WCR-12-1935

WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED
WESTERN HIGHWAYS BUILDER

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DECEMBER, 1935

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Denver Taps New Water Supply

Record Culvert for Highway

Cars to Inspect Pipe Lines

Extensive Flood Control Work

Heavy rock work on the Morrison-Knudsen Co. contract with the Bureau of Public Roads for the Tioga Road in Yosemite National Park.

FOUNDATION WEAKNESSES CAUSE SERIOUS LOSSES

Inadequate or decaying foundations are the most costly impairments to a house... constituting a constant drain on the pocketbook for repairs in almost every part of the home.

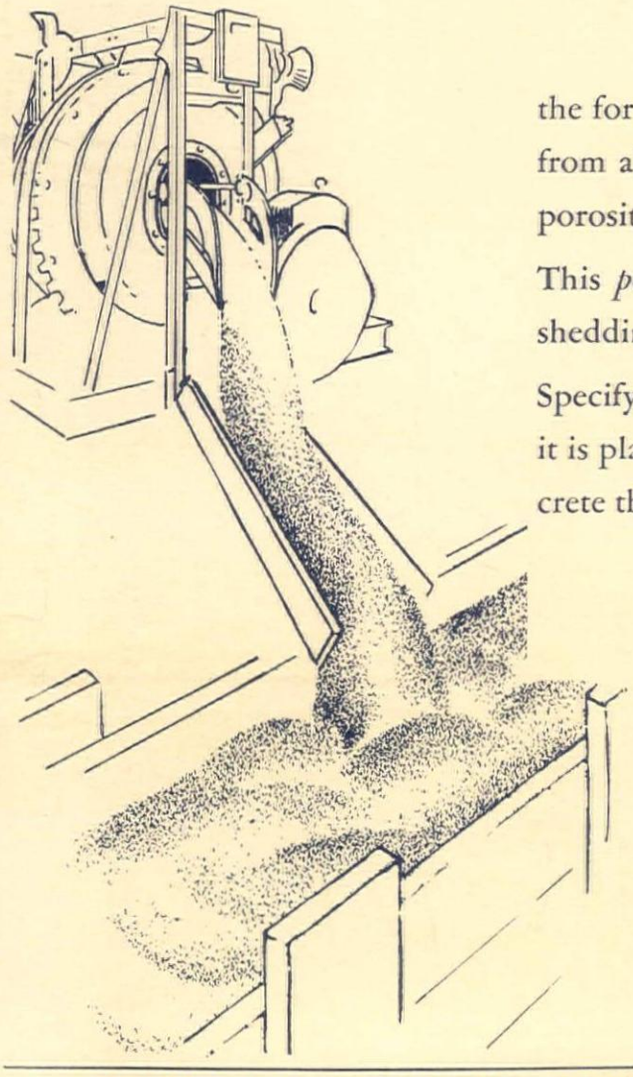
Weak, crumbling foundations mean a sagging, cracking and falling-down process of the house generally which affects every floor and wall. Many home owners pay out hundreds of dollars for floor and wall repair work without realizing that a small amount of money expended on the foundation would stop the cause of the continual financial drain.

Good, permanent foundations can be given every house easily and economically... One of the best improvement investments is the strengthening of the foundation, for the life of the entire house is lengthened, repair bills for other parts of the home are lowered, or wiped out entirely, and livability increased by recreational use of the basement.

From F. H. A. clip sheet, August, 1935

How TAN PLASTIC *pourability*

assures smooth, solid walls and dry basements



A concrete mix of TAN PLASTIC pours into the forms like lava, enabling it to be puddled into a solid mass free from all voids, air pockets and honeycombs that later might cause porosity and disintegration.

This *pourability* together with TAN PLASTIC'S proven moisture shedding qualities make it ideal for foundations and basement walls.

Specify and use TAN PLASTIC on your next job. Watch how easily it is placed in the forms. See for yourself the firm, solid, smooth concrete that results when the forms are removed.

Most likely your materials dealer handles Tan Plastic. If not he can easily obtain it for you.

GOLDEN GATE
TAN
PLASTIC
WATERPROOF PORTLAND CEMENT

PACIFIC PORTLAND CEMENT COMPANY • SAN FRANCISCO

10 NORTHWESTS for Fredrickson & Watson Construction Co.

HERE is a concern that years ago established a reputation for the quality of its work. Fredrickson and Watson Construction Company of Oakland, California.

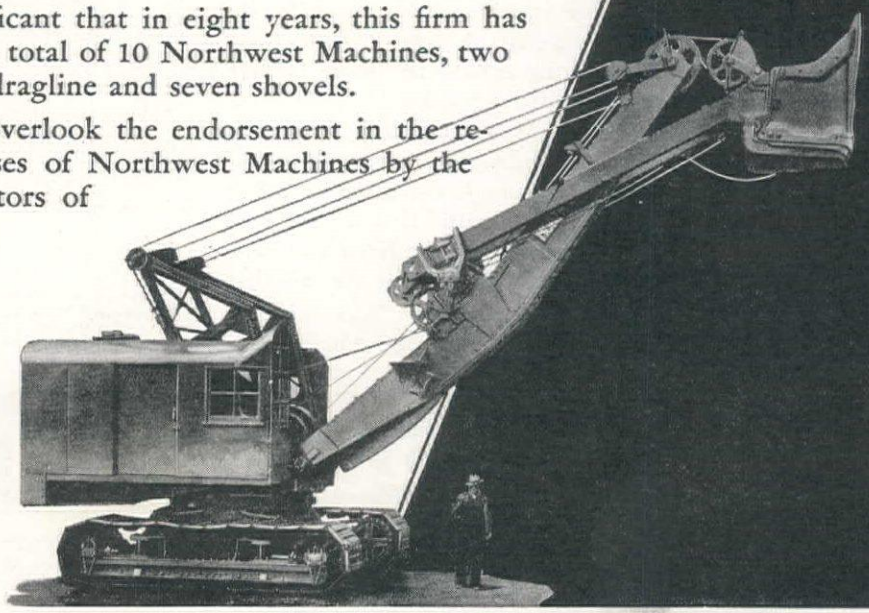
Eight years ago they bought their first Northwest. Their record of repeat orders follows:

1927	Two	Northwest	Cranes
1929	One	"	Shovel
1930	Two	"	Shovels
1931	One	"	Dragline
1932	One	"	Shovel
1933	Two	"	Shovels
1935	One	"	Shovel

The Fredrickson and Watson Construction Co., is in a position to buy any machine it requires to do its work best.

It is significant that in eight years, this firm has purchased a total of 10 Northwest Machines, two cranes, one dragline and seven shovels.

You cannot overlook the endorsement in the repeated purchases of Northwest Machines by the leading contractors of the Nation.



NORTHWEST
ENGINEERING CO.
The world's largest exclusive builders of gasoline, oil, diesel or electric powered shovels, cranes, draglines, pullshovels and skimmers
1736 Steger Building
28 E. Jackson Boulevard
Chicago, Ill, U. S. A.

SHOVELS, CRANES, DRAGLINES, PULLSHOVELS, SKIMMERS

NORTHWEST

GASOLINE, OIL, DIESEL OR ELECTRIC POWERED

BUILT IN A RANGE OF 12 SIZES, 1/2 CU. YD. CAPACITY AND LARGER

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.; Neil B. McGinnis Co., 1401 S. Central Ave., Phoenix, Ariz.

This 12-foot blade is cutting a 1 to 1 slope on a bank 8 feet high; it is capable of cutting much higher of course on steeper banks.

NEW RANGE OF BLADE POSITIONS

A ROAD GRADER'S value to you is based largely, is it not, on what you can do with it—how completely it answers your needs? If you have high banks to cut back, a grader that will cut to the top of them is more valuable to you than one that will not. If you have backsloped, flat-bottom ditches to cut, a grader that will cut them to specifications without the use of a backsloper attachment is more valuable to you than one that requires an attachment. For finishing soft shoulders, a grader that can extend its blade farther beyond the line of wheels is of distinct value.

The new-type Adams Leaning Wheel Graders are worth more to you because you can get more extreme positions of the blade and make cuts that are outside the range of other machines. Their adjustment is so flexible that on 90% of your work you don't even have to change the setting of your lift links or the position of moldboard on the circle—that means much time saved.

In addition to this, all adjustments throughout the machine are made very quickly and easily. You get a visibility of the blade that is not approached in any other machine. You get all-welded construction which, for strength and rigidity, is unequalled; machine-cut gears and liberal use of anti-friction bearings insure long life.

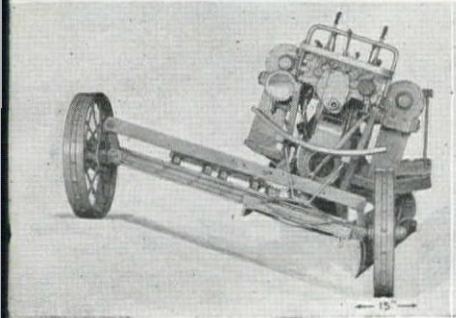
Have our local representative show you one of these remarkable machines or write for complete details. Now available in 12 and 10-ft. blade sizes with hand or power-operated controls.

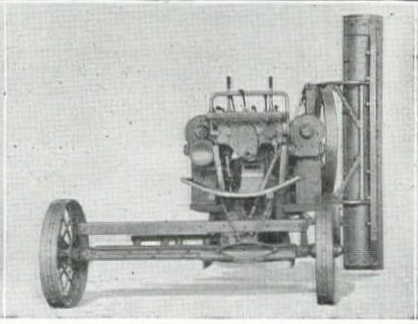
J. D. ADAMS COMPANY

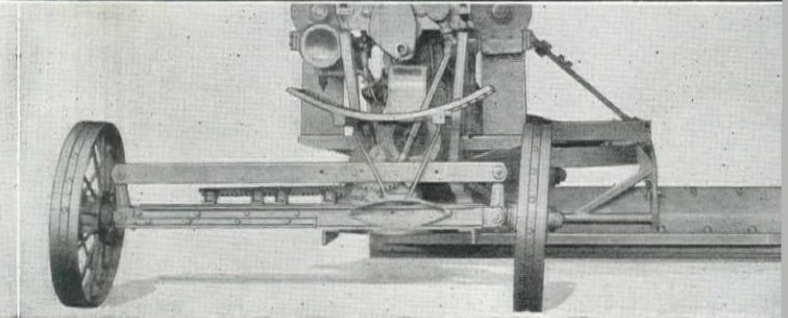
SAN FRANCISCO—LOS ANGELES—SPOKANE

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

—the New-Type ADAMS GRADERS







Above illustrations (left to right) show 1—how blade can be set at sharp angle to cut narrow, flat-bottom ditches. Sharp angles also permit cutting narrow-frame design, the blade can actually be swung through an arc of 90 degrees to cut any desired slope. 3—The blade can be extended far

The Engineer

By E. LEON DALTON

In The Cornell Civil Engineer

Who comes with Faber sharpened keen,
With profile long and sober mien,
With transit, level, book and tape,
And glittering ax to swat the stake?
The Engineer.

Who sets the level, bends his spine,
Squints through the glass along the line,
Swings both his arms at rapid rate,
Yells, "Hold that bloomin' rod up straight"?
The Engineer.

Who raves and snorts like one insane,
Jumps in the air and claws his mane,
Whene'er he sees a scraper take
A whack at his most cherished stake?
The Engineer.

Who swears he'll charge an "even ten"
For stakes destroyed by mules and men,
While on all fours he tries in vain
To find that vanished stake again?
The Engineer.

Who saws the air with maddened rage,
And turns with haste the figured page,
And then with patience out of joint,
Ties in another "reference point"?
The Engineer.

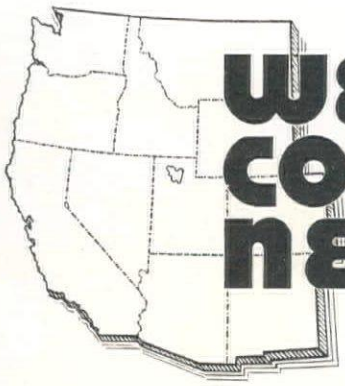
Who calls it your "unrivalled gall"
Whene'er you kick for overhaul,
And gives your spine the frigid chill,
Whene'er you spring an "extra bill"?
The Engineer.

Who deals with figures quite profuse,
Then tells you solid rock is loose,
That hard-pan's nothing more than loam,
While gumbo's lighter than sea foam?
The Engineer.

Who after all commands your praise,
(In spite of his peculiar ways)
While others harvest all the gains,
That spring from his prolific brains?
The 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.



WESTERN CONSTRUCTION NEWS

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J. I. BALLARD, Editor

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Bridge over south fork of Eel River, Leggett Valley Road, Mendocino County, Calif. Truss members, stringers, decking, floor beams, and all other timbers are California Redwood.

Staying Quality

Real Staying Quality in materials of construction permits no "line of least resistance." Staying Quality, applying the term broadly, demands uniformity of durable fiber and collective opposition to destructive elements.

In important construction, the engineer gives preference to that material from which he may expect hundred per cent staying quality *throughout* its *cross section.*

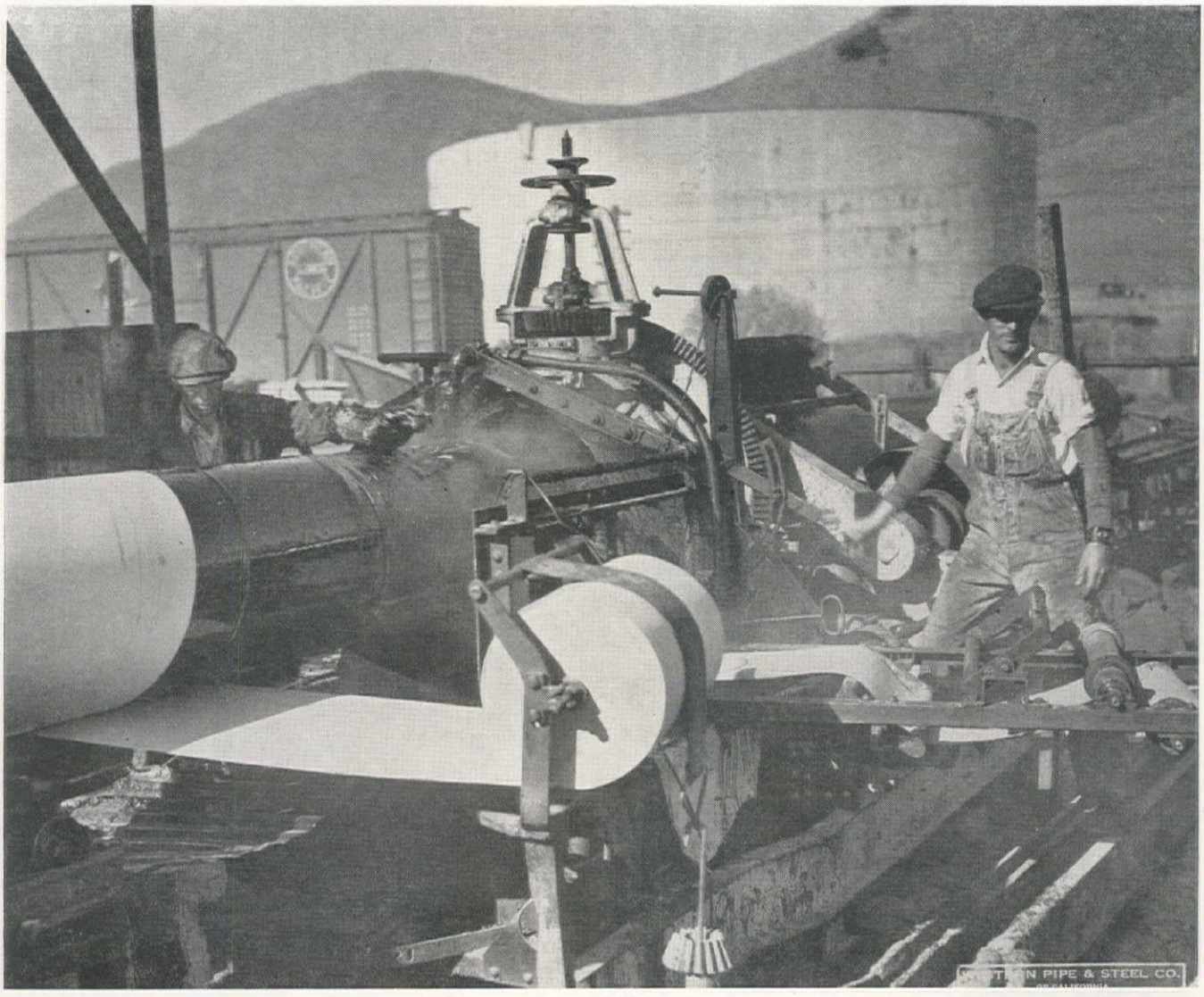
The widespread use of Structural Grades of California Redwood is proof of the acceptance, among engineers, of this fundamental fact.

Staying Quality gives Low Annual Cost. Low Annual Cost is the goal in engineering design. Achieve this through the use of California Redwood.

California Redwood Association

405 Montgomery Street, San Francisco

NATURALLY DURABLE CALIFORNIA REDWOOD



45 MILES (additional) welded steel pipe for Natural Gas—22″ x 5/16″—250# working pressure—being fabricated for Pacific Gas & Electric Co., Milpitas to San Francisco. (We fabricated a similar line for P. G. & E. in 1929.) Route of present line after crossing Lower Bay—South of Stanford campus, Woodside, La Canada road to Skyline Boulevard near Crystal Springs Country Club, past Daly City to Junipero Serra and Alemany boulevards to tie in with 26″ line to Potrero Gas Plant. Illustration shows continuous spiral wrapping operation, applying two coats of dip with wrapping of one thickness of asphalt paper and one thickness of Kraft paper, all in a single operation.

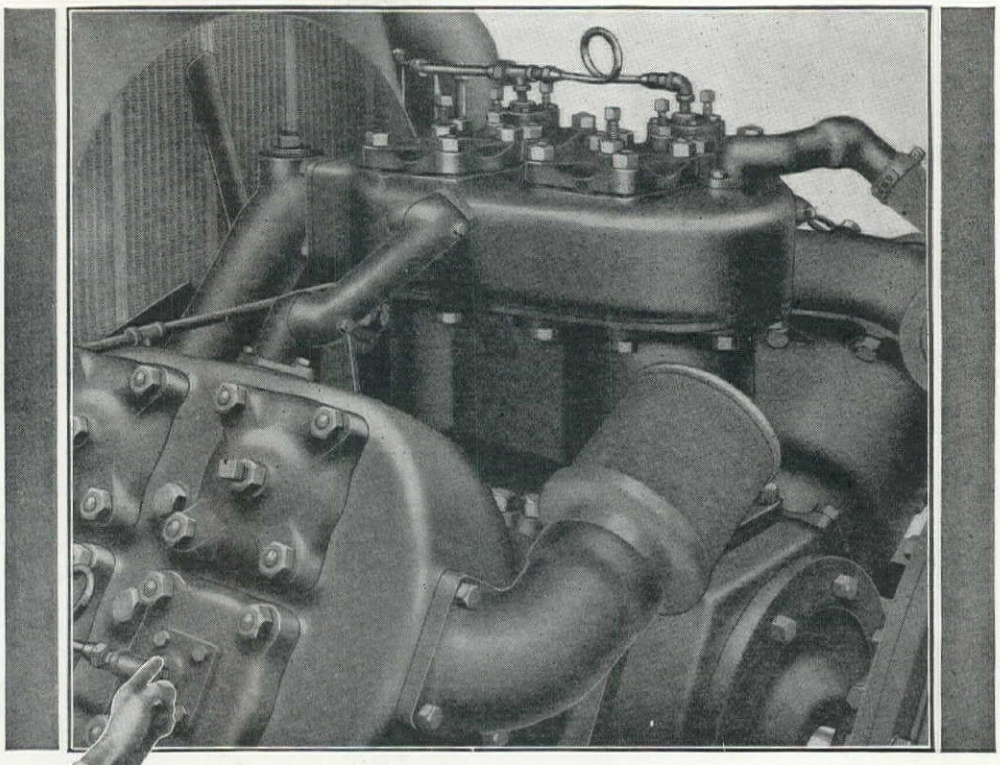
WESTERN PIPE & STEEL COMPANY

OF CALIFORNIA

LOS ANGELES SAN FRANCISCO FRESNO BAKERSFIELD PHOENIX

Affiliated: HARDINGE-WESTERN COMPANY

UNIFORM OPERATING TEMPERATURES AT ALL SEASONS



This is a photograph of the "air-end" of a Gardner-Denver water-cooled two-stage portable air compressor.

GARDNER-DENVER
210 Portable Compressor

Water Cooling in Hot Weather, means—

1. At least 50° cooler discharge temperature.
2. HIGHER PRESSURE at the drill.
3. LOWER lubricating oil consumption.
4. BETTER lubrication—LESS wear.
5. LONGER life for air hose.

in Cold Weather, means—

1. Engine jacket water WARMS compressor BEFORE it is clutched in.
2. Elimination of damage from cold starting.
3. NO SCORING of cylinders.
4. INDEPENDENCE of atmospheric temperature.
5. CORRECT operating temperature.

Air-cooling can never be as effective as water-cooling because the air strikes only one side of the cylinders, and because water has more than four times the heat-dissipating ability of air.

PROTECT YOUR AIR SUPPLY WITH WATER JACKETED CYLINDERS AND HEADS

GARDNER-DENVER COMPANY (*Since 1859*) **102 WILLIAMSON STREET, QUINCY, ILL.**

Western Branch Offices: Butte, Mont.; Denver, Colo.; Los Angeles, Cal.; Portland, Ore.; Salt Lake City, Utah; San Francisco, Cal.; Seattle, Wash.; Wallace, Idaho

GARDNER-DENVER

MORE AND COOLER AIR BY GARDNER-DENVER

BIG DRUMS MEAN GREATER CABLE ECONOMY

Are you getting satisfactory service from your dragline cables? To overcome this costly source of trouble LIMA draglines are equipped with machine grooved drums and boom point sheaves of extra large diameters.

With drums thirty times the diameter of cable used, and widths that will accommodate extra long cable length without double wrapping, LIMA users get from five to six times longer service from drag and hoist cables.

If you are in the market for a dragline of ½ yard capacity or larger, it will be to your advantage to consider the many savings offered by LIMA.

Bulletins will be sent upon request

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

Smith-Booth-Usher Co., 2001 Santa Fe Ave., Los Angeles; A. L. Young Machinery Co., 26-28 Fremont St., San Francisco, Calif.; H. J. Armstrong Co., 2244 First Ave. S., Seattle, Wash.; Western Steel & Equipment Corp., 734 N. E. Fifty-fifth Ave., Portland, Ore.; General Machinery Co., E. 3500 Blk., Riverside Ave., Spokane, Wash.; C. H. Jones Equipment Co., 236 West South Temple St., Salt Lake City, Utah; H. N. Steinbarger Co., 1711 Market St., Denver, Colo.

ANOTHER REASON why the cost per yard is LESS with a LIMA

LIMA DRAGLINES are built in ½ YARD CAPACITY and LARGER

LIMA
SHOVELS-DRAGLINES-CRANES

GIANT NECKLACES for Ol' Man River

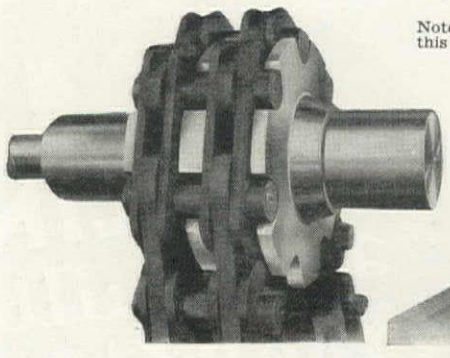
WHEN the mighty Mississippi goes on a rampage . . . it takes something mighty big to hold him in check . . . to stop some of that rollin' along.

To furnish the chains for raising and lowering the roller gates on the Mississippi River Dams, Jeffrey . . . with its full experience in handling big projects of every description . . . was the logical selection.

These veritable Giant's Necklaces . . . mightier than Ol' Man River himself . . . were built for a recent job. Each of the chains was 85 ft. long . . . each weighed about 27,500 pounds . . . each had an ultimate breaking strength in excess of 1,500,000 pounds.

In the section of this massive chain shown at the right, note the size of the side bars as compared to the man standing beside the chain. Below appears a section of this chain . . . mounted on sprocket and shaft . . . which are forged integral and weigh approximately 5,500 pounds.

Whether your job calls for large or small chain . . . or any type of material handling equipment . . . Jeffrey's experience can be of value to you.



Note the perfect fit of this massive chain over the sprocket.

The Jeffrey Manufacturing Co.

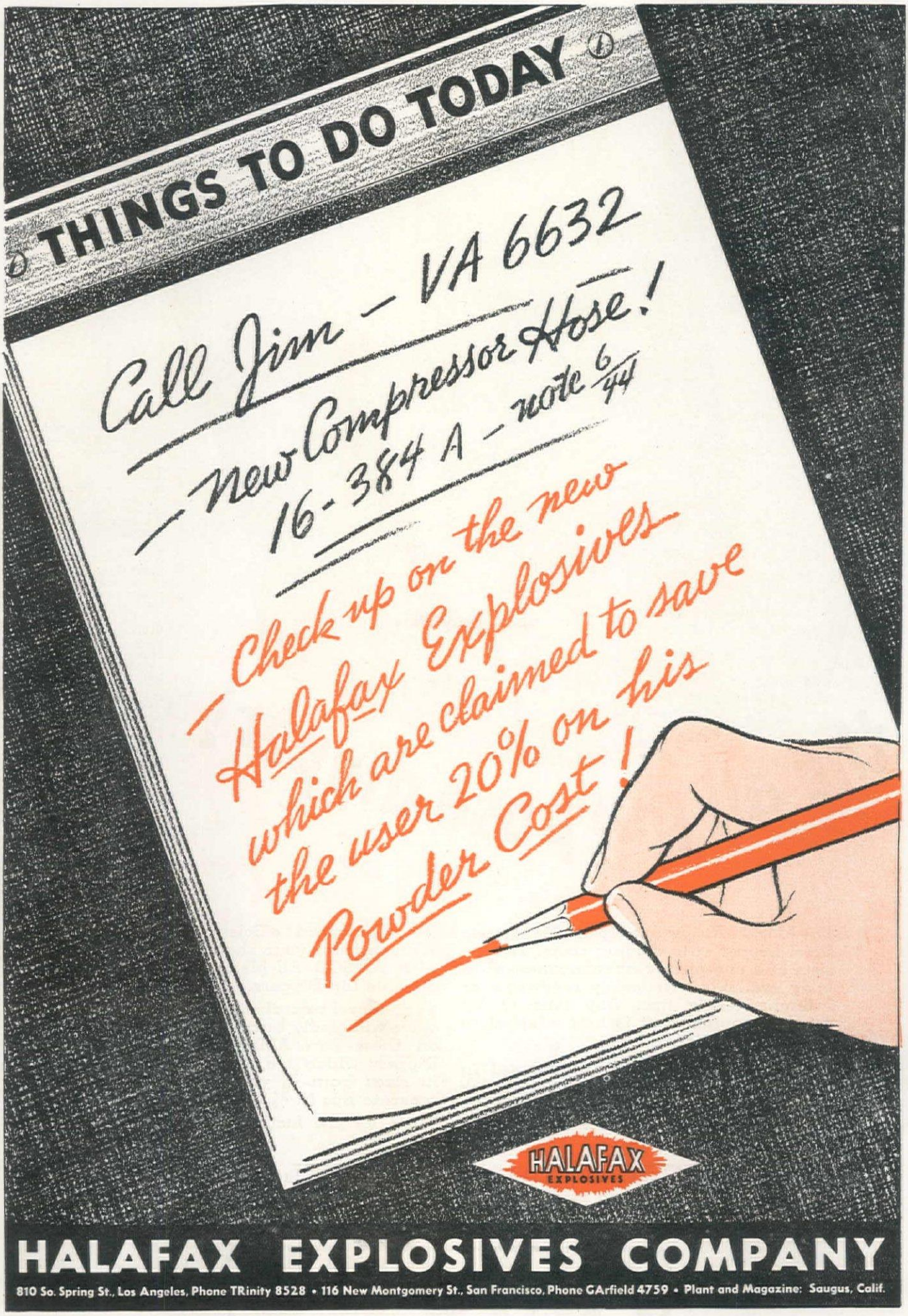
951-99 North Fourth Street, Columbus, Ohio

New York, Buffalo, Philadelphia, Pittsburgh, Boston, Scranton, Penn., Cincinnati, Cleveland, Detroit, Chicago, Terre Haute, Ind., Huntington, W. Va., Milwaukee, Denver, Salt Lake City, Birmingham, St. Louis

Jeffrey Manufacturing Company, Ltd., of Canada
Head Office and Works, Montreal—Branch Offices, Toronto, Calgary, Vancouver

JEFFREY CHAINS AND MATERIAL HANDLING EQUIPMENT

When writing to THE JEFFREY MANUFACTURING CO., *please mention Western Construction News*



the all purpose dipper!

1.
Tooth bases are cast integral with lip (no expense for renewing bases).

2..
Note the dovetail joint! Lips are quickly and easily changed by loosening two U-bolts and removing four wedges.

3...
The U-bolt fastening between lip and back supplements and reinforces the dovetail joint between lip and front.

4....
Back lugs can be arranged to fit any type of dipper stick. Dippers are made either with bail or without as required.

