTY—To Hemstreet & Bell, 501 11th St., Marysville, $28,131 for 1.5 mi. grad. and cr. run base surf.

and seal coat applied betw. Lincoln and Newcastle at various locations. (2) SACRAMENTO COUNTY—To A. Teichert & Son, Inc., P. O. Box 1113, Sacramento, $131,857 for 16.4 mi. grading, exist. pavmt. widened with cr. run base and portions resurf. with plant mix surf. betw. Walnut Grove and Freeport. (3) ALAMEDA COUNTY—To Heafey-Moore Co., 344 High St., Oakland, $41,238 for 0.7 mi. grad and asph. conc. paving portions, exist. RR track removed and new tracks installed on adjacent private right-of-way on 12th St., in Oakland betw. 20th Ave. and 29th Ave. (4) CALAVERAS COUNTY—To Biasotti, Willard & Biasotti, 40 W. Clay St., Stockton, and Rocca & Co., 15 4th St., San Rafael, $146,939 for 1.8 mi. grading and const. reinf. concr. bridge betw. S. Fork of Mokelumne River and Herbert's Ranch. 12-18

SACRAMENTO, CALIF.—To Oswald Bros., 366 E. 58th St., L. A., $94,078 by Calif. Div. of Highways, Sacramento, for 5.4 mi. grad. and surf. with roadmix surf over grav. base betw. 1 mi. E. of Santa Ynez and Los Olivos in SANTA BARBARA COUNTY, Calif. 12-10

SACRAMENTO, CALIF.—To Stewart & Nuss, Inc. & John Jurkovich, 3530 Balch Ave., Fresno, $30,244 by Calif. Div. of Highways, Sacramento, for 1.6 mi. grad. betw. Junction with Route 41 and 1½ mi. west, Fresno-Sand Creek Road, FRESNO COUNTY. 12-10

SACRAMENTO, CALIF.—To Southern Calif. Roads Co., 2145 E. 25th St., L. A., $67,509 by Calif. Div. of Highways, Sacramento, for 5.1 mi. grad. and roadmix surf. betw. 4 mi. S. of Shafter and Shafter in KERN COUNTY, Calif. 12-12

SACRAMENTO, CALIF.—To Stewart & Nuss, Inc., & John Jurkovich, 3530 Balch Ave., Fresno, $34,328 by Calif. Div. of Highways, Sacramento, for 1.3 mi. grading betw. E. entrance to Kern County Park and 1¼ miles east (Kern Park Road) in KERN COUNTY, Calif. 12-12

SACRAMENTO, CALIF.—To A. Teichert & Son, Inc., P. O. Box 1113, Sacramento, $177,031 by Calif. Div. of Highways, Sacramento, for 6.6 mi. grading and cr. run base and roadmix surf. between 1 mi. E. of Cholame and Kern County Line in SAN LUIS OBISPO COUNTY, Calif. 12-12

SACRAMENTO, CALIF.—To N. M. Ball Sons, 1889 Yosemite Road, Berkeley, who bid $38,488 by California Div. of Highways, Sacramento, for 1.7 mi. grading and crusher run gravel surfacing and treating with asphalt at the Oakes and Clow Creek (Mendocino 48 A & B) MENDOCINO COUNTY, Calif. 12-12

SACRAMENTO, CALIF.—To A. Teichert & Son, Inc., P. O. Box 1113, Sacramento, $67,255 by Calif. Div. of Highways, Sacramento, for 5.5 mi. grad. and roadmix surf. tr. and seal coat betw. Ede's Ranch and Beckworth Pass, PLUMAS COUNTY, Calif. 12-13

SACRAMENTO, CALIF.—To Hemstreet & Bell, 501 11th St., Marysville, $146,014 by Calif. Div. of Highways, Sacramento, for 14.8 mi. widening roadbed and widen strip const. consisting of plant mix surf. (med. curing type) on untr. cr. grav. or stone base betw. southerly boundary and 3 mi. N. of Los Molinos in TEHAMA COUNTY, Calif. 12-13

SACRAMENTO, CALIF.—Awards as follow by Calif. Div. of Highways, Sacramento, for: (1) SHASTA COUNTY—To Peninsula Paving Co., 9 Main St., S. F., $197,656 for 7.7 mi. grad. and cr. run base and pl. mix surf. betw. 1.5 mi. E. of Bella Vista and Diddy Hill. (2) SONOMA COUNTY—To N. M. Ball Sons, 1889 Yosemite Road, Berkeley, $60,856 for 1.8 mi. grad. and cr. run base and bitum. macad. surf. betw. Stoney Point and Cotati. 12-16

SACRAMENTO, CALIF.—To C. F. Fredericksen & Sons, Lower Lake, Calif., $79,235 by Calif. Div. of Highways, Sacramento, for 1⅛ mi. grading and penetr. oil tr. applied betw. 2½ mi. W. of Cedarville and the Nevada State Line, MODOC COUNTY, Calif. 12-23

SACRAMENTO, CALIF.—To Lord & Bishop, Native Sons Bldg., Sacramento, who bid $55,835 by Calif. Div. of Highways, Sacramento, for 0.5 mi. grading and surfacing with bitum. macadam on crushed run base and const. 2 bridges through the town of Ben Lomond, SANTA CRUZ COUNTY, Calif. 12-23

DENVER, COLO.—To Larson Const. Co., 1902 Blake St., Denver, Colo., $31,536 by Bureau of Public Roads, Denver, Colo., for 4.483 mi. dense graded bitum. road mix surf. on the Deer Ridge Moraine Park Highway located in Rocky Mountain National Park, LARIMER COUNTY, Colo. 12-2

DENVER, COLO.—Awards as follow by State Highway Dept., Denver, Colo., for: (1) CROWLEY COUNTY (WPSS 359C)—To W. F. Pigg & Son, Inc., Commonwealth Block, Denver, $13,157 for 3 mi. gravel surfacing betw. Ordway and Limon. (2) KIOWA COUNTY (WPSS 402B)—To Monaghan & Kenney, 357 S. Down St., Denver, Colo. $83,636 for 10 mi. gravel surfacing betw. Eads & Chivington. 12-16

DENVER, COLO.—To Pople Bros. Const. Co., 748 W. Main St., Trinidad, Colo., $48,212 by State Highway Dept., Denver, Colo., for 6.5 mi. grav. surf. betw. Springfield & Campo in BACA COUNTY, Colo. WPSS 354 C. 12-20

DENVER, COLO.—To Driscoll Const. Co., P. O. Box 733, Pueblo, Colo., $78,792 by State Highway Dept., Denver, Colo., for 3 mi. grav. surf. betw. Starksville and Morley in LAS ANIMAS COUNTY, Colo. 12-20

BOISE, IDAHO—To Olof Nelson, Box 413, Logan, Utah, $75,236 by Comm. of Public Works, Boise, Idaho, for 3.961 mi. roadbed, drain. struc. and plac. screen grav. subbase and surf. matl. full width of roadbed on Old Oregon Trail Highway betw. Onyx and McCammon in BANNOCK COUNTY, Idaho. 12-9

BOISE, IDAHO—To Robinson Const. Co., Twin Falls, Ida., $23,619 by Comm. of Pub. Works, Boise, for 4.971 mi. surf. with cr. grav. on North Side Highway, from Hazelton-east in JEROME COUNTY, Ida. (WPH 37-J & SAP 38-E). 12-13

BOISE, IDAHO—Awards as follow by Comm. of Public Works, Boise, Idaho, for: (1) GEM and BOISE COUNTIES—To Quinn-Robbins Co., Inc., Boise, Ida., $63,738 for 5.596 mi. grading, drain. struc. and cr. grav. surf. betw. Montour and Horseshoe Bend on Payette Highway, Emmett Branch. (2) JEFFERSON COUNTY—To Western Const. Co., Pocatello, Ida., $55,970 for 4.837 mi. grad., drain. and irrig. struc. and cr. grav. surf. from Rigby east on Roberts-Rigby-Ririe Highway. 12-16

BOISE, IDAHO—Awards as follow by Comm. of Public Works, Boise, Idaho, for: (1) LEMHI COUNTY (WPH 5-A)—To W. C. Burns, Idaho Falls, Ida., $63,602 for 5.811 mi. const. roadbed and drain. struc. on the Sawtooth Park Highway betw. Ellis and Salmon. (2) BONNER COUNTY (WPSS 157-B)—To Clifton & Applegate, Spokane, Wn., $36,117 for 3.534 mi. const. roadbed, drain. struc. and cr. rock surf. on Spirit Lake Highway, north and south of Blanchard. (3) LINCOLN COUNTY (WPSS 188-B)—To Robinson Const. Co., Twin Falls, Ida., $65,593 for 6.101 mi. grading, dr., and surf., with cr. grav. on the Richfield Branch of the Sawtooth Park Highway between Shoshone and Marley. 12-19

BOISE, IDAHO—To Triangle Const. Co., Boise, Ida., $63,645 by Comm. of Public Works, Boise, Idaho, for 7.140 mi. const. roadbed and drain. struc. on Boise Basin Highway betw. Barber & Gooseneck Bridge, ADA COUNTY, Ida. 12-23

BOISE, IDAHO—To W. C. Burns, Idaho Falls, Ida., $145,744 by Comm. of Public Works, Boise, Idaho, for 11.167 mi. const. roadbed and drainage struc. and placing screened gravel subbase where required on

the Yellowstone Park Highway betw. Preston and Bannock County Line in FRANKLIN COUNTY, Idaho. 12-23

HELENA, MONT.—Awards as follow by State Highway Department, Helena, Mont.: (1) MADISON COUNTY (WPH 281C)—To Threet Bros., Lovell, N. M., $64,737 for 6.678 mi. grad. and const. small dr. str. and const. timb. pile trestle bridges on Sec. C of the Vigilante Trail. (2) ROSEBUD COUNTY (WPGH 114 A, Unit 4)—To McNutt Bros., 351½ E. Broadway, Eugene, Ore., $80,655 for 5.503 mi. grad. surf. and const. small dr. struc. on Sec. A of the Hysham-Forsyth Rd. (3) DAWSON COUNTY (WPMH 199-A)—To Nolan Bros., 18 N. 2nd St., Minneapolis, Minn. $22,057 for 0.595 mi. grad. and surf. on Merrill Ave. in City of Glendive. (4) LEWIS & CLARK COUNTIES (WPMS 372)—To M. J. Kiely & Son, Butte, Montana, $78,913 for 0.841 mi. grad. and const. small dr. struc. and pav. with concr. on State Capitol, Approach Road in City of Helena. (5) TREASURE COUNTY (WPMS 373)—To D. M. Manning, Hysham, Mont., $19,833 for grading, surf. and const. small dr. struc. on Elliott Ave. and Buford St. in town of Hysham. (6) GOLDEN VALLEY and YELLOWSTONE COUNTIES—To Callison & Dolvin, Inc., Billings, Mont., $119,497 for 8.467 mi. grad. and surf. and const. small drain. struc.; also const. 4 tr. trestle bridges on Lavina South Road. (7) PONDERA COUNTY (WPMS 357 A. & WPSO 357B)—To Tomlinson-Arkwright Const. Co., Great Falls, Mont., $55,659 for 4.564 mi. grad. and surf. and const. small dr. struc. on Sec. A. & B. of the Valier E. Road. (8) SWEET GRASS COUNTY (WPSO 365)—To C.&F. Teaming & Trucking Co., Butte, Montana, $49,378 for 2.894 mi. grading, surfacing and const. small drainage struc. on Big Timber N. Road. (9) TREASURE COUNTY (WPSO 367, Units 1 and 2)—Callison & Dolvin, Inc., Billings, Montana, $42,897 for 3.101 mi. grading, surfacing and constructing small drainage structures and constructing tr. timber pile trestle bridge across Buckingham Road. 12-3

BILLINGS, MONT.—To A. Lalonde, Bainville, Mont., $52,919 by State Highway Comm., Billings, Mont., for 4.407 mi. grading, surf. const. small drainage struc. and misc. work, including tr. timber pile trestle bridge on the Wibaux South Road in WIBAUX COUNTY (WPSO 345) Mont. 12-27

BILLINGS, MONT.—Awards as follow by State Highway Comm., Billings, Montana, for: (1) DAWSON COUNTY (WPMH 199A)—To Nolan Bros. Co., 18 N. 2nd St., Minneapolis, $22,357 for 0.595 mi. grad., surf., etc. on Merrill Ave. in City of Glendive. (2) MISSOULA COUNTY (WPH 237-B)—To J. C. O'Conner, Butte, $101,259 for 4.048 mi. grad. and const. small dr. struc. on Sec. B of the Bonner-Ovando Road. (3) TOOLE COUNTY (WPSO 366)—To S. Birch and Sons Const. Co., Great Falls, Mont. $59,896 for 3.695 mi. grad., surf. and const. small drain. struc. on the Sweet Grass West Road. (4) VALLEY COUNTY (WPSO 368)—To C. Braathen, Malta, Mont., $29,789 for 2.339 mi. Grad., surf. and const. small dr. struc., etc., on the Opheim South Road. (5) SHERIDAN COUNTY (WPH 251 E)—To Lobnitz Bros., Libby, Mont., $101,259 for 11.976 mi. grad. and const. small dr. struc. on Sec. E of Plentywood-Scobey Road. (6) MUSSELSHELL COUNTY (WPMH 328 & WPH 328B)—To Tomlinson-Arkwright Const. Co., Great Falls, Mont., $104,416 for 12.577 mi. grade and const. small dr. str. on Sec. A & B of Roundup-Forsyth Road. 12-27

BILLINGS, MONT.—Awards as follow by State Highway Comm., Billings, Montana, for: (1) CARTER COUNTY (WPSO 347)—To J. C. Boespflug, Miles City, $38,441 for 2.342 mi. grading, surf. and const. small dr. struc. on the Ekalaka-Alzada Road. (2) CASCADE & CHOTEAU COUNTIES (WPSO 348)—To S. Birch & Sons Const. Co., Great Falls, Mont., $24,292 for 1.025 mi. grad., surf. and const. small dr. struc. on Fourt Corners-Highwood Road. (3) DEER LODGE COUNTY (WPSO 352)—To Lawler Corp., Lewisohn Bldg., Butte, $45,854 for 1.149 mi. grad. and const. small dr. struc. on the Anaconda-Ralston Road. (4) GRANITE COUNTY (WPSO 354)—To L. A. Gudgel & Sons, Kalispell, $38,337 for 2.449 mi. grad., surf. and const. small dr. struc. and const. timb. trestle bridges on Philipsburg-Skalkaho Road. (5) PETROLEUM COUNTY (WPSO 356)—To Callison & Dolvin, Inc., Billings, $49,502 for 5.516 mi. grad., surf. and const. small dr. struc. on the Winnett South Road. (6) RICHLAND COUNTY (WPSO 361)—To A. Lalonde, Bainville, $39,966 for 3.932 mi. grad., surf. const. dr. struc. and const. tr. timb. pile trestle on Fairview West Road. (7) BIGHORN COUNTY (WPSS 5-A & WPSS 5-B)—To C. A. Wagner, Sioux Falls, S. D., $43,989 for 3.369 mi. grad., surf. const. small drain. struc. and 2 timb. bridges on Hardin-Custer Highway. (8) CUSTER COUNTY (FAP 18)—To Prahl & Sawtelle, Miles City, $168,964 for 13.739 mi. grad., surf. and small dr. struc. on Tongue River Road No. 1 and Sec. D of Miles-City Broadus Road. 12-27

CARSON CITY, NEV.—Awards as follow by Nevada State Highway Comm., Carson City, for: (1) ELKO CO. To Utah Const. Co., Ogden, Utah, $159,007 for 26.07 mi. cr. grav. or stone surf. betw. 26 mi. South of Wells and Wells, Rt. 13, Sec. B3. (2) MINERAL & LYON CO. (FAP 80-B)—To Isbell Const. Co., P. O. Box 2351, Reno $57,646 for 14.73 mi. cr. grav. or stone surf. betw. Schurz and 9½ mi. E. of Yerington, Rt. 3, Sec. G. & A3. (3) PERSHING CO. To Jack Casson, 319 Warren St., Hayward, $49,109 for 4.98 mi. grading, etc. betw. Lovelock and 5 mi. South in Nevada. (4) WHITE PINE CO. To George French, Jr., Box 107, Stockton, $84,546 for 5.38 mi. cr. grav. or stone surf. betw. Lund & Preston, Rt. 38, Sec. A, Proj. WPSS 130. 12-5

CARSON CITY, NEV.—Awards as follow by Nevada State Highway Comm., Carson City, for: (1) STOREY & LYON CO. To Nevada Rock & Sand Co., Reno, Nev., $180,004 for 5.19 mi. grad. & grav. surf. betw. Virginia City and Silver City, Rt. 17, Sec. B&A2. (2) CLARK CO. To Pacific Const. Co., Box 1666, Reno, $83,860 for 2.5 mi. grav. surf. & curbs, gutters, etc. on Main St., etc. near N. city limits of Las Vegas. (3) WHITE PINE CO. To Pacific Const. Co., Box 1666, Reno, $48,505 for 0.88 mi. grav. surf., const. curbs and gutters in City of Ely, Rt. 4, Sec. B3. (4) CLARK CO. To Pacific Const. Co., Box 1666, Reno, $82,602 for 8.31 mi. grad. & grav. surf. from Railroad Pass toward Searchlight. 12-13

SANTA FE, NEW MEXICO—Awards as follow by State Highway Engineer, Sante Fe, for: (1) LEA COUNTY (Proj. No. 4-B)—To Henry Thygesen, Albuquerque, $87,338 for 7.209 mi. grad., minor dr. struc., surf. & misc. const. betw. Carlsbad and Hobbs in EDDY and LEA COUNTIES, U. S. Highway No. 62. (2) GUADALUPE COUNTY (WPMH 22)—To Henry Thygesen, Albuq. $196,890 for 11.325 mi. grad., minor drain. struc., concr. box culv. and misc. const. on U. S. Highw. 66, east and west from Santa Rosa. (3) GUADALUPE COUNTY (WPGH 97-H, Unit 2)—To Walter H. Denison, Vaughn, N. M., $79,393, for 17.324 mi. grad., minor drain. struc., 4 multiple span conc. box culv., and misc. const. on U. S. Highway Rt. 60, between Vaughn and Fort Sumner. 12-5

SANTA FE, NEW MEXICO—Awards as follow by State Highway Engineer, Sante Fe, for: (1) QUAY COUNTY (FAP 5)—To A. O. Peabody, Las Cruces, $267,460 for 16.937 mi. grading, minor drain. struc., 4 conc. & steel bridges and 7 multiple span conc. box culverts, each of over 20' clear span, 2 course surf. and misc. const. of Highway Route 54-65, betw. Santa Rosa and Tucumcari. (2) EDDY COUNTY (WPSS 206-D)—To Dudley Stone Products Co., El Paso, $92,598 for 8.295 mi. grad., minor drain. struc., 2 course surf. and misc. const. on State Highway No. 83, betw. Artesia and Lovington. (3) HIDALGO COUNTY (WPGH 54)—To

Brown Bros. $52,565 for .568 mi. grading, const. concr. and steel overpass of 2 50' spans and 1 60' span and miscel. const. on U. S. Highway Route 80, betw. Rodeo and Lordsburg. (4) EDDY COUNTY (Proj. No. 5)—Dudley & Stone Produc. Co., El Paso, $80,360 for grading, minor drain struc., 2-course surf. and misc. const. on St. Highw. 83, betw. Artesia and Lovington. 12-21

SANTA FE, NEW MEXICO—Awards as follow by State Highway Engineer, Santa Fe, N. M., for: (1) CHAVES COUNTY (WPH 12-B)—To Armstrong & Armstrong, Roswell, $178,699 for 16.9 mi. grading, drainage struc., culverts and surfacing on U. S. Highway Rt. 389. (2) CATRON COUNTY (WPSS 217-B)—To Ernest W. Everly, Albuquerque, N. M., $109,167 for 11.6 mi. grading, draining, surfacing and miscellaneous construction on State Highway Route No. 12, between Reserve and Horse Springs. 12-23

PORTLAND, ORE.—Awards as follow by Oregon State Highway Commission, Portland, for: (1) LANE COUNTY (WPMH 262-B)—To Itschner & Ridgon, Barlow, Ore., $26,855 for 1.8 mi. grad. Junction City-Siuslaw Junc. Sec. of Junction City-Eugene Second. Highway. (2) LINN and POLK COUNTIES (WPSO 261&WPSO)—To E. C. Gerber, Oregon City, Ore., $33,353 for 12.87 mi. oil mat. surf., tr. on Byerley Corner-Bethel Sec. of Lincoln-Ballston County Road in Pol, Co., and Corvallis Junc-Peoria Sec. of Corvallis-Harrisburg County Road in LINN COUNTY. (3) MALHEUR COUNTY (St. Proj.)—To Quinn-Robbins Co., Inc., Robt. Noble Bdg., Boise, Ida., $9,684 for furn. approx. 7,000 cu. yd. cr. grav. in stockpiles on Cairo-Adrian Rock Produc. Proj. on Old Oregon Trail and Jordan Valley Secondary Highway. (4) MARION COUNTY (WPSS 265)—To R. O. Dail & Warren Bros., P. O. Box 444, Aberdeen, Wn., $53,375 for 13.69 mi. resurf. and oil mat. surf. tr. on Silverton-Silver Creek Falls Sec. of Silver Creek Falls Second. Highw. (5) UNION and WALLOWA COUNTIES—To Homer G. Johnson, Imperial Hotel, Portland, $134,574 for 5.76 mi. regrad., surf. etc. on Island City-Grande Ronde River Sec. of Cove. Sec. Highway and 5.98 mi. regrad. surf. etc. on Enterprise-Joseph Sec. of Wallowa Lake Highway. (6) UNION COUNTY (State Project)—To A. S. Wallace, Roseburg, Oregon, $13,260 for 6,000 cu. yd. crushed rock in stockpiles on Hot Lake-Bidwell Hill Rock Production project on the Old Oregon Trail. 12-3

PORTLAND, ORE.—To M. L. O'Neil & Son, Eugene, $41,779 by Ore. State Hwy. Comm., Portland, Ore. for 2.07 mi. grading on Agency Sec. of Warm Springs Highway, JEFFERSON COUNTY, Ore. FLH 2-B. 12-2

SALT LAKE CITY, UTAH—To W. W. Clyde & Co., Springville, Utah, $82,422 by Utah State Road Comm., Salt Lake City, for 5.664 mi. gravel surfacing road betw. Klondyke Wash and Seven-Mile Wash, FAP 5 & FLHP 20-A in GRAND COUNTY, Utah. 12-5

SALT LAKE CITY, UTAH—To J. M. Sumison, Springville, Utah, $25,546 by Utah St. Road Comm., Salt Lake City, for 10.341 mi. const. graded earth road betw. Nephi and Levan and Levan Siding Revision, in JUAB COUNTY, Utah, Project WPMH 70-A&WPH 17-C. 12-14

SALT LAKE CITY, UTAH—To Strong & Grant, Springville, Utah, $31,080 by Utah St. Road Comm., Salt Lake City, for 2.938 mi. const. graded earth road betw. Provo and Springville in UTAH COUNTY, Utah, Project WPMH 35-A-B & 37-A.

SALT LAKE CITY, UTAH—Awards as follow by Utah State Road Comm., Salt Lake City, for: (1) EMERY COUNTY (WPH 4-F&H)—To J. M. Sumison, Springville, $33,694 for 3.682 mi. grav. surf. road betw. Castle Dale and Ferron. (2) WASHINGTON COUNTY (WPMH 113-C)—To Knowlton & Rupert, Layton, Utah, $32,572 for 2.726 mi. graded earth road betw. Hurricane and La Verkin Junction. (3) SALT LAKE COUNTY (WPMS 165)—To Floyd S. Whiting, Kaysville, $40,180 for 1.208 mi. gravel surfaced road betw. Beck St. and Columbis St. 12-26

CHEHALIS, WN.—To Graham Bros., & Medley, 974 North St., Chehalis, Wn., $35,238 by Lewis County Comm., Chehalis, Wn., for 1.1 mi. improving Bear Canyon Road on Secondary Highway (PWA project) and const. a steel bridge across Tilton River at Old Bergen place. 12-18

DAYTON, WN.—To H. C. Rogers & Sons, P. O. Box 181, Dayton, Wn., $7,432 by Columbia County Comm., Dayton, Wn., for grading and draining 3 mi. of Secondary Highway No. 21, COLUMBIA COUNTY, Wn. 12-12

EVERETT, WN.—To E. J. Templeton & Co., 902 Hoyt Ave., Everett, Wn., $26,556 by City Clerk, Everett, Wn., for paving 16th St. betw. Rockefeller and Walnut Streets. 12-16

EVERETT, WN.—To E. J. Templeton & Co., 902 Hoyt Ave., Everett, Wn., $60,886 by City Clerk, Everett, Wn., for 19.055 sq. yd. concr. paving on 19th St. from Rucker to Walnut Sts. 12-19

OLYMPIA, WN.—To Elliott & Co., Inc. 2155 Northlake, Seattle, $203,763 by Director of Highways, Olympia, Wn., for 3.1 mi. grad. & surf. with cr. stone on Co. Rd. Winesap North. 12-5

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) ADAMS COUNTY—To G. J. Morris, Spokane, Wn., $11,474 for 3.2 mi. grad. and surf. on County Road, Ralston vicinity. (2) COLUMBIA COUNTY—To J. C. Wachter, Inc., Stevenson, Wn., $7,343 for 1.1 mi. grading and ballasting on County Rd. Tucannon River Road. (3) LINCOLN COUNTY—To Leo J. Lavin, Coulee City, Wn., $17,856 for 3.4 mi. grading and surf. on County Road, Creston south. 12-5

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) GRAYS HARBOR COUNTY—To R. O. Dail & Warren Bros., Box 444, Aberdeen, Wn., $55,870 by above for 4.7 mi. grading, draining and surf. on State Road No. 9, Malone to Elma. (2) CLALIAM COUNTY—To Walker Const. Co., 4540 S. Adams St., Tacoma, $95,895 for 5.6 mi. grading, draining and surfacing on State Road No. 9, Sequim to Blyn. 12-23

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) GRANT COUNTY (WPSO 197-A)—To F. R. Hewett, 420 W. 22nd Ave., Spokane, Wn., $110,556 for 21.4 mi. surf. with cr. stone and const. bitum. surf. tr. on County Road, Soap Lake to Coulee City. (2) PEND OREILLE COUNTY (WPGH 193-H)—To N. A. Degerstrom, Peyton Bldg., Spokane, Wn., $109,904 for 5.1 mi. grad. and cr. stone surf. on St. Rd. No. 6, Dalkena to Cusick. (3) ASOTIN COUNTY (WPH 124-B)—To G. D. Lyon & Co., Hutton Bldg., Spokane, Wn., $33,910 for 0.9 mi. grad. and surf. with cr. stne on St. Rd. No. 3, Clarkston, West, Sec. 1. 12-23

SEATTLE, WN.—To Northwest Const. Co., 3950 6th, N. W., Seattle, Wn., $31,619 by King County Comm., Seattle, Wn., for concr. paving and surf. on 1.25 mi. of the Military Road south of Seattle. 12-4

SEATTLE, WN.—Awards as follow by King County Comm., Seattle, for: (1) N. Fiorito, Inc., 844 W. 48th St., Seattle, $22,027 for clear., grad., grub. and ditching, incl. 0.81 mi. conc. pav. on 3rd Ave. N. W. (2) N. Fiorito, Inc., Seattle, Wn., $46,867 for clearing, grad., grub. and ditching, incl. 0.26 mi. bitum. pav. and 1.69 mi. conc. pav. on Maple Valley-Black Diamond Road. (3) N. Fiorito, Inc., Seattle, Wn., $53,945 for clearing, grubbing, grading and graveling 3 mi. on the R. A. Ballinger Road. 12-12

TACOMA, WN.—To Joseph Warter, Jr., 631 N. Fife St., Tacoma, Wn., $26,405, by County Comm., Tacoma, Wn., for improving 1½ miles of Puyallup-Graham Road, Proj. No. 46. 12-12

VANCOUVER, WN.—Awards as follow by Board of County Comm., Vancouver, Wn., for: (1) To Klinelin, Barns & Johnson, Vancouver, Wn., $19,958 for 2.77 mi. regrading and resurf. the Jaggy Road. (2) To Klineline, Barns & Johnson, Vancouver, Wn., $17,398 for grading and surfacing of 1.64 mi. Mill Plain Road and 1.24 mi. on Ellsworth Road. 12-17

Bridges and Culverts . . . . . .