5.....
A renewable Manganese Steel wearing band compensates for wear at the dipper heel.

6.....
Furnished with double wall lip and teeth for hard digging and rock handling; single wall cutter type lip and teeth for rehandling, stock piling and loose material digging; and a thin, serrated edge, cutter type lip for mucking, clay digging, etc.

U. S. Patent No. 1,945,064

The AMSCO Renewable Lip All-Manganese Steel Dipper cuts digging costs. It consists of a one-piece cast manganese steel body available with easily renewable or interchangeable lips. Any type of lip can be supplied that is best adapted to digging conditions.

Lips are quickly and easily changed in the field—no trouble—no delay. Knock out four keys, loosen two U-bolts and the lip is off. No rivets to punch out or renew.

Get maximum efficiency and greater yardage from your shovels—equip them with AMSCO All-Manganese Steel Renewable Lip Dippers.

Your shovel manufacturer or our nearest office will gladly furnish complete details on these new AMSCO Renewable Lip Dippers which are made for all shovels in sizes from ¾ yard up and without separate lips in ⅜, ½ and ⅝ yard sizes.

Write for the facts today.

AMERICAN MANGANESE STEEL COMPANY

402 East 14th Street, Chicago Heights, Ill.

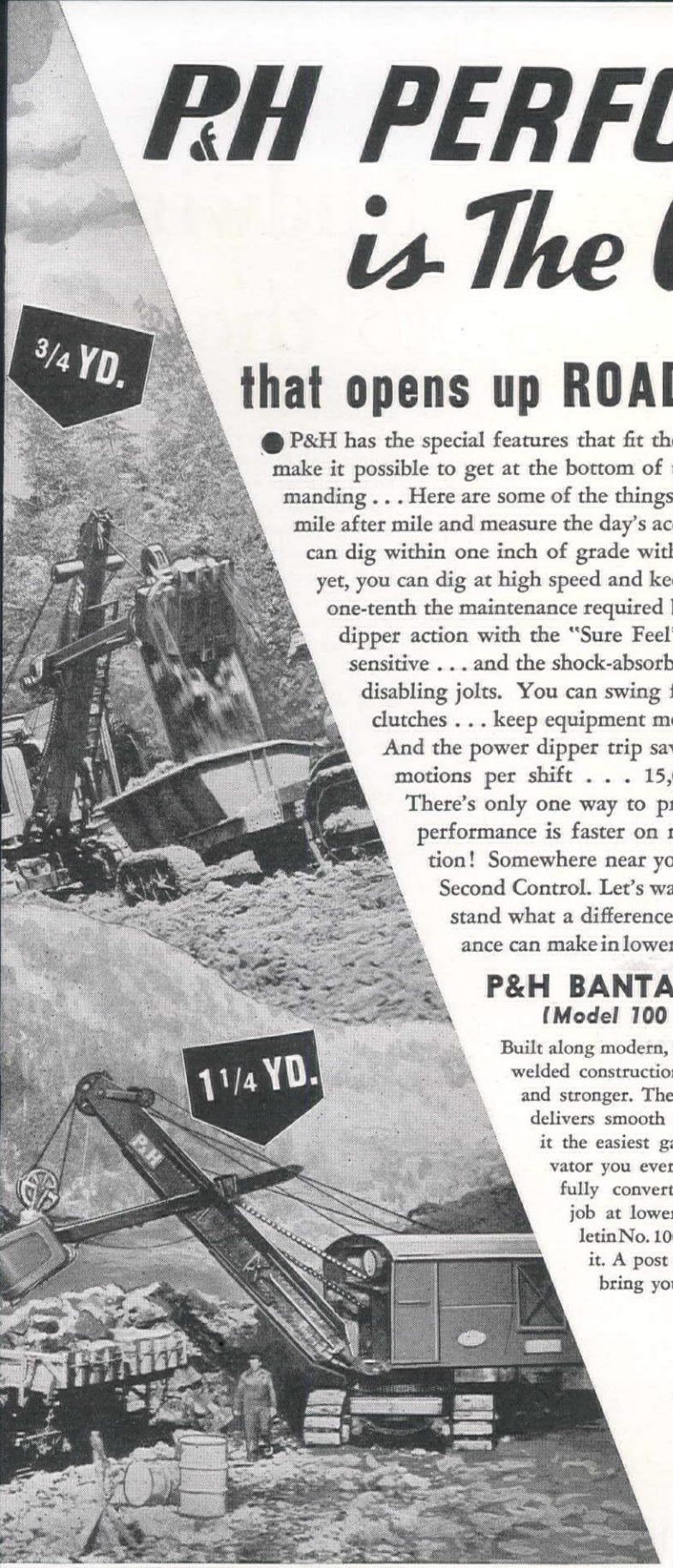
Division of American Brake Shoe & Foundry Co.

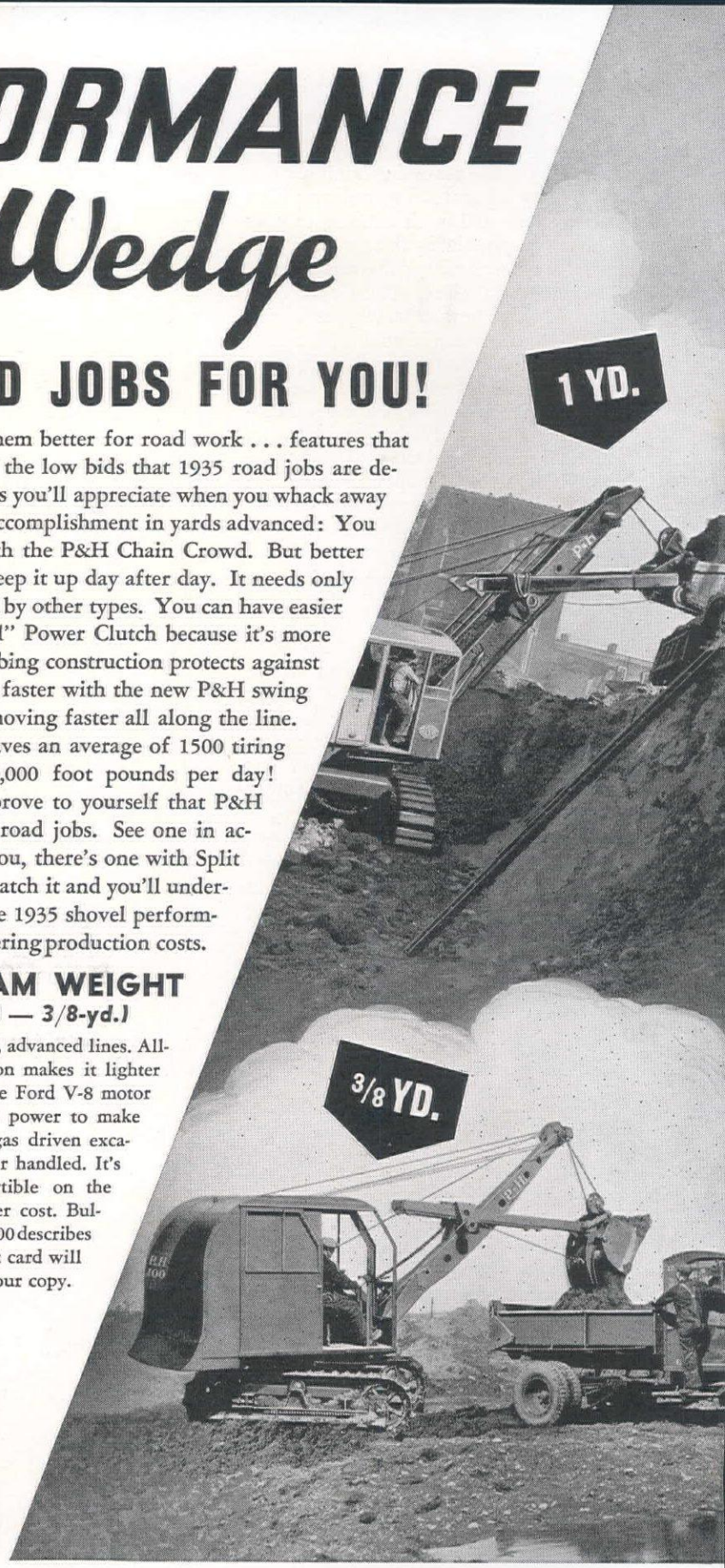
AMSCO

TRADE MARK REGISTERED

P&H PERFORMANCE is The Wedge

that opens up ROAD JOBS FOR YOU!





● P&H has the special features that fit them better for road work . . . features that make it possible to get at the bottom of the low bids that 1935 road jobs are demanding . . . Here are some of the things you'll appreciate when you whack away mile after mile and measure the day's accomplishment in yards advanced: You can dig within one inch of grade with the P&H Chain Crowd. But better yet, you can dig at high speed and keep it up day after day. It needs only one-tenth the maintenance required by other types. You can have easier dipper action with the "Sure Feel" Power Clutch because it's more sensitive . . . and the shock-absorbing construction protects against disabling jolts. You can swing faster with the new P&H swing clutches . . . keep equipment moving faster all along the line. And the power dipper trip saves an average of 1500 tiring motions per shift . . . 15,000 foot pounds per day! There's only one way to prove to yourself that P&H performance is faster on road jobs. See one in action! Somewhere near you, there's one with Split Second Control. Let's watch it and you'll understand what a difference 1935 shovel performance can make in lowering production costs.

P&H BANTAM WEIGHT

(Model 100 — 3/8-yd.)

Built along modern, advanced lines. All-welded construction makes it lighter and stronger. The Ford V-8 motor delivers smooth power to make it the easiest gas driven excavator you ever handled. It's fully convertible on the job at lower cost. Bulletin No. 100 describes it. A post card will bring your copy.

HARNISCHFEGER CORPORATION

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

Warehouses and Service Stations:

HARNISCHFEGER CORPORATION, 82 Beale St., San Francisco; R. M. Taylor. WESTERN LOGGERS MACHINERY CO., 302 S. W. Fourth Ave., Portland, Oregon

SEATTLE DALLAS LOS ANGELES SAN FRANCISCO

P&H PERFORMANCE SPEEDS UP ROAD BUILDING

WITH the sea-going habit obtaining an increasingly strong hold on travelers and with cruises rapidly growing in popularity, larger, finer and faster ships are sailing the routes most favored by travelers. The Grace Line offers its three new super-express liners Santa Rosa, Santa Paula and Santa Elena operating on a regular eighteen day schedule between San Francisco, Los Angeles and New York via Mexico, Guatemala, Salvador, the Panama Canal, Colombia and Cuba. These three new liners, superb in appointments and trim in design, beckon the traveler on a zestful voyage of exploration, and relaxation.

After leaving Los Angeles harbor, last American port of call, the Grace liner heads south for Mazatlan, Mexico. The very entry into this Mexican seaport is unusual—the great white bluffs rising sheer above the water; the island lighthouse topping a mass of rock that challenges Gibraltar, greets the traveler. A shore excursion at this quaint seaport reveals all the drowsy atmosphere of Old Mexico.

San Jose de Guatemala is the liner's next destination—here the tourist travels by rail to Guatemala City and passes through a country of amazing splendor and variety. The train passes through many native villages and finally arrives at Guatemala City situated on a great plateau, five thousand feet above sea level where the temperature of the thermometer registers perpetual spring.

The Grace liner next steams into the harbor of La Libertad, El Salvador, for a stop of several hours. From there the liner sails on to Balboa in the Panama Canal Zone. The traveler may take a short trip to Panama City with its laughter and allurement to all tourists—its tempting bazaars, displaying wares from the four corners of the earth.

On the twelfth day of the journey the ship passes through the Panama Canal. This interesting trip through the locks takes about seven hours and can be enjoyed from a comfortable deck chair. A guide is aboard to explain every section as it is traversed and also point out the mechanism and operation of the locks.

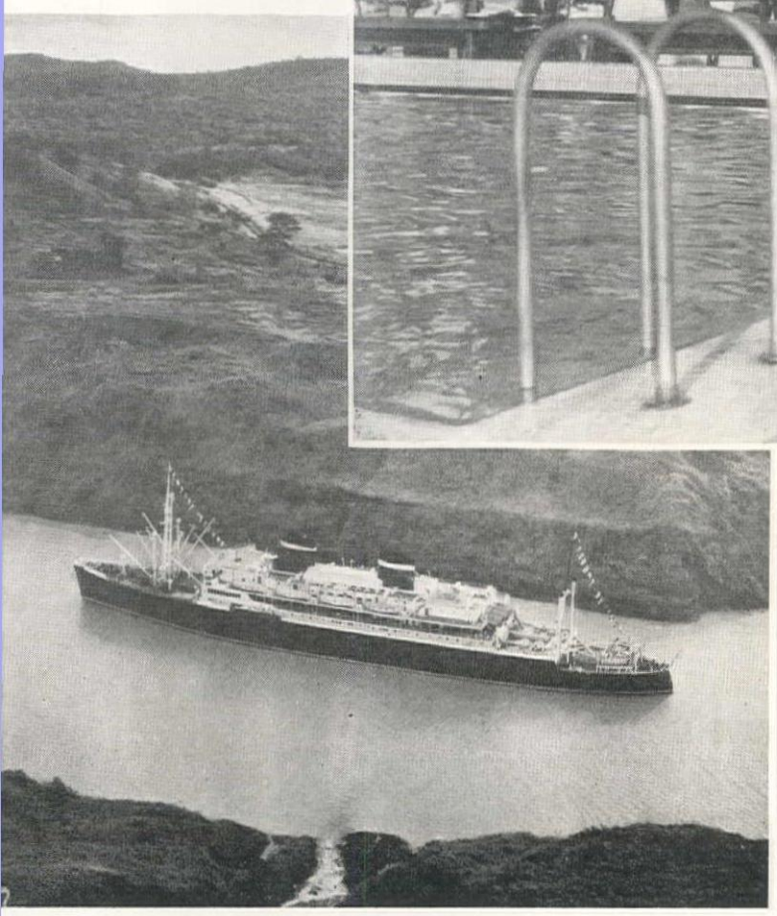
Sailing from Cristobal at the Atlantic entrance to the Canal, the ship now heads for Cartagena, the first South American port of the voyage. Cartagena is the finest medieval city in the western hemisphere and one of the few walled cities left in the world. The ancient ruins and the eight outlying forts of this port will probably be the high spot of interest to the tourist on the cruise.

Vacation ventions

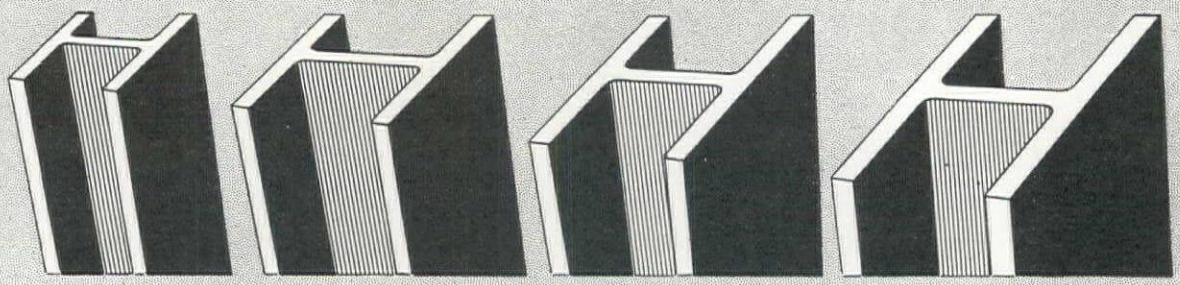
Left: A luxurious Grace "Santa" ship in San Francisco Bay. In the foreground is the famed Ferry Building, with Yerba Buena Island, center of the Bay Bridge, in the background.

Below: Afternoon relaxation at the outdoor swimming pool aboard a "Santa" ship. Such outdoor gatherings may be enjoyed under tropical skies during the trip.

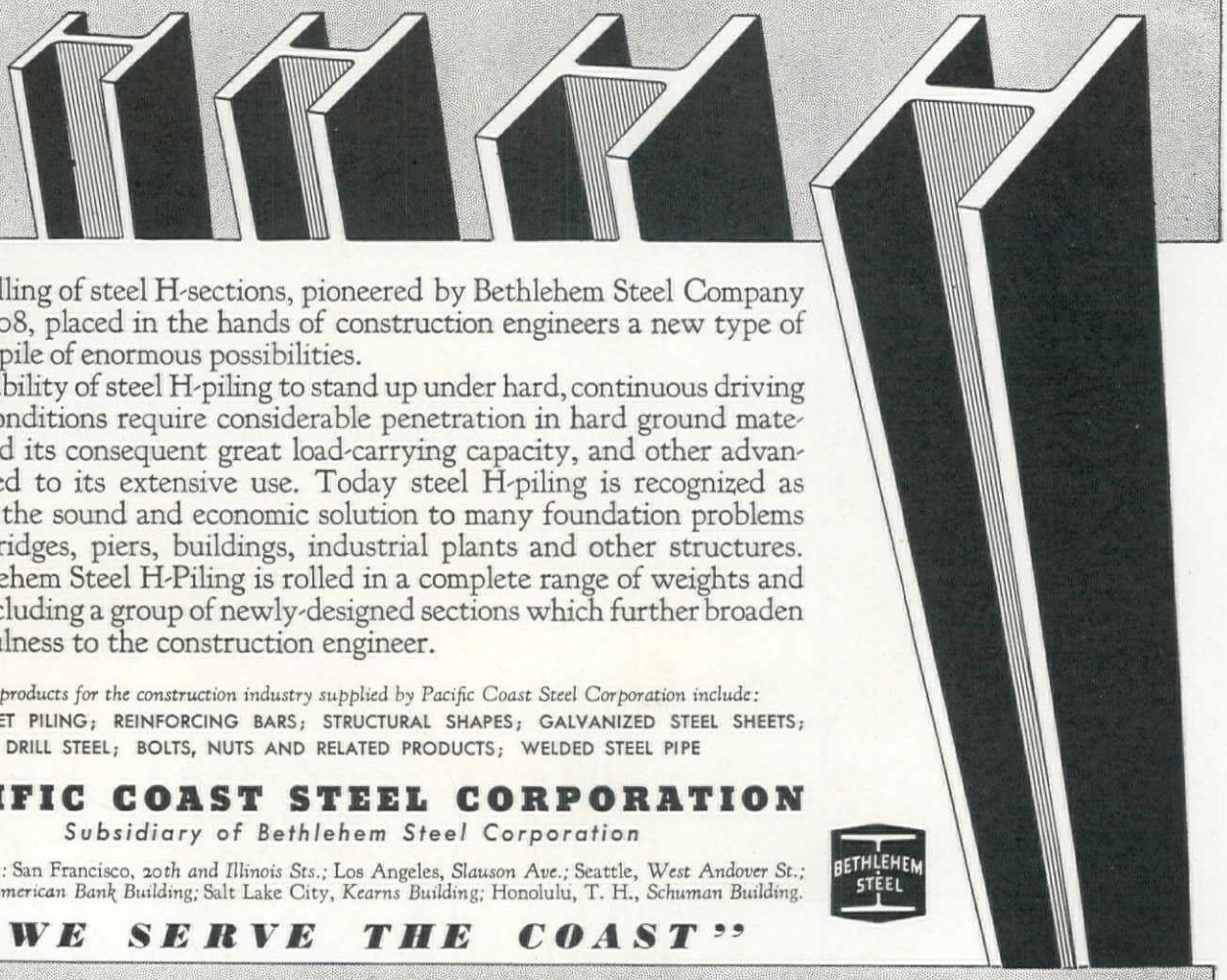
Below: Sights along the world-famous Panama Canal may be enjoyed from a deck chair. Operation of locks are explained by guides.



Grace Cruises
DESIGNED for PLEASURE TRAVEL



The sound and economic solution to many a foundation problem



THE rolling of steel H-sections, pioneered by Bethlehem Steel Company in 1908, placed in the hands of construction engineers a new type of bearing pile of enormous possibilities.

The ability of steel H-piling to stand up under hard, continuous driving when conditions require considerable penetration in hard ground materials, and its consequent great load-carrying capacity, and other advantages, led to its extensive use. Today steel H-piling is recognized as offering the sound and economic solution to many foundation problems —for bridges, piers, buildings, industrial plants and other structures.

Bethlehem Steel H-Piling is rolled in a complete range of weights and sizes, including a group of newly-designed sections which further broaden its usefulness to the construction engineer.

Other products for the construction industry supplied by Pacific Coast Steel Corporation include:
STEEL SHEET PILING; REINFORCING BARS; STRUCTURAL SHAPES; GALVANIZED STEEL SHEETS; DRILL STEEL; BOLTS, NUTS AND RELATED PRODUCTS; WELDED STEEL PIPE

PACIFIC COAST STEEL CORPORATION
Subsidiary of Bethlehem Steel Corporation

Sales Offices: San Francisco, *20th and Illinois Sts.;* Los Angeles, *Slauson Ave.;* Seattle, *West Andover St.;* Portland, *American Bank Building;* Salt Lake City, *Kearns Building;* Honolulu, T. H., *Schuman Building.*

BETHLEHEM STEEL

"WE SERVE THE COAST"

BETHLEHEM Steel H-PILING

5 CYCLES a minute in most digging is nothing unusual for the 10-B. So sure and easy to handle are the controls that the operator can maintain top speed hour after hour. This full-revolving 3/8-yard machine travels up to 4 1/4 miles per hour, hustles up grades even steeper than 30%, and "turns on a dime" at full speed. A light, pneumatic-tired trailer is available. The 10-B is outstanding in modern high-speed performance; put it on your jobs today.

fast

BUCYRUS-ERIE

EXCAVATING, DRILLING, AND MATERIAL-HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN

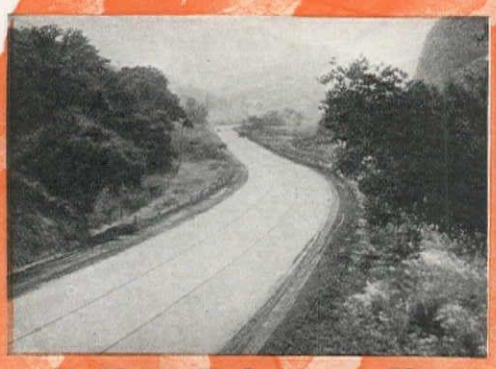
SAN FRANCISCO: BUCYRUS-ERIE CO., 989 Folsom St.; PORTLAND: CLYDE EQUIPM'T CO., 17th and Thurman Sts.
LOS ANGELES: CROOK COMPANY, 2900 Santa Fe Ave.; SEATTLE: CLYDE EQUIPM'T CO., 3410 First Ave., South

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

200

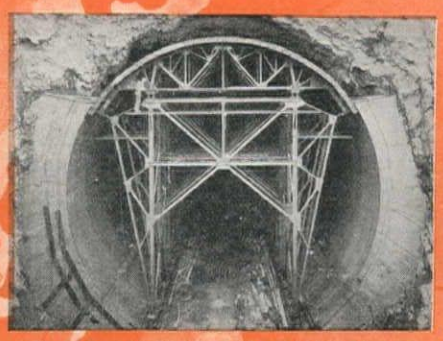
Overburden excavation at Grand Coulee Dam—the $63,000,000 Columbia Basin project.

The start of the Fort Peck project, estimated to cost approximately $72,000,000.

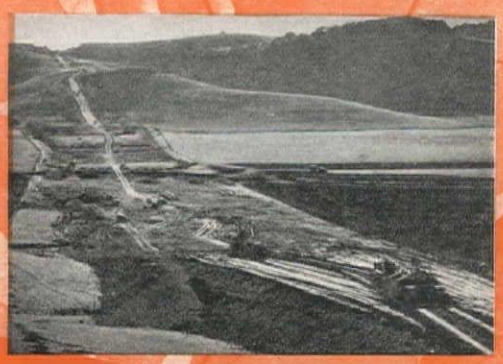


Mt. Shasta Highway near Mt. Shasta Springs, California (Route 3).

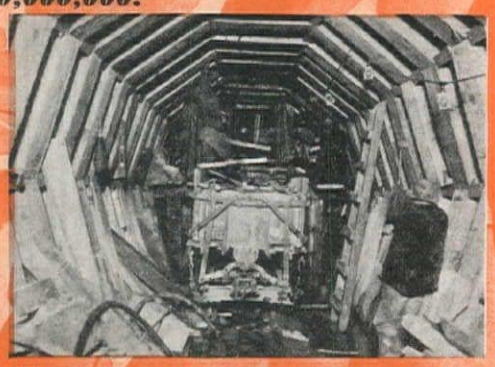
East Portal Coxcomb tunnel —Colorado River Aqueduct— One of the 29 tunnels in transmission system — a project costing $220,000,000.



Concrete lining for fifty foot diversion tunnel — Boulder Dam.



American Canyon cutoff near Cordelia, California.



Tunnel No. 5—Station 178, working in wet sand—Owyhee project in Oregon and Idaho—an $18,000,000 irrigation project.

Construction scene at Rodriguez Dam, Mexico.

Advertisers *took advantage* of this *tremendous* Buying Power during 1935

The January, 1936, *Annual Review and Progress Issue* will give every manufacturer an opportunity to tell his story to all the worthwhile contractors and engineers in the West. And these men are the cream of the nation, in point of buying power. More projects in the "millions" class are in progress in the eleven Western states than in all the thirty-seven Eastern states.

The men who are responsible for their design and construction are a fast moving lot. They must be on their toes. Costs, methods, and practices are carefully studied. New machinery, equipment and supplies are always first to be tried in this region. The nature of their work demands these things.

Western Construction News has caught their spirit, their viewpoint. PROOF: more than 8,000 of them read this publication. But let's emphasize one point here. These readers include not only the engineers and contractors in construction's "Who's Who," but the far greater number of designers, superintendents, foremen, and inspectors — the men whose judgment and decisions influence all buying.

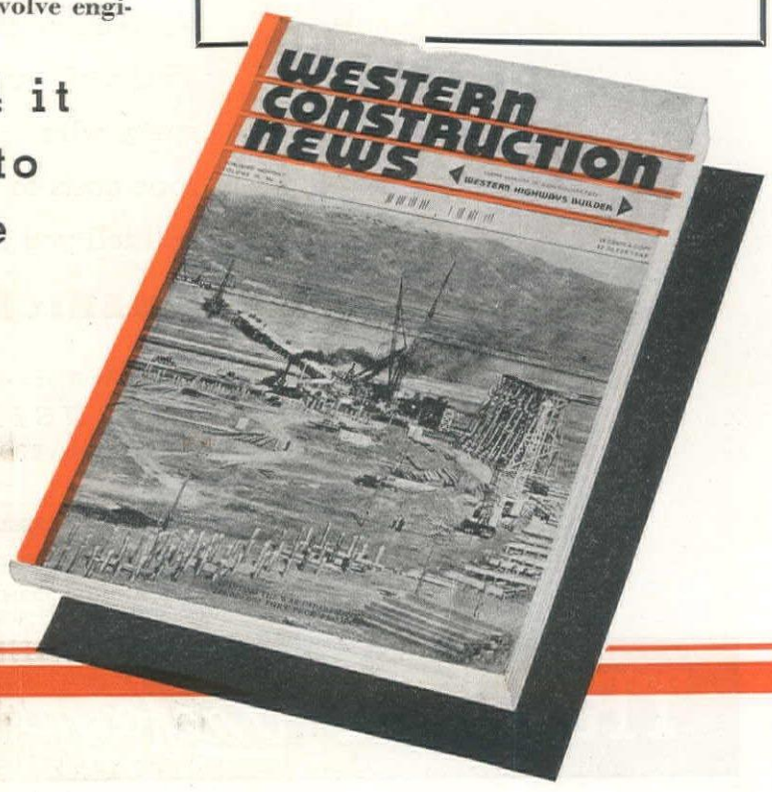
Further, they are connected with state highway departments, water works departments, and all other classifications that involve engineering. It's an all-industry coverage—an all-Western coverage that is not approached by any other publication serving this BILLION DOLLAR construction market.