BIDS RECEIVED

LOS ANGELES, CALIF.—Oscar Oberg, 150 N. Vista St., Los Angeles, $154,942 low to Calif. Div. of Highways, L. A., for undergrade crossing on Soto Street, under tracks of Union Pacific Railroad in Los Angeles, consisting of reinf. conc. abutments on timber pile foundations with steel superstructure; also approximately 0.22 miles roadway to be grad. and conc. pav. in LOS ANGELES COUNTY, Calif. 12-19

LOS ANGELES, CALIF.—L. E. Dixon Co., 609 S. Grand Ave., L. A., $241,661 low for Calif. Div. of Highways, L. A., for const. undergrade crossing under tracks of Pacific Elec. Ry. at Mission Rd. in L. A., LOS ANGELES COUNTY. 12-19

LOS ANGELES, CALIF.—Clinton Const. Co. of California, 923 Folsom St., San Francisco, $578,420, low to Calif. Div. of Highways, L. A., for overhead crossing over tracks of S. P. Railroad and L. A. Railway at Figueroa Street in Los Angeles, consisting of one 127', one 200' and one 103' steel plate girder span and 5 75' concrete girder spans on concrete piers and abutments; also 0.23 mi. roadway to be grad. and asph. conc. paved in LOS ANGELES COUNTY, Calif. 12-19

LOS ANGELES, CALIF.—Griffith Co., L. A. Railway Bldg., Los Angeles, $116,864 low to Calif. Div. of Highways, L. A., for overhead crossing over Valley Blvd. and tracks of S. P. Railroad in Los Angeles at Soto Street, consisting of concrete piers and abutments with steel superstruc. and approx. 0.62 mi. grading and asphalt concrete paving roadway in LOS ANGELES COUNTY. 12-19

SACRAMENTO, CALIF.—N. M. Ball Sons, 1889 Yosemite Rd., Berkeley, $91,790 low to Calif. Div. Highw. Sacramento, for undergr. cross. under S.P.R.R. tracks and 0.45 mi. grad. and conc. pav. rdw. ½ mi. south of Red Bluff. 12-11

SACRAMENTO, CALIF.—Barrett & Hilp, 918 Harrison St., San Francisco, $152,897 low to Calif. Div. of Highways, Sacramento, for const. undergrade crossing under S. P. tracks at LaFayette St. in Santa Clara, SANTA CLARA COUNTY, Calif. 12-11

PORTLAND, ORE.—Bids received as follow by the Oregon State Highway Comm., Portland: (1) GRANT COUNTY (WPSO 260)—Tom Lillebo, Reedsport, Ore., $62,818 low for bridge over N. Fork of John Day River and 0.48 mi. grad. and surf. on Long Creek-Monument County Road at Monument. (2) KLAMATH COUNTY (WPGS 30-A)—All bids submitted on const. concr. bridge over OC&E RR and 0.51 mi. grad. and surf. etc. on Klamath Falls-Lakeview Highw. were rejected. 12-3

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To Shofner & Gordon, 1631 N. Main St., L. A., $106,024 by Calif. Div. of Highways, L. A., for undergrade crossing over Pacific Electric tracks at Firestone Blvd. in Los Angeles, LOS ANGELES COUNTY, Calif. 12-18

LOS ANGELES, CALIF.—To Byerts & Dunn, 1131 N. Orange Ave., L. A., $51,838 by Calif. Div. of Highw. L. A., for const. overhead crossing over S. P. Co.'s tracks in RIVERSIDE COUNTY, Calif. 12-4

LOS ANGELES, CALIF.—Awards as follow by Calif. Div. of Highways, L. A., for: (1) LOS ANGELES COUNTY—To Sharp & Fellows Contracting Co., 533 Central Bldg., L. A., $202,941 for steel and conc. overh. crossing over AT&SF RR at Wilmington consist. of 4 61' 6" spans, 2 42' spans and 2 39' spans and grade and asph. conc. pav. appr. and conc. paving strips. (2) RIVERSIDE COUNTY—To B. G. Carroll, 4396 Maryland St., San Diego, $105,829 for reinf. conc. girder overh. crossing over SP RR tracks 2.24 mi. W. of Indio, consisting of 1 61' clear span and 2 45' 6" clear spans and 0.54 mi. grad. and conc. paving roadway. 12-13

LOS ANGELES, CALIF.—To John Strona, Pomona, $146,122 by Calif. Div. of Highw. L. A. for undergrade crossing under AT&SF RR tracks at Hobart, consist. of 2 steel beam spans with conc. deck on conc. pier and 2 conc. abutments with wingwall, in LOS ANGELES COUNTY, Calif. 12-13

LOS ANGELES, CALIF.—To Geo. Herz & Co., Platt Bldg., San Bernardino, $60,808 by Calif. Div. of Highways, L. A., an undergrade crossing under AT&SF RR near Verdemont, consisting of two conc. abutments with steel and conc. superstructure and .57 mi. grad. and plant-mix surf. approaches in SAN BERNARDINO COUNTY, Calif. 12-19

LOS ANGELES, CALIF.—To Mundo Engineering Co., 2305 E. 9th St., Los Angeles, $104,729 by Calif. Div. of Highways, L. A., for an undergrade crossing under AT&SF RR at Northam near Buena Park, consisting of 2 conc. abutments with wingwalls and steel plate girder superstructure. Sides of the cut to be slope pavement and 0.86 mi. grad. and conc. paving approaches in ORANGE COUNTY, Calif. 12-19

LOS ANGELES, CALIF.—To Basich Bros., 20550 N. Normandie Ave., Torrance, $54,142 by Calif. Div. of Highways, L. A., for overh. crossing over AT&SF RR, 8 mi. W. of Needles, in SAN BERNARDINO COUNTY, Calif. 12-19

SACRAMENTO, CALIF.—To M. B. McGowan, Inc., Call Bldg. San Francisco, $38,969 by Calif. Div. of Highways, Sacramento, for undergrade crossing under SP RR tracks at Army St., in San Francisco, to be widened, in SAN FRANCISCO COUNTY, Calif. 12-18

SACRAMENTO, CALIF.—To Bodenhamer Const. Co., 1101 75th Ave., Oakland, $149,371 by Calif. Div. of Highways, Sacramento, for undergrade crossing under tracks of WP RR at Washington Ave., consisting of 2 reinf. concr. abutments with steel superstruc. and approx. 0.26 mi. grad. and conc. pav. near San Leandro, ALAMEDA COUNTY, Calif. 12-18

SACRAMENTO, CALIF.—To Parish Bros., 1222 North Gower St., Los Angeles, $12,425 by Calif. Div. of Highways, Sacramento, for a reinf. conc. bridge on Las Positas Road over S. P. Railroad and Santa Barbara, SANTA BARBARA COUNTY, Calif. 12-12

SACRAMENTO, CALIF.—Awards as follows by Calif. Div. of Highways, Sacramento, for: (1) ALAMEDA COUNTY—To A. Soda & Son, 5231 Grove St., Oakland, $49,469 for undergr. crossing under Sacramento Northern RR at Mt. Blvd. in Oakland, consisting of 2 conc. abutm. and steel superstruc. and 416 ft. roadw. to be grad. and asph. conc. pav. (2) FRESNO COUNTY—To R. R. Bishop, 5017 E. Broadway, Long Beach, $184,766, for overh. crossing over AT&SF RR consist. of 158 lin. ft. track span and 28 40-ft. conc. girder spans on conc. piers and abutm. with timb. pile foundation approaches const. and conc. paved. 12-13

SACRAMENTO, CALIF.—To Griffith Co., L. A. Railway Bldg., Los Angeles, $295,611 by Calif. Div. of Highways, Sacramento, for grade separation project under S. P. tracks consisting of 2 reinf. concrete abutments and a steel girder structure for carrying Railroad tracks, and a rein. conc. bridge across Poso Creek and 2.2 miles grading and paving State Highway and const. structure at Famosa, KERN COUNTY, Calif. 12-23

SACRAMENTO, CALIF.—To Biasotti, Willard & Biasotti, 40 West Clay St., Stockton, and Rocca & Co., 15 4th St., San Rafael, $267,421 by Calif. Div. of Highways, Sacramento, for undergrading crossing under S. P. & W. P. RR. at Charter Way in Stockton, consisting of reinf.

concrete abutments with steel superstructures and 0.21 miles grading and concrete paving roadway in SAN JOAQUIN COUNTY, Calif. (See Unit Bid Summary) 12-19

SACRAMENTO, CALIF.—To F. O. Bohnet, Union Avenue, Campbell, $249,108 by Calif. Div. of Highways, Sacramento, for undergrade crossing under S. P. tracks at Salinas, MONTEREY COUNTY, Calif. 12-19

SACRAMENTO, CALIF.—To Paul J. Tyler, Oroville, and Lord & Bishop, Native Sons Bldg., Sacramento, $155,187 Calif. Div. of Highways, Sacramento, for undergrade crossing under S. P. tracks, consisting of 2 reinf. conc. abutments with steel superstructure and grading and concrete paving and roadmix surfacing of roadway at Soledad, in MONTEREY COUNTY. (See Unit Bid Summary) 12-19

SACRAMENTO, CALIF.—Awards as follows by Calif. Div. of Highways, Sacramento, for: (1) SAN JOAQUIN COUNTY—To Lindgren & Swinerton, 225 Bush St., $223,255 for overhead crossing over S.P. RR. tracks ½ mi. E. of Tracy, consist. of 1 81 ft. and 2 48 ft. plate girder spans, 2 52 ft. steel beam spans and 29 40 ft. reinf. concr. girder spans on conc. bents & abutm. with wingwalls on timb. pile founda. and 0.3 mi. grad. & conc. pav. (2) SANTA CLARA COUNTY—To Eaton & Smith, 715 Ocean Ave., S. F., $132,213 for undergrade crossing under tracks of S.P. RR. at Embarcadero Road in Palo Alto, consist. of 2 concr. abutm. and steel superstruc. and approx. 0.21 mi. roadway to be graded and conc. paved. (3) SACRAMENTO COUNTY—To Lord & Bishop, Native Sons Bldg., Sacramento, $36,026 for widening undergr. crossing at 16th St., Sacramento. (4) ALAMEDA COUNTY—To Peninsula Paving Co., 9 Main St., S. F., $87,161 for undergr. crossing under W.P. RR. tracks at Jackson St., consist. of 2 reinf. conc. abutm. with steel superstruc. and approx. 0.15 mi. grade and conc. pav. at Hayward. (5) SAN FRANCISCO COUNTY—To F. C. Amoroso & Sons, Keith & Wallace Ave., S. F., $28,940 for widen. overh. crossing over S. P. tracks at Williams St. in S. F. consist. of 1 42 ft. and 1 43 ft. 7 in. steel I-Beam span on steel bent and concr. abutum. with wingwalls on spread footings. (6) ALAMEDA COUNTY—To Lindgren & Swinerton, 225 Bush St., S. F., $103,386 for undergrade crossing under tracks of Sacramento Northern Ry. at Broadway Terrace in Oakland, consist. of 2 concr. abutments; 1 concr. center pier and steel superstructure and approx. 0.34 mi. roadway graded and concr. paved and approx. 0.24 mi. roadway graded and paved with plant mix surfacing. 12-18

DENVER, COLO.—To Strong & Grant, Springville, Utah, $141,496 by Bureau of Public Roads, Denver, for the Fishing Bridge Approaches, Parking Areas, etc., a distance of approx. .738 mi. on Proj. RTEC 1-E-1 Parking Area, 5-D-1, part D-2 and Secondary Roads of the Grand Loop and East Entrance Highway, located in Yellowstone Nat'l Park, Wyo. 12-2

DENVER, COLO.—To Phelps Bros., Fowler, Colo., $13,473 by State Highway Dept., Denver, for a bridge and approaches between Strasburg and Anton in WASHINGTON COUNTY, Colo., under Project Nos. ERP 9 and FAP 351 G. 12-4

DENVER, COLO.—Awards as follows by State Highway Dept., Denver, for (1) ROUTT COUNTY—To H. C. Lallier Const. & Engr. Co., P. O. Box 928, Denver, $41,105 for ½ mi. RR. overh. crossing and appr. betw. Oakcreek and Phippsburg. (2) EL PASO COUNTY—To F. M. Kenny, 56 Steele St., Denver, $51,498 for concr. arch bridge over Pine Creek betw. Colorado Springs and Breed. 12-16

BOISE, IDAHO—To Interstate Engr. & Const. Co., Newport, Wn., $30,267 by Comm. of Public Works, Boise, Ida., for 162 ft. concrete overhead structure over Chicago, Milwaukee, St. Paul & Pac. RR. and grad. and surf. approaches on 1.519 mi. of Spirit Lake Highway in KOOTENAI COUNTY, Idaho. 12-9

BOISE, IDAHO—Awards as follows by Comm. of Public Works, Boise, for: (1) BANNOCK COUNTY—To Moser & Hill, 256 N. 1st, W., Logan, Utah, $83,584 for a concr. viaduct over Oregon Short Line RR. and grad. and drain. appr. on 0.568 mi. of Yellowstone Park Highway at Red Rock. (2) KOOTENAI COUNTY (WPGH 100-A & WPH 100-A & WPSO 225)—To A. B. Carscallen, Coeur d'Alene, Ida., $53.621 for conc. structure over Spokane International RR. and grad. and surf. appr. with cr. rock on 0.941 mi. of the North and South Highway and 0.771 mi. of Garwood-Rathdrum connection at Garwood. 12-13

BOISE, IDAHO—To Interstate Engr. & Const. Co., Newport, Wn. $31,901 by Comm. of Pub. Works, Boise, for concr. overhead struc. over the Northern Pac. RR. & 0.399 mi. grade and screened grav. surf. approaches on the Spirit Lake Highway in Rathdrum, KOOTENAI COUNTY, Ida., WPGS 200-A. 12-16

BOISE, IDAHO—To H. C. Malott, Seattle, Wn., $46,522 by Comm. of Public Works, Boise, Ida., for a 214 ft. conc. overhead structure over Northern Pacific RR. and grading and surf. approaches on 0.624 mi. of Moscow-Bovill Highway, 2 miles east of Joel in LATAH COUNTY, Idaho. 12-23

BILLINGS, MONT.—Awards as follows by State Highway Comm., Billings, Mont., for: (1) CUSTER COUNTY (FAP 18 and 156-D)—To H. E. Nesbit, Miles City, $24,669 for 8 timb. pile trestle bridges and 1 std. tr. timber stockpass on the Tongue River Road No. 1 and Sec. "D" of the Miles City-Broadus Road. (2) CASCADE COUNTY (WPGH 64-A)—To Woodward Const. Co., Billings, Mont. $25,216 for steel and concr. underpass of the Gr. Northern Ry. Co. tracks, 2 mi. east of Gerber on Sec. A of the Great Falls-Belt Road, together with grad.. surf., etc., on 0.151 mi. of appr. (3) GRANITE COUNTY (WPH 161-C)—To J. M. Coverdale, Anaconda, $18,544 for const. reinf. concr. bridge across Rock Creek on Section C of the Skalkaho Road. (4) SILVER BOW COUNTY (WPGM 207)—To Lawler Corp., Lewisohn Bldg., Butte, Mont., $139.394 for raising the Northern Pac. Ry. Co.'s tracks and const. a steel plate girder railway bridge over Silver Bow Creek and const. a plate girder railway viaduct over Montana St. in City of Butte. (5) JEFFERSON COUNTY (WPGH 281A)—To J. C. Maguire Const. Co., Lewisohn Bldg., Butte, Mont., $59,243 for steel and concr. viaduct over the tracks of the Chicago, Milwaukee, St. Paul & Pacific RR. Co. at their Vendome siding, together with 0.360 mi. approach road on Sec. A of the Vigilante Trail. 12-27

BILLINGS, MONT.—Awards as follows by State Highway Comm., Billings, Mont., for: (1) WHEATLAND COUNTY (WPGS 292A)—To J. L. McLaughlin, Great Falls, $96,863 for steel and conc. viaduct over the Chicago, Milwaukee, St. Paul and Pac. Ry. Co.'s track at Harlowton, on Sec. A of the Harlowton So. Bend Road; also 0.460 mi. road appr. (2) VALLEY COUNTY (WPGM 315 D)—To Lease & Leigland, Great Falls, $121,206 for reinf. concr. and steel underpass crossing the Gr. Northern Ry. Co.'s tracks in City of Glasgow, also grad., pav. with concr. and const. small dr. struc. on 0.151 mi. approach road. (3) MUSSELSHELL COUNTY (WPH 328B)—To D. M. Manning, Hysham, $25,675 for 7 tr. timber pile trestle bridges on Sec. B of the Roundup-Forsyth Road. (4) PHILLIPS COUNTY (WPSO 335B)—To Massman Const. Co., Box 577, Glasgow, Mont., $27,037 for 8 tr. timber pile trestle bridges on Sec. B of the Sacto North Road. (5) VALLEY COUNTY (WPSO 368)—To L. V. Lockwood,

Glasgow, Mont., $9,223 for 2 tr. timber pile trestle bridges on the Opheim South Road. (6) FLATHEAD COUNTY (WPGH 375 and 257-B)—To Nolan Bros., 18 N. 2nd St., Minneapolis, $92,797 for concr. and steel I beam girder railroad bridge as an undercrossing of Gr. Northerly Ry. Co. tracks at Belton. 12-27

HELENA, MONT.—Awards as follows by State Highway Comm., Helena, Mont., for: (1) ROSEBUD COUNTY (WPGH 114 A)—To D. M. Manning, Hysham, Mont., $8,708 for tr. timb. pile trestle bridges on Sec. A of the Hysham-Forsyth Road. (2) PHILLIPS COUNTY (WPGH 153 B)—To Inland Const. Co., 3867 Leavenworth, Omaha, $84,503 for reinf. conc. overpass of the Gr. Northern Ry. Co.'s tracks about 4½ mi. E. of Dodson on Sec. B of the Dodson-Malta Road. (3) YELLOWSTONE COUNTY (WPH 187F and WPGH F)—To Woodward Const. Co., Rock Springs, Wyo., $75,256 for const. concr. overpass over Northern Pac. Ry. Co.'s tracks about 2 mi. east of City of Billings on Billings-Hardin Road. (4) FERGUS COUNTY (WPGH 235 B)—To Fred B. Dudley, Great Falls, Mont., $45,804 for const. reinf. conc. overpass over the C. M. St. P and P RR. tracks about 2 mi. west of City of Lewistown on Sec. B of Armington-Lewistown Road. 12-3

HELENA, MONT.—Awards as follows by State Highway Comm., Helena, Mont., for: (1) BEAVERHEAD COUNTY (WPGH 255A)—To Lawler Corp., Lewisohn Bldg., Butte, $84,579 for reinf, concr. overpass over the Oregon Short Line RR. Co. tracks about 2½ mi. of City of Dillon on Sec. B of the Dillon-Idaho Line road, etc. (2) FLATHEAD and LAKE COUNTIES (WPH 87-B)—To McNutt Bros., 351½ E. Broadway, Eugene, $114,964 for 10.804 mi. grad. and const. small drain. struc. on Sec. B of the Plains-Elmo Road. (3) GRANITE COUNTY (WPH 161 C)—To Barnard Curtiss Co., Phoenix Bldg., Minneapolis, $82,110 for 6.344 mi. grad. and const. small drain. struc. on Sec. C of the Skalkaho Road. (4) YELLOWSTONE COUNTY (WPH 187 B)—To Wagner Const. Co., Sioux Falls, N. D., $27,681 for reinf. conc. bridge and 0.562 mi. grad. and surf. on Sec. B of the Billings-Hardin Road. (5) SHERIDAN COUNTY (WPH 251 E)—To McNutt Bros., 351½ E. Broadway, Eugene, Ore., $99,586 for 11.976 mi. grad. and const. small dr. str. on Sec. E of the Scobey-Plentywood Road. (6) GALLATIN COUNTY (WPGH 44 A)—To Fred B. Dudley, Great Falls, Mont., $82,189 for reinf. concr. viaduct over the Northern Pacific Ry. Co.'s tracks 2 mi. North of Bozeman and grad. and surf. on 0.418 mi. of approach road. (7) CASCADE COUNTY (WPGH 64 A)—To Thos. Staunton, Great Falls, Mont., $27,986 for steel and conc. underpass of Gr. Northern Ry. Co.'s tracks about 2 mi. E. of Gerber on Sec. A of the Gr. Falls-Belt Road and grad. and surf. on 0.15 mi. of approach road. 12-3

SANTA FE, NEW MEXICO—To W. E. Bondurant, Roswell, N. M., $32,974 by State Highway Engineer, Santa Fe, N. M., for a conc. and steel overpass consisting of 2 50 ft. spans and 1 60 ft. span and approaches on 0.565 mi. of U. S. Highway Route 60, betw. Vaughn and Encino, GUADALUPE COUNTY, N. M. 12-24

SANTA FE, NEW MEXICO—Awards as follows by State Highway Engineer, Santa Fe, for: (1) QUAY COUNTY (WPGH 160-D)—To R. L. Haynes, Denver, $41,952 for Railroad underpass struc. and approaches on 0.563 mi. of U. S. Highway Route 54 betw. Logan and Nara Visa. (2) OTERO COUNTY—To Brown Bros., $47,473 for 196 ft. cantilever conc. and steel overpass and approaches on 0.558 mi. of U. S. Highway 54, Tularosa and Carrizozo. (3) CATRON COUNTY (WPSS 217B)—To L. R. Allison, $33,852 for 2 conc. box culverts of more than 20 ft. clear span, 1 coarse surf. grading, and misc. const. on 11.626 mi. of State Highway Route 12, betw. Reserve and Horse Springs. 12-24

SANTA FE, NEW MEXICO—Awards as follows by State Highway Engr., Santa Fe, N. M.: (1) GUADALUPE COUNTY—To Ernest W. Everly, who bid $26,819 for 0.680 mi. const. concr. and steel underpass and approaches on U. S. Highway Rt. 66. (2) TORRANCE COUNTY—To Wheeler & Silver, Albuquerque, $22,399 for .588 mi. const. conc. and steel overpass on U. S. Highway Rt. 60, betw. Vaughn and Encino. 12-21

BEND, ORE.—To E. F. & W. F. Philpott, Portland, $40,738 by City Recorder, Bend, for reinf. conc. bridge and appr. at Newport Ave. and wood pile trestle at Tumalo Ave. 12-16

PORTLAND, ORE.—To Mt. States Const. Co., Eugene, Ore., $34,316 by Oregon State Highway Comm., Portland, for 9 creo. pile trestle bridges with conc. decks and a concr. box culv. on Junction City-Eugene Secondary Highway in LANE COUNTY, Proj. No. (WPMH 262 A & B). 12-6

PORTLAND, ORE.—Awards as follows by Oregon State Highway Comm., Portland, for: (1) JACKSON COUNTY (WPGH 190-G)—To Berke Bros., Inc., 2815 S. E. Harrison St., Portland, Ore., $158,765 for concr. and steel undercrossing under S. P. Co.'s tracks and 0.41 mi. grading on Pacific Highway approx. 9 mi. south from Ashland. (2) LANE COUNTY (WPGH 262-A)—To Harold Blake, 400 N. Thompson St., Portland, Ore., $74,185 for conc. bridge over the S. P. Co.'s tracks and 0.52 mi. grad. and pav. on the Junction City-Eugene Secondary Highway, approx. 1 mi. N. from Eugene. (3) MULTNOMAH COUNTY WPGH 257)—To Edlefsen-Weygandt Co., Peninsular Ave. and Columbia Blvd., Portland, Ore., $44,580 for an underpass under the O.W.R. & N. Co.'s tracks and 0.30 mi. grad. and pav. on 162nd Ave. (Barker Road) approx. 4 mi. E. of 82nd St., Portland. 12-3

SALT LAKE CITY, UTAH—To V. R. Bush, Moab, Utah, $34,949 by Utah State Road Comm., Salt Lake City, for a multiple slab reinf. concrete bridge over Upper Courthouse Wash in GRAND COUNTY, FAP No. 5, betw. Klondyke Wash and Seven Mile Wash, to be 278 ft. 4 in. long. 12-5

OLYMPIA, WN.—Awards as follows by Director of Highways, Olympia, Wn., for: (1) SKAGIT COUNTY—To S. H. Steffenson, 6714 1st Ave., N.W., Seattle, Wn., $63,686 for a timber and steel trestle with concr. deck on State Road No. 1, Lake Samish road branch, Burlington-North, overcrossing of Great Northern Ry., near Belleville. (2) KITTITAS COUNTY—To Henry Hagman, Cashmere, Wn., $31,624 for 200-ft. steel riveted bridge with reinf. concrete approaches on county road, Ellensburg-Throp road, Yakima River bridge near Dudley. 12-5

OLYMPIA, WN.—Awards as follows by Director of Highways, Olympia, Wn., for: (1) GRANT COUNTY (WPH 219-B & WPGH 219-A)—To D. Nygren, Lloyd Bldg., Seattle, Wn., $56,938 for steel girder undercrossing of Gr. Northern Ry. Co , 3 mi. west of Ephrata. (2) KING COUNTY (WPGM 227-A)—To D. Nygren, Lloyd Bldg., Seattle, $99,442 for steel girder overcrossing on West Dravus St. in Seattle. (3) PIERCE COUNTY—To Malcom & Bell, Sherlock Bldg., Portland, $97,308 for steel girder undercrossing of the Northern Pac. Ry. tracks on Pacific Highway, Olympia to Nisqually, Northern Pacific Point Defiance line. 12-23

OLYMPIA, WN.—To Puget Sound Bridge & Dredging Co., 2929 16th Ave. S.W. Seattle, $92,823 by Director of Highways, Olympia, for steel span with reinf. conc. appr. on W. end and pile and timb. appr. on E. end of St. R. No. 8, Cook East. Little White Salmon River Bridge, SKAMANIA COUNTY. 12-19

SEATTLE, WN.—To General Const. Co., 3840 Iowa Avenue, Seattle, Wn., $66,990 by Bd. of Pub. Works, Seattle, Wn., for a struc. steel bridge on North Queen Anne Drive, at 2nd Ave., North. 12-14

TACOMA, WN.—To McRae Bros., 614 5th Ave., Seattle, Wn., $109,455 by Bd. of Contracts and Awards, Tacoma, for a 242 ft. open spandrel, reinf. conc. arch bridge over Pacific Ave. Gulch on E. 34th St. 12-7

Water Supply Systems. . . . . .