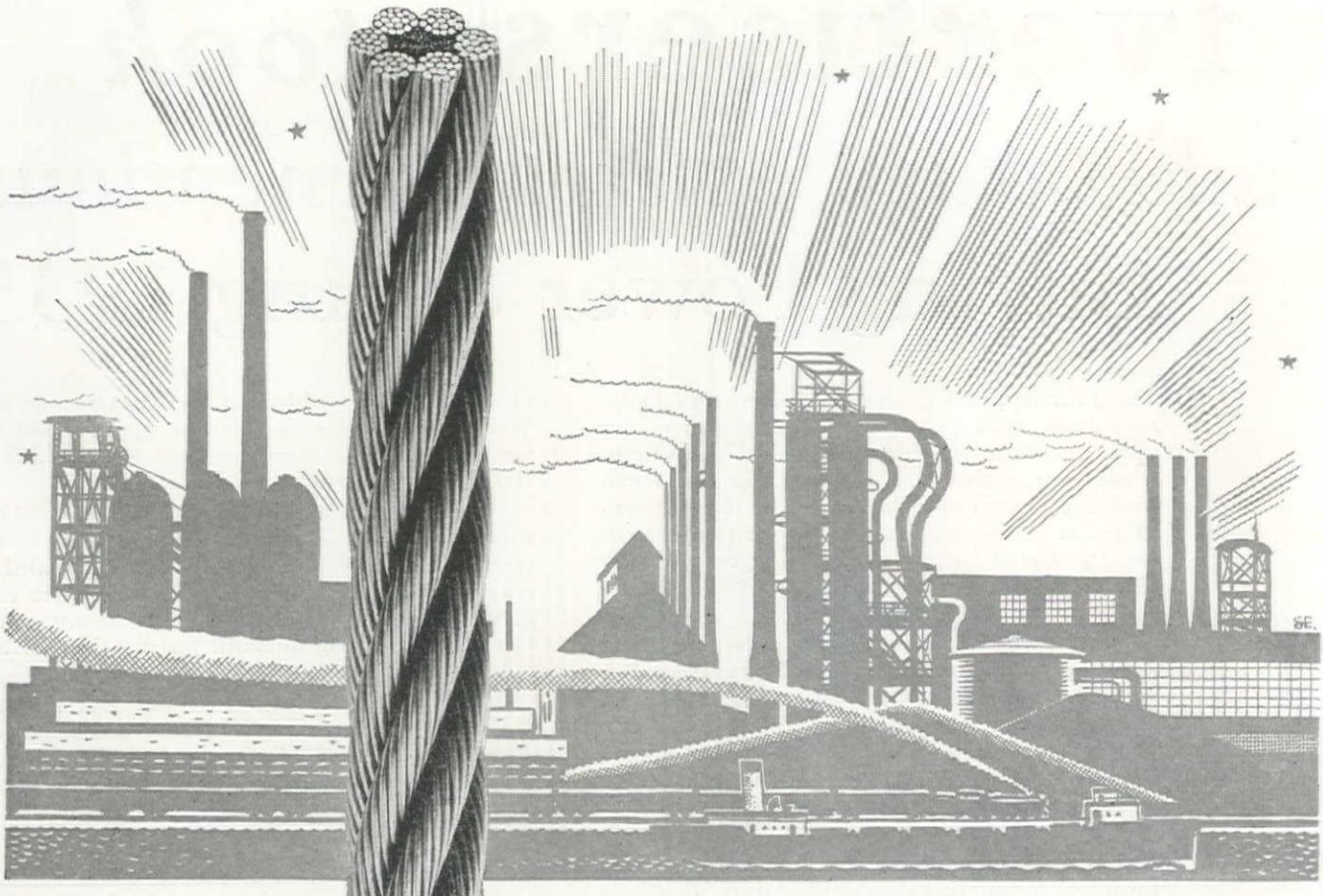
Advertisers are finding this *active Western Construction News* audience a vitalizing influence on sales. Which is one way of explaining *why* in 1935 *Western Construction News* carried more pages of advertising than any other monthly civil engineering publication in the country.

Plan your message now for the *Annual Review and Construction Issue*, published on January 10. You'll find a receptive audience. Then, follow through with a planned attack during the biggest construction boom in the history of the country—right here in the West.

More than DOUBLE the circulation of any other publication for complete coverage of the West

After January 4 it will be too late to advertise in the Annual REVIEW and PROGRESS NUMBER...





ONE OF THE LARGEST

industrial companies in the United States bought some TRU-LAY Preformed wire rope several years ago. • Since then they have gradually standardized on TRU-LAY—in every branch factory and for practically every wire rope need. • If you want to cut your wire rope costs to the absolute minimum, write us, and we will tell you how you can gain the same dollar-value.

AMERICAN CABLE COMPANY, Inc.

Wilkes-Barre, Pennsylvania

An Associate Company of the American Chain Company, Inc.

IN BUSINESS FOR YOUR SAFETY

San Francisco: 630 Third St. Los Angeles: 841 Petroleum Securities Bldg.
Tacoma: 2312 East "E" St.

DISTRIBUTORS

ELECTRIC STEEL FOUNDRY CO.
24th and York Sts., Portland, Oregon

ELECTRIC STEEL FOUNDRY CO.
2724 First Avenue So., Seattle, Wash.

L. A. SNOW COMPANY
Spokane, Washington

NATIONAL EQUIPMENT CO.
Salt Lake City, Utah

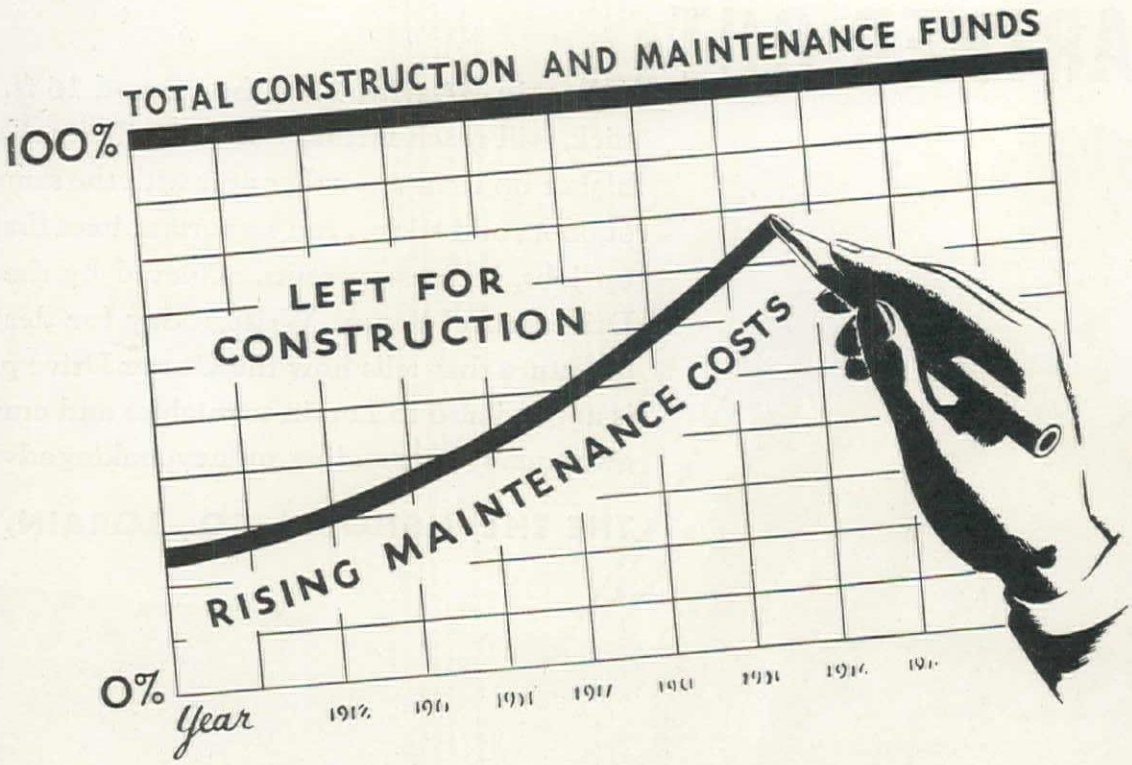
CROOK COMPANY
2900 Santa Fe Ave., Los Angeles, Calif.

HALL-PERRY MACHINERY CO.
Butte, Montana

ACCO

TRU·LAY *Preformed* Wire Rope

When writing to AMERICAN CABLE COMPANY, INC., *please mention Western Construction News*



Where these lines meet

is "THE END OF THE ROAD"

HIGHWAY systems, whether county or state, cannot be loaded down with a large mileage of temporary surfacing without disastrous consequences ensuing.

Inferior, temporary highway surfaces clamor for more and more maintenance and reconstruction, year after year. Eventually, any *new* roads are out of the question. All the annual road money goes for upkeep! Then, "the end of the road has been reached," both literally and figuratively.

What a difference with Concrete! Accurately designed to the actual traffic load, enduring Concrete actually costs *less* than any other pavement *of equal load carrying capacity.*

Every mile of Concrete laid, saves maintenance money for years to come, and preserves money for new construction. It is true in road construction, as in other things, that the best costs less in the long run.

CONCRETE

can prevent maintenance from gobbling *all* your highway budget. Concrete is the standard by which all roads are judged.

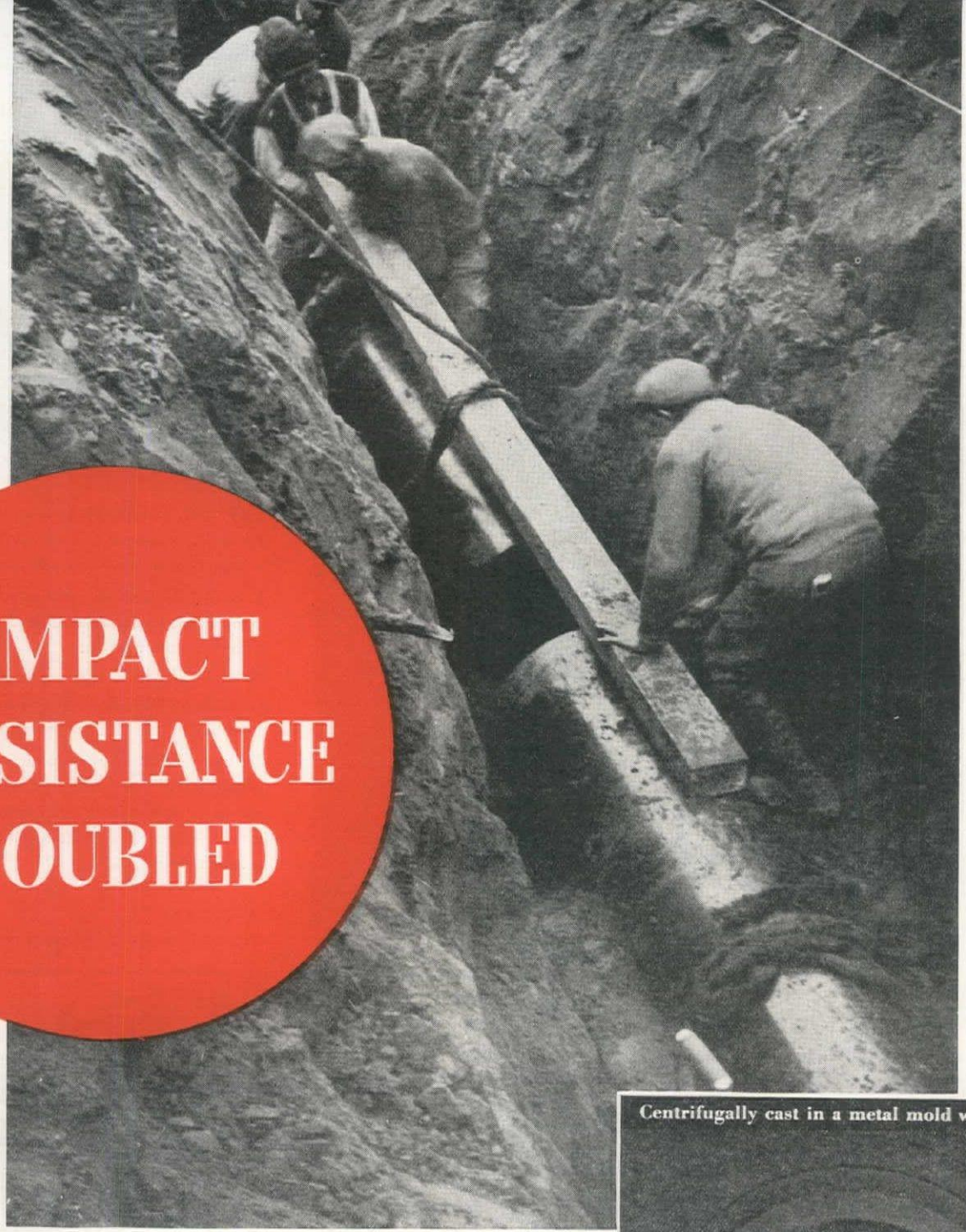
All the needed data including proved formulae, sketches and details for designing pavements as engineering structures, are contained in a Free booklet, "Concrete Road Design Simplified and Correlated with Traffic," written by Frank T. Sheets, for 9 years Chief Highway Engineer of Illinois. "Short Count Traffic Surveys," by Dr. Miller McClintock, nationally known traffic expert, and director of the Erskine Traffic Bureau of Harvard University, explains a new low-cost system of predicting traffic. Write for your copies.

PORTLAND CEMENT ASSOCIATION

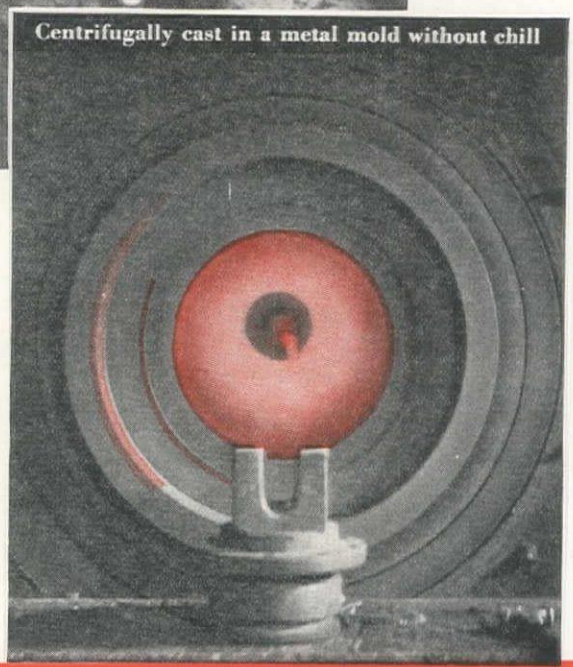
Dept. 1012

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

IMPACT RESISTANCE DOUBLED



Recent installation of Super-de Lavaud Pipe at Pensauken, New Jersey



Centrifugally cast in a metal mold without chill

A 270-year-old main in France still transports water—a 500-year-old temple roof in China still sheds rain — both are cast iron. The passing centuries which have proved cast iron's effective resistance to rust have also witnessed great advances in the manufacture of cast iron pipe. The Super-de Lavaud Process, developed and patented by this Company, is the first commercially practicable method of producing *unchilled* gray iron castings in a metal mold. Super-de Lavaud Pipe with doubled impact strength, *cast without chill in a metal mold*, was publicly announced in February 1934. In December 1935, with nearly 9 million feet installed, evidence is overwhelming to the effect that Super-de Lavaud is a stronger, tougher, more ductile pipe. Ask for descriptive literature.

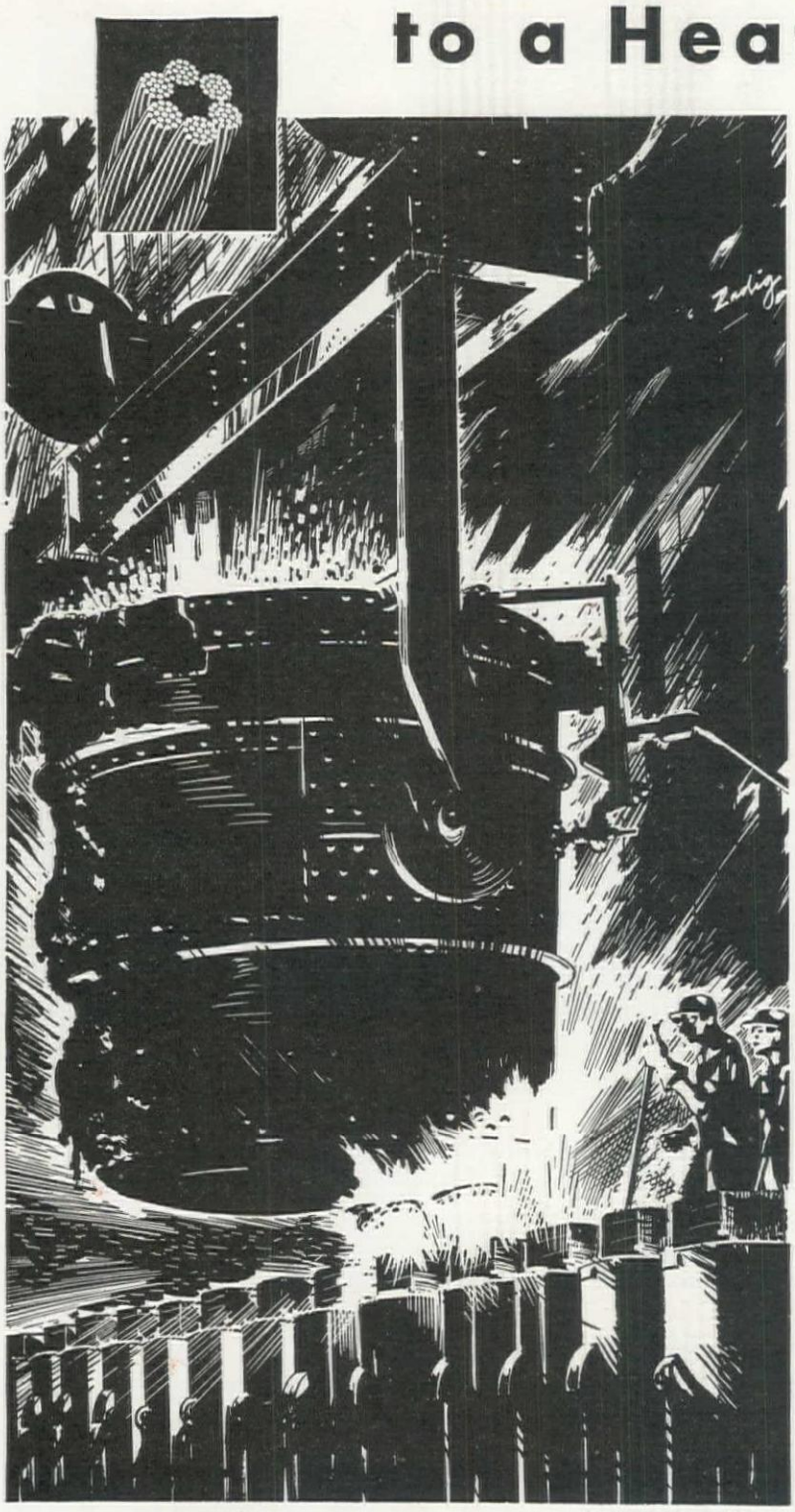
U.S. SUPER-de LAVAUD PIPE

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

Only 30 Tons to a Heat...Why?



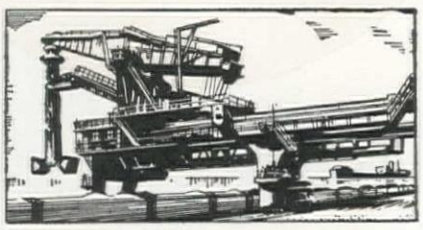
LET US IMAGINE you are in the Roebling Steel Mill. Your eyes travel up a long line of open-hearth furnaces.

Perhaps you are disappointed. You expect huge furnaces. These are *small.* Why?... you wonder?

Well, it is because famous Roebling Acid Open-hearth Steel for wire rope is being made.

It takes Roebling's custom methods to make such steel... steel of extraordinary stamina. Special equipment... small, closely-controlled heats of 30 tons or less ... painstaking care.

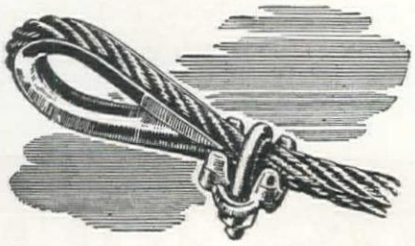
A TITAN...
RIGGED WITH ROEBLING WIRE ROPE



One of two Hulett Ore Unloaders operated by Ashtabula and Buffalo Dock Co., Toledo, O., owned by New York Central Railroad. Both unloaders are rigged with Roebling "Blue Center" Steel Wire Rope.

FOR SAFETY... USE ROEBLING "BLUECLAD" WIRE ROPE FITTINGS

They are made specially for wire rope service... each and every part designed for maximum durability and for extreme ruggedness. Types for every requirement.

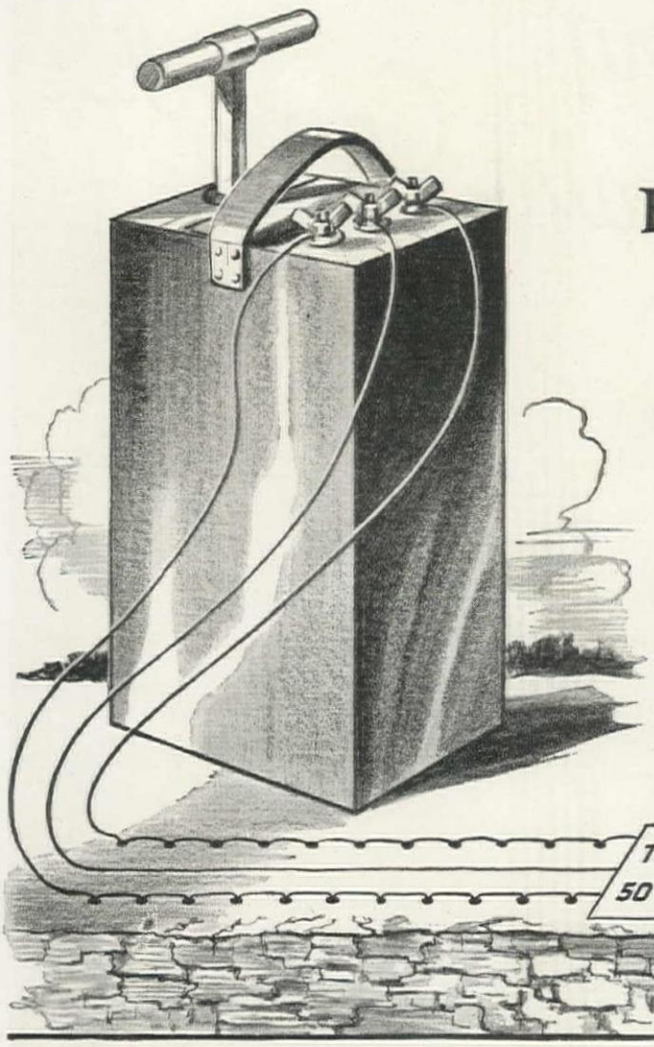


TO MAKE CERTAIN that Roebling Wire Rope will give the user the highest obtainable degree of safe, economical service, Roebling has enlisted the aid of the finest and most complete research, testing and manufacturing facilities. Roebling's special equipment for making Acid Open-hearth Steel is an example. John A. Roebling's Sons Co. of Calif., *San Francisco, Los Angeles, Seattle, Portland*

ROEBLING ...THE PACEMAKER IN WIRE ROPE DEVELOPMENT

When writing to JOHN A. ROEBLING'S SONS CO., *please mention Western Construction News*

Another ATLAS FIRST



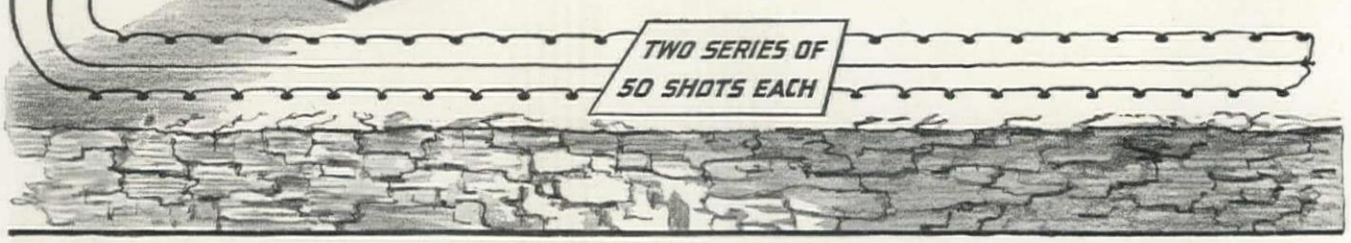
THE NEW ATLAS TWIN FIFTY BLASTING MACHINE

Again Atlas contributes an important advance in the application of the controlled force of explosives.

Used with two leading wires the Twin Fifty Blasting Machine fires a single series of 50 Electric Blasting Caps. Used with *three* it fires a *first* and a *second* series of 50 caps each—with an interval of *only a few thousandths of a second between*—at a single stroke of the rackbar!

The slight interval between the firing of two series increases accuracy in directing the force of explosives, reduces back break, increases fragmentation and lessens pulverization of the burden being moved.

Electric blasting aids materially in confining gases from explosives *behind* the burden, thus utilizing a greater portion of their available energy. Electric Blasting provides the ultimate in control—and the Atlas Twin Fifty is the ultimate in blasting machines of this type.



Atlas 2-B
1-10 Electric Blasting Cap Capacity

Atlas 3-30
1-30 Electric Blasting Cap Capacity

Atlas 3-50
1-50 Electric Blasting Cap Capacity

Holes may be properly located and spaced. They may be right in size and depth. But—the final result may depend on your blasting machine.

The price of a good blasting machine represents only a small fraction of the cost of most blasting operations. Here are pictures of other Atlas Blasting Machines. Each is designed for high capacity, rugged service and ease of operation. Consult the Atlas representative.

ATLAS POWDER COMPANY

THE IANT DIVISION

Everything for Blasting

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

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

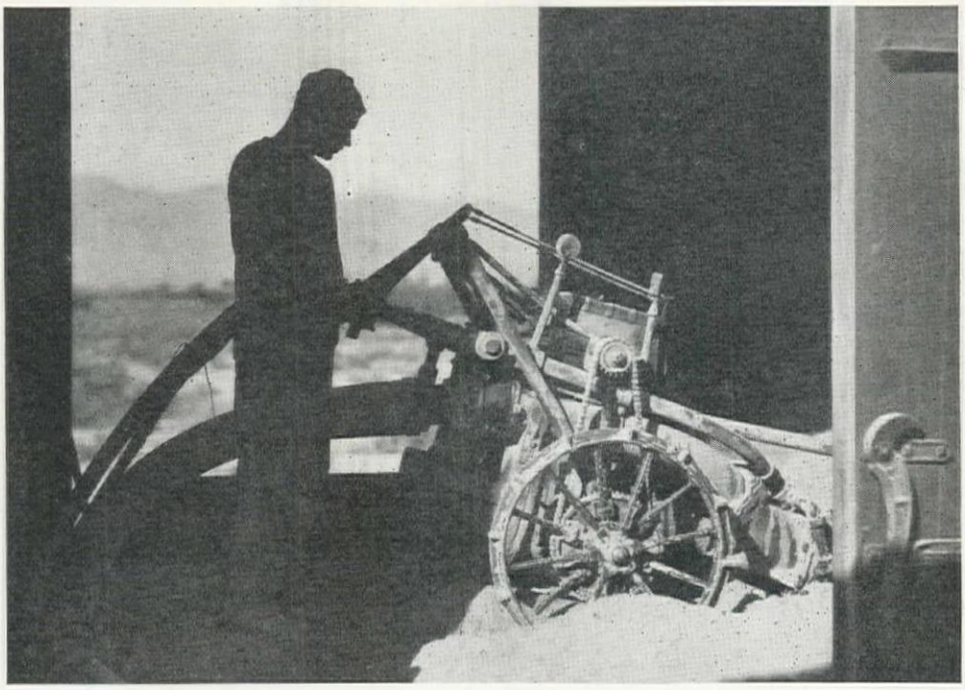
Los Angeles, Calif. Salt Lake City, Utah Butte, Mont.

Other Offices:

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

ATLAS EXPLOSIVES

ATLAS EXPLOSIVES



Fuller-Kinyon Portable Pump unloading bulk cement

ON THE JOB — IT'S ADAPTABILITY AND SERVICE THAT COUNTS

THE Fuller-Kinyon Portable Pump, due to its own peculiar construction, can be adapted to any condition or kind of work where cement is to be handled in bulk. They are built for practically life-time service . . . are of rugged construction, have few wearing parts, repairs can be made with a minimum loss of time, and can be transferred from job to job . . . items to be seriously considered on every construction operation.

Fuller-Kinyon Portable Pumps are used for unloading bulk cement in various ways and under many different conditions, some of which are—

From—

BOX CARS to STORAGE
HOPPER-BOTTOM CARS to STORAGE
BARGES to STORAGE
BOX CARS to MIXER
HOPPER-BOTTOM CARS to MIXER
BARGES to MIXER

STORAGE to MIXER

Conveying through pipe lines enables one operator to distribute cement to any number of receiving bins through the use of valve controlled branch lines.

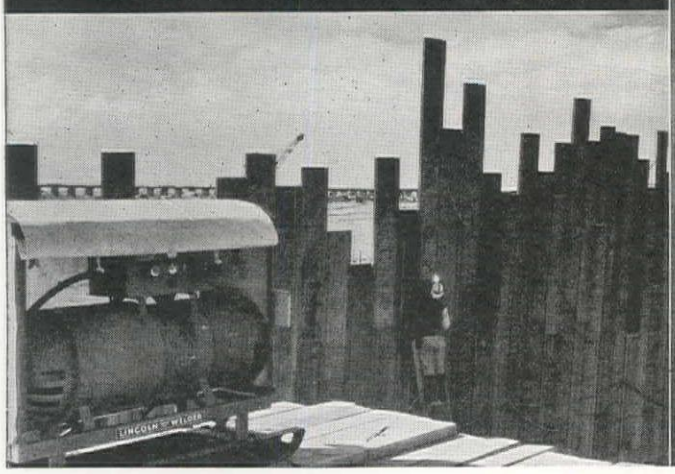
While the illustration in this advertisement shows a portable pump for unloading bulk cement, very often a stationary Fuller-Kinyon Pump is used, depending upon the character of the work to be done.

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

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

P-1

"Shield-Arc" WELDS STEEL CORE WALL for FORT PECK DAM



FORT PECK DAM now joins Grand Coulee, San Francisco-Oakland Bay Bridge and other amazing engineering feats which have been made less difficult by "*Shield-Arc*" welding.