CALLS FOR BIDS

LA MESA, CALIF.—Bids to Jan. 28th, by La Mesa, Lemon Grove and Spring Valley Irrig. Dist., La Mesa, Calif., for const. of 10,400 lin. ft. of the El Capitan Pipeline, involving: 1,300 ft. 48 in. elec. welded steel pipe, ⅝ in. plate and 9,100 ft. 48 in. elec. welded steel pipe, ¼ in. plate; OR 9,100 ft. 48 in. I. D. ¼ in. steel cylinder conc. protected pipe; and other items. 12-27

SAN DIEGO, CALIF.—Bids to Jan. 28th, by City Council, San Diego, for the El Capitan-Lakeside Pipeline from Sta. 104 to Lakeside. Proposals on either electric welded steel pipe or concrete protected steel cylinder pipe, involving: 20,936 lin. ft. steel pipe, 48 in. dia.; 11,467 lin. ft. 36 in. steel pipe and other items. 12-26

MARE ISLAND, CALIF.—Bids to 11 a. m., Feb. 5th by Bureau of Yards and Docks, Navy Dept., Washington, D. C., for two water treatment systems, a continuous blow-down system, and a chemical feeding system at the Navy Yard (Hospital), Mare Island, Calif., under Spec. No. 8092. Est. cost $7,500. 12-28

SAN FRANCISCO, CALIF.—Bids to 3 p. m., January 21st by Public Utilities Comm., S. F., for the Central Pumps Reservoir, to be covered with concrete roof and lining, valve house and inlet and outlet structure. 12-24

SAN FRANCISCO, CALIF.—Bids to 3 p. m., January 15th by Public Utilities Comm., S. F., for laying 20 in. and 24 in. steel feeder mains in San Francisco, under S.F.W.D. Contract No. 101. 12-24

BIDS RECEIVED

CASCADE LOCKS, ORE.—Carl Laconto, Cascade Locks, Ore., $46,941, low to City Recorder, Cascade Locks, Ore., for const. of a water system, involving an intake, reinf. conc. reservoir, water supply and distribution line with necessary appurtenances. 12-19

EUGENE, ORE.—F. C. Dillard, 39 Summit Ave., Medford, $63,891 low to Eugene Water Board, Eugene, Oregon, for furnishing materials and installation of cast iron water mains. 12-2

PORT ORFORD, ORE.—Hauser Const. Co., Portland, Oregon, $29,000, only bid to City Recorder, Port Orford, Ore., for const. an intake reservoir and water supply and distribution system, including hydrants and other accessories. 12-6

TUALATIN, ORE.—D. P. Slater, 744 N. Capitol St., Salem, Oregon, $11,502, low to H. M. Esterly, Corbett Bldg., Portland, Ore., for construction of water supply and distribution works for City of Tualatin, Oregon. 12-5

OGDEN, UTAH—Bids received as follows by City Clerk, Ogden, Utah, for constructing the high level water supply line for northern section of Ogden: (1) Lynch-Cannon Engrg. Co., Atlas Bldg., Salt Lake City, $19,230 low for labor. (2) Identical bids of $49,646 by Geo. A. Low Co., Crane Co., and Waterworks Equipment Co. for materials. 12-21

PORT ORCHARD, WN.—D. Coluccio, 8257 Latona Ave., Seattle, Wn., $21,191, low to Town Clerk, Port Orchard, Wn., for improvements to waterworks system involving replacing various wooden water mains in Town of Port Orchard with approx. 20,300 ft. cast iron pipe together with fittings, valves and appurtenances. 12-6

CONTRACTS AWARDED

DOS PALOS, CALIF.—Award recommended (subject to PWA approval) to P. L. Burr, 320 Market St., San Francisco, $58,620 to City Clerk, Dos Palos, for water works system, involving filter plant, 100,000 gal. elevated storage tank, 4 in, 6 in. and 8 in. cast iron pipe for distribution system. 12-28

GALT, CALIF.—Awards as follows by Frank D. Talbot, Engineer, 804 Forum Bldg., Sacramento, for improvements to water works system for the Galt Water District, Galt: (1) To Underground Const. Co., R.F.D. No. 1, Box 756, Berkeley, $27,449 for water distributing system. (2) To Pittsburgh Des Moines Steel Co., Rialto Bldg., S. F., $7,267 for 75,000 gal. tank. 12-20

INGLEWOOD, CALIF.—To Western Pipe & Steel Co., 5717 Santa Fe Ave., Los Angeles, $1.45 per ft. to City Clerk, Inglewood, for furn. and laying 8,850 lin. ft. welded steel pipeline from the City's main pumping plant in Centinela Park to Reservoir No. 5, under Plan No. 1157. 12-24

LONG BEACH, CALIF.—Contract awarded (subject to PWA approval) to Western Pipe & Steel Corp., 5717 Santa Fe Ave., Los Angeles, $234,330 by Board of Water Comm., Long Beach, for 6 each rivited steel tanks, 3,500,000 gal. each. 12-14

LOS ANGELES, CALIF.—To J. F. Shea Co., Inc., Mecca, $1,107,032 on SCH. 6P and $1,212,430 on SCH. 7P, by Metropolitan Water District, L. A., for precast concrete pipeline and appurtenant works of the Colorado River Aqueduct distribution system between Sta. 1436 and 3009-18 of the Upper Feeder, under Spec. 134. (See Unit Bid Summary). **12-21**

SACRAMENTO, CALIF.—To Peter J. McHugh, 3854 24th St., S. F., $96,300 by City Clerk, Sacramento, for installation of new watermains to replace old mains on various streets within the City. 12-21

SACRAMENTO, CALIF.—To DeLaval Steam Turbine Co., 61 Beale St., S. F., $23,990 by City Clerk, Sacramento, for furn. pumping equipment, motors and auxiliary equipment in pumping station at Sacramento Filtration Plant. 12-3

SACRAMENTO, CALIF.—To Campbell Const. Co., 800 R St., Sacramento, $36,929 by City Clerk, Sacramento, for reconst. the old pretreatment works. 12-3

SAN FRANCISCO, CALIF.—To Sibley Grading & Teaming Co., Ltd., 165 Landers St., San Francisco, $25,948 by Dept. of Public Works, S. F., for const. 4 reinf. concrete fire cisterns at Van Ness Avenue and Broadway, etc. 12-20

SAN FRANCISCO, CALIF.—To G. W. Williams Co., 315 Primrose Road, Burlingame, $35,183 by Public Utilities Comm., S. F., for valve houses and wood covering for pipe on trestle for Bay Crossing Pipeline No. 2 in Alameda and San Mateo Counties, under Spec. W. D. 88. 12-19

WATSONVILLE, CALIF.—To Union Paving Co., Call Bldg., S. F., $68,575 by City Clerk, City Hall, Watsonville, for const. and replacing water transmission line betw. dam on Corralitos Creek and the filter plant; replac. of transmission line betw. Corralitos and the Five Mile

House; install. high pressure line betw. Freedom Reservoir and Lincoln St.; installing high pressure main betw. Lincoln St. and Sudden St., on Main St.; replacing distribution lines on portions of Lincoln St., Lake Ave., and Third St., installing transmission line on E. Corralitos Road from Corralitos to Green Valley Road. 12-16

DENVER, COLO.—To Lock Joint Pipe Co., 1716 California St., Denver, $96,580 (pre-cast concrete) by Board of Water Commissioners, Denver, Colo., for const. Siphon No. 6 of the South Boulder Diversion Conduit. 12-7

DENVER, COLO.—To Dutton, Kendall & Hunt, Inc., 816 E. 18th Ave., Denver, Colo., $274,949 by Board of Water Commissioners, Denver, Colo., for const. a reservoir and settling basins for the West Side Filter Plant. 12-9

DENVER, COLO.—To Driscoll Const. Co., 220 S. Main St., Pueblo, Colo., $81,950 by Board of Water Comm., Denver, Colo., for const. lined and unlined sections of the canal of the South Boulder Diversion Conduit. 12-9

DENVER, COLO.—To Peter Seerie, Interstate Trust Bldg., Denver, Colo., $146,133 by Board of Water Comm., Denver, for const. flumes No. 5 and No. 6, Transitions and Vortex Sections for Flume No. 5, Flume No. 6 and Siphon No. 6; By-pass and Inlet Canals including the transitions, stilling basins, Venturi Flume, Wye, Taintor gates, and two highway bridges of the South Boulder Diversion Conduit. 12-27

REUBENS, IDAHO—To A. G. Kester, Lewiston, Idaho, $5,471 (labor only) to Village Clerk, Reubens, Idaho, for constructing waterworks system in the Village of Reubens, Idaho. 12-20

AMITY, ORE.—To J. C. Compton, McMinnville, Oregon, $20,962 by City Clerk, Amity, Ore., for a water supply line and relining the reservoir with a concrete lining. 12-18

EMPIRE, ORE.—To Gunnell & Gunnell, Marshfield, Oregon, $8,764 by City Recorder, Empire, Ore., for repairs to dam, and furn. and inst. pipe and chlorinator. 12-11

OAKRIDGE, ORE.—To D. P. Slater, 744 N. Capitol St., Salem, Oregon, $46,506 by City Recorder, Oakridge, Ore., for Intake Works, a 133,000 gal. circular reinf. concrete reservoir, steel pipe supply and distribution mains, hydrants, valves, and appurtenances, etc. 12-5

UMATILLA, ORE.—Award recommended to Eugene Ruedy Co., Sherlock Bldg., Portland, $18,091 by City Recorder, Umatilla, Ore., for a supply line, pumping plant, cistern, pump house and reservoir. 12-13

WEST LINN, ORE.—Award recommended (subject to PWA approval) to United Contracting Co., Stock Exchange Bldg., Portland, Ore., $18,407 by City Recorder, West Linn, Ore., for installation of reservoir improv. consisting of const. a new 500,000 gal. concr. lined reservoir with drains, and inlet and outlet lines. 12-11

CHEHALIS, WN.—To F. J. Parker, Chehalis, Wn., $121,314 (subject to PWA approval) by City Clerk, Chehalis, Wn., for 10½ miles replacements to pipeline. 12-6

EATONVILLE, WN.—To D. Coluccio, 8257 Latona Ave., Seattle, Wn., $14,474 by City Clerk, Eatonville, Wn., for constructing watermains. 12-11

EVERSON, WN.—To Seattle Boiler Works, 1132 W. 45th St., Seattle, Wn., $5,940 by Town Clerk, Everson, Wn., for erection of a 50,000 gal. steel water tank. 12-20

EVERSON, WN.—To Wilder & Montfort, Blaine, Wn., $12,000 by Town Clerk, Everson, Wn., for a pumphouse, furn. and placing two 200 G.P.M. pumps, laying 3400 lin. ft. 8 in. wood main, 1930 lin. ft. 6 in. wood main, 4620 ft. 4 in. wood main, 400 lin. ft. 6 in. cast iron main, 770 lin. ft. 3 in. wood main, and setting gate valves and hydrants. 12-20

PORT TOWNSEND, WN.—To James H. Coyne, Port Townsend, Wn., $54,098 by City Clerk, Port Townsend, Wn., for improvements to City waterworks system. 12-13

RIDGEFIELD, WN.—To Parker-Schram Co., Couch Bldg., Portland, $22,400 by Town Clerk, Ridgefield, Wn. for replac. 2,850 ft. 8 in., 4,100 ft. 6 in. and 8,650 ft. 4 in. exist. wooden water mains with new cast iron mains, incl. hydrants, valves, fittings, and service changes. 12-16

SNOHOMISH, WN.—To Queen City Const. Co., 603 18th Ave., So., Seattle, Wn., $35,475 by Town of Snohomish, Wn., for const. water distribution system. 12-19

TACOMA, WN.—To American Concrete & Steel Pipe Co., Tacoma, Wn., $107,715 by Board of Contracts and Awards, Tacoma, Wn., for replacement of 2,021 lin. ft. of 46 in. wood stave pipe with same length of 52 in. reinforced concrete pipe and replacement of 4,042 lin. ft. 54 in. wood stave pipe with 58 in. reinforced concrete pipe in the Green River Gravity Pipe Line. 12-14

Sewer Construction . . . . . .

CALLS FOR BIDS

GLENDALE, ARIZ.—Bids to January 27th by City of Glendale, Arizona, for construction of a sewage disposal plant. Est. cost $32,000. 12-24

BIDS RECEIVED

ROSEBURG, ORE.—Ek & Lind, 1705 N. Humboldt St., Portland, $98,221 to City Recorder, Roseburg, Ore., for reconstruction and extension of the sewerage system and a sewage disposal plant. 12-2

TALENT, ORE.—Medford Concrete Const. Co., Medford, Ore., $34,683 low to Town Clerk, Talent, Ore., for const. a sewage disposal plant. 12-5

ELMA, WN.—Walters & Soule, Elma, Wn., $47,034 low to Town Clerk, Elma, Wn., for const. sewer system, involv. 8 in., 10 in., 12 in., and 15 in. vitr. pipe, septic tank and 75 manholes. 12-13

SELAH, WN.—L. Coluccio, Securities Bldg., Seattle, Wn., $40,679, low to Town Clerk, Selah, Wn., for const. a sewer system. 12-18

CONTRACTS AWARDED

PRESCOTT, ARIZ.—Contract awarded (subject to PWA approval) to Pearson & Dickerson Co., Prescott, Ariz., $36,250 by City Clerk, Prescott, for const. a sewage treatment plant, lengthening outfall sewer line 3,500 ft. and const. a dump road. 12-19

PALM SPRINGS, CALIF.—To Gogo & Rados, 10024 S. Figueroa St., L. A. (subject to PWA approval) $51,433 by Palm Springs Sanitary District, Palm Springs, for construction of a sewage disposal plant and sewer system. 12-5

SACRAMENTO, CALIF.—To Lord & Bishop, Native Sons Bldg., Sacramento, $17,550 by City Clerk, Sacramento, for extensions of the main sewer line into Sacramento River. 12-21

SACRAMENTO, CALIF.—Awards as follows by City Clerk, Sacramento, for: (1) To J. W. Terrell, 2765 Donnor Way, Sacramento, $20,401 for storm sewers on "W" and "X" Sts. betw. 18th and 27th Sts. (2) To Gogo & Rados, 10024 S. Figueroa St., L. A. and A & B Const. Co., 912 S. Atlantic Blvd., Hynes, Calif., $41,900 for storm sewer on "L" St. betw. 9th and 18th St. 12-3

SACRAMENTO, CALIF.—To Lord & Bishop, Native Sons Bldg., Sacramento, $54,900 by City Clerk, Sacramento, for storm sewer on 13th and "G" Streets in Sacramento, Calif. 12-3

SAN DIEGO, CALIF.—To H. H. Peterson, 3788 Atlantic St., San Diego, $12,799 by 11th Naval Dist., San Diego, for outfall sewer at the Naval Operating Base (Air Station) under Spec. 8091. 12-21

SAN FRANCISCO, CALIF.—To Healy Tibbitts Construction Co., 64 Pine St., San Francisco, $334,259 by Dept. of Public Works, S. F., for the Alemany Sewer Extension, Section D1, under Spec. DPW 18,900. 12-18

SANTA ANA, CALIF.—Award recommended to Gogo & Rados, 10024 S. Figueroa St., Los Angeles, (subject to PWA approval) $118,500 by County Board of Supervisors, Santa Ana, for const. of the West Anaheim Storm drain. 12-4

SANTA ANA, CALIF.—Award recommended, subject to PWA approval, to Macco Construction Co., Clearwater, $23,770 by County Board of Supervisors, Santa Ana, for construction of the Lovita Ave. Storm Drain. 12-4

STOCKTON, CALIF.—Award recommended (subject to PWA approval) to W. J. Tobin, 3701 Balfour Ave., Oakland, $42,447 by City Clerk, Stockton, for const. sanitary trunk line sewer on Hazelton Ave. 12-3

ASHLAND, ORE.—To Dunn & Baker, Klamath Falls, Ore., $76,831 by City Recorder, Ashland, Ore., for intercepting sewers, and a sewage treatment plant. 12-11

BURNS, ORE.—To Morrison-Knudsen Co., Inc., 319 Broadway, Boise, Ida., $21,285 by City Recorder, Burns, Oregon, for additions to and remodeling of sewage disposal plant. 12-23

HILLSBOROUGH, ORE.—Awards as follows by City Recorder, Hillsboro, Ore., for const. a sanitary sewerage system and treatment plant: (1) To Kern & Kibbe, 42 S.E. Salmon, Portland, Ore., $125,621 for const. sewerage system. (2) To Warren N.W., Inc., 102nd & Warren Road, N.W., Portland, Ore., $44,270 for treatment plant. 12-9

SEATTLE, WN.—To Northwest Const. Co., 3950 6th, N.W., Seattle, Wn., $123,522 by Board of Public Works, Seattle, Wn., for Units 2 and 8 of the Henderson St. trunk sewer, incl. const. a trunk sewer north along East Marginal Way from S. City limits to a connection with the Beacon Hill sewer; also const. a pumping plant near Webster Street. 12-14

SEATTLE, WN.—To Arcorace & Coluccio, 8423 48th Ave., So., Seattle, Washington, $226,317 by Board of Public Works, Seattle, Wn., for Units 3, 4, 6 and 7 of the Henderson Street trunk sewer, involving construction of a trunk sewer of 42 in. and 48 in. concrete from a connection with the recently completed Seward Park unit at Henderson St., westerly to and through Beacon Hill at west slope of which a wood stave sewer 36 in. in diam. will carry the sewage west to Duwamish Waterway. 12-16

River and Harbor Work. . . . .

BIDS RECEIVED

SAUSALITO, CALIF.—Lindgren & Swinerton, 225 Bush St., San Francisco, $219,140, low to Golden Gate Yacht Harbor, Ltd., 892 Mills Bldg., San Francisco, for const. harbor facilities for the Golden Gate Yacht Harbor at Sausalito, including piers, bulkheads, dolphins, Marine railway, foundations, dredging, filling and pavement, buildings, boat storage space, etc. 12-11

SEATTLE, WN.—General Const. Co., 3840 Iowa St., Seattle, Wn., $52,338, low to U. S. Engineer Office, Seattle, for 366,000 cu. yd. dredging material from Duwamish waterway. 12-24

CONTRACTS AWARDED

OAKLAND, CALIF.—To A. W. Kitchen, Inc., 110 Market St., S. F., $206,747 by Port of Oakland, Ft. of Grove St., Oakland, for const. wharf and rear retain wall, dredging and riprap and railroad tracks. 12-17

RICHMOND, CALIF.—To San Francisco Bridge Co., 503 Market St., San Francisco, $8,631 by City Clerk, Richmond, for repairs to fender system and repairs to dolphin on Wharf No. 2. 12-18

SAN DIEGO, CALIF.—To Sparkes & McClellan, 23rd and Central Ave., Newport Beach, Calif., $47,000 by 11th Naval District, Foot of Broadway, San Diego, for dredging of areas in the vicinity of the piers at the Fuel Depot and areas in the vicinity of the quay wall at the Destroyer Base, involving 80,000 cu. yd. under Spec. No. 8105. 12-7

THE DALLES, ORE.—To Parker-Schram Co., 515 Couch Bldg., Portland, Ore., $219,501 (untreated piling) by the Port Comm., Te Dalles, Ore., for const. a ship and barge dock and terminal to be 1,000 ft. long, 110 ft. wide; with a warehouse 960 ft. long by 94 ft. wide. 12-2

PORTLAND, ORE.—To General Const. Co., 3840 Iowa Ave., Seattle, Wn., $96,710 by U. S. Engineer Office, Portland, Ore., for clearing land, excavating and removing material and placing rock riprap for backwater channel improvement in Columbia River between Bonneville and Cascade Locks, Oregon, Under Invit. for Bids 694-36-157. 12-23

PORTLAND, ORE.—To Pacific Const. Co., Seattle, Wn., $40,730 by U. S. Engr. Office, Portland, Ore., for loading, hauling and placing loose and hand placed riprap on the slopes of the lower lock approach canal at Bonneville, Ore., under Inv. 694-36-134. 12-16

Irrigation and Reclamation . .

BIDS RECEIVED

OGDEN, UTAH—J. A. Terteling & Sons, 2223 Fairview Ave., Boise, Idaho, $424,978 low to Bureau of Reclamation, Ogden, Utah, for earthwork, canal lining, and structures, Ogden-Brigham Canal, Sta. 587 to Sta. 1260, and South Ogden Highline Canal, Sta. 10 to Sta. 335, Ogden River Project, Utah, under Spec. 659. (See Unit Bid Summary). 12-20

CODY, WYO.—Taggart Const. Co., Cody, Wyo., $104,876 low to Greybull Valley Irrigation District, Cody, Wyo., for const. of Supply Canal (exclusive of structures) leading from the Diversion Dam in the Greybull River to the Sunshine Reservoir, Canal is 9.3 mi. long and is located 45 mi. from Cody, Wyoming. 12-12

CONTRACTS AWARDED

HIGLEY, ARIZ.—To Southwestern Cement Pipe Co., $49,732 by Chandler Heights Citrus Irrigation District, Higley, Arizona, for irrigation work. 12-14

YUMA, ARIZ.—To Frazier Davis Co., St. Louis, $489,527 by Bureau of Reclamation, Yuma, Ariz., for siphon structures at 120 Wash, 424 Wash, Unnamed Wash and Picacho Wash, under Spec. 645. 12-18

YUMA, ARIZ.—To Geo. Pollock Co., Forum Bldg., Sacramento, $700,987 on SCHED. 2, by Bureau of Reclamation, Yuma, Ariz., for 5 mi. earthwork, All-American Canal, from Imperial Dam to the Callahan Const. Co. Schedule, under Spec. No. 647. (See Unit Bid Summary). 12-16

WESTLEY, CALIF.—Award recommended (subject to PWA approval) to C. W. Wood & M. J. Bevanda, Elks Bldg., Stockton, $180,027 by West Stanislaus Irrigation District, Westley, Calif., for 2,000,500 sq. ft. concr. lined canals within the District. 12-26

FAIRFIELD, MONT.—To T. G. Rowland, 1558 Yale Ave., Salt Lake City, Utah, $43,530 by Bureau of Reclamation, Fairfield, Mont., for earthwork and structures, Mill Coulee wasteway and laterals and sublaterals at Greenfields Div. and Sun River Slope Div., Sun River project, Montana, under Spec. 650. 12-26

HELENA, MONT.—Awards as follows by State Water Conservation Bd., Helena, Mont., for const. 5 water conservation projects, as follows: (1) To J. L. McLaughlin, Great Falls, Mont., $202,146 for Dam on North fork of Smith River. (2) To Inland Const. Co. 3867 Leavenworth, Omaha, $231,925 for dam on Flint Cr. (3) To J. L. McLaughlin, Gr. Falls, Mont., $99,237 for const. Park Branch Canal, Park County. (4) To J. L. McLaughlin, Gr. Falls, Montana, $159,233 for dam on Willow Creek. (5) To Max J. Kuney Co., 102 E. Augusta, Spokane, $51,221 dam on Swamp Creek. 12-5

HELENA, MONT.—To James Crick, 3104 N. Monroe St., Spokane, Wn., $216,837 by Montana State Water Conservation Board, Helena, for canals and appurtenant structures on Flint Creek storage project, Granite County, Montana. 12-9

HASTINGS, NEBR.—Contract awarded (subject to PWA approval) to Haas, Doughty & Jones, Merchants Exchange Bldg., S. F., Morrison-Knudsen Co., 319 Broadway, Boise, Ida., and J. A. Terteling & Sons, 2223 Fairview Ave., Boise (joint bid) $622,529 by Central Nebraska Public Power & Irrigation District, Hastings, Nebr. for 96.6 mi. canals and 86 timber bridges located at or near Holdrege, Minden and Hastings, Nebraska. 12-16

Dam Construction

BIDS RECEIVED

BOISE, IDAHO—T. E. Connolly, Inc., 461 Market St., San Francisco, $395,040, low to Bureau of Reclamation, Boise, Ida., for raising the Arrowrock Dam, Boise Project, Idaho, under Spec. No. 661. 12-23

CARLSBAD, NEW MEXICO—Hallett Construction Co., Crosby, Minnesota, $1,132,547 low to Bureau of Reclamation, Carlsbad, New Mexico, for construction of the Almagordo Dam. 12-23

CONTRACTS AWARDED

PHOENIX, ARIZ.—To Allied Bridge & Const. Co., and Central Bridge & Const. Co., Omaha, Neb., $150,723, by Bureau of Reclamation, Phoenix Ariz., for construction of spillway channels at Stewart Mountain Dam. 12-16

YUMA, ARIZ.—To Morrison-Knudsen Co., Inc., Utah Const. Co., and Winston Bros., 1 Montgomery St., San Francisco, $4,374,240, by Bureau of Reclamation, Yuma, Ariz., for const. the Imperial Dam and desilting works, Boulder Canyon project, Arizona, California, Nevada, under Spec. 644. 12-16

VALE, ORE.—To J. A. Terteling & Sons, 2223 Fairview Ave., Boise, Idaho, $273,989, by Bureau of Reclamation, Vale, Oregon, for constructing the Unity Dam, Burnt River project, Oregon, under Spec. 653. 12-18

CASPER, WYO.—To Morrison-Knudsen Co., Inc., Utah Const. Co., and Winston Bros. Co., 1 Montgomery St., San Francisco, $2,759,804 (Sched. 1 only), by Bureau of Reclamation, Casper, Wyo., for const. the Seminoe Dam and Power Plant, Casper-Alcova project, Wyoming. Work is located on the North Platte River about 37 mi. northeast of Parco, Wyo., under Spec. 630. 12-16

RIVERTON, WYO.—To S. J. Groves & Sons Co., 510 Wesley Temple Bldg., Minneapolis, Minn., $653,397, by Bureau of Reclamation, Riverton, Wyo., for constructing the Bull Lake Dam, Riverton project, Wyoming, under Spec. 658. 12-21

Tunnel Construction

BIDS RECEIVED

ONTARIO, ORE.—J. A. Terteling & Sons, 2223 Fairview Ave., Boise, Ida., $292,415, low to Bureau of Reclamation, Ontario, Ore., for constructing Tunnels 1, 2, 3 and 4, Black Canyon Canal, under Spec. No. 654. 12-3

CONTRACTS AWARDED

YAKIMA, WN.—To Morrison-Knudsen Co., 319 Broadway, Boise, Ida., $993,839, by Bureau of Reclamation, Yakima, Wn., for Tunnels 1, 2 and 3, Yakima Ridge Canal, Roza Div., Yakima project, Wn., under Spec. 652. 12-21

CASPER, WYO.—To W. E. Callahan Const. Co., and Gunther & Shirley, 206 S. Spring St., Los Angeles, $794,948, by Bureau of Reclamation, Casper, Wyo., for Tunnels Nos. 3, 4, 5 and 6, Casper Canal, Casper-Alcova project, Wyoming, under Spec. No. 649. 12-10

CODY, WYO.—To Utah Const. Co., Ogden, Utah, $614,509, by Bureau of Reclamation, Cody, Wyo., for Tunnels 1, 2 and 3, Shoshone Canyon Conduit, Heart Mt. Division, Shoshone project, Wyoming, under Spec. 656. 12-21

Power Development

CONTRACTS AWARDED

SPOKANE, WN.—Contract awarded (subject to PWA approval) to Puget Sound Const. Co., Colman Bldg., Seattle, $437,475, by City Council, Spokane, for const. the Upriver Station control works and powerhouse. 12-7

SPOKANE, WN.—To Allis-Chalmers Mfg. Co., Milwaukee, Wis., $157,300, by City Council, Spokane, for furn. three 1625 KV-A generators with exciters and thrust bearings; seven 100,000 KV-A transformers, 15,000 volt, metal-clad oil circuit breakers; seven steel switchboard panels, three 25 KV-A transformers, 2400 to 220 110-volts; control and indicating devices; wire cables and conduit. 12-11

SPOKANE, WN.—To Allis-Chalmers Mfg. Co., Milwaukee, Wis., $129,450, by City Council, Spokane, Wn., for furnishing and installing three automatically adjustable blade propeller type governors and all auxiliaries. 12-11

EQUIPMENT and MATERIALS SECTION

This is a directory of products made by manufacturers whose advertisements appear in this issue of *Western Construction News*. If you do not find what you want, write for further information to *Western Construction News*, 114 Sansome Street, San Francisco, California.

On the following pages will be found the "Where to Buy in the West" section; and an alphabetical index of advertisers is on the last page of this issue.

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Harnischfeger Corp.
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Northwest Engineering Co.
Thew Shovel Co.