Here at Fort Peck, "*Shield-Arc*" ends seepage dangers by welding a sheet steel wall through the center of the dam. And that wall, welded by "*Shield-Arc*," will stand the test of time. For every "*Shield-Arc*" weld is stronger, more resistant to corrosion and as ductile as the steel itself.

On every type of construction job, from dams and bridges to buildings, pipe lines and water mains, "*Shield-Arc*" welding insures better construction for less money. Structures welded by "*Shield-Arc*" are stronger and stiffer yet cost far less than with old-time methods.

And maintenance as well as construction costs are lowest with "*Shield-Arc*" welding. "*Shield-Arc*" saves contractors thousands of dollars a year on equipment repairs. Example: A dipper front, costing approximately $850, was repaired recently by "*Shield-Arc*" for only $200!

If it is your responsibility to get greatest value from construction dollars, we suggest that you find out now about the savings possible with "*Shield-Arc*" welding. Contractors, especially, are invited to check "*Shield-Arc*" economy with Lincoln before bidding on new work. Write for particulars today. Mail the coupon to THE LINCOLN ELECTRIC COMPANY, Dept. K-187, CLEVELAND, OHIO. Largest Manufacturers of Arc Welding Equipment in the World.

POP: "Am I glad we consulted Lincoln about cutting construction costs with '*Shield-Arc*' welding."

LAD: "You said it, Pop! If we hadn't asked them, we wouldn't have known about the big '*Shield-Arc*' savings that helped make our bidding successful."

THE LINCOLN ELECTRIC COMPANY, DEPT. K-187, CLEVELAND, OHIO

Gentlemen: Please send complete particulars on the savings possible with "*Shield-Arc*" welding.

Firm _____

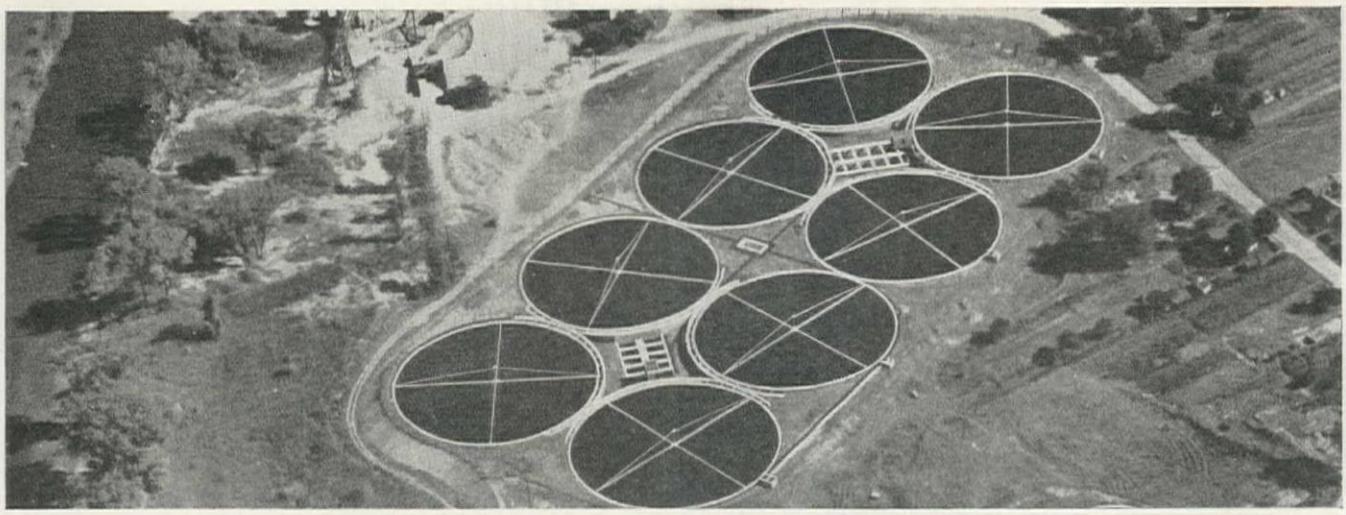
Your Name _____ Title _____

Address _____

City _____ State _____

HOW UNIFORM?

THE DORRCO DISTRIBUTOR



Aerial view of Cedar Rapids trickling filter installation. Eight 167 ft. Dorrco Distributors used.

A Complete Line of Sanitary Engineering Equipment

Bar Screens
Fine Screens
Detritors
Clarifiers
Digesters
Aerators
Distributors
Flocculators
Mixers
Pumps

DORRCO

Cedar Rapids, Iowa, has the country's largest rotary distributor installation—a battery of 8 Dorrco Distributors, each 167 ft. in diameter, with a combined capacity of 8800 gallons per minute.

They wanted to know definitely what we meant when we talked of the uniformity of distribution effected by Dorrco Distributors. And they found out in the most convincing way possible—detailed field testing of their own installation by an impartial outside engineer.

Here are the results which speak for themselves:

Trickling Filter	Gals./Sq. Yd. Day	Per Cent of Average	Per Cent Variation
No. 1	630	100.16	+0.16
No. 2	626	99.52	—0.48
No. 3	636	101.11	+1.11
No. 4	626	99.52	—0.48
No. 5	634	100.79	+0.79
No. 6	620	98.57	—1.43
No. 7	613	97.46	—2.54
No. 8	647	102.86	+2.86
Average	629		

• The greatest variation from the average rate of delivery was +2.86 per cent and the average variation for all 8 trickling filters 1.2 per cent.

• Here are certain comments made by the engineers in charge of the tests:

"We believe this is an exceptionally good performance—and we have no hesitancy in recommending unqualified acceptance of this equipment."

The Dorrco Distributor applies sewage evenly and uniformly over every square yard of filter area at every revolution, thus effecting maximum utilization of investment in the bed.

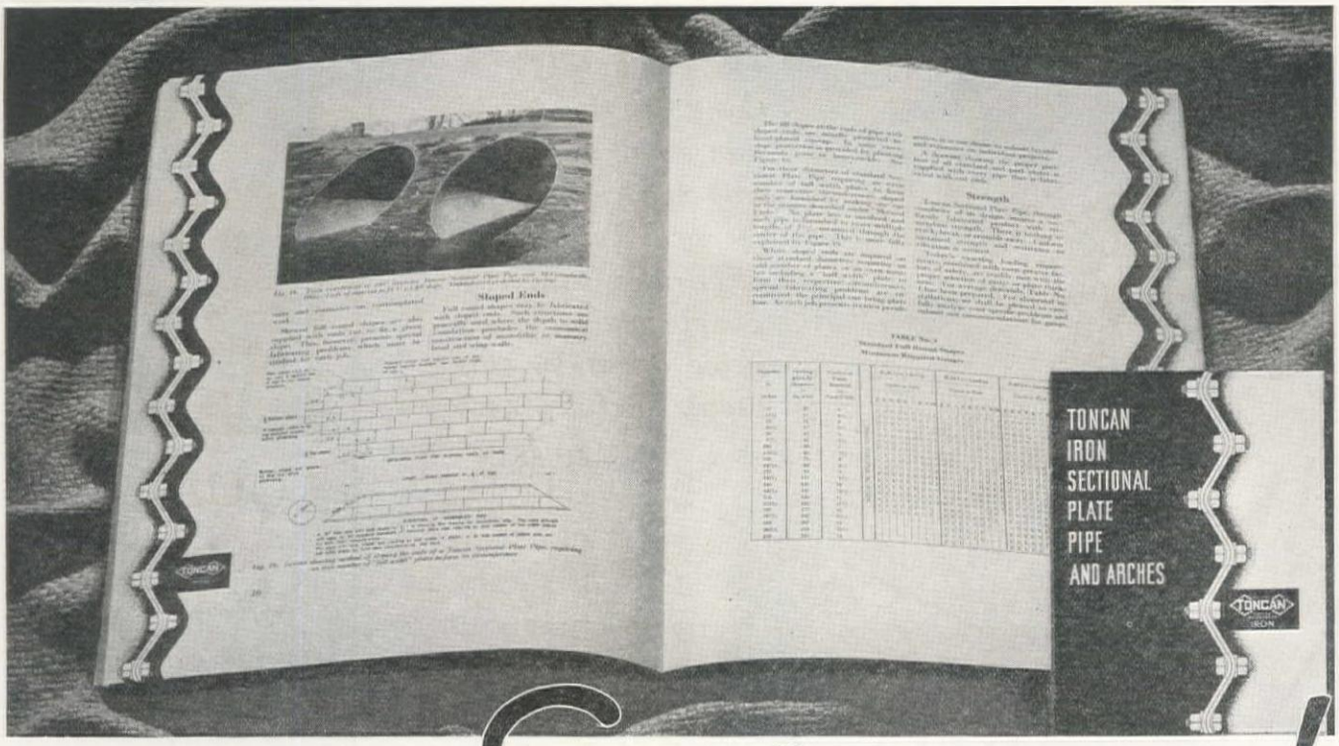
A note to our nearest office will bring you full particulars.

THE DORR COMPANY INC.

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

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

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



REG.U.S.PAT.OFF.
TONCAN
COPPER
MO-LYB-DEN-UM
IRON
SECTIONAL
PLATE PIPE
AND ARCHES

Engineers!

A NEW TONCAN IRON SECTIONAL PLATE PIPE AND ARCH HANDBOOK . . .

Yours for the Asking.

A new Toncan Sectional Plate Pipe and Arches Handbook is just off the press. This handbook has new and authoritative information on sectional plate and arch construction, along with charts, formulas and drawings that you will want to have. This worthwhile piece of literature is yours for the asking. Just fill out the coupon below.

Toncan Iron Sectional Plate Pipe and Arches in standard sizes are now carried in stock on the West Coast.

TONCAN CULVERT MANUFACTURERS' ASSOCIATION

BEALL PIPE & TANK CORPORATION . . . . . Portland, Oregon
BERGER METAL CULVERT CO. of N. E., 307 Dorchester Ave., Boston, Mass.
BLUEGRASS PIPE & CULVERT CO., 17th & Arbegust Ave., Louisville, Ky.
CENTRAL CULVERT COMPANY . . . . . Alexandria, La.
DOMINION METAL & CULVERT CORP. . . . . Roanoke, Va.
EASTERN CULVERT CORP., 16th St. & Washington Ave., Philadelphia, Pa.
A. N. EATON, METAL PRODUCTS . . . . . Omaha, Nebraska
A. N. EATON METAL PRODUCTS CO. . . . . Billings, Montana
EMPIRE STATE CULVERT CORPORATION . . . . . Groton, New York
ILLINOIS CORRUGATED CULVERT CO. . . . . Peoria, Ill.
JENSEN BRIDGE & SUPPLY CO. . . . . Sandusky, Mich.
H. V. JOHNSTON CULVERT CO. . . . . Minneapolis, Minn.
H. V. JOHNSTON CULVERT CO. . . . . Aberdeen, S. D.
WM. E. NEWMAN & SONS CO. . . . . Ogden, Utah
REPUBLIC STEEL CORPORATION, Canton Culvert Division, Canton, Ohio
THOMPSON MFG. CO. . . . . 30th & Larimer Sts., Denver, Colorado
TRI-STATE CULVERT MFG. CO. . . . . Memphis, Tenn., Atlanta, Ga.
TRUSCON STEEL CO. . . . Indiana Culvert Division, Indianapolis, Indiana
WESTERN PIPE & STEEL CO. . . . Los Angeles and San Francisco, Calif.
WISCONSIN CULVERT CO. . . . . Madison, Wis.
WYATT METAL & BOILER WORKS . . . . Houston and Dallas, Texas

REPUBLIC STEEL CORPORATION BUILDING

YOUNGSTOWN, OHIO

Gentlemen:
Please send me the Toncan Handbook, Form 115-A.

Name_____

Address_____

I am ☐ Engineer ☐ Contractor ☐ Road Official

When writing to TONCAN CULVERT MANUFACTURERS' ASSOC., *please mention Western Construction News*

"There is hardly anything in the world that some man cannot make a little worse and sell a little cheaper; and the people who consider price only, are this man's lawful prey."

—RUSKIN

"Ruskin was RIGHT!"

Ruskin was a poet—but the shrewdest business man couldn't have summed up the *Quality* argument more forcefully — and truthfully. Read Ruskin's words into your thinking when you come to buying *Water Meters* . . . and you will make no mistaken investment. It is such thinking that has made so many Water Works men invest in the quality of Trident and Lambert Water Meters—the meters that never grow obsolete. A type for every service. Write for catalogs to the Neptune Meter Co., (Thomson Meter Corp.), 50 West 50th Street, (Rockefeller Center), New York City . . or . . Neptune National Meters, Ltd., Toronto, Canada.

Trident

and *Lambert* WATER METERS

OVER SIX MILLION MADE AND SOLD

QUALITY in the making

Not how they're made, but how well they run, how accurately they register, how long they last — that is what interests you, the buyer.

•

But in the story behind the making of every detail of Trident and Lambert Water Meter lies the explanation of the quality for which they are famous.

•

Genius has been called "an infinite capacity for taking pains." We lay no claim to genius in meter-making —but infinite pains are taken with every smallest gear and pinion in these meters.

•

No part of any Neptune-built meter so small but that two or more gauges are used to check and re-check its precision.

•

Even the little renewable and heat-proof rubber bushings in registers and gear-trains are checked by five separate gauges!

•

Remember this—Trident and Lambert Water Meters are built on the principle of interchangeable parts. New parts fit into old meters—meters of 30 years back—meters 30 years hence. That wipes deterioration off your books—permanently.

•

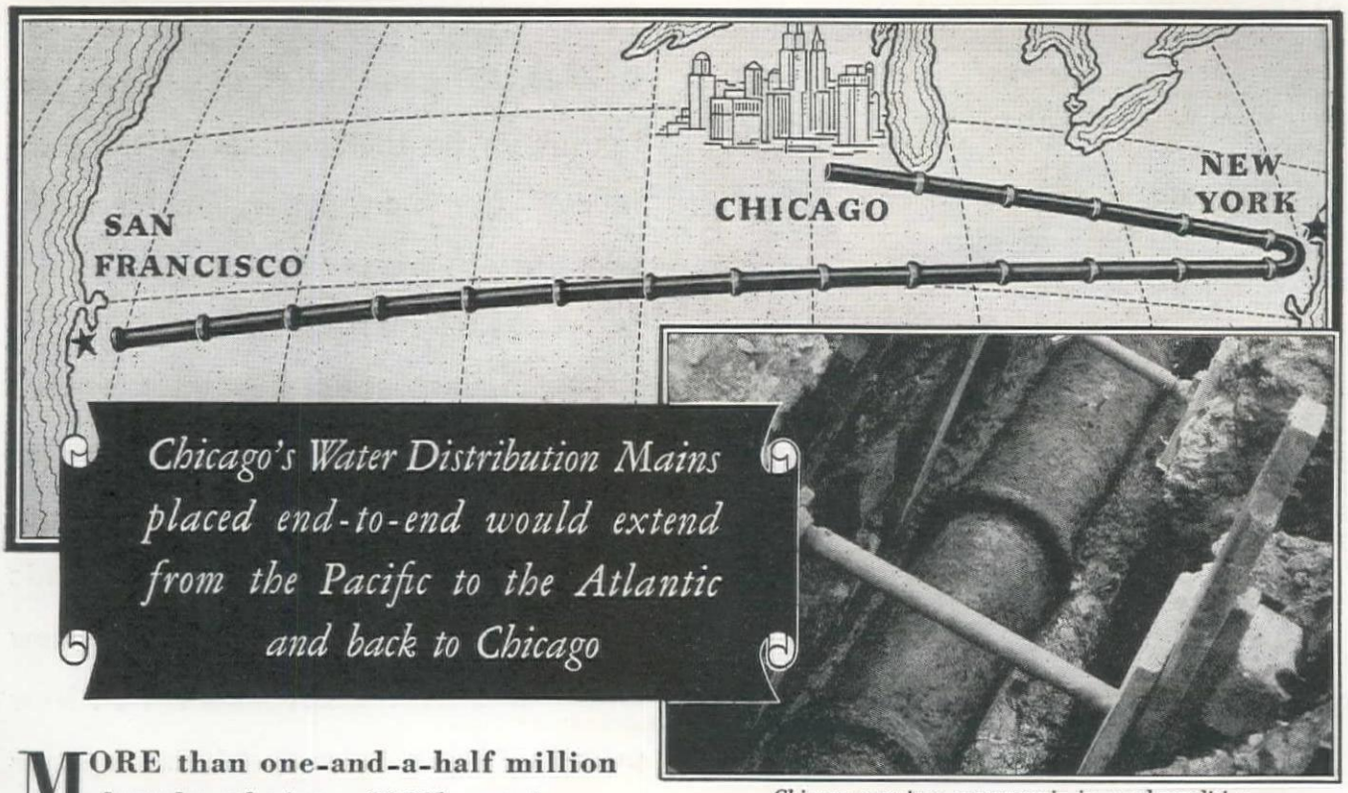
That is one example of Water Meter QUALITY.

•

Pioneers in Meter Progress

Yesterday
TODAY
Tomorrow

CHICAGO'S 3652 *miles of water mains are* 100% CAST IRON---



Chicago cast iron water main in good condition after more than 80 years of continuous service

MORE than one-and-a-half million lengths of pipe—*100% cast iron*—distribute water to Chicago's three-and-a-quarter million population. In airline distance these cast iron mains placed end-to-end would reach from San Francisco to New York and back to Chicago. The rated pumping capacity of Chicago's system is 1,900,000,000 gallons. The maximum amount of water pumped on one day was 1,280,000,000 gallons.

The average percentage of cast iron pipe in the water distribution systems of the 15 largest cities in the United States is 95.6%.

Cast iron is the standard material for water mains. Cast iron pipe 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, Illinois.

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.

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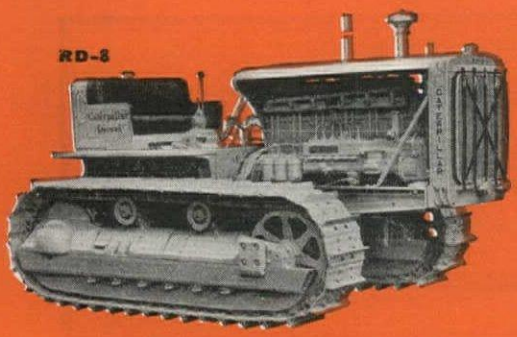

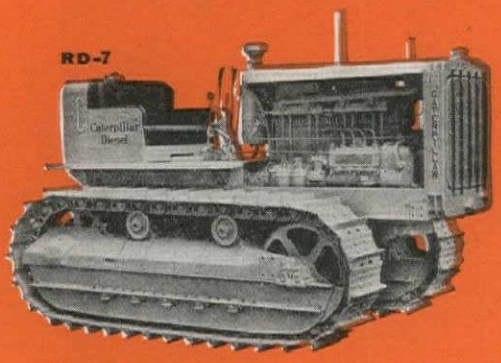

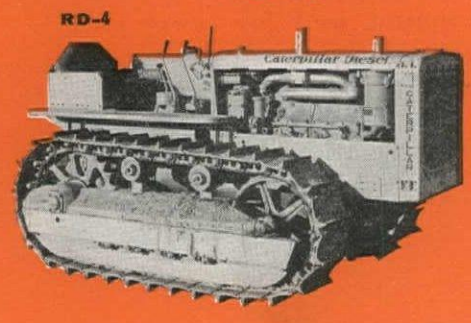

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DIESEL

WESTERN CONSTRUCTION NEWS
WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER

December, 1935 Vol. 10, No. 12

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

The Outlook for 1936 And the Following Years

THE rising volume of construction work going under contract during the current weeks assures a coming season of unusual activity in the West. There appears to be no individual project which will provide a contract of Boulder Dam or Grand Coulee proportions—unless the California State Plan receives unexpected additional financing — but the broad programs of highway work, grade crossing construction, smaller units of Bureau of Reclamation projects, and a long list of municipal water works and sewerage improvements provides an aggregate of substantial volume and diversity. The diversity of the 1936 program, in particular, means a wide variety of engineering employment, work for different types of contracting organizations and a wide range of equipment and materials to be used. In all, the West will continue to be the bright spot in the national construction field.

The condition does not result from any temporary situation, but is occasioned by fundamental characteristics of the region. Construction activity in the West will always exceed that in other regions, in proportion to population and industrial factors. In the West, units of highways are much longer between centers of population and more difficult to build; in the West, agriculture is dependent on irrigation works including the construction of dams, conduits, tunnels and canals; in the West, water supplies must be conveyed long distances through costly tunnels and conduits and, as a corollary, the reclamation of sewage for secondary uses comes to have more economic value; in the West, the power supply is fundamentally hydroelectric, involving huge dams, canals and penstocks; in the West, the municipal facilities, when compared to many Eastern communities, are rather "frontier" and will result in continuing improvements for many years. All of these prospects indicate that the coming 1936 season may be considered the forerunner of the work which will be done in the West during the next decade.

Preparing for Next Season

TODAY, many western contractors are outlining plans for carrying out an awarded contract at a fixed figure, which represents their bid for a specified amount of construction. The price they will get for the work has now been fixed by their bid, but the cost of doing this work depends on skillful planning and execution. In turn, this should result in a careful review of equipment which might be used on the project and its suitability for the type and volume of the work to be done. As a result, this is a particularly fitting time for the contractor and the equipment manufacturer to confer with mutual benefits. The solution of modern contracting problems results from the skillful use of proper equipment. In the drafting rooms and the shops of the manufacturers there is a constant effort to develop better equipment and improve existing models. In the field, contractors and their forces are continually analyzing the work to be done in an effort to reduce costs. The manufacturer must bring his new developments to the attention of the contractor and, in turn, the contractor must be alert in taking advantage of the new developments in machines and equipment. With the National Road Show to be held next month in Cleveland and the usual announcements of new models at this time of the year ,it is the proper time for contractors to become acquainted with all late developments as possible aids for the work to be done during the coming season.

•

Springville, Utah

IN any history of construction and contracting in the West, an important chapter will have to be reserved for the men of Springville, Utah, and their accomplishments. For two generations this small community has accepted contracting as its principal industry and has watched its leading citizens follow the game from job to job leaving a record of difficult work well done and fair and honest dealing. Many years ago, Springville was the home of an outstanding group of early railroad builders, whose teams and grading outfits pushed many miles of track across the mountains and deserts of the West. Later, as the era of railroad construction declined, this same generation of stalwart contractors adapted their operations to irrigation work and built many of the early water development projects in the Intermountain country. And today, a younger generation, still loyal to Springville and the ideals established by their fathers, is carrying forward the building of the West in the rôle of highway and public works contractors.

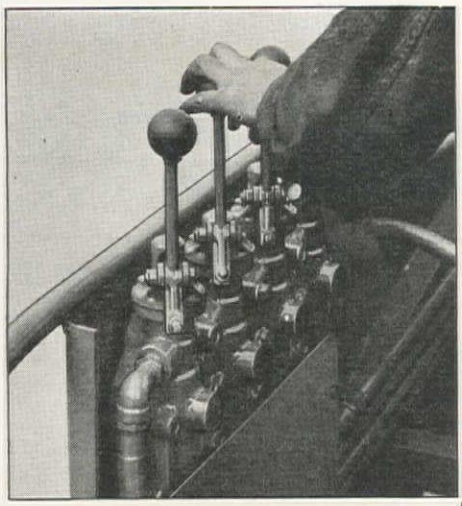
In this issue we publish a first-hand recounting of the history of this outstanding group of early western contractors and the work they did. The story ought to be familiar to everyone in the construction industry. It constitutes a rich heritage for the present constructors. The West may feel justly proud of Springville — the cradle of western contracting—as Springville is proud of its contractors.

•

Just One Drawback

THE present grade-crossing elimination program will result in much comfort, increased efficiency and safety to the general motorist, but presents one drawback. It will tend to halt the steady removal of a class of drivers who should be taken from the highways of the country. Highway engineers continue to build more safety into highways and the reckless driver continues to nullify this work. Safe construction should be paralleled by the culling out of drivers who endanger their own lives and the lives of others, and this is not an engineering job.

The Annual Index for Volume X appears in the back of this issue. The issue of January, 1936, will be devoted to a review of western construction in 1935 and the programs for 1936.



This is all it takes to raise and lower, or side shift the blade, steer, lean the wheels, reverse the circle, or shift the frame on the rear axle. Almost effortless but always accurate.

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AND THE *toughest backbone* ON THE ROAD

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Other features: direct draft between tractor hitch and blade, excellent blade visibility from the operator's platform, one-piece oversize circle, five-point draft beam support—make the most effective blade grader on the market today.

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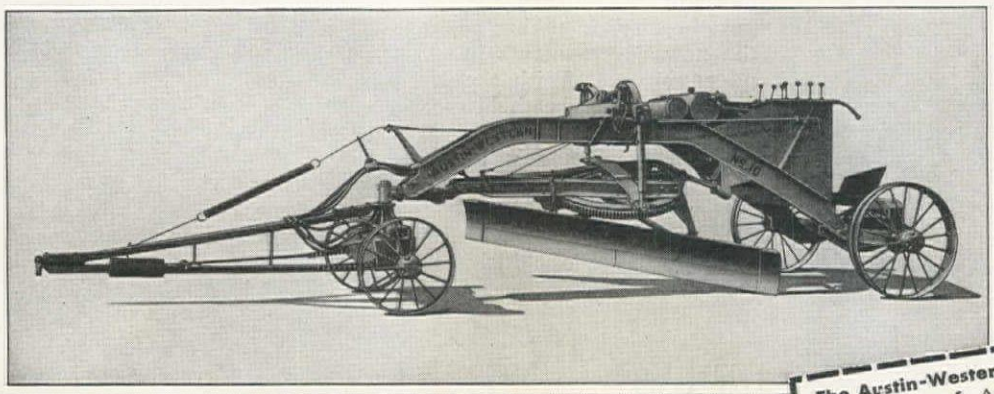

Welded girder type frame resists strain or twist. Permits greater high lift angle, more accurate adjustments, and a better view of the blade.

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When writing to THE AUSTIN-WESTERN ROAD MACHINERY COMPANY, *please mention Western Construction News*

WESTERN CONSTRUCTION NEWS

DECEMBER, 1935

Springville, Utah

Cradle of Western Contracting

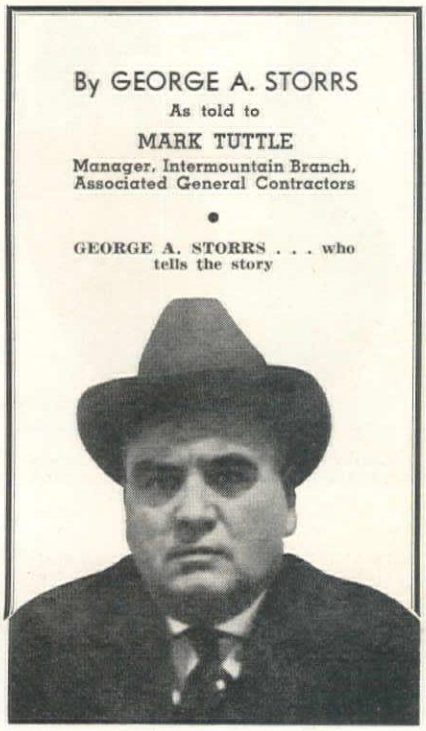
The story of a community where contracting is the principal industry and some history about men who helped build the West

By GEORGE A. STORRS

As told to

MARK TUTTLE

Manager, Intermountain Branch, Associated General Contractors



GEORGE A. STORRS . . . who tells the story

SPRINGVILLE, Utah, boasts that it has more persons engaged in contracting than any other permanent city in the United States, in proportion to population. Possibly more than any other city in the world; but the United States is enough territory for the loyal Springville citizen to cover in his claim.

The last United States Census enumerators counted 3,748 men, women, and children in Springville and there were sixteen cities in the state besides Springville with more than 3,000 population, including Salt Lake City with 144,000 (28% of the state), and yet the assertion is probably true that more than one-half the highways built in Utah since the present road-construction era got under way about twenty years ago are the work of Springville contractors. In addition, Springville contractors have built hundreds of miles of highways in other states. Certainly the density of contractor population in Springville is unusually high.

Springville has another boast, equally significant, if not more so:

Never has a Springville contractor failed to complete his contract without being taken over by his bonding company. Never has a Springville contractor defaulted.

Truly an enviable record!

Readers of *Western Construction News* usually talk in terms of exact facts and figures and it might be possible to determine the number of millions of cubic yards of rock and earth that have been moved by Springville contractors in the last sixty or seventy years; the tons of steel that have been placed; the yardage of concrete poured. Undoubtedly, the totals would prove astounding. But let us forget these dry statistics for a moment and look at the human side of the story. What are the reasons for Springville's outstanding prominence in the construction world? Why is it that the contracting industry has so deeply touched the lives of the residents of this little community lying in the center of a fertile, irrigated area in Utah? What sort of a community has resulted from the devotion of such a large proportion of its population to the building of railways and highways throughout these western United States?

There is a whole string of agricultural settlements on the rather narrow strip of land between the Wasatch Mountains and the eastern shore of Utah Lake. Here and elsewhere in Utah there are cities and towns with origins quite similar to that of Springville. Why should the construction industry pass by the other towns and cities, and select Springville?

Springville residents will tell you that a few bolts of calico did the trick.