Batchers, Concrete Aggregates
Western Pipe & Steel Co.

Bearings, Roller
Timken Roller Bearing Co.

Bins, Storage and Hopper
Chain Belt Company
Western Pipe & Steel Co.

Bits, Rock Drilling
Chicago Pneumatic Tool Co.
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Chicago Pneumatic Tool Co.
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Link-Belt Co.

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American Hoist and Derrick Company
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Industrial Brownhoist Corp.
Harnischfeger Corp.
Koehring Co.
Lima Locomotive Works, Inc.
Link-Belt Co.
McKiernan-Terry Corp.
Northwest Engineering Co.
Osgood Company
Thew Shovel Co.
Universal Crane Co.

Crushers
Austin-Western Road Mchy. Co.
Smith Engineering Works

Culverts
Austin-Western Road Mchy. Co.
California Corrugated Culvert Co.
Hardesty Manufacturing Co.
Pure Iron Culvert & Mfg. Co.
Toncan Culvert Mfrs. Assn.
Washington Corrugated Culvert Co.
Western Pipe & Steel Co.

Derricks, and Derrick Fittings
American Hoist and Derrick Company
Harnischfeger Corp.
McKiernan-Terry Corp.

Drill Bits, Detachable
Timken Roller Bearing Company

Drills, Diamond
Chicago Pneumatic Tool Co.
Sullivan Machinery Company

Drills, Rock
Chicago Pneumatic Tool Co.
Cleveland Rock Drill Company
Sullivan Machinery Company
Worthington Pump & Mchy. Corp.

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Apache Powder Co.
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Link-Belt Co.

Engines, Diesel, Gasoline and Steam
Case, J. I., Company
Caterpillar Tractor Co.
Chicago Pneumatic Tool Co.
Cummins Engine Company
International Harvester Company 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.
Industrial Brownhoist Corp.
Lima Locomotive Works, Inc.
Link-Belt Co.
Northwest Engineering Co.
Osgood Company
Thew Shovel Co.

Excavators, Dragline
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Lima Locomotive Works, Inc.
Link-Belt Co.
Northwest Engineering Co.
Osgood Company
Thew Shovel Co.

Explosives
Apache Powder Co.
Atlas Powder Co.
Halafax Explosives Co.
Trojan Powder Co.

Ferric Chloride
Great Western Electro-Chemical Co.

Flumes, Metal
California Corrugated Culvert Co.
Hardesty Mfg. Co.
Pure Iron Culvert & Mfg. Co.
Toncan Culvert Mfrs. Assn.
Washington Corrugated Culvert Co.
Western Metal Mfg. Co.
Western Pipe & Steel Co.

Forms, Concrete
Western Pipe & Steel Co.

Generators, Electric
General Electric Co.
Harnischfeger 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.
Smith Engineering Works

Hoists, Diesel, Gas, Electric and Hand Power
American Hoist and Derrick Company
Chain Belt Company
Chicago Pneumatic Tool Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Link-Belt Co.
McKiernan-Terry Corp.
Ramsey Machinery Company
Wellman Engineering Co.

Hoppers, Steel
Link-Belt Co.
Standard Steel Works
Western Pipe & Steel Co.

Hose, Air, Steam and Water
Chicago Pneumatic Tool Co.

Hydrants
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.

Lumber
Baxter, J. H., & Co.

Lumber, Redwood
California Redwood Assn.

Lumber, Treated
Baxter, J. H., & Co.

Meters
Neptune Meter Co.

Mixers, Concrete
Chain Belt Company
Koehring Co.
Link-Belt Company
Western Pipe and Steel Company

Motors, Electric
General Electric Co.
Harnischfeger Sales Corp.

Oxygen
Air Reduction Sales Company

Paints, Protective
General Paint Corp.

Paving Breakers
Chicago Pneumatic Tool Co.
Worthington Pump & Mchy. Corp.

Penstocks
Western Pipe & Steel Co.

Pile Drivers
American Hoist and Derrick Company
Harnischfeger Corp.
Industrial Brownhoist Corp.
McKiernan-Terry Corp.

Piling, Creosoted
Baxter, J. H., & Co.

Piling, Wood
Baxter, J. H., & Co.

Pipe, Cast Iron
Pacific States Cast Iron Pipe Co.
U. S. Pipe and Foundry Company

Pipe, Riveted Steel
Western Pipe & Steel Co.

Pipe, Steel
Western Pipe & Steel Co.

Pipe, Welded Steel
California Corrugated Culvert Co.
Hardesty Mfg. Co.
Toncan Culvert Mfrs. Assn.
Washington Corrugated Culvert Co.
Western Pipe & Steel Co.

Powder
(See Explosives)

Pumps
Chain Belt Company
Chicago Pneumatic Tool Co.
Layne & Bowler Co.
Pelton Water Wheel Co.
Pomona Pump Co.
Worthington Pump & Mchy. Corp.

Rollers, Compacting
LeTourneau, R. G., Inc.

Rollers, Road
Austin-Western Road Mchy. Co.

Rope, Wire
American Cable Company
Leschen, A., & Sons Rope Co.

Scarifiers
Adams, J. D., Co.
Austin-Western Road Mchy. Co.
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Scrapers
Adams, J. D., & Co.
Austin-Western Road Mchy. Co.
LeTourneau, R. G., Inc.

Screens, Sand and Gravel
Austin-Western Road Mchy. Co.
Link-Belt Company
Smith Engineering Works

Second Hand Equipment

(See Opportunity Section)

Sewage Disposal Equipment

Chain Belt Company
Link-Belt Company
Wallace & Tiernan Company

Sharpeners, Drill

Sullivan Machinery Company
Worthington Pump & Mchy. Corp.

Shovels, Power

American Hoist and Derrick Company
Austin-Western Road Mchy. Co.
Bucyrus-Erie Company
Harnischfeger Sales Corp.
Koehring Company
Lima Locomotive Works, Inc.
Link-Belt Company
Northwest Engineering Co.
Osgood Company
Thew Shovel Company

Steel, Abrasion Resisting

American Manganese Steel Co.
Electric Steel Foundry Co.

Steel, Sheet-Galvanized Corrugated

California Corrugated Culvert Co.
Toncan Culvert Mfrs. Assn.

Steel, Structural

Western Pipe & Steel Co.

Tanks, Metal

California Corrugated Culvert Co.
Western Pipe & Steel Co.

Timber, Creosoted

Baxter & Company, J. H.

Tires, Rubber

Firestone Tire & Rubber Co.

Tools, Pneumatic

Chicago Pneumatic Tool Co.
Sullivan Machinery Company
Worthington Pump & Mchy. Corp.

Torches, Carbide

Air Reduction Sales Co.

Tractors

Allis-Chalmers Mfg. Co.
Case, J. I., Company
Caterpillar Tractor Company
International Harvester Company of America

Tramways, Aerial

Leschen, A., & Sons, Rope Co.

Trucks, Motor

International Harvester Company of America

Turbines

General Electric Co.
Pelton Water Wheel Co.

Valves, Gate

California Corrugated Culvert Co.
Pacific Pipe Co.
Pelton Water Wheel Co.

Vibrators, Concrete

Chicago Pneumatic Tool Co.
Electric Tamper & Equipment Co.

Wagons and Trailers

Adams, J. D., Co.
Austin-Western Road Mchy. Co.
Koehring Co.
LeTourneau, R. G., Inc.

Water Wheels

Pelton Water Wheel Co.

Welding and Cutting Equipment

Adams, J. D., Co.
Air Reduction Sales Company
Harnischfeger Corp.

Welding Gas

Air Reduction Sales Company

Welding Rods and Wire

Adams, J. D., Co.
Air Reduction Sales Company

WHERE TO BUY IN THE WEST

A directory of distributors and branch offices of the manufacturers whose advertisements appear in this issue of *Western Construction News*. Because of space limitations only the principal centers of the West are listed. If you do not find what you want, or the firm you want, write for further information to *Western Construction News*, 114 Sansome Street, San Francisco, California. In communicating with distributors or branch offices, please mention *Western Construction News*.

A directory of equipment and materials and an alphabetical index of advertisers will be found on the last pages of this issue.

Arizona

Phoenix

Allison Steel Mfg. Co.,
S. 19th Ave.
4-1191
American Cable Co., Inc.

Arizona Tractor & Equipment Co.,
134 South First Ave.
3-1146
Bucyrus-Erie Co.
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Fuller, W. P., & Co.,
117 East Jackson St.
4-2123
Reilly Tar & Chemical Corp.

General Electric Company,
441 West Madison St.
3-6139

McGinnis, Neil B., Company,
1401 South Central Ave.
4-1493
Adams, J. D. Co.
Allis-Chalmers Manufacturing Company
Northwest Engineering Co.

Mine & Smelter Equipment Co.,
110 South Third Ave.
3-6418
Link-Belt Co.
Page Engineering Co.

Pratt-Gilbert Hardware Co.,
701 South Seventh St.,
3-5145
Air Reduction Sales Co.
Apache Powder Co.
Koehring Co.
Leschen, A., & Sons Rope Co.

Stapley, O. S., Co.,
723 Grand Ave.,
4-1116
Austin-Western Road Machinery Co.
Chain Belt Company
Columbia Steel Co.
International Harvester Co. of America, Inc.

Torson Construction Co.,
220 South 7th Ave.,
Electric Tamper & Equipment Co.

The Western Metal Mfg. Co.
Western Pipe & Steel Co.
611 South Dunlap Ave.
3-5602
California Corrugated Culvert Company
Toncan Culvert Manufacturers' Association

Tucson

Corbett, J. Knox, Lumber & Hdw. Co.,
340 North Sixth Ave.
2140
Austin-Western Road Machinery Co.

Fuller, W. P. & Co.,
219 East Congress St.
2278
Reilly Tar & Chemical Corp.

Ronstadt Hdw. & Mchy. Co.,
92 East Broadway
680
International Harvester Co. of America, Inc.

Steinfeld, Albert, & Co.,
119 North Stone Ave.
882
Apache Powder Co.

California

Los Angeles

Adams, J. D., Company,
1202 Mateo St.
TRinity 8381
Adams, J. D., Co.
International Harvester Co. of America, Inc.

Air Reduction Sales Co.,
2423 East 58th St.
JEfferson 6141

American Cable Co., Inc.,
841 Petroleum Sec. Bldg.
PRospect 5753

American Manganese Steel Co., Inc.,
5805 Downey Road
LAfayette 1159

Atlas Powder Co.,
805 Title Guarantee Bldg.
MIchigan 8896

Austin-Western Road Mchy. Co.,
4400 District Boulevard
KImball 4156

Bevis Machinery Co.,
3649 Santa Fe Ave.
KImball 4149
Industrial Brownhoist Corp.

Brown-Bevis Equipment Co.,
4900 Santa Fe Ave.
JEfferson 5221
J. I. Case Company
Chain Belt Company
Electric Tamper & Equipment Co.
Page Engineering Co.

California Corrugated Culvert Company,
409 LeRoy St.
CApitol 13181

California Equipment Co.,
4900 Santa Fe Ave., Vernon
JEfferson 4106
Smith Engineering Works

California Redwood Association,
117 West Ninth St.
MUtual 8156

Case, J. I., Company,
819 Mateo St.
VAndike 0396

Chain Belt Company,
1414 Santa Fe Ave.
TRinity 6237

Chicago Pneumatic Tool Company,
655 Santa Fe Ave.
MIchigan 2651

Collins, Harry C., Mchy. Co.,
1919 Santa Fe Ave.
TR. 8751
Link-Belt Co.

Columbia Steel Co.,
2087 East Slauson.
LAfayette 1171

Columbian Iron Works,
2801 East 12th St.

Crook Company,
2900 Santa Fe Ave.
KImball 5137
Allis-Chalmers Manufacturing Company
American Cable Co., Inc.
Bucyrus-Erie Co.
Sullivan Machinery Company

Diesel Motor Sales & Service Corp.,
2331 East Ninth St.
TRinity 4967
Cummins Engine Co.

Electric Steel Foundry Co.,
2205 Santa Fe Ave.
JEfferson 4191

Firestone Tire & Rubber Company of California,
2525 Firestone Blvd.
JEfferson 4241

Fuller Company,
1041 South Olive St.

Fuller, W. P., & Co.,
135 North Los Angeles St.
TRinity 0711
Reilly Tar & Chemical Corp.

Garlinghouse Bros.,
2416 East 16th St.
JEfferson 5291
Leschen, A., & Sons Rope Co.,
McKiernan-Terry Corp.
Worthington Pump & Machinery Corp.

General Electric Co.,
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.
Wellman Engineering Co.

International Harvester Co. of America, Inc.,
(Tractors and Power Units)
734 Lawrence St.
TRinity 5132

International Harvester Co. of America, Inc.,
(Motor Trucks)
1628 East 7th St.
TRinity 5132

Layne & Bowler Corp.,
900 Santa Fe Ave.
TRinity 2543

Link-Belt Co.,
361 South Anderson St.
ANgelus 6171

Neptune Meter Co.,
701 East Third St.
TRinity 2879

Northwest Engineering Co.,
3707 Santa Fe Ave.
JEfferson 2196

Pacific Portland Cement Co.,
633 East Gage Ave.
ADams 6103

Pioneer Rubber Mills,
822 East Third St.
MIchigan 7791

Portland Cement Association
816 West 5th St.
MIchigan 9897

Reilly Tar & Chem. Corp.,
Architects Building
MUtual 0433

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 Co.,
2001 Santa Fe Ave.
TRinity 6911
Lima Locomotive Works, Inc. (Shovel and Crane Division)
Page Engineering Co.
Worthington Pump & Machinery Corp.

St. John, A. S., Co., Inc.,
126 West Third St.
VAndike 8865
Apache Powder Co.

Sparling, R. W., Company,
954 North Main St.
CApitol 13168

Standard Steel Works
5001 Boyle Ave.
LAfayette 1138

Stevenson Chemical Co.,
641 Gibbons St.
Gt. Western Electro-Chemical Co.

Sullivan Machinery Company,
2900 Santa Fe Ave.
KImball 5137

Timken Roller Bearing Service & Sales Company, The,
1526 South Olive St.
PRospect 3165

United States Pipe and Foundry Co.,
504 Subway Terminal Bldg.
VAndike 5166

Victor Welding Equipment Co.,
2032 Santa Fe Ave.
JEfferson 6246
General Electric Co.

Wallace & Tiernan Co.,
3923 West Sixth St.
FEderal 6823

Western Pipe & Steel Co.,
5717 Santa Fe Ave,
JEfferson 3131
Toncan Culvert Manufacturers' Association

Worthington Pump & Machinery Corp.
5075 Santa Fe Ave.
JEfferson 6251

Oakland

Air Reduction Sales Co.,
Park Ave. & Halleck St.
OLympic 4100

Allis-Chalmers Manufacturing Company,
2533 Peralta St.
GLencort 2530

American Manganese Steel Co., Inc.,
956 Ferry St.
HIgate 1703

Bacon, Edw. R., Co.,
2059 Webster St.
GLencourt 7400
LeTourneau, R. G., Inc.
McKiernan-Terry Corp.
Page Engineering Co.

Bates, Sam, Co.
1925 Dennison St.
ANdover 4327
Chicago Pneumatic Tool Company
Page Engineering Co.

Case, J. I., Company,
2001 Peralta St.
LAkeside 0838

Fuller, W. P., & Co.,
259 10th St.
GLencourt 0167
Reilly Tar & Chemical Corp.

Harron, Rickard & McCone Co.,
2059 Webster St.
GLencourt 7400
Electric Steel Foundry Co.
Harnischfeger Corp.
Koehring Co.
Wellman Eng. Co.

Industrial Equipment Co.,
Outer Harbor.
GLencourt 5909
Bucyrus-Erie Co.
Chain Belt Company

International Harvester Co. of America, Inc.,
1640 East 12th St.
ANdover 5700

Link-Belt Co.,
526 Third St.
HIgate 4286

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 St.
Main 445
LeTourneau, R. G., Inc.
McKiernan-Terry Corp.
Page Engineering Co.

DeHart, S. B.
1051 34th Street
Capital 4475-W
Adams, J. D., Co.

Fuller, W. P., & Co.,
1013 12th St.
Main 6890
Reilly Tar & Chemical Corp.

Where to Buy in the West

General Paint Corp.,
11th and R
Capital 2121

Harron, Rickard & McCone Co.,
1431 2nd St.
CApitol 1514
Elec. Steel Foundry Co.
Harnischfeger Corp.
Koehring Co.
Wellman Eng. Co.

Sacramento Tractor & Equipment Co.,
1730 16th St.
CApital 1065
Allis-Chalmers Manufacturing Company

Vandercook Gold Co.,
F & M Bldg.
Sacramento
Main 2085
Worthington Pump & Machinery Corp.

Weaver-Rye Tractor Co., Inc.,
1715 2nd St.
Main 4100
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Western Pipe & Steel Co.,
Care of Sutter Club
Main 217
Toncan Culvert Manufacturers' Association

San Diego

Contractors Equipment & Machinery Co.
1344 National Ave.
Main 8833
Worthington Pump & Machinery Co.

Fuller, W. P., & Co.,
803 7th Ave.
Main 0181
Reilly Tar & Chemical Corp.

General Electric Co.,
206 W. Market St.
Main 4288

Hazard-Gould & Co.,
Fifth and K Sts.
MAin 6174
Allis-Chalmers Manufacturing Company

International Harvester Co. of America, Inc.,
1482 Broadway
FRanklin 1550

San Diego Tractor & Equipment Co.,
701 First Ave.
Main 6151
Caterpillar Tractor 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, Inc.

Air Reduction Sales Co.,
313 6th St.
SUtter 4582

American Cable Co., Inc.,
630 Third St.
SUtter 1708

Associated Equipment Co., Ltd.,
355 Fremont St.
KEarny 1181
Thew Shovel Co.

Atlas Powder Co.,
1 Montgomery St.
GArfield 8640

Austin-Western Road Mchy. Co.,
435 Brannan St.
DOuglas 2183

Bacon, Edward R., Co.,
17th and Folsom Sts.
HEmlock 3700
Allis-Chalmers Manufacturing Company
LeTourneau, R. G., Inc.
McKiernan-Terry Corp.
Page Engineering Co.

Bay Equipment Company,
68 Eighth St.
HEmlock 0085
Sullivan Machinery Company

Bucyrus-Erie Co.,
989 Folsom St.
GArfield 8192

California Redwood Association,
Financial Center Bldg.
EXbrook 7880

Chain Belt Company,
909 Harrison St.
GArfield 1438

Chicago Pneumatic Tool Company,
175 First St.
KEarny 2014

Cummins Diesel Sales Corporation,
525 Fourth St.
GArfield 4688
Cummins Engine Co.

Firestone Tire & Rubber Company of California,
111 Townsend St.
DOuglas 5400

Fuller Co.
564 Market St.

Fuller, W. P., & Co.,
301 Mission St.
EXbrook 7151
Reilly Tar & Chemical Corp.

Garfield & Co.,
Hearst Bldg.
SUtter 1036
Industrial Brownhoist Corp.
Link-Belt Co.
Worthington Pump & Machinery Co.

General Electric Co.,
235 Montgomery St.
DOuglas 3740

General Paint Corp.,
2627 Army St.
ATwater 5100

Great Western Electro-Chemical Co.,
9 Main St.
GArfield 8323

Harnischfeger Sales Corp.,
82 Beale St.
DOuglas 2313

Harron, Rickard & McCone Co.,
2070 Bryant St.
ATwater 2202
Electric Steel Foundry Co.
Harnischfeger Sales Corp.
Koehring Co.
Wellman Engineering Co.

International Harvester Co. of America, Inc.,
201 Potrero Ave.
HEmlock 6681

Jenison Machinery Company,
900 Tennessee
VAlencia 1710
Chain Belt Company
Smith Engineering Works

Kratz & McClelland, Inc.,
522 Bryant St.
SUtter 6807
Electric Tamper & Equipment Co.

Leschen, A., & Sons Rope Co.,
520 Fourth St.
GArfield 8134

Link-Belt Co.,
400 Paul Ave.
DElaware 6400

Neptune Meter Co.,
320 Market St.
GArfield 8144

Northwest Engineering Co.,
255 Tenth St.
HEmlock 5060

Pacific Pipe Co.,
207 Folsom St.
EXbrook 6255

Pacific Portland Cement Co.,
111 Sutter St.
GArfield 4100

Pacific States Cast Iron Pipe Co.,
Rialto Bldg.,
KEarny 5075

Pioneer Rubber Mills,
353 Sacramento St.
SUtter 5780

Portland Cement Association
564 Market St.
SUtter 8159

Robinson Tractor Co.,
1175 Howard St.
MArket 8020
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Sullivan Machinery Company,
145 10th St.,
HEmlock 7317

Thew Shovel Co.,
355 Fremont St.
KEarny 1181

Timken Roller Bearing Service & Sales Company, The,
1800 Van Ness Ave.
ORdway 6521

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

Weber & Company,
Rialto Building
EXbrook 7841
Clyde Sales Company

Welding Service Sales, Inc.,
954 Howard St.
DOuglas 3292
Harnischfeger Corp.—Welders

Western Pipe & Steel Co.,
444 Market St.
GArfield 6788
Toncan Culvert Manufacturers' Association

Worthington Pump & Machinery Corp.,
543 Howard St.

Young, A. L., Machinery Co.,
26 Fremont St.
SUtter 5736
Lima Locomotive Works, Inc.

Colorado

Denver

Asacon-Miller Diesel Sales Company,
1300 Glenarm Place
CHerry 1276
Cummins Engine Co.

American Cable Co., Inc.,
2125 Blake St.
TAbor 0197

American Manganese Steel Co., Inc.,
Fourth and Wazee Sts.
TAbor 8171

Atlas Powder Co.,
401 Midland Savings Bldg.

Bostwick, Frederick H.,
Denver Natl. Bank Bldg.
TAbor 5744
Western Pipe & Steel Co.

Case, J. I., Company,
1800 15th St.
KEystone 7338

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.
Chain Belt Company
Page Engineerig Co.

Denver Oxygen Co.,
901 Navajo
TAbor 4725
Air Reduction Sales Co.

Fitzgerald, Paul,
U. S. Natl. Bank Bldg.
TAbor 1841
Harnischfeger Corp.—Welders

General Electric Co.,
650 17th St.
KEystone 7171

General Machinery & Supply Co.,
635 Walnut St.
KEystone 1500
Worthington Pump & Machinery Co.

Hardesty Mfg. Co.,
3063 Blake St.
MAin 4156
California Corrugated Culvert Company

Hendrie & Bolthoff Mfg. & Supply Co.
1639 17th St.
KEystone 4111
General Electric Co.

International Harvester Co. of America, Inc.,
2308 15th St.
GAllup 0138

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

McKelvy Machinery Co.,
754 South Broadway
Adams, J. D., Co.
Koehring Co.

Mine & Smelter Supply Co.,
1422 17th St.
KEystone 3111
McKiernan-Terry Corp.
Northwest Engineering Co.
Smith Engineering Works

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, Inc.
Thew Shovel Co.
Wellman Engineering Co.

Neptune Meter Co.,
1700 15th St.
MAin 3221

Pacific States Cast Iron Pipe Co.,
1921 Blake St.
MAin 0697

Stearns-Roger Mfg. Co.,
1720 California
KEystone 3311
Chicago Pneumatic Tool Company

Pioneer Rubber Mills
1726 Wazee St.
TAbor 5545

Steinbarger, Herbert N., Co.,
1711 Market St.
MAin 3460
Lima Locomotive Works, Inc.

Thompson Mfg. Co.,
3001 Larimer
KEystone 8196
Toncan Culvert Manufacturers' Association

Wilson Machinery Company,
2811 Walnut St.
TAbor 0135
Allis-Chalmers Manufacturing Company

Worthington Pump & Machinery Co.,
512 18th St.

Idaho

Boise

Bunting Tractor Co.,
926 Front St.
2649
Caterpillar Tractor Co.

Feenaughty Machinery Co.
9th and Grove Sts.
1333
Thew Shovel Co.

Fine, Jake
Post Office Box 549
3613J
Adams, J. D., Co.

General Electric Co.,
906 East Bannock St.
368

General Paint Corp.,
2218 W. Fairview Ave.
2861-W

Hardesty Mfg. Co.,
223 South Third St.
3031
California Corrugated Culvert Company

Intermountain Equipment Co.,
Broadway and Myrtle St.
171
Allis-Chalmers Manufacturing Company
Bucyrus-Erie Co.
Chain Belt Company
General Electric Co.

Where to Buy in the West

Ingersoll-Rand Company,
420 East Iron St.
2-3903
LeTourneau, R. G., Inc.
Page Engineering Co.

Jeter, F. A.
1116 North 18th St.
2612
Austin-Western Road Machinery Co.

Olson Mfg. Co.,
214 South 5th St.
4277
Leschen, A., & Sons Rope Co.

Montana

Billings

Adams, J. D., Company

Allis-Chalmers Manufacturing Company,
25th and 4th Aves.
5484

Austin-Western Road Mchy. Co.,
2413 First Ave. N.

Case, J. I., Company,
2203-17 Montana Ave.
2126

Connelly Machinery Co.,
2706 Montana Ave.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Leschen, A., & Sons Rope Co.,
LeTourneau, R. G., Inc.

Hardie, W. C.,
1121 N. 32nd St.
5548
Adams, J. D., Co.

International Harvester Co. of America, Inc.,
20 South Broadway
4144

Midland Implement Co.,
2300 Montana Ave.
Koehring Co.
Page Engineering Co.

Butte

Atlas Powder Co.,
412 West Broadway
2-4868

Chicago Pneumatic Tool Company,
920 South Arizona St.
2-4285

Daugherty, H. H.,
420 South Idaho St.
3884
Bucyrus-Erie Co.

General Electric Co.
20 West Granite St.
5479

Hall-Perry Machinery Co.,
812 East Iron St.
6376
American Cable Co., Inc.,
Chain Belt Company
Page Engineering Co.
Smith Engineering Works
Thew Shovel Co.

Wright, S. P., & Co., Inc.
48 East Broadway
2-3221
Lima Locomotive Works, Inc.

Great Falls

Case, J. I., Company,
301-3 Second St., South
4290

Connelly Machinery Co.,
315 2nd Street S.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Leschen, A., & Sons Rope Co.
LeTourneau, R. G., Inc.

Holdal, Milton
1306 Second Ave. South
3320

International Harvester Co. of America, Inc.,
422 Second St., South
7621

Northwest Equipment Co., Inc.,
Great Northern Tracks
3982
Koehring Co.

Viles, Fred M.
1003 Second Ave., N. W.
4755
Allis-Chalmers Manufacturing Company

Missoula

Hardesty Mfg. Co.
Star Garage,
California Corrugated Culvert Company

Mountain Tractor & Machinery Co.,
618 South Higgins Ave.
4612
Allis-Chalmers Manufacturing Company

Wells, Walker J.
Austin-Western Road Machinery Co.

Westmont Tractor & Equipment Co.,
Bucyrus-Erie Co.
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Sealed proposals will be received at the office of the East Bay Municipal Utility District, until 8 p. m., Wednesday, January 22, 1936, and will at that hour be opened, for furnishing approximately 60,000 feet of cast iron pipe, of diameters 4" and 6".

Specifications (No. LS 165) may be obtained upon application at Room 406 of the office of the District, 512 Sixteenth Street, Oakland, California.

JOHN H. KIMBALL,
Secretary.

Oakland, California,
January 9, 1936.

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JOHN H. KIMBALL,
Secretary.

Oakland, California,
January 9, 1936.

NOTICE TO CONTRACTORS

Sealed proposals will be received at the office of the East Bay Municipal Utility District, 512 Sixteenth Street, Oakland, Califorina, until 8 p. m., Wednesday, January 22, 1936, and will at that hour be opened for furnishing one portable air compressor.

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JOHN H. KIMBALL,
Secretary.

Oakland, California,
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