The "Calico Railroad"

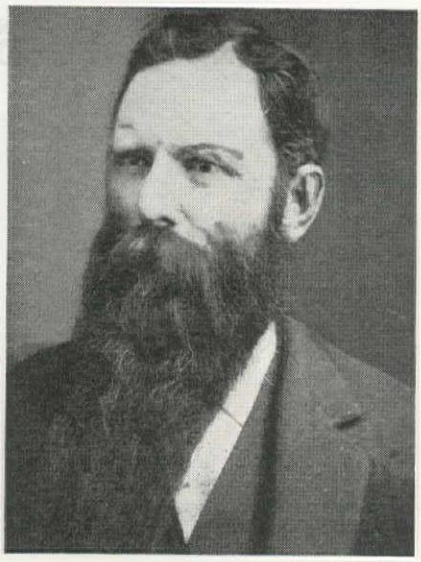
There were similar bolts of calico in many of the other towns which in early days so much resembled Springville. The real living thing that brought industry to Springville was an idea or vision in the mind of the Springville merchant who had the calico on his store shelves. It was Milan O. Packard, Sr., proprietor of a pioneer general store in Springville, who gave the community its start in the contracting game.

The story runs like this: Shortly after the golden spike had been driven on the line of the Union Pacific near Promontory, Utah, connecting the Pacific with the Atlantic by rail, there came an era of feverish activity in railroad construction. A revolution in economic transportation was in progress. Mr. Packard and associates had acquired coal properties at Scofield in the Carbon County fields, and they undertook to build a narrow gage line to connect their property with Springville and the coal consuming market.

Money was scarce in Utah. Arrangements were made that the men who worked on the grade should receive part payment (a major part, so the story goes) in goods at the Packard store. It was a common remark among the men that they might not be getting much money for their labors, but they could get their wives some calico with which to make dresses.

Whatever the reason, the railroad when constructed became known as the "Calico Railroad," in local parlance. And from its construction dates the devotion of Springville to the construction industry, especially engineering construction involving large scale excavation work, as in railway and highway building.

The late A. F. Doremus, Utah state engineer and also city engineer for Salt Lake City, was associated in the construction of the Calico Railroad. The property was later sold to the old Denver & Rio Grande which acquired large



MILAN O. PACKARD . . . calico from his shelves paid for the first construction work.

holdings in the Carbon County coal fields, and later converted the railroad to standard gage.

There were railroads constructed in Utah, and by Utahns, before the Calico railroad. In fact the word was already spreading in the construction world that "the Mormons are good railroad builders." Contracts on the Union Pacific went to various Salt Lake City interests. The Wattises, of Ogden, had already begun to lay the foundation of the far flung activities now directed by the Utah Construction Co. But neither Salt Lake City nor Ogden was so exclusively tied up with the contract construction industry as was Springville.

Two main reasons

There were perhaps two main reasons for this. One was the fact that it was early found that the supply of irrigation water for the Mormon colony of Springville was scant. The colonists had early to look to some other occupation beside tilling the soil to eke out a livelihood. The second condition which may have made Springville a fertile field for developing a new industry, results, perhaps in part, to the same scarcity of the water supply. Before the railroad came, Springville had attained success as a freighting center. Residents purchased products of the farm, or loaded up with store goods and carried them on the long trek overland to Virginia City or Pioche, Nev., or to the mining camps of Montana. George McKenzie, Martin Crandall, the Birds, Deals, Palfreymans, Tucketts, Mason, Sumsion, and others fitted out freight trains in this class of trade.

The freighting business in those days, when roads were mere trails, when Indians were often hostile, and the whites were often hard-boiled, was no bed of roses. But it did require horses, and outfits, and the knowledge of how to do for oneself in the wilds. And for these reasons the transition from freighting to contracting for the construction of railroads into the wilderness was an easy one. Men who had been freighting moved on to the grade of the Calico Railroad.

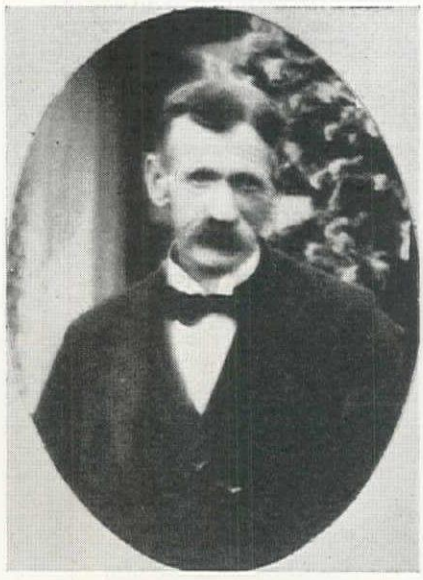
More railroads

Other railroads were built. Springville furnished many of the sub-contractors on the road which was extended into Sanpete Valley, and is now the Marysvale branch of the Denver & Rio Grande Western. The old Utah Central, now a part of the Union Pacific connecting Salt Lake City with Los Angeles, was built as far as Juab, and later was taken over and extended by W. A. Clark of Montana mining fame. Springville contractors, Sumsion and Mason, Martin Crandall and Sons, and George McKenzie built the extension of this line from Juab to the mines at Frisco, where the old Horn Silver poured millions into the laps of its owners.

The era of activity in railroad construction in the mountain and intermountain region lasted from the coming of the Union Pacific until well into the present century, and Springville contractors were ever getting their share of the work. Men became skilled in the vocation. Others who also followed grade construction came to make their homes in Springville. The contractors went after, and obtained, work in other states. In those days there was not so much said as is sometimes the case nowadays, about bringing in "outsiders." Several jobs for the Rio Grande railroad in Colorado and New Mexico were dotted for miles with Springville subcontractors using Springville men and outfits. The same was true of Union Pacific work in Idaho and of the double-tracking of that line in Wyoming.

The last transcontinental railway to come through Utah was the Western Pacific and a long stretch in the Feather River canyon in California was built by Baxter, Straw, and Storrs, a corporation, of which the physical equipment of 250 head of stock and five steam shovels came from the Springville firm of Straw and Storrs (Nephi Straw and George A. Storrs) which shortly before had completed the narrow gage Uinta Railway from Mack, Colo. to Watson, Utah. F. E. Baxter had been chief engineer for the Denver & Rio Grande, controlled by the same financial interests which built the Western Pacific.

Railroad construction fell away about the same time, and highway construction came along. Irrigation works also furnished some important dirt-moving contracts. Springville men sub-contracted, for example, the first canal to take water from the Grand river (now the Colorado River) on the western slope in Colorado. That was before the present thriving city of Grand Junction, Colo., had started. The contractor, Matt Arch, became hard pressed for money. He offered to pay the men with lots on Main Street of Grand Junction, at $50 a lot. "We would not have traded an acre at Springville,"



GEORGE McKENZIE (above) . . . Pony Express rider, early freighter and general contractor.

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RICHARD PALFREYMAN (left) . . . partner with Dennis Palfreyman, the father of B. D. Palfreyman, Palfreyman Construction Co., Provo, Utah.

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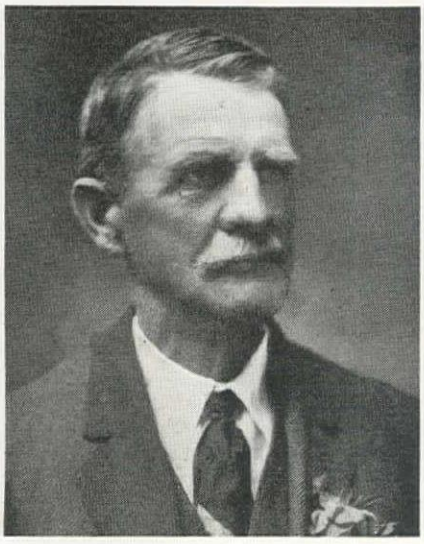
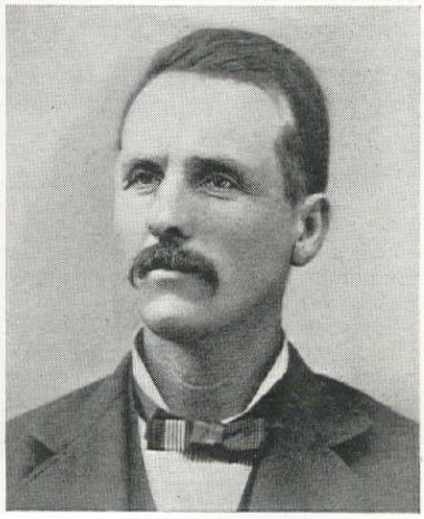
WILLIAM SUMSION (right) . . . Sumsion and Mason built sections of the old Utah Central, now part of the Union Pacific line between Salt Lake City and Los Angeles.





In 1906, Baxter, Strong and Storrs, general contractors for sections of the Western Pacific Railroad main line through the Feather River Canyon in California, moved this 70-ton Bucyrus steam shovel between Beckwith Pass and Spring Garden Tunnel with oxen and five teams of horses.

said Mr. Storrs, "for the whole townsite. But inside of three years land on Main St., Grand Junction, was selling at $50 to $100 a front foot."

Outstanding characters

Sturdy men were these empire builders, men of action and accomplishment, and withal real human beings. Romanzo A. Deal, remembered by his many friends as "Manny," is typical. He was usually in charge on the job for the firm of Deal Brothers & Mendenhall which did a merchandising as well as contracting business. Mounted on a beautiful black charger "Manny" rode the grade to superintend the work. But there was no barrier between him and his employees who were his neighbors. They respected and loved him. They recognized in him a true friend.

George Mackenzie, of Mackenzie & Sons, is likewise well remembered. Other notable firms and contractors in the early days of Springville were Martin Crandall & Son, Sumsion & Mason, Boyer Brothers, Richard and Dennis Palfreyman, Abner and Richard Thorn, Straw and Storrs, Thomas and Amasa Bird, H. T. Reynolds, founder of the Reynolds-Ely Construction Co., and many others.

Nor were the men alone in laying the foundations for Springville's prominence in contracting and construction. The women helped. In many instances wives, daughters, or sisters of the contractors were the cooks at the construction camps. Sometimes one of these would be the only woman in the camp. Western chivalry prevailed, and every man on the work was ready to visit dire vengeance on the person who would make any move to molest or annoy. The presence of the women and their help contributed much, it often happened, to the success of the enterprise. These women presided in later years in some of the finest homes in Springville, or the state, for that matter.

Under such circumstances it may be natural that contracting seems to run in the blood of some of the Springville citizens. B. D. Palfreyman, now of Provo, but originally of Springville, is the son of Dennis Palfreyman. A. O. Thorn, another modern Springville contractor, is Abner Thorn's son. J. M. Sumsion is son of William Sumsion of Sumsion & Mason. H. T. Reynolds, Jr., is head of the Reynolds-Ely Construction Co. The list might be extended indefinitely.

W. W. Clyde, the guiding head of W. W. Clyde & Co., which is perhaps the largest individual contracting firm in the Springville group, came into the contracting game through the engineering school. After graduating he

HENRY T. REYNOLDS (above) . . . founder of the Reynolds-Ely Construction Co., Springville, headed by H. T. Reynolds, Jr.

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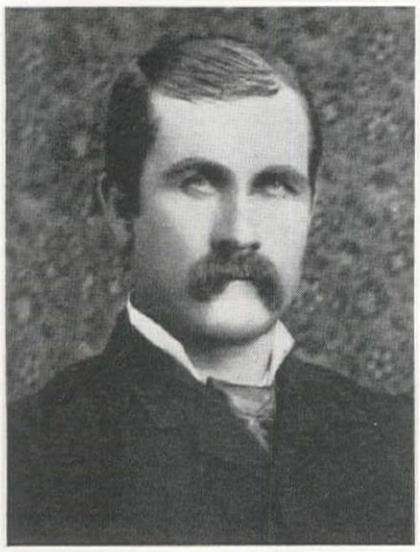

ROMANZO A. DEAL (left) . . . known to his many friends as "Manny," he was in active charge of the work for Deal Brothers & Mendenhall.

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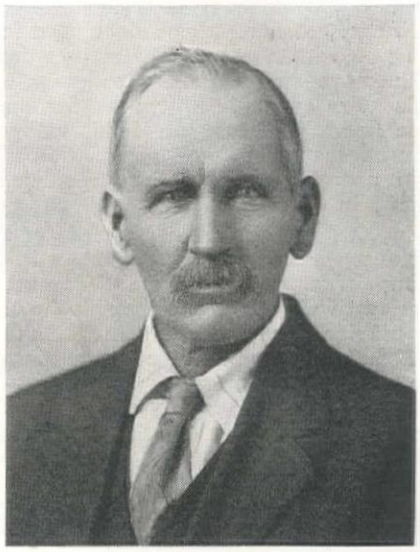
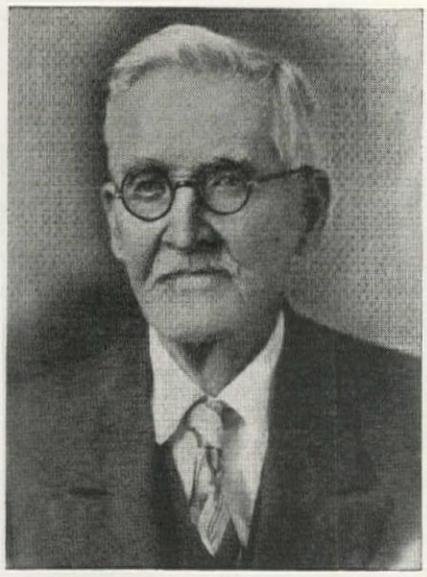


THOMAS L. MENDENHALL (right) . . . this name continues among Springville contractors through Guy W. Mendenhall, associated in W. W. Clyde & Co.



G. S. CONDIE . . . a contractor as early as 1879. Mr. Condie celebrated his 90th birthday October 29, 1935.

was associated with Mr. Storrs in coal mining activities, and from that came with his brothers into contracting. The brothers and Guy W. Mendenhall, of contracting lineage, form the "Co." of the firm. In a business way at least, therefore, the Clydes may be said to be "to the manor born." Strong & Grant and J. W. Whiting are other contractors of Springville who are leaders in the public works and highway fields in this and surrounding states.

The home community

What of the community which these builders have assisted in building for their home? A railway grade, with its cuts and fills, is not an object of remarkable beauty, and all too frequently, at least until very recent years, highways have been constructed with an eye more to the utilitarian than to the esthetic. Yet Springville, nestling at the foot of the Wasatch range, is an attractive city. Many of its homes—the residences built by its business men and contractors, are handsome edifices, with harmonious and well appointed surroundings.

Nor is this love for the beautiful a characteristic of only some individual residents of Springville. The city has a wide reputation as an art center, and in connection with its high school, an annual art exhibition is conducted which attracts entries from all parts of the United States, and even from foreign lands. Contractors and the men who work for them may be a rough, practical, if resourceful, lot on the grade, but at home they like to indulge their love for the beautiful and for the finer things of life. At least Springville is outstanding among cities of its size—or cities of any size, in its community appreciation of the artistic.

Detroit has its automobile industry; Fall River, Mass., its textiles; Hartford, Conn., its insurance companies; Hollywood its motion pictures—the list might be continued indefinitely.

Springville has its contractors. And it's proud of them.

Corrosion of Water Main Corrected in Salt Lake City

Severe ground conditions and inadequate protection necessitate extensive repairs to line after 4-year service—Work completed with main remaining in operation

REPAIRS have been made on sections of steel water pipe in the Salt Lake City system which have seriously corroded during the past four years, as a result of severe ground conditions. The pipe line formed part of an emergency system which was built in 1931 to avert a serious water shortage. Recently, leaks developed in the line with a result that steps were taken to repair the damage and to provide more adequate protection for the pipe line. The features of this rather unusual instance of corrosive action of acid ground conditions are reviewed briefly in the following:

In 1931 Salt Lake City, faced by a serious water shortage, developed a group of artesian wells in the south section of the city. This supply flows by gravity to a pumping plant built at the same time and is there boosted into the city distribution system. The pumping plant discharges through a 30-in. welded steel line, ¼ in. in thickness, laid as part of the 1931 emergency program. Because of the imminent water shortage the line had to be installed without much advance study of conditions and, in fact, the entire project was completed in a 60 day period.

The usual precaution against corrosion was taken by coating the pipe with an asphaltic preparation on the outside, followed by wrapping to preserve this coat during laying operations. The inside of the pipe was dipped in the same hot asphaltic preparation. The pipe was laid in the usual trenching method under a paved street and covered with about 5 ft. of backfill.

In the spring of 1935 several leaks developed in this line and when the pipe was uncovered at these points, serious pit corrosion was observed and the coating had failed to the point of water coming in direct contact with the steel. Corrosion was attributed to soil conditions and the possibility of stray electric currents using the pipe as a conductor, or both. Analysis showed the soil to be a heavy clay, rich in decomposed organic matter and extremely acid in reaction. After a thorough study of conditions had been made a program of repairs and future protection was adopted.

At the several points where leaks had developed, the trench was opened for lengths of about 10 ft. The pipe coating was completely removed, in these open sections and the pipe cleaned to bare metal. The pits and corroded areas were then built up by the arc welding process. Following this repair work a prime coat of coal tar was applied. This prime coat was then covered with a 3/32 in. thickness of coal tar enamel. Difficulty was experienced in applying this enamel because the line was maintained in service and the steel had a temperature of about 66 deg. As a result, the enamel stiffened so rapidly that the operation was more like plastering than painting.

After this enamel coat had been applied it was spark tested. As a further precaution, the backfilling includes a 12-in. layer of gravel all around the pipe.

To protect the pipe against electrolysis at the several points where the line was opened up, a copper conductor was attached to the pipe and an insulated wire lead to a steel plate about 4-ft. square set below normal moisture line, about 12 ft. from the pipe. This arrangement is intended to conduct stray currents from the pipe and concentrate any resulting corrosion in these steel plates.

Soil samples have been taken at regular intervals along the pipe and these indicate that a length of about 1,000 ft. contains the most severe corrosive conditions.

George D. Keyser is water works commissioner of Salt Lake City and H. K. Burton is superintendent of water works. Consulting experts who have studied the present condition include P. Richards, chemist of Denver and F. J. O'Leary of Los Angeles.

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Grant Lake Dam Starts

Stripping operations for the earth fill dam to be built at Grant Lake on the Mono Basin development of the Los Angeles Water Bureau have moved 150,000 cu. yd. (Nov. 1). Temperatures have dropped below zero but the program calls for continuing construction during the winter except for unusual snow. These operations, which involve a crew of almost 100 men, are under the immediate direction of Stanley Dunham, under the general direction of H. L. Jacques, engineer of construction, Los Angeles Water Bureau.

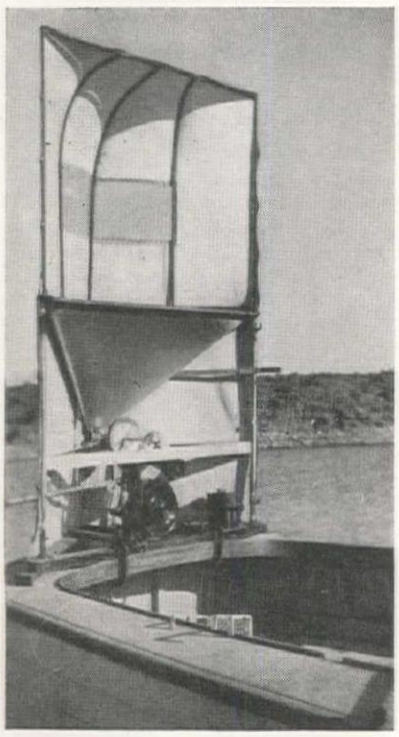
Copper Sulphate Treatment Applied By New Method

Dry crystals broadcast over reservoirs from boat —Many advantages outlined, including marked decrease in costs and higher efficiency

A NEW METHOD of copper sulphating reservoirs, consisting of a machine to broadcast dry crystals from the back of a boat, was described in a paper by R. F. Goudey, sanitary engineer, Los Angeles Bureau of Water Works and Supply, at the San Diego convention of the California Section of the A. W. W. A. The complete paper reviewed the history of the use of copper sulphate in treating water supply reservoirs to control algal growths and the usual method of application, pointing out that existing procedure is "crude, wasteful, incapable of applying required minimum doses, chemically inefficient, excessive in time required to treat a reservoir, and involves a relatively high labor cost." A brief review of the new method outlined by Mr. Goudey follows:

Preliminary experiments tried in 1934 with a hand operated dusting machine using dry copper sulphate were so encouraging that a power machine was developed and successfully used to put 80 tons of chemical on seven of the larger reservoirs of the Los Angeles Bureau of Water Works and Supply during the past season. Briefly, the machine consists of a 12-in. concave, copper disc, with small deflectors to aid in casting the crystals, rotated at 1,400 r.p.m. by a ½ h.p. gasoline engine; a hopper for holding 250 lb. of dry copper sulphate with an adjustable gate discharging onto the disc, capable of feeding from 5 to 50 lb. of crystals per min.; an iron frame for attaching the machine to the end of a boat and canvas cover. The machine is shown in operation in the accompanying illustrations.

Appearance of the broadcaster (above) which scatters crystals uniformly over a width of 50 to 100 ft.



Clamped to the back of a power boat (left) the new equipment includes a ½ h. p. gasoline engine driving the casting disc at 1,400 r. p. m., a hopper for 250 lbs. of crystals and a canvas screen.

The material is sized to pass a 16-mesh screen. In calm weather the heavy crystals (4 milligrams) are thrown over a width of 40 to 50 ft. from the boat, with the dust, which amounts to a small percentage of the weight, settling near the boat. Laboratory experiments showed the largest crystals sank 20 ft. before dissolving and gave concentrations varying from a trace at the surface to 0.6 p.p.m. in the first 5 ft. A fine crystal (about ½ milligram) descended 4½ ft. before dissolving and gave an average concentration of 2 p.p.m.

Field tests showed that the material passing the 16-mesh sieve gave a 70% distribution in the top 3 ft. of water, 17% at the 15-ft. depth, 7% at 30 ft. and none below 60 ft.

Amounts of material used by the new method vary from 7.5 lb. to 29.4 lb. per acre, with an average figure of 15.3 lb. The 15.3 lb. per acre average results from the use of higher amounts than were necessary because of being too conservative in reducing doses all at once, from the amounts required by the old method. It is believed that the present equipment can feed at a minimum rate of 10 lb. per acre, which compared with 27.2 lb. per acre for the old method.

In the spreading of 80 tons of copper sulphate by the new method during the past nine months the time required has been about 1 hr. per 28 acres in reservoirs less than 100 acres in area, and 1 hr. per 140 acres in larger reservoirs. Reasons for the rapid rate of application by the new method, as compared to the old are obvious.

It is still desirable to develop equipment that can feed copper sulphate at a minimum rate of 5 lb. per acre. Some trouble has been experienced with the material lumping while in storage and not feeding evenly. This tends to cause some slight overtreatment in the wake of the boat. The advisability of adding about 1% of either magnesium carbonate or activated clay to make the copper sulphate flow freely is being considered. Specifications for the copper sulphate to be used by the new method include the passage of all material through a 16-mesh sieve, not more than 8% passing the 150-mesh sieve, a copper content of 65% and free sulphuric acid not to exceed 0.001%.

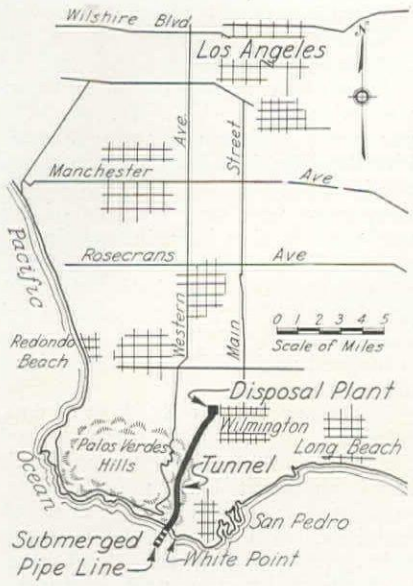
"The new method of adding copper sulphate to reservoirs consists of scattering fine crystals passing a 16-mesh sieve by a 'scatterer' which spreads copper sulphate uniformly over sections of a reservoir 50 to 100 ft. in width, depending on wind or wave action. The copper sulphate dissolves as the crystals fall through the water giving a uniform vertical distribution which can be varied according to concentration and depth of treatment desired. In this way the active copper can be mixed immediately in all the water requiring treatment instead of depending on overtreatment of narrow lanes and lateral diffusion by the old method of dragging sacks filled with large copper sulphate crystals.

"Based on applying 90 tons of material the new way and 300 tons by the old procedure, the new method, with equipment admittedly not entirely efficient as it theoretically could be, effects a saving of 63% of the chemical applied, is three times quicker in its application and requires 65% less labor.

"The procedure of applying copper sulphate crystals over the surface is being covered by a process patent application, but the method used to scatter copper surplate is not included."

The Los Angeles Chemical Co. developed the machine described and illustrated in this abstract.

Sewer Tunnel and Outfall Program for Los Angeles



Completing the major units of the sewerage system of the Los Angeles County Sanitation Districts, 6 mi. of tunnel and a mile-long ocean outfall are now under construction—Project reviewed and progress outlined

CONSTRUCTION work is well started on the $2,500,000 sewer tunnel and ocean outfall project of the Los Angeles County Sanitation Districts. This work will complete the major construction program on the districts' system, which has been providing disposal for sanitary sewage and industrial wastes for a score of small cities and about 222 sq. mi. of developed territory in the Los Angeles metropolitan area, for the past decade. With completion of the ocean outfall, discharging 5,000 ft. offshore at White Point, the present activated sludge plant will be converted to plain sedimentation with separate sludge digestion. Present contracts were financed through the PWA and are scheduled to be completed in July, 1937.

As a background for a review of the construction work now starting, and its relation to the plans and operation of the districts' system, this article will first sketch the history of the formation and functions of the Los Angeles County Sanitation Districts.

Brief historic review

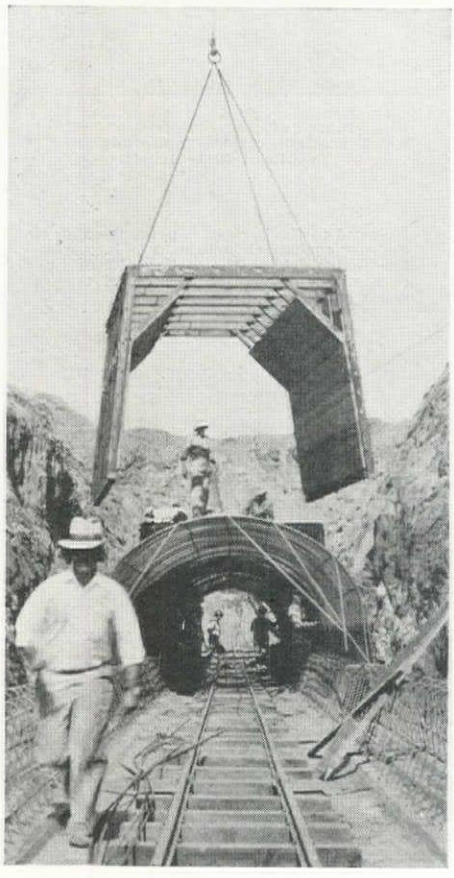
Authorized by general law enacted in 1923, the formation of the districts was started almost immediately in Los Angeles County and a plan developed to provide joint sewage disposal facilities for some 17 small cities, 28 unincorporated communities and 222 sq. mi. of unincorporated area. The general lack of streams in the region for necessary dilution of wastes, and the prohibitive cost of individual treatment plants or outfalls to the ocean for these communities were essential factors resulting in the district type of organization. Through the extensive system since developed and now in use, these towns and industrial plants are completely relieved of the problem of disposal and are only concerned to the point of collecting sewage for delivery into the district's trunk lines.

The first bond issue of $9,000,000 was voted in 1925 and the construction of interior trunk lines was active during 1925 and 1926.

From the outset, the plan of the system provided an ocean outfall. A review of the program and general recommendations (*Western Construction News*, April 25, 1926), which included approval of the White Point submerged outfall, was made in 1926 by X. H. Goodnough, then chief engineer, Massachusetts State Board of Health. Although there was incidental controversy on the part of shore communities on the site of the outfall, its location has not been changed since the original plans were made by the district's engineers in 1925.

In December, 1926, the state board of health denied the application of the districts to discharge screened sewage 5,000 ft. off shore at the White Point location, but approved outfalls at two other sites which had been discussed (Badger Ave. and San Pedro breakwater). Following a change in plans to provide subsidence and grease removal before discharging into the ocean, the state board (April, 1927) granted permission to use the White Point location.

Near the plant, open trench construction was used for 950 ft. to the tunnel portal. The sewer was built with inner steel forms and exterior timber forms handled in sections, as shown, by crane on the edge of the cut.



Sewage was turned into the lines and plant of the district's system in February, 1928. This disposal plant originally built for 3 m.g.d. capacity provided for pre-sedimentation, activated sludge treatment, and final clarification with discharge in Nigger Slough, pending construction of the outfall. This plant has been operating since that time with enlargement to a present capacity of 20 m.g.d. and improvements to include separate sludge digestion and collection and use of gas (1931) for engine operation to drive pumps. During this period the collector mains have been gradually extended to care for growth and expansions in the districts.

From 1928 to 1935 the construction of the ocean outfall has been held in abeyance for economic reasons. PWA financing for this final phase of the development was secured in 1935 and the project moved ahead rapidly to the beginning of active construction work in July.

Features of the project

Beginning at the disposal plant end the project includes: (1) about 950 ft. of conduit built in open cut, (2) 31,000 ft. of 8-ft. horseshoe section reinforced concrete lined pressure tunnel to the ocean shore, (3) 670 ft. of a double line of 60-in. reinforced concrete submerged pipe in rock trench (one line blanked off for future use), (4) 1,600 ft. of single 60-in. concrete pipe in rock trench, (5) 2,730 ft. of 60-in. concrete pipe on sand bottom and (7) diffuser 5,000 ft. offshore at El. —110.

For bidding, the project was divided into four sections. Unit bids were published in *Western Construction News*, July, 1935, page 44. Contract awards appear in the accompanying table.

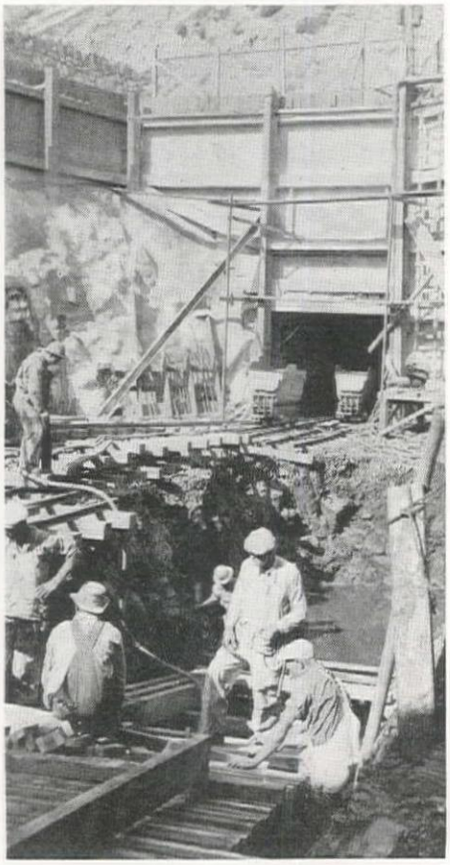
United Concrete Pipe Corp. contract

Beginning at the disposal plant end of the outfall project, the first 1.72 mi. of conduit and tunnel construction (Schedule No. 3) was awarded to the

to Complete Districts

United Concrete Pipe Corp. on a bid of $440,058. This work consists of about 950 ft. of open cut trenching with the conduit poured as a monolith, followed by about 8,140 ft. of 8-ft. horseshoe shaped tunnel.

The open cut work involved no particular problems and did not develop any unusual construction procedure. The sand material was excavated by dragline to the required grade followed by the placing of the concrete invert and concluded with the pouring of the arch section. Forms for the inside of the sewer were of steel and were designed to be moved ahead as the pouring advanced. The outside forms were of timber and built up in sections which were handled by the crane from the edge of the cut.



At the beach portal of the tunnel this access cut has been excavated and protected against storms. The ramp being built down to the lower level is for trucks which will be loaded direct from the muck trains.

Concreting operations for this initial section of the work were used to experiment with concrete control and placing procedure. Although this type of construction would have allowed the concrete to be placed almost vertically into the forms, it was permitted to flow ahead on a slope to simulate placing methods to be used later in the lining of the tunnel. This permitted observations as to segregation, encasing of the reinforced steel and other problems.

The concrete was vibrated into position and observations were made to determine the proper amount of vibrating to secure best results. At first, some problems were encountered in the sealing of the doors in the forms to prevent fins of cement forming. After some experimenting the solution was found in smearing the edges of these steel doors with heavy grease which effectively stopped this leakage of grout.

For a space of about 100 ft. next to the tunnel of the portal, the conduit work was stopped to provide working room for the tunneling operations. At this point the trench is about 28 ft. deep. Below tunnel invert grade, a pit was excavated along one side of the trench. This pit is used to take the discharge from the muck trains and the sandy material is removed by clamshell bucket from a crawler crane mounted on the edge of the trench. This crane loads into trucks for disposal of the material.

Tunnel driving procedure

After a few timber sets had been placed at the tunnel portal, the standard steel rib supports were started and about 2,700 ft. of tunnel has been driven. The material is damp sand of rather uniform character and driving has averaged about 50 ft. per day. Although the material requires complete lagging behind the ribs and the heading must be driven under timber spiling, the operations are well organized, the equipment is well designed for the operations and the work is moving forward rapidly.

The operations at the heading include the following routine procedure. The rounds are 4 ft. to correspond to the spacing of the steel ribs. The sand face is held with breast boarding, depending on the ability of the material to stand, with trench jacks against the last rib in place. With the excavation for the round completed, the crew of five men and a shifter clean up the footing spaces and set up the two halves of the steel rib which is bolted together at the top. The bottoms of the rib rest on timber blocks with a timber spreader piece between. After bolting up, the rib is plumbed and blocked in position. The lagging is then started up both sides using pieces of timber cut from the ends of the old spiling. This lagging is back-filled with sand and completed up to the spring line so that the rib is firmly held in position.

Across the beach from the tunnel portal this excavation marks the start of the work for the mile-long submerged outfall. Operations include digging a trench through soft rock and building a working trestle.

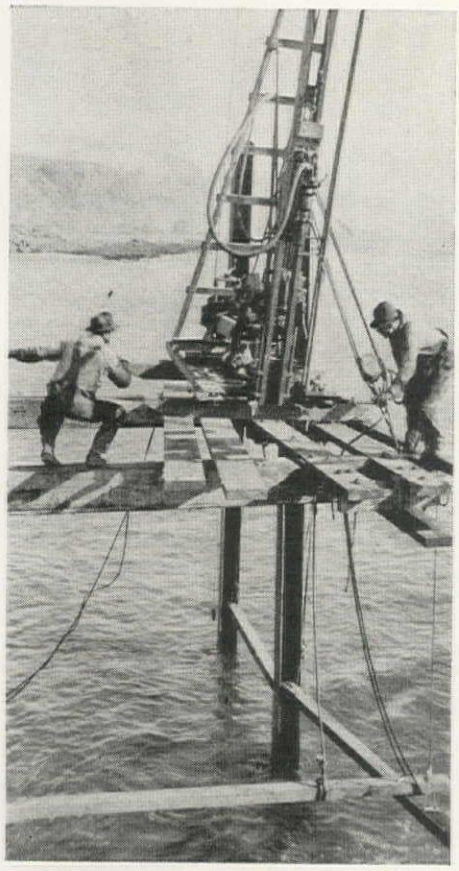
A temporary platform is then set up and the driving of the spiling is started. The timber spiling is driven by hand, beginning at the crown of the arch, and the sand is spaded out with air tools and the driving continued until the roof of the next four feet is held by the spiling. After a further breaking down of the face with the air tools, the mucker is moved into position.

This machine is a special small size Conway, electrically operated, designed for this size of bore. The mucker discharges onto the end of a 120-ft. conveyor belt which is mounted on a steel frame running on a 4-ft. gage track, outside the regular 2-ft. track for the trains. This conveyor belt is high enough to clear the tops of the 3-yd. muck cars. Disposal of the material at the heading is the outstanding feature of this tunneling procedure and is working in a satisfactory manner.

When the empty 7-car train comes into the heading it includes an extra flat car at the forward end which carries the two half ribs and all of the timbering required for the next set. This is run under the gantry up to the mucker and the crew then unloads this material in a convenient position near the face while the mucking is in prog-

Section	Length (Miles)
Tunnel at plant end	1.72
Tunnel (2 schedules)	4.38
Ocean outfall	1.00

Contractor	Contract
United Concrete Pipe Corp.	$ 440,058
Shofner & Gordon	1,606,281
Merrit, Chapman & Scott	528,059



Out on the end of the working trestle this drill is being set up to open up a hole in the rock so that the steel H pile can be driven by drop hammer to complete the 3-pile bent.

ress. The train is then pulled back, as the mucking proceeds, to fill the cars at the end of the 120-ft. conveyor. One man at the end of the conveyor controls the belt and directs the movement of the train as the cars are filled. This train is sufficient to take care of the excavation for one complete round which usually fills six cars, with one in reserve in case of excess material. In this procedure the mucking does not have to stop during a complete round and there is no switching or handling of individual cars. As the mucking of the sand continues the crew breaks down the face and sets up breast boards as required. This sequence of operations requires about two hours to complete, on the average, which is necessary to complete the 50 ft. of progress a day. Work is carried forward in four 6-hr. shifts with the crews working a 30-hr. week, in accordance with the PWA requirements. The tunnel is dry and the usual provisions are made for supplying air, power, and ventilation at the face.

Shofner and Gordon schedules

The central section of the tunnel project is being driven from a 150-ft. shaft and from the portal at the ocean end. This work includes Schedules 1 and 2, and aggregates 4.38 mi. of tunnel. The contract is held by Shofner and Gordon on a total bid of $1,606,281.

At the shaft access point, about the center of Schedule 2, the contractor has completed the sinking of a shaft about 150 ft. to tunnel grade and late in October was excavating a muck pocket about 40 ft. below tunnel grade. Additional work at the shaft will include the excavation of a pump chamber and a battery charging room at tunnel grade. The contractor elected to sink this shaft about 75 ft. off the tunnel line and this will permit the muck trains from either heading to turn and discharge their loads into the muck pocket off of the main tunnel line. A double skip hoisting system will be installed to lift from the rock pocket to a compartment in the timber head frame structure from there trucks will dispose of the material to a nearby ravine.

The shaft was sunk through shale with water and some hydrogen sulphide gas providing the principal difficulties. It is circular in section, about 14 ft. in diameter and lined with steel plates. Inside the shaft the guide frames for skips, the necessary piping and man-way will be installed.

The camp at this site includes the customary office building, first aid house, shops, and a compressor building, housing a 1,000 cu. ft. and 500 cu. ft. Ingersoll-Rand units. A Conway mucker will be used at this location after driving gets under way. From the north heading this tunnel will be extended, mostly through shale rock, about 4,200 ft. to meet the work of the United Concrete Pipe Corp. (Schedule 3). The south heading will extend 9,850 ft. (approximately) to meet the heading driven from the portal, which is also part of the Shofner and Gordon contract (Schedule 1).

Work at the ocean portal

At the ocean portal end the contractor has completed access works in a rather difficult location, and has opened up more than 500 ft. of tunnel although equipment and methods are not yet standardized to the point of adequate description.

The excavation at the portal was sunk through beach sand and rock to invert grade at El. —12. On the beach side this excavation is heavily braced with vertical steel H beams set in concrete, with heavy timber waling and lagging. This heavy construction was considered essential to resist severe storm waves during the winter season. The rock exposed in this access excavation has been given a coat of gunite to prevent weathering.

A sloped ramp down the side of this excavation provides access and will be used by trucks in hauling out the tunnel excavation to a dump ground along the shore. A pit has been dug below tunnel grade where the muck trains discharge side dump cars directly into trucks.

The material to be encountered in this heading will probably be shale, some of which is fairly hard. Temporarily drilling has been done with jackhammers from a car-mounted timber drilling platform. Four-ft. rounds are drilled and shot to meet the spacing of the steel rib supports. This heading, at an invert grade of El. —12, is wet and there will be problems involved in handling the water since the tunnel is level.

Ocean outfall

Contract for the 5,000-ft. ocean outfall end is held by Merritt, Chapman & Scott on a low bid of $528,059 for precast reinforced concrete pipe. The construction program calls for laying the first 500 ft. out from the shore from a construction trestle with the remainder of the line to be laid from floating equipment. This trestle extends out beyond the breakers and permits the use of large dredges and barges for the remainder of the line.

The trestle consists of bents of steel H section piles at 20-ft. spacing, braced by steel members bolted in position. This structure is completed with heavy timber caps and stringers to support the weight of a crawler mounted crane and the pipe to be placed. The piling was driven with a drop hammer into the soft rock of the shore. A Northwest crane was used in this trestle construction work. Pipe to be laid in this section will be placed in a rock trench and covered with tremie concrete. At the outer end of this rock trench section a transition section is provided with flexible joints, and the remaining 2,170 ft. will be laid directly on the hard, sandy bottom. At the present time, dredging in the rock section is under way with the large dredge "Argyle" but pipe laying work has not been started.

Organization

A. K. Warren is chief engineer and general manager of the Los Angeles County Sanitation Districts; A. M. Rawn is assistant chief engineer in charge of construction and operation; F. D. Bowlus is resident engineer on the tunnel and outfall project.

On the contract of the United Concrete Pipe Corp., Ted Mosier is superintendent. Bert Werden is superintendent for the Shofner and Gordon operations and R. R. Helen is superintendent for Merritt-Chapman & Scott Corp.

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Colorado Springs Dam

The new Crystal Creek reservoir and dam, an important addition to the water system of Colorado Springs, Colo., was completed this month at a cost of $1,200,000. Built on the north slope of Pike's Peak, the project was financed by the PWA to the extent of $325,000. A lake is forming behind the 100-ft. dam which will store 3,500 ac. ft. of water for the city. In piping the water to the city, about 3½ miles of tunnels were driven. Plans are now being made to change the present Pike's Peak highway next spring so that it will run for nearly half a mile across the dam's crest.

Denver Building Transmountain System To Supplement Present Water Supply

An outline of the important project which includes collection conduits on the West Slope, lining of the Moffat Water Tunnel, siphons, and a filtration plant

By E. H. SCHNEIDER
Designing Engineer, Board of Water Commissioners, Denver, Colorado

THE DIVERSION of a supplemental water supply from the west side of the Continental Divide for the City of Denver has been under serious consideration for many years, even prior to the building of the Moffat Railroad Tunnel. This additional water for the South Platte River basin is needed to augment existing supplies for municipal and irrigation uses. At the time of the building of the railroad tunnel through the Continental Divide it was the part of wisdom to make provision also for a water tunnel to provide for a transmountain diversion from the west slope of the Rockies to Denver.

At this point it should be recalled that in order to construct the Moffat Railroad Tunnel, a bill forming the Moffat Tunnel Improvement District was passed by a special session of the general assembly of Colorado in 1922. The railroad tunnel was begun in 1923 and completed in 1927. As a part of the construction project a pioneer tunnel was driven with 23 cross cuts to working chambers or sections of the main tunnel. The railroad tunnel and the pioneer tunnel were driven parallel to each other and 75 ft. apart c. to c. It was the intention from the beginning to utilize the pioneer tunnel as a water tunnel.

In 1921 the Board of Water Commissioners of Denver made surveys and maps of the watershed of the upper Fraser River and its tributaries on the west side of the divide and adjacent to the west portal of the tunnel. On the basis of these surveys and maps filings were made with the state engineer for the transmountain diversion of water from this watershed.

In 1929 the Board of Water Commissioners of the City and County of Denver leased the pioneer tunnel (now officially termed the Moffat Water Tunnel), from the Moffat Tunnel Commission for a period of 99 years. Due credit should be given to Benjamin F. Stapleton, mayor at that time, for his ardent work and influence in inducing the board to secure the above referred to lease.

In March, 1930, a board of consulting engineers was employed by the board to make a study of the water tunnel, the diversion project as a whole and prepare plans for lining the tunnel. The board of consulting engineers consisted of Herbert S. Crocker, chairman, George Lewis and George M. Bull. The writer was the designing engineer. A study of the entire project including the collection and diversion systems was made and estimates of costs prepared. Plans were prepared for lining the Moffat Water Tunnel, but no plans were prepared for the collection and diversion systems. This engineering work was completed in June, 1931.

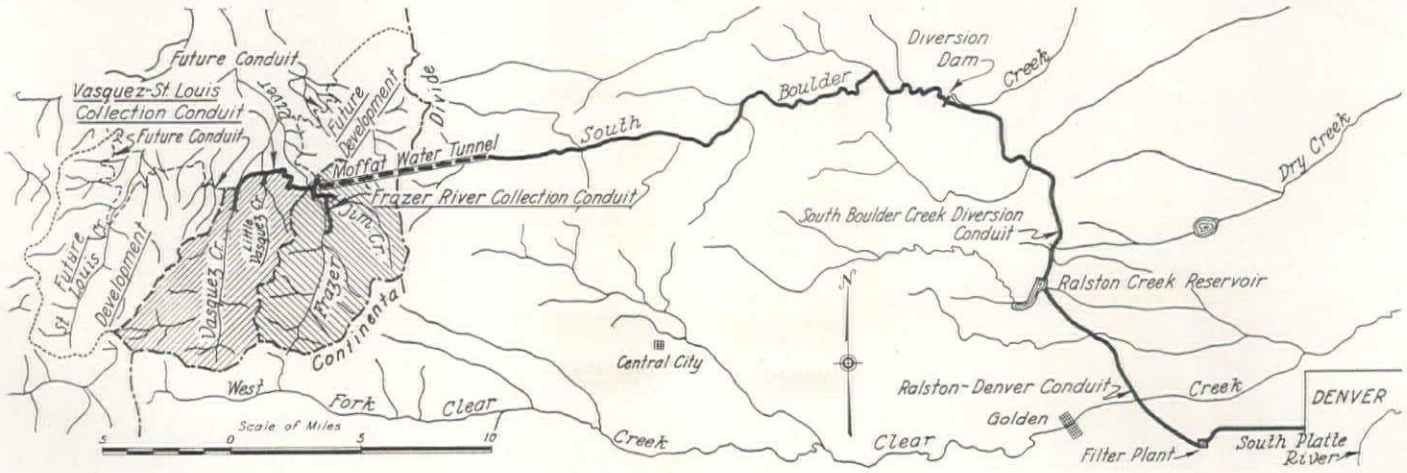
At that time the Board of Water Commissioners did not enter upon a program of constructing a permanent lining in the Moffat Water Tunnel, but adopted a program of maintenance work. This program was carried forward until late in 1934, when Herbert S. Crocker was engaged as consulting engineer and a PWA loan was secured from the Federal Government for (1) the construction of a permanent lining in the tunnel, (2) the construction of a diversion conduit and (3) a collection conduit for about 50% of the total contemplated diversion from the Fraser River and its tributaries.

The present plan is for the diversion of approximately 54,000 ac. ft., which will require a carrying capacity in the Moffat Water Tunnel and the trunk line conduits of about 600 sec. ft. The required capacity for the total contemplated diversion to be developed in the future will be 1,200 sec. ft., or 106,000 ac. ft. The tunnels and the permanent structures in the diversion conduit system are designed for this ultimate capacity of 1,200 sec. ft. One siphon on the South Boulder diversion conduit is designed for a capacity of 1,200 sec. ft., but the other five are designed for 600 sec. ft. When the future water supply is developed, a second siphon of 600-sec. ft. capacity will be constructed along side and parallel to these.

This first loan was not adequate for the necessary construction to bring the water into the City of Denver. It had for its purpose the transmountain delivery of the water to Big Dry Creek, a tributary of the South Platte River. It was the intention to pass the water down this creek to the river and exchange it for water farther up the river which would be diverted directly into the city's reservoirs and water system. This loan is known as the Moffat Water Tunnel Project, PWA Docket No. 1380.

In September, 1935, a second loan was secured from the PWA which will permit the conduit system to be extended to a reservoir which is to be constructed on Ralston Creek. This

From the West Slope of the Continental Divide, the City of Denver will divert water through the improved pioneer bore of the Moffat Tunnel and re-divert it from the channel of South Boulder Creek by conduit to a filtration plant to be built near the city.



supplemental loan also provides for a filter plant which will be located just west of the city and a pipe line from the reservoir to the filter plant and from the filter plant to the Ashland Avenue distributing reservoir. This loan is known as the Moffat Tunnel Extension Project, Docket No. Colo. 1005.

The Moffat water tunnel project and its extension are subdivided into the following divisions: (1) The Moffat Water Tunnel, (2) the Fraser River collection conduit, (3) the Vasquez-St. Louis collection conduit, (4) the improvement of South Boulder Creek, (5) the South Boulder Creek diversion conduit, (6) the Ralston Creek reservoir dam, (7) the Ralston Creek-Denver conduit, and (8) the filter plant.

There follows a brief review of the purpose and principal features of these various sections of the project. The location of these units and their relations to the development are indicated on the accompanying map.

1.—*The Moffat Water Tunnel,* as already stated, was driven at the time of the construction of the railroad tunnel and is approximately 6.3 mi. long. It is driven on an ascending grade from both portals with the apex near the center of the tunnel. It is, therefore, necessary to bring the water into the tunnel at an elevation high enough to flow over the apex by gravity. A shaft was driven from the tunnel to the surface as it is more economical to bring a part of the water into the tunnel by this means. The shaft is located approximately 2,700 ft. east from the West Portal of the tunnel. The portion of the tunnel west of the apex will be permanently lined with a reinforced concrete lining, providing a finished diameter of 10 ft. 6 in. Only such portions of the tunnel east of the apex will be lined as is necessary to make it water tight. The tunnel when fully lined will have a capacity of about 1,250 sec. ft. It is expected that the unlined sections of the tunnel east of the apex will carry about 600 sec. ft.

2.—*The Fraser Collection Conduit* will have two diversion dams, one on the Fraser River proper and the other on Jim Creek. The conduit consists of an open canal and a siphon. The canal is unlined where it is in ground of a character that will admit of such construction and lined where it is in unfavorable ground. The steel siphon is for the conduit crossing over Jim Creek and is 1,718 ft. long. The length of the canals, both lined and unlined, is 14,752 ft.

3.—*The Vasquez-St. Louis Collection Conduit* extends westwardly from West Portal. Under the present program it will be constructed to the Big and Little Vasquez Creeks. Its extension to St. Louis Creek will be deferred to some future time. The conduit has a siphon over the Fraser River at West Portal, 1,930 ft. long. From the west end of this siphon the conduit will be a lined open canal 9,000 ft. long, to the mountain divide between the Fraser River and Little Vasquez Creek, where a 2,200-ft. tunnel will be driven through this point. A lined canal will extend from the west end of the tunnel to the diversion dam on the Little Vasquez Creek. A siphon 960 ft. long will extend across the Little Vasquez and thence a lined canal 9,300 ft. long to the diversion dam on Big Vasquez.

From the East Portal of the Moffat Water Tunnel, the water will flow down South Boulder Creek, on the eastern slope of the Rocky Mountains, a distance of 23 mi. to the diversion dam. Some improvement in the creek channel and highway crossings will be necessary as the flow of the stream will be practically doubled.

4.—*The South Boulder Diversion Conduit* extends from the diversion dam on South Boulder Creek to the storage reservoir on Ralston Creek. This conduit has five tunnels, six siphons, and six flumes. The tunnels are through the foothills from the diversion dam in the canyon on South Boulder Creek. Tunnel No. 1 is 236 ft., tunnel No. 2 is 591 ft., No. 3 is 3,078 ft., No. 4 is 3,207 ft., and tunnel No. 5 is 580 ft. long.

Siphon No. 1 between tunnels 2 and 3 is 111 in. in diameter and 900 ft. long. Siphon No. 2 between tunnels 2 and 3 is 96 in. in diameter and 400 ft. long. Siphon No. 3 between tunnels 4 and 5 is 84 in. in diameter and 1,378 ft. long. Siphons No. 4, No. 5 and No. 6 aggregating 8,108 ft. are in the conduit line across Stony Flats at the border between the plains and foothills. There is a reinforced concrete flume between tunnels 3 and 4, and a reinforced concrete bench flume south of the easterly portal of tunnel 5. Four flumes are designed for ravines or draws in the canal line.

The total lengths of the several types of structures of the South Boulder Diversion Conduit are:

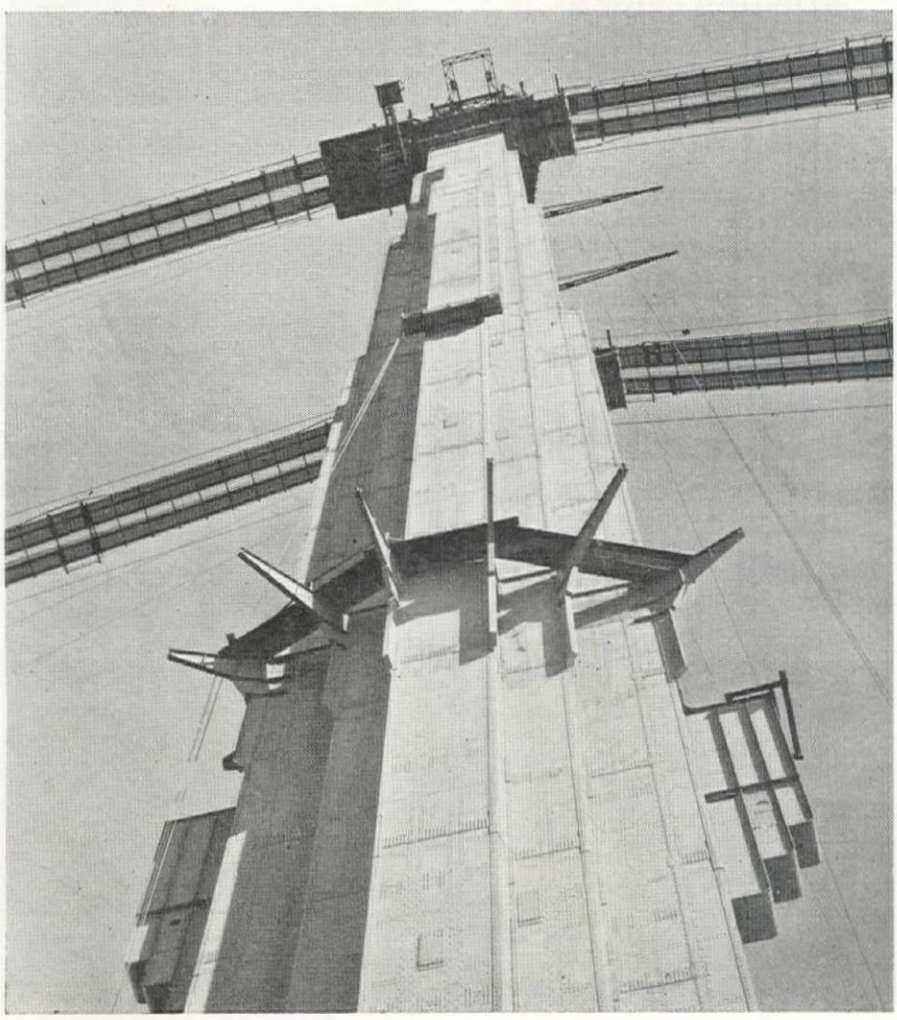
Tunnels No. 1 to No. 5, inclusive	7,692 ft.
Siphons No. 1 to No. 6, inclusive	10,786 ft.
Flumes No. 1 to No. 6, inclusive	1,752 ft.
Canals, both lined and unlined	30,710 ft.

The total distance from the diversion dam on South Boulder Creek to the reservoir on Ralston Creek is 51,100 ft. or 9.68 mi.

5.—*The Ralston Creek Dam* will be an earth fill 1,150 ft. long and 175 ft.

Catwalks Top the Golden Gate Bridge Towers

On November 9 actual cable spinning started on the Golden Gate bridge, when guide wires were strung from anchorage to anchorage, over each catwalk, shown crossing the top of one of the two 746-ft. towers. These wires were adjusted to the proper sag for the 25,570 individual wires to be spun for each cable. Spinning is now well started and the present progress schedule calls for completion of the entire project by May 1, 1937.



high. The reservoir will have a capacity of 12,060 ac. ft. at spillway level.

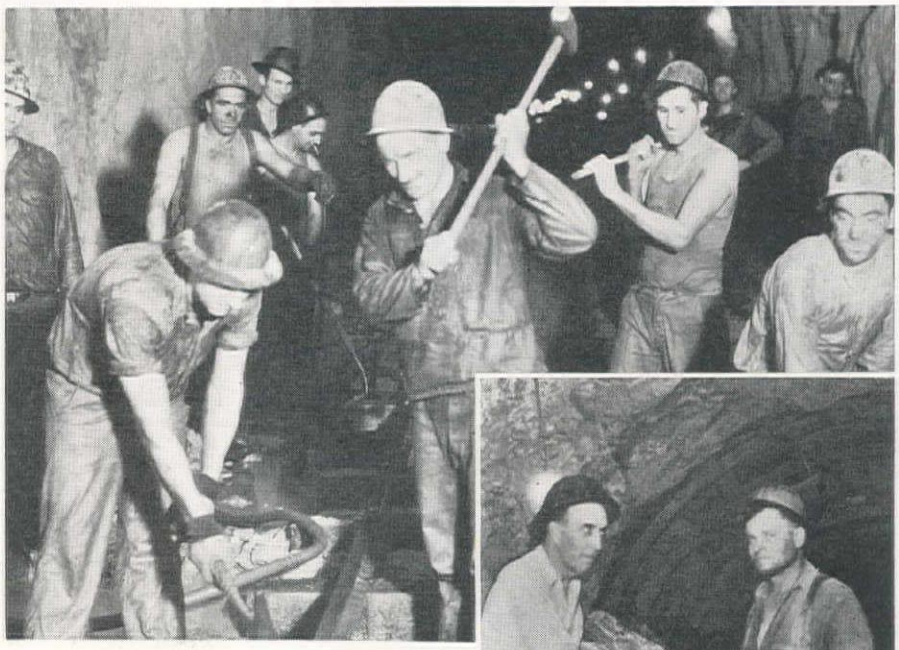
A pipe line will extend from the reservoir to the filter plant and from the filter plant to Ashland Avenue distributing reservoir. The size of these pipe lines have not been definitely determined as the surveys at the present writing have not been completed.

Status of work

Plans and specifications for the work on the Moffat Water Tunnel project have been completed and the contracts let with the exception of the Vasquez-St. Louis collection conduit. The work under contract is progressing rapidly and one of the contracts is nearing completion. The plans for the Vasquez-St. Louis conduit are being prepared and the 2,200-ft. tunnel on this division of the work will soon be advertised for bids.

Plans for the work on the Moffat Tunnel extension project are well under way and one contract has been let. Two additional contracts will soon be advertised for bids. One contract will be for a siphon approximately 4,000 ft. long and the other will be for canal structures. Plans for the reservoir dam are progressing rapidly and this contract will be advertised in November.

The work on both projects is under the direct supervision and direction of Herbert S. Crocker, consulting engineer, A. A. Matthews is supervising engineer, and the writer is designing engineer. O. M. Strange is field engineer on the Moffat Tunnel project and H. R. Oliver is field engineer on the extension project.



Last Spike for Tunnel

On October 30, when crews of the Utah Construction Co. and Winston Bros. Co. joined in this "last spike" driving ceremony at the uniting of the rails between two headings of the Iron Mountain tunnel on the Colorado River Aqueduct, it marked the completion of a 29,915-ft. section of tunnel work. This tunnel is on the eastern end of the project being built by the Metropolitan Water District of Southern California.

The $1,699,705 contract of the Utah Construction Co. covers 16,172 ft. of tunnel driven from the west portal of the 39,805-ft. bore; driving was completed on Aug. 12. In the period between June 16 and July 15, this heading was advanced at the rate of 9.2 ft. per shift. Lining operations have not yet started.

On the eastern end of this tunnel a $2,143,799 contract of Winston Bros. Co. covers a section of 13,800 ft. to connect with the Utah contract, and 9,800 ft. to the eastern portal. All of the driving has been carried on from a shaft. On October 31 there remained 1,020 ft. to be driven to the eastern portal.

Driving has been directed by E. A. Bernard (left), superintendent for Winston Bros. Co., and Ben Arp, superintendent for the Utah Construction Co. John Stearns is division engineer for this section of the aqueduct. F. E. Weymouth is general manager and chief engineer of the Metropolitan Water District.

Tabulation of Large Size Reservoirs In the World

By ROBERT A. SUTHERLAND
Designing Engineer, associated with Lars Jorgensen, Consulting Engineer

EVERYONE knows that the Boulder Dam is the highest in the world and creates the largest man-made storage. However, it is not generally realized how greatly the reservoir behind this great dam exceeds all previous storages. Thousands of Californians have made the trip to New York via Panama, and have been duly impressed by steaming for several hours across the man-made Gatun Lake, and yet this enormous body of water would suffice to fill the Boulder reservoir to only 1/7th of its capacity.

The accompanying table shows the relative size of some of the most notable storages so far created, or shortly to be completed. As stated, this list is not complete since many large storages are created by comparatively low dams, almost always by the raising of the level of existing or ancient lakes. Such storages can therefore be considered chiefly the work of nature.

Some very considerable storages were actually created long before the modern era, although exact particulars are fragmentary. For example, the Mudduk Dam in India (not now in use) is stated to have been built about the year 1500 and to have stored 855,000 ac. ft. of water. In the light of our present knowledge, the impounding of such a body of water would not be justified by the relatively crude means then used for the purpose and for the control of the water when impounded. It may therefore be said that the creation of very large artificial storages under secure control is quite a recent development, starting with the Assuan Dam in Egypt, completed in 1902 with a storage of about 792,000 ac. ft. This dam has since been twice raised. Not very long after the completion of the Assuan Dam, the lead in importance of storages passed, with the construction of the Pathfinder, Elephant Butte and Gatun dams, to the western hemisphere, where it has ever since remained. Of the twenty-seven storages given in the table, at least nineteen, or over two-thirds have been created either in America or under the supervision of American engineers and six under the supervision of British engineers. The list of reservoirs follows:

Some Large Water Storages

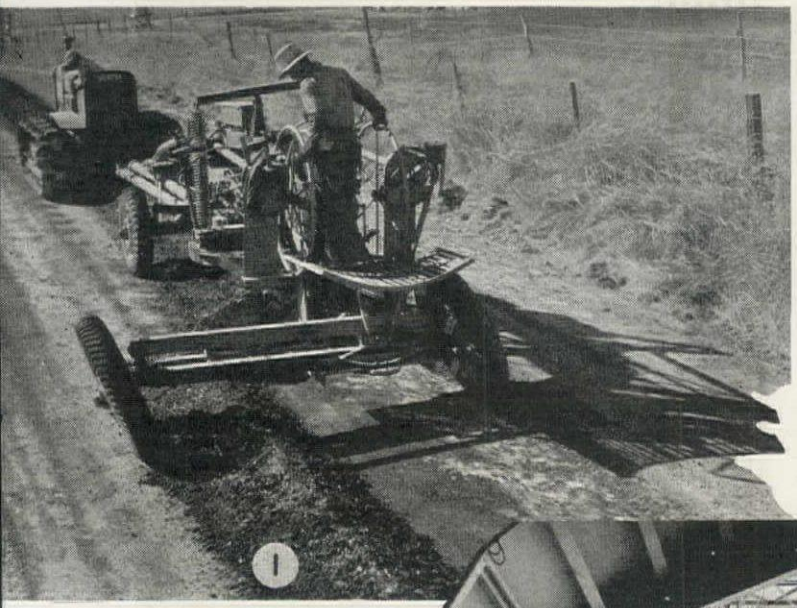
NAME	LOCATION	STORAGE (Acre Feet)
Boulder	U. S. A.	30,500,000
Fort Peck	U. S. A.	19,500,000
Grand Coulee	U. S. A.	9,610,000*
Gatun	Panama	4,413,000
Assuan	Egypt	4,040,000
Norris	U. S. A.	3,600,000
Kennet	U. S. A.	2,940,000†
Elephant Butte	U. S. A.	2,637,000
Saluda	U. S. A.	2,300,000
Mettur	India	2,140,000
Roosevelt	U. S. A.	1,637,000
Martin	U. S. A.	1,620,000
Coolidge	U. S. A.	1,300,000
Don Martin	Mexico	1,124,000
Owyhee	U. S. A.	1,120,000
Hume	Australia	1,098,000
Pathfinder	U. S. A.	1,070,000
Hamilton	U. S. A.	1,000,000
Ricobayo	Spain	960,000
Seminoe	U. S. A.	910,000
Dnieprostroy	Russia	900,000
Conklingsville	U. S. A.	868,000
Cobble Mountain	U. S. A.	812,000
Barrenjuick	Australia	772,000
Lloyd	India	551,000
Sennar	Sudan	517,000
Madden	Panama	506,000

* Final storage; base section only of dam being built now.

† Proposed in California.

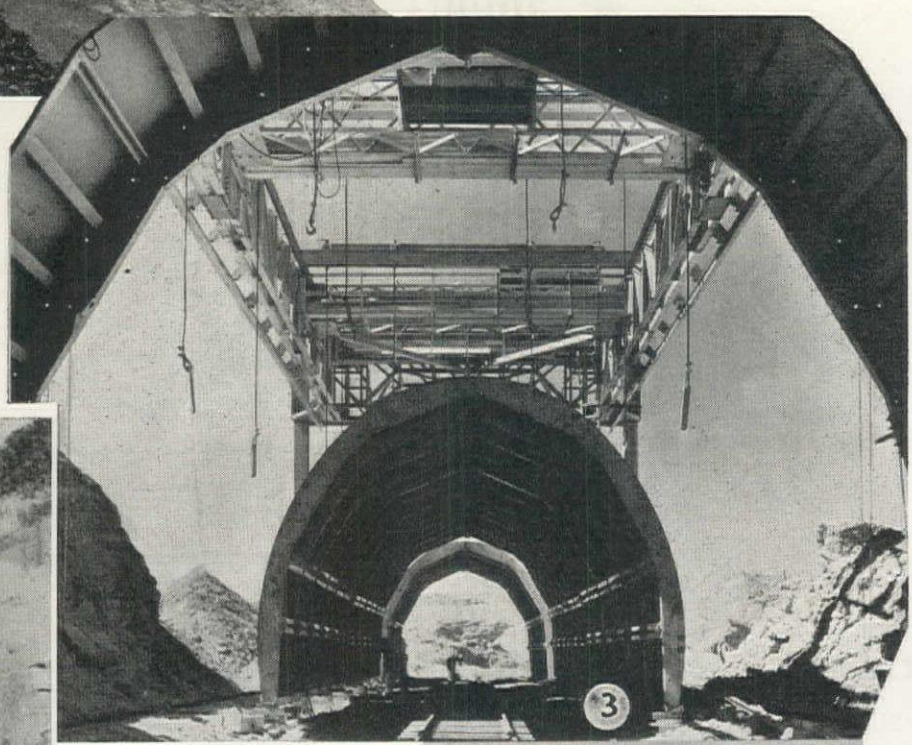
Note: This list includes only dams over 100 ft. high, and makes no claim to completeness, since many dams of less height store large amounts of water, e. g., the Great Lake Dam in Tasmania, although only 40 ft. high, stores 1,180,000 acre feet of water.

On the Western Construction Front

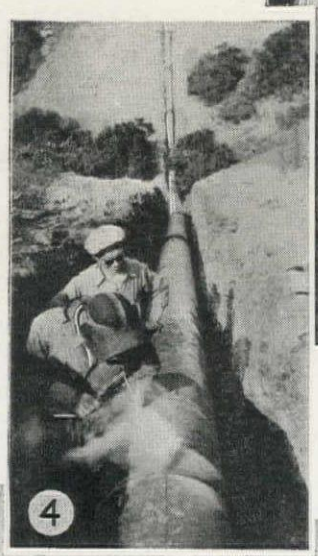


1—Turning over oilmix material on a California highway, San Luis Obispo County uses this Adams Leaning Wheel grader, Model 104, pulled by a McCormick-Deering T-40 TracTracTor.

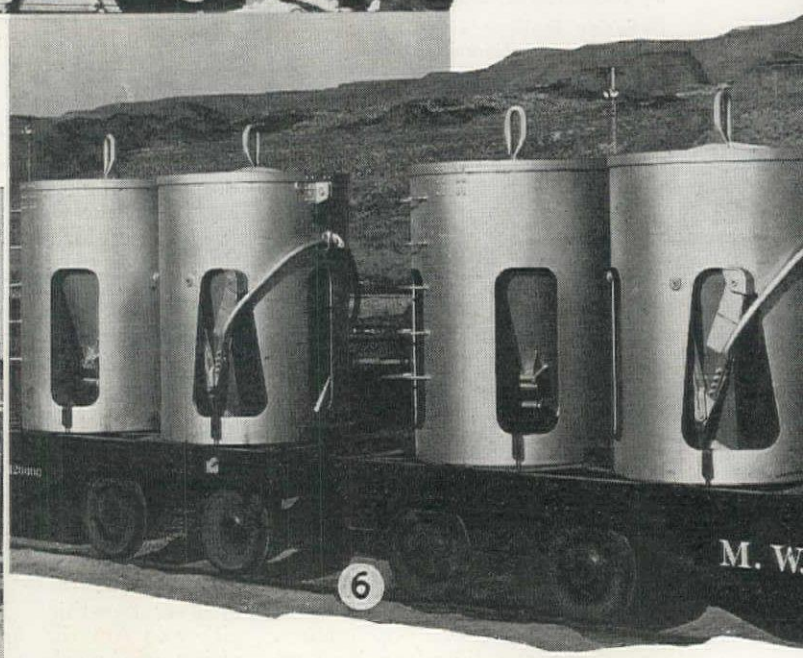
2—Preparing foundation rock for the start of concreting on Grand Coulee Dam is a job for many men and jackhammers. Concrete placing is scheduled to begin this month.



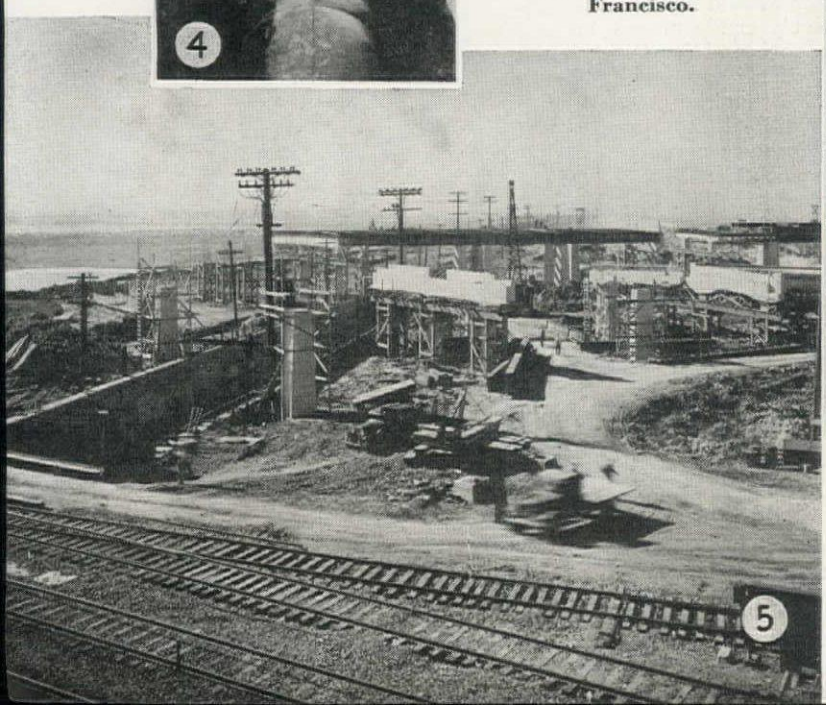
3—Steel forms and handling gantry for conduit work on Schedule No. 1 of the Colorado Aqueduct project — contract of the Aqueduct Construction Co.



4—H. C. Price, Inc., used Lincoln shielded arc welding equipment on this 45-mi. natural gas line to San Francisco.



6—Part of the shipment of forty Blaw-Knox 4-yd. roller gate concrete buckets to be used by the M. W. A. K. at the Grand Coulee Dam.



5—Barrett & Hilp are making rapid progress on the complicated, interlacing distribution structure which will handle vehicular traffic at the eastern end of the San Francisco-Oakland Bay Bridge.

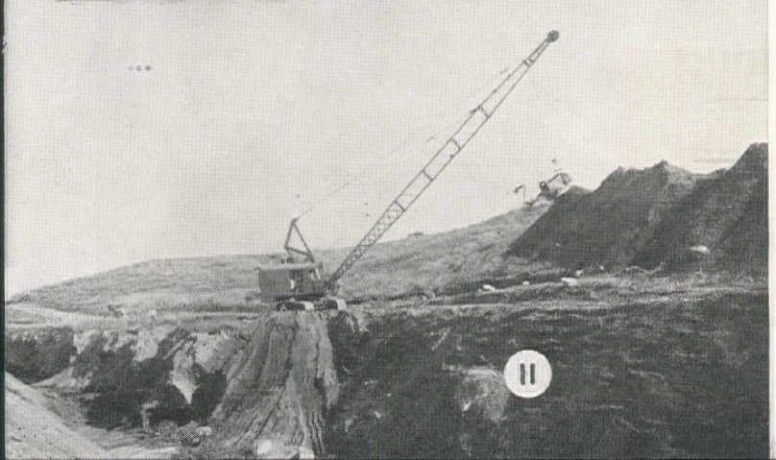
7—Early snows hit the job of the Utah Construction Co. on the Red Lodge dam project in Montana. The Caterpillar drawn LeTourneau scrapers are hauling as far as 1,600 ft. from the north borrow pit.

8—J. E. Haddock & Sons are using a 12-yd. Austin-Western carryall scraper on a highway contract in the Laguna Mountains, San Diego County, Calif.

9—Seminoe dam site on the North Platte River in Wyoming, where a 260-ft. concrete dam will be built by the Bureau of Reclamation as the major structure on the Casper-Alcova project. White lines on the left abutment indicate the line of the dam.

10—Excavating work is still going on along the Colorado Aqueduct. This 801 Koehring dragline with 2½-yd. Esco bucket is located on the Jahn & Bressi Contract, near Rice.

11—Cajalco dam work is opening up and the Griffith Co., contractor, is digging a canal from the Val Verde tunnel to the Cajalco reservoir with a Northwest Model 80, using an 80-ft. boom and a 2-yd. bucket.



12—Morrison-Knudsen Co. are in solid rock work on their contract with the Bureau of Public Roads for the Big Meadows route in Yosemite National Park, and are using a Northwest Model 80.

County Flood Control Plan of Aided by U. S. Engineers With

Allotment of $14,000,000 used for construction of revetment works, concrete flood channels and debris basins—Work advanced rapidly and already employing 3,250—Projects do not provide for conservation of water—Corps of Engineers directing operations

WITH a federal appropriation of $14,000,000, the U. S. Engineers are carrying out large scale construction operations on the established program of the Los Angeles County Flood Control District. The work includes channel improvements, river revetment and the building of debris basins, and is designed to provide flood protection and does not include features of water conservation. This work is exclusive of the renewed operations on San Gabriel No. 1 dam, reviewed in the last issue of *Western Construction News*, which is being carried forward by the district. The program being carried out by the U. S. Engineers is in the nature of an emergency unemployment relief operation, and the work is scheduled to be completed by Nov. 1, 1936.

In the interest of forwarding the flood protection program in the Los Angeles metropolitan area at a more rapid rate than was possible through regular financing, the County Flood Control District applied for federal funds covering a comprehensive program, following the outline of the general plan. An appropriation of $14,000,000 was made for this work, with the provision that it should be expended on the flood control project of the district under the direct supervision of the Corps of Engineers. Further, these funds were to be used only for active construction work and the district is required to furnish rights-of-way and other items which will total about $3,000,000.

The organizing of this work was started immediately under the direction of Major Theodore Wyman, Jr., Corps of Engineers, district engineer, and has been accelerated at a rapid rate with construction work opening up at fast as possible. Employment has increased to 224 in the engineering division, and the field force totals more than 3,200. The last tabulation of employment in this project follows:

Employment Record at End of November

	Civil Service	Outside Civil Service	Relief	Total
Administrative..	55	23	60	138
Operations	26	18	57	101
Engineers	70	110	44	224
Supply Depot....	3	1	18	22
1st Field Area..	45	57	1,519	1,621
2nd Field Area..	10	30	823	863
3rd Field Area..	7	6	223	236
4th Field Area..	28	7	6	41
Total.....	244	252	2,750*	3,246

* Net gain 447 over previous week.

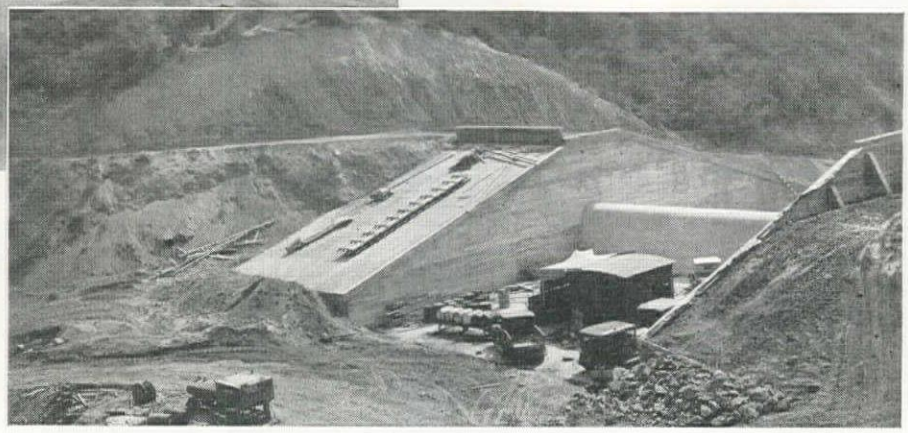
Types of work

The work may be divided into three general classifications, including: (1) channels for flood control and drainage; (2) riprap levee construction; and (3) debris basins. The work has been divided into a number of small projects scattered over the entire area.

On the lower Los Angeles River, riprap levies of quarry rock are being built along both banks for a total distance of about 19,000 feet. This work is similar to operations already carried out by the district and will complete the channel improvement program for the river.

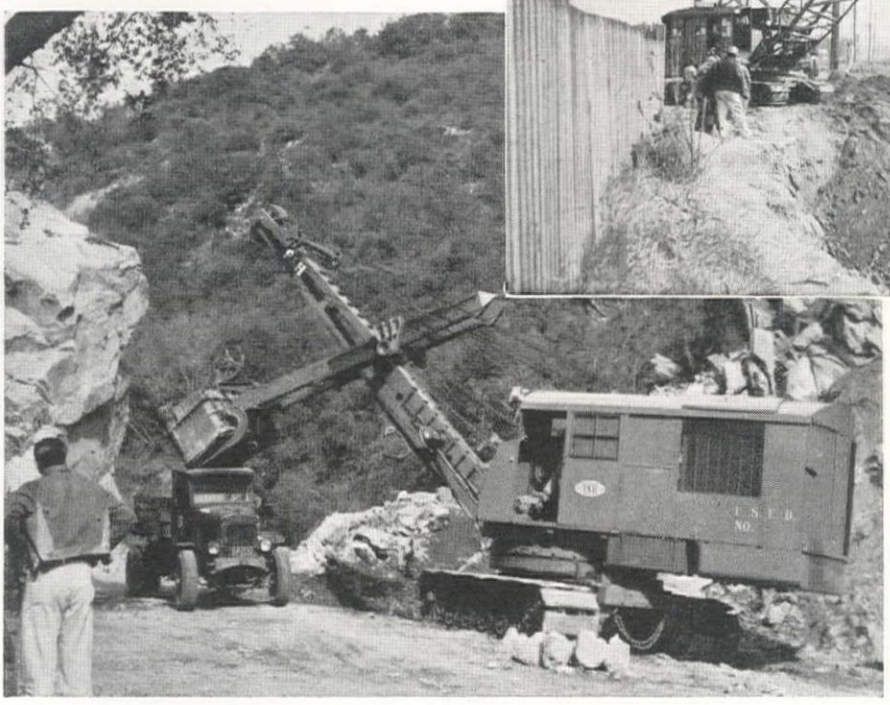
The majority of the individual projects consist of constructing reinforced concrete channels to complete gaps in the program carried forward by the district. These channels involve no particularly unique type of construction and may be described as rectangular concrete conduits to confine flood water and straighten out flood channels, with resulting reduction in flood danger and destruction of property. The small size channels are usually about 10 ft. wide and 5 ft. high with a 6-in. reinforced concrete floor and walls having a minimum thickness of 7 in. A typical large sized channel might be 60 ft. wide with walls 12 ft. high. In this size channel the floor slab is usually 10 to 12 in. thick, and

Inlet structure of a debris basin previously completed by the flood control district, which illustrates the type of approach work and detention space to be used in the new units.



Outlet structure of previously completed unit, indicating the type of work to be done for the additional basins.

Los Angeles Federal Funds



Present excavation work (above) on one of the flood channel units with 2-yd. P. & H. dragline.

In the Santa Inez quarry (left) where rock is obtained for the river revetment work, with 2-yd. P. & H. shovel loading trucks.

Organization

The organization for this extensive program is under the general supervision of Major Wyman, district engineer, with Capt. F. B. Butler, executive officer in charge of the administrative division. Capt. Louis J. Claterbos, is chief of the operations division, with Capt. George K. Withers, assistant chief. Capt. R. E. Cruse, is chief of the engineering division, with Capt. Maurice W. Gilland, assistant in charge of rivers and harbors, and Guy B. Bebout, assistant chief.

The field operations have been divided into four field areas with the following area engineers in charge: Harry Hodgman, Thomas H. Holmes, Roy G. McGlone, and H. W. McOuat.

C. H. Howell is chief engineer of the Los Angeles County Flood Control District.

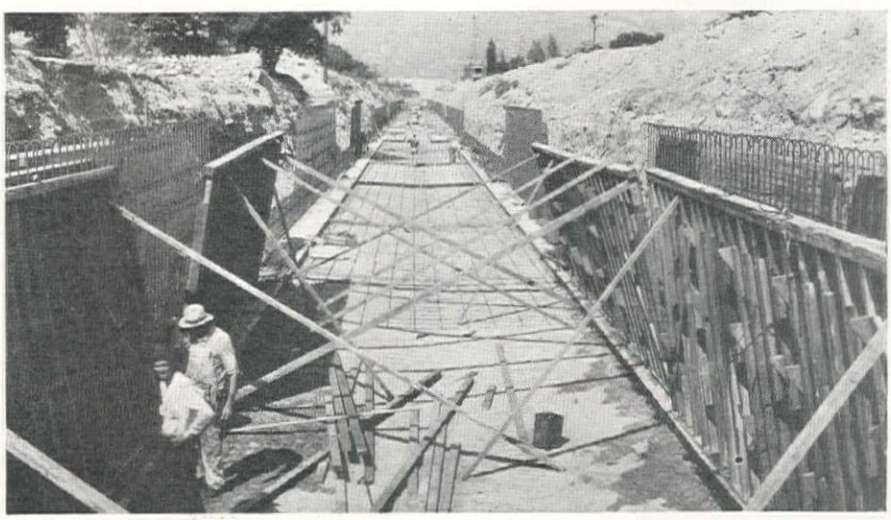
the walls vary from a 7-in. minimum at the top to a 12-in. thickness at the bottom.

Excavation is usually required for these channels and this is usually done by draglines, followed by the construction of forms and concreting operations. For the most part, these drainage channels are uncovered except at street intersections and in areas of dense population.

The construction of the debris basins, following the practice of the district, is perhaps the most characteristic feature of this construction program. These debris basins are designed to retain the heavy material carried by flash floods down the steep slopes in the mountainous area between Tujunga River on the north, and the Arroyo Seco on the south, north of Glendale. The steep slopes above this residential area results in flows of debris and material washed from the hillsides during periods of storm; the outstanding instance was the January storm in 1934, when mud and debris was carried into the La Crescenta area.

These basins are not designed to hold back flood waters or to provide conservation, but, as the name implies, are merely to effect temporary detention for the debris laden flood, so that it will deposit the major load of material. Briefly, each basin consists of an inlet structure, an excavated area forming the basin, and a concrete overflow outlet structure. In operation, the plan is to permit these basins to operate without control and to restore their debris retaining capacity by clearing them out when they have become sufficiently filled to seriously reduce their effectiveness. The accompanying picture shows a debris basin previously constructed by the district and is typical of the several basins which will be built under the present program.

Typical reinforced concrete channel, indicating the type of work which will be done on many of the individual projects of the present program.



Oregon Highways Planned For Service With Safety

State system of 6,800 mi. designed to care for traffic volume and character, speeds of the future and access to recreational areas

MAJOR objectives of the Oregon State Highway Commission for the state system comprising 6,800 mi. were listed as: (1) the building of an adequate system of highways, (2) effective maintenance at minimum expense, (3) reduction in the cost of transportation of passengers and commodities, and (4) elimination of hazards in the operation of motor vehicles, in a paper by R. H. Baldock, state highway engineer, presented before the Portland Section of the Am. Soc. C. E. The main features of the paper are contained in this abstract.

The road system of Oregon comprises about 47,800 mi. of which 41,000 mi. are county roads and 6,800 mi. are state highways. The state highway system consists of 4,800 mi. of primary highways, of which 4,200 mi. are surfaced and 2,000 mi. of secondary highways, of which 1,500 mi. are surfaced. The majority of the main highway routes were adopted by the legislative act of 1917. Subsequent additions have been made, from time to time, by the state highway commission.

One of the major problems in road building is the avoidance of obsolescence due to the rapid improvements and innovations in motor transport. To overcome this danger, the Oregon state highway department is now employing the most modern standards used in road locations and construction in the United States. The roads are built so straight that there should be no necessity for changing location. Such construction permits moderately high speeds with safety. To obviate, if possible, obsolescence in highway construction, the heavy traffic arterial highways of Oregon are designed for safe speeds ranging from 50 to 75 miles per hour in which the critical or overturning speed exceeds the safe speed by about 50 per cent.

Due regard is given to the landscaping of highways and to the preservation of the natural beauty of the roadsides. On the more scenic roads, a landscape architect works in the field with the locating engineer and artist's sketches are prepared to show how the proposed improvement will appear after construction.

During the past six years we have cut the per mile maintenance cost of our primary highways in half. This means a saving to the motorists of this state, based on our present mileage, of $1,750,000 per year, brought about through better construction procedure such as the introduction of oil-treated macadam which stopped the wear on untreated rock and gravel surfaces and the adoption of thick foundations of cheap materials which have made it possible to carry heavy commercial traffic on our highways at moderate first cost and low maintenance expense.

The elimination of hazards to motor vehicle operation is not susceptible to any exact cost analysis, since human life cannot be evaluated. However, the destruction of property by reason of countless motor vehicle accidents occurring daily is appalling. We endeavor to build maintenance into our highways; in other words, construct them so the maintenance costs will be low. Likewise, we endeavor to build safety into our highways by constructing them in such manner that, with ordinary care, motor vehicle operation is safe.

A résumé of the methods used in making highways safer follows:

1. Nonskidding of slippery pavements;
2. Elimination of all possible curvature and gradients;
3. Use of spiral or transition curves, which decreases the effect of centrifugal force;
4. Use of superelevated or banked curves;
5. Placing of guard fence and sight posts;
6. Use of proper signs and signals to warn the motorist of approaching conditions;
7. Painting of traffic stripe down the center of the highway;
8. Widening of grades and pavements;
9. Increase of horizontal and vertical sight distance;
10. Patching of rough pavements;
11. Use of crossing bells and flashing lights;
12. Elimination of railway grade crossings.

Nine million four hundred thousand dollars have been allocated for construction work which we hope to complete within the next fifteen months. We further expect to allocate an additional $3,600,000 on or about the first of the year. Moreover, there will be expended on the Coast Highway bridge construction program next summer some $2,000,000, making a grand total of work under construction next year of approximately $15,000,000. This will be the maximum expenditure of any year during the history of the commission, with the exception of 1921, at which time a total of approximately $17,000,000 was expended, of which $13,000,000 were revenues derived from bond sales.

The separate sources of the $15,000,000 which we expect to expend during the next fifteen months are as follows: The $2,000,000 Coast Highway bridge moneys represent 30 per cent federal grant and 70 per cent federal loan under the PWA; the regular federal aid funds totaling $7,600,000 covering a two years' allocation represent $3,600,000 of state funds and $4,000,000 of government funds. These are known as regular federal aid funds and are matched by the state in the proportion of 62 per cent federal funds and 38 per cent state funds. Such funds have been available to the states almost every year since 1917.

In addition to this, there are the work relief funds available this year amounting to approximately $5,400,000. Of this amount $2,300,000 is available for the elimination of railway crossings at grade either by relocation or by grade separation structures. Forty per cent of the expenditures for the elimination of railway grade crossings must go into direct labor on the job. Likewise, $3,100,000 has been appropriated for highway construction projects.

Recently the highway commission appropriated funds for determining the essential elements in highway planning in coöperation with the U. S. Bureau of Public Roads. This involves a traffic survey to reveal in detail the character, volume, origin, destination, fluctuation and purpose of all traffic, including the following elements:

1. Average daily density of passenger car, truck and bus traffic;
2. Maximum daily density of passenger car, bus and truck traffic;
3. Maximum daily and seasonal fluctuation of passenger car, truck and bus traffic;
4. Classification of truck and bus traffic by rated capacity of vehicles.
5. Wheel loads, gross load and dimension of trucks and buses related to rated capacity classification;
6. Origin and location of traffic by locality;
7. Classification of traffic by type of origin and destination;
8. Character, volume, origin and destination of all commodities moved over the highways.

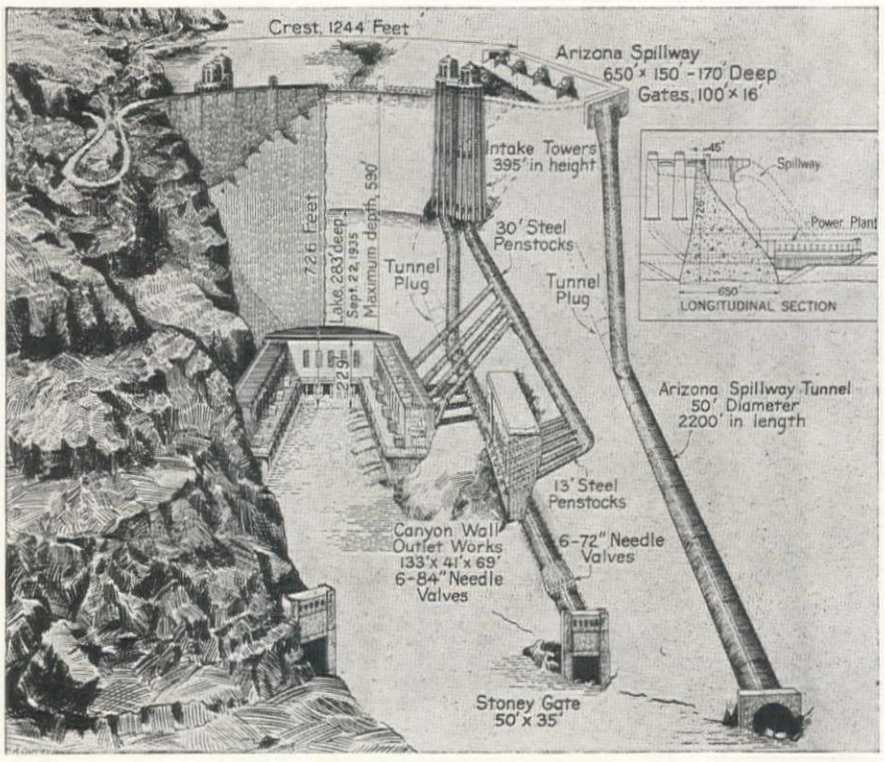
The highway commission will also conduct investigations leading to a determination of factual data on the amount of highway taxation required and its relation to existing tax policies. Their object is to further classify roads and determine those types which should be built and maintained by motor vehicle tax and those types which should be financed by property tax. The first class consists of general use roads, such as the primary and secondary state highways, important county roads and the arterial streets of cities. The second class includes the land service roads and the residential and minor traffic streets of cities and towns.

The objectives hoped to be reached by such a survey will be:

1. The selection of an integrated highway system, including all roads to be improved during the next twenty years, with an indication of priority of improvement;
2. The determination of the relation of the present status of the roads of the system with relation to the traffic carried and the need of further improvement to render satisfactory service;
3. The determination of the equitable sources of revenue in proper relation to the benefits derived.

The Oregon highway commission has recently installed a new department—that of advertising and tourist promotion. Oregon stands in the forefront of the states in wealth of scenic beauty. The lure of the Oregon country attracts an increasing number of tourists each year. The massive cordillera known as the Cascade Mountain Range is a veritable summer playground.

The Oregon state highway commission has a great responsibility. It must provide a safe and economical roadbed for the motor vehicular transportation of passengers and commodities, through the equitable and judicious expenditure of the motor vehicular revenues. It is likewise charged with the proper advertisement of the state's scenic resources in order to attract tourists. These activities have a decided influence upon the commercial and the social life of all the people.



Penstock System at Boulder Dam

The Boulder Canyon project is illustrated by means of a diagram indicating the diversion and penstock works, which will handle the flow of water out of the 30,000,000-ac. ft. reservoir. This drawing was prepared by the Bureau of Reclamation, and shows the Arizona Canyon wall cut away to disclose the penstock pipe system, outlet works and the spillway. A duplicate system of conduits is located in the Nevada side of the canyon. The principal dimensions of the dam and the penstocks are indicated as well as the reservoir water depths.

Shaft Completed on Mono Craters Tunnel Adds Two Headings on 11-mi. Bore

WITH the completion of the 299-ft. shaft No. 2, two new headings are in use in driving the Mono Craters tunnel on the Mono Basin project of the Los Angeles Water Department. Before this shaft was completed, the 11-mi. tunnel was being driven from the two portals and the addition of the two headings from the shaft should practically double the rate of progress. The shaft was started last February and since that time has been sunk at an average rate of 2.75 ft. per day for three shift operations. With a depth of 299 ft. to tunnel grade the shaft extends to a depth of 362 ft. to the bottom of a 63-ft. rock pocket. Water was encountered in the bottom of the shaft with a maximum flow of 178 g. per min. The shaft is 20 ft. x 7 ft. in section with four compartments including two skip ways 5 ft. sq., a man way, and a 4 x 5-ft. pipe way.

Shaft No. 1 on the same project has been sunk to a depth of 650 ft. (Oct. 15) and will be 900 ft. deep at tunnel grade. The second shaft will open up two more headings on the tunnel.

On Oct. 15 the footage driven from the two portal headings total 14,172 ft. and about 200 ft. had been driven from the two headings from shaft No. 1.

The sinking of shaft No. 2 was done under the direction of Ed Cahill, foreman and he has now been transferred to take charge of completing shaft No. 1. E. V. Hendrix is foreman at shaft 2, D. L. Reaburn is foreman at the east portal and Cecil Lewis at west portal. The entire tunnel project is being carried out under the direction of Hugh Mulholland. H. A. Van Norman is chief engineer and general engineer of the water bureau.

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A. G. C. National Meeting

The seventeenth annual convention of the Associated General Contractors of America will be held January 13-15 in Miami, Fla., and is believed to open a construction season in which there will be a revival of major proportions in the construction industry, including a steadily rising trend in private construction. According to Edward J. Harding, managing director of the A. G. C., "Every recent statistical study makes it quite apparent that the volume trend in the field of private construction has definitely headed upward, that it may be expected to continue upward, and that the trend will be accelerated."

For the first time in more than four years, therefore, it is anticipated that the convention's major interest will be turned to the encouraging and acceleration of private construction rather than to the field of public works which has been the principal source of business for the construction industry during the depression.

New nominees scheduled to head the A. G. C. for the ensuing year are Wm. A. Klinger, president of Wm. A. Klinger Corp., prominent midwestern building contracting firm of Sioux City, Iowa, nominated for the office of president and Edward P. Palmer, secretary-treasurer of Senior & Palmer, engineering contractors of New York City, nominated for vice-president-at-large.

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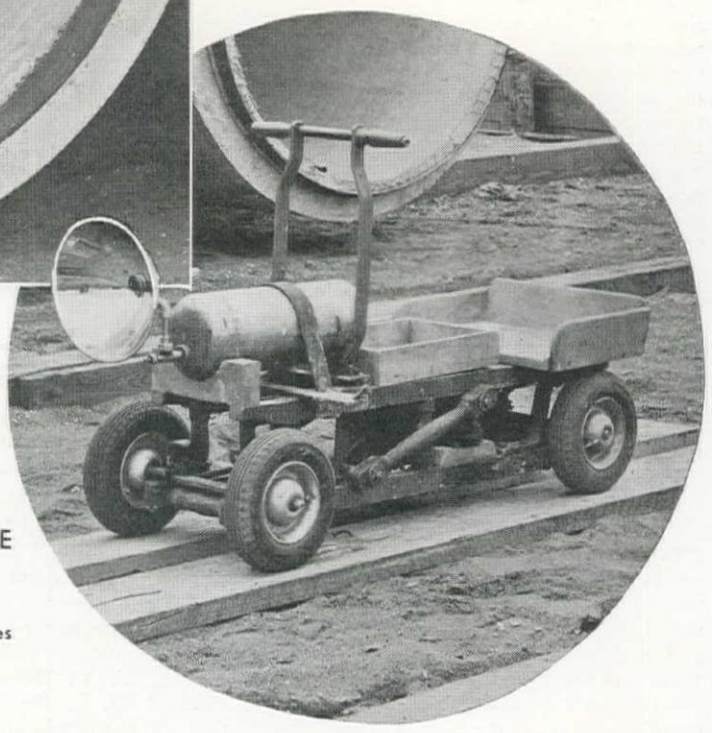
Start Denver Sewage Plant

Preliminary work on Denver's new sewage disposal plant has been started. Crews began clearing the site for the plant which will be located near the eastern city limits. The Monarch Engineering Co., with a low bid of $11,900, was awarded the contract for the clearing operations, which will take about 60 days.



Inspection Cars For Pipe Lines

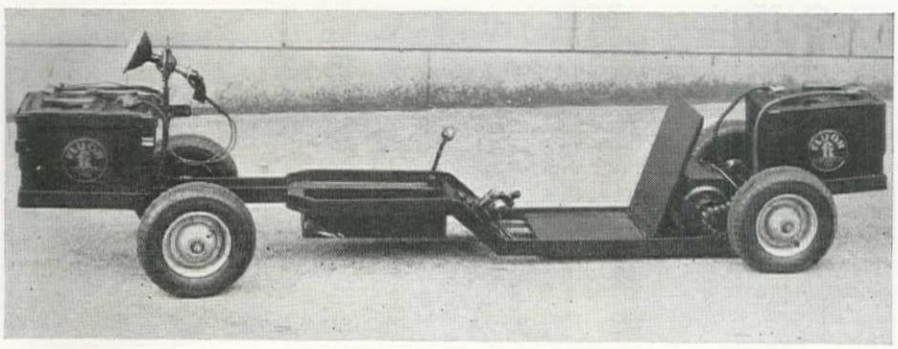
By J. G. EERNISSE
Electro-Mechanical Engineer
Dept. of Public Utilities
Tacoma, Washington

TO INCREASE the efficiency of field inspection work in connection with the present extensive program of pipe line construction being carried on by the water division of the City of Tacoma, two specially constructed cars were furnished the inspectors. One is hand-propelled, the other is motor-driven and both have balloon tires. The hand-propelled car was developed especially for use in the 6½ mi. of 54-in. diameter Lock Joint steel cylinder concrete pipe, while the electrically propelled car was developed for use in the 2 mi. of coal-tar enamel-coated 42-in. diameter steel pipe.

The hand-propelled car was constructed by rebuilding a railway velocipede. The frame was shortened and the bearings for the four wheels, carrying 2.75 x 10 pneumatic tires, were underslung to bring the seat as low as possible. Between the propelling handles is mounted a Presto tank for lights, either stationary or portable. The seat and tool box are easily removable. The car is short enough to be turned around inside the pipe, and it can be dismantled and passed through a 17 x 19-in. manhole in the side of the pipe by pulling four small pins and removing four wing nuts. To keep the car from climbing the side of the pipe, it is steered with the feet. For pushing the car along the pipe, the wheels are kept in line with springs.

One of the accompanying pictures shows a man on the car inside of a 54-in. diameter concrete pipe, indicating that there is plenty of head room to use the car in much smaller pipe. It was found that the car with the original gears and two-wheel drive was geared a little too high for grades exceeding 5%, but the inspector liked the car so well that he would not part with it long enough during progress of the work to permit the change. The change will be made, however, before the next job, when steeper grades will have to be negotiated. Single-wheel or differential drive instead of the solid connection between the two rear wheels would probably also help to make the car run more easily.

The 42-in. diameter pipe is coated with coal-tar enamel and the field joints are inspected for sufficient coverage by a high voltage impressed upon the coating by means of a wire brush. This method of inspection and the small diameter of pipe presented an additional and interesting problem for



Storage-battery operated car provides inspector with current for electric tests of coating material.

the inspector, who was expected to cover the welding, cleaning, priming and coating of the field joints.

With the possibility of having the welding and the final coating crews widely separated, and the necessity of carrying a storage battery in connection with the testing, the advantages of an electrically propelled car was considered very desirable, since it would provide rapid and convenient transportation. The car also has the advantage of making the testing equipment available to the inspector at all times.

The motor-driven car was designed with a seat clearing the floor by only 3 in. The wheels have ball bearings and 2.75 x 10 pneumatic tires. It has a single-wheel drive and a reversible Sims-Hoff compound wound automobile generator-starter motor, which was considered one of the most efficient units available for this purpose. Six volts or twelve volts are available for driving the car by throwing a series-parallel switch mounted within easy reach of the operator. Reversing, variable speed and braking effect is obtained by the movement of a single lever which rotates the brushes on the motor. An automobile starter switch is placed in series with the motor circuit so that it must be held in closed position while the car is in motion, thereby preventing the possibility of having the car run away by mistake.

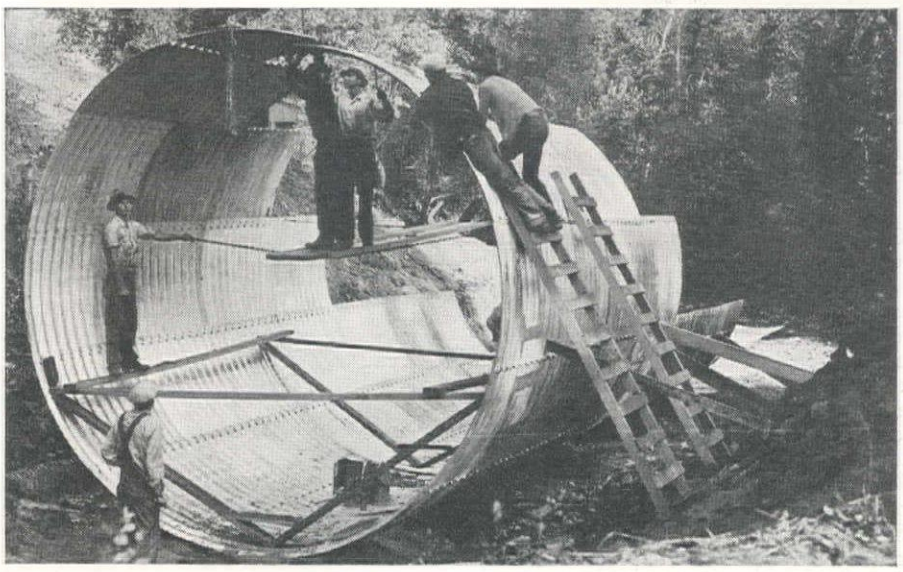
Two heavy-duty 160 A. H. 17-plate 6-volt Fluor storage batteries are used for power. It is estimated that they will operate the car for a period of 14 hr. continuously at speeds varying from 2 to 15 m.p.h. The car is steered with the feet similarly to the hand-propelled car. Trouble is being experienced in backing the car, and a handle with micrometer adjustment will be attached to the front wheels for steering in reverse direction. A very convenient light is provided, as shown in the accompanying picture. The batteries can be charged in place or easily removed for charging by means of the special type of connectors used.

This car cannot be turned inside the 42-in. pipe without removing one of the batteries and one set of wheels, which permits pushing one end of the car through a manhole in the side of the pipe to turn it. The batteries are set on hinged frames which fold over the body of the car. When the rear battery carrier is folded up, the rear wheels drop off, permitting the drive chain to be slipped off the motor sprocket. The front wheels come off by removing the pin held in place with a cotter key. Disconnecting the batteries is the largest job in connection with dismantling the car for removal from the pipe through a manhole. The whole operation of dismantling takes about five minutes.

The Model T Ford vibrator type of spark coil is mounted in the tool box and furnishes the required high voltage used in testing the coating. This coil is equipped with a spring switch, which must be held down to operate the coil. Variable voltage for the coil is obtained by means of a spring clamp attached at any desirable point on the storage battery. The spark coil and connections are not shown in the picture.

Thus far only one case of tire trouble has developed, caused by a projecting reinforcing wire in the end of a concrete pipe.

These cars were designed by the writer and manufactured under his supervision by the Pacific Iron and Steel Works and the Pacific Electric Machinery Co., respectively, of Tacoma. They are being used in connection with the $2,000,000 pipe line construction program described in the November issue of *Western Construction News*, by W. A. Kunigk, superintendent and chief engineer of the Tacoma Water Division. The Water Division, the Light Division and the Municipal Belt Line, constitute the Department of Public Utilities of Tacoma, which is under the general supervision of Commissioner Ira S. Davisson.



Record Size Culvert on Santa Clara Valley Project

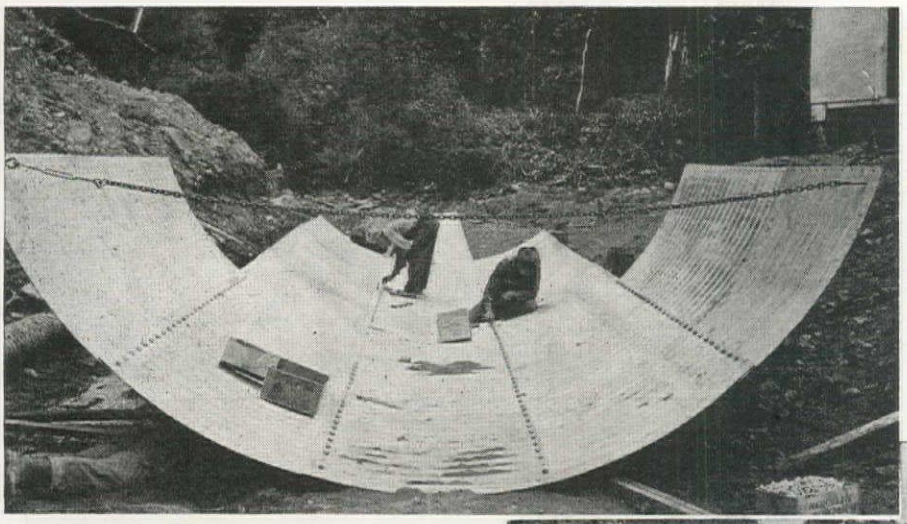
Fifteen-foot diameter unit 85 ft. long erected in eight 6-hr. shifts by crew of six

By HAROLD I. WOOD
Supervising Engineer
For Fred H. Tibbetts, Consulting Engineer

A RECORD SIZE culvert 15 ft. in diameter was recently installed to provide a waterway under a highway fill across the upper end of the reservoir formed by the Stevens Creek dam, constructed as part of the development program of the Santa Clara Valley Water Conservation District, in Santa Clara County, Calif. The 85-ft. length of culvert, with individual sections weighing more than 500 lb. was erected in eight 6-hr. shifts by a crew of six men. From available records, this is the largest full circle Multi Plate corrugated culvert ever constructed.

The reservoir which will be formed by the dam now under construction on Stevens Creek, about 15 mi. west of San Jose, requires a waterway of large diameter on the creek near the upper end of the overflowed area. Water depth will be as much as 10 ft. at the point where the creek is crossed by the roadway which will give access to two sides of the newly-formed lake. A full-circle Armco Multi Plate culvert, 15 ft. in diameter and 85 ft. long, was decided upon as the bridge construction at this point. This type of structure was approved by Robert B. Chandler, county surveyor of Santa Clara County. The metal is No. 1 gage (9/32 in.) in thickness, and has the usual corrugations.

For stream diversion during construction, 12-in. corrugated pipe was laid along one side, and after the boulders had been removed from the creek bed, a mat of gravel was placed to form a proper foundation. All the plates forming the invert or bottom course were laid and bolted, followed by the assembly of the side and top plates. The circle was completed at the inlet end and progressively extended before many of the side plates were put in position, to facilitate assembly. A chain with turnbuckle and eye-bolts was used to support the structure during the building up of the side plates and to aid in matching the bolt holes. A Northwest derrick was used to handle the



After laying the invert course the side plates were started, using a chain and turnbuckle for temporary support.

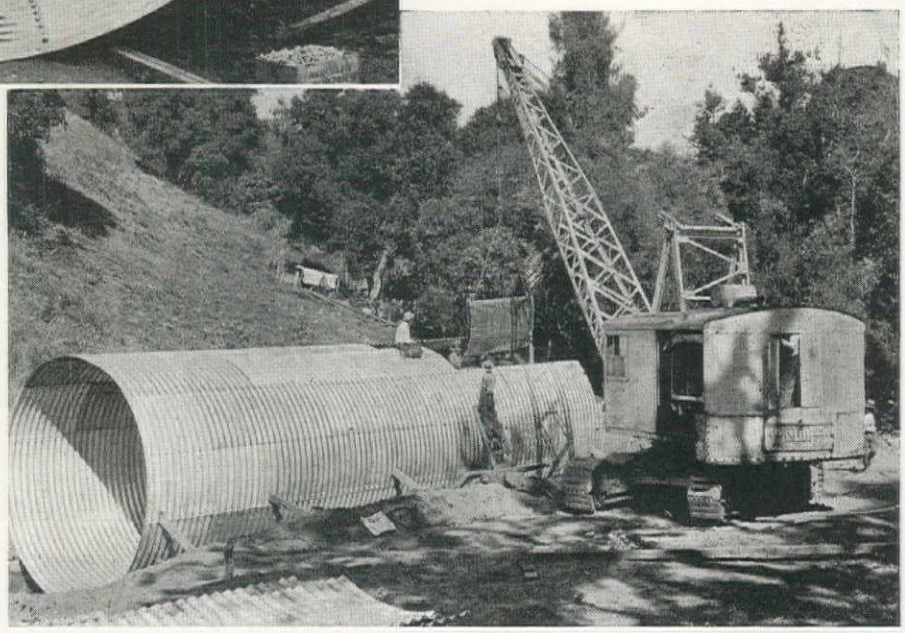
10-ft. sections of plates which weighed over 500 lb.

The assembly was accomplished in less than four days with two 6-hr. shifts of six men each. Simple erection scaffoldings inside the culvert and rough ladders at the sides were used. Wooden braces held the cylinder securely in position during assembly and before the backfill was placed.

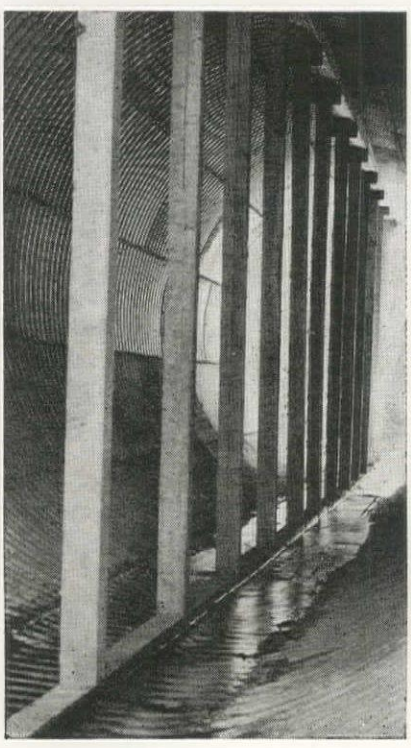
After the culvert was assembled it was strutted out of round to about 3%, that is, the vertical diameter was increased by approximately 5½ in. This was accomplished with the aid of two 35-ton oil jacks. Timber struts (6 x 6 in.), sills and compression caps were used, with the struts spaced at 6 ft. The compression caps placed transversely to the struts are useful in imparting a certain measure of flexibility to the structure even while the struts are in place as, under heavy fills, they allow some movement at the sides and produce a more even distribution of the pressure. When the backfill has been placed and settled over the pipe the struts are removed and the structure reassumes circular form. In the present case it is planned to remove the struts after the first heavy rains have aided in consolidating the fill.

The backfilling and tamping was done by hand up to three-fourths of the culvert diameter. The remainder was accomplished by the bulldozer with a small sheeps-foot roller for tamping. A fill of about 8½ ft. was placed at the top of the pipe, or 23½ ft. from invert level.

The contractors were Bohnett and McDonald. The writer, as supervising engineer for Fred H. Tibbetts, chief engineer for the district, had general charge, while E. S. Stafford had immediate direction of the installation and was responsible for ingenious and time-saving methods of handling the material.



Sections of No. 1 gage thickness, 10 ft. long, weighing 500 lb. were handled by a Northwest crane (above).



To allow for settlement in the 8½-ft. fill over the culvert, it was strutted out of round about 5½ in. (left) using two 35-ton jacks. The struts will be removed after rains consolidate the fill.

Annual "Road Show" in Cleveland Jan. 20 Will Feature Record Equipment Display

ADVANCE reports indicate that the revival of the "Road Show" of the American Road Builders' Association, to be held in Cleveland, January 20-24, will set a new record and point to a definite revival in the construction machinery industry. Applications for space in the show far exceeded the original area set aside for these exhibits and the committee had to engage additional space. This is the first road show in three years. The exhibitors and the list of equipment indicate that the Road Show will display "everything in the highway world" for those who attend.

The convention program starts Monday, January 20, with general sessions which include discussions on such subjects as "Federal Highway Appropriations" and "National Highway Legislation." On the following day there will be a joint meeting of county highway officials and the initial meeting of the newly organized educational division of A. R. B. A. The highway contractors will hold a session Jan. 21 and, at the same time, there will be a meeting of the Pan-American division and a general technical session.

The contracotrs will continue their program through a meeting the following morning, as will the highway technicians and the county and city officials. The closing general session will be Wednesday afternoon and the road builders' banquet will be held Thursday evening.

Construction Design Chart

III. Timber-beams Without Lateral Support

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

FLEXURE and shear are not the only factors affecting the choice of a timber beam. If such were the case, a beam very deep as compared to breadth would be the economical section. A load carrying beam has the fibers of one side in tension and the other side in compression. The compression side of the beam is then acting as a column. Like a column it has a tendency to buckle sideways unless lateral stiffness or support is sufficient to prevent such buckling.

My usual demonstration of this buckling tendency of a beam is made with two pieces of thin cardboard each about 10 in. long by 1 in. wide. Supporting one piece as a beam with the 10-in. length as the span and the 1-in. dimension as the depth, we have a beam very narrow as compared to depth. This beam will be found to buckle on the application of the least load. On the other piece of cardboard one edge is bent at right angles so as to form a small flange through the entire length. With this crimped edge for the compression side of the beam it will now support a substantial load although it has a depth less than that of the first beam.

The basic working stresses in timber beams permitted by the various building codes presupposes that lateral buckling is to be prevented. This lateral support is either impossible or impractical in the case of a beam used for hoisting a load on a construction project. While the problem is mentioned by some authorities, to the best of my knowledge only one has offered a definite solution. Henry D. Dewell, consulting engineer, San Francisco, suggests the following solution (page 100, Hool and Johnson, Vol. I, Handbook of Building Construction):

For timber beams having no lateral support, on which are applied a single concentrated load

$$f = f_1 \left(1 - \frac{L}{120\,b}\right)$$

f = allowable maximum fiber stress in flexure.

f_1 = basic allowable maximum fiber stress.

L = span, or laterally unsupported length of beam, ft.

b = breadth of beam, inches.

The accompanying chart has been constructed on the basis of this formula. A single line intersecting all three scales is necessary for solution.

In the September issue, a problem was solved wherein a 6 x 10-in. timber beam was found adequate to support a single concentrated load of 2,000 lb. on a simple span of 15 ft. If a timber having a basic allowable maximum fiber stress of 1,400 lb. per sq. in. had been used, what would the maximum allowable working stress be, assuming that no lateral support has been provided. For this particular beam

$$\frac{L}{b} = \frac{15 \times 12}{6} = 30$$

A solution line has been drawn on the chart indicating an allowable working stress of 1,050 lb. per sq. in.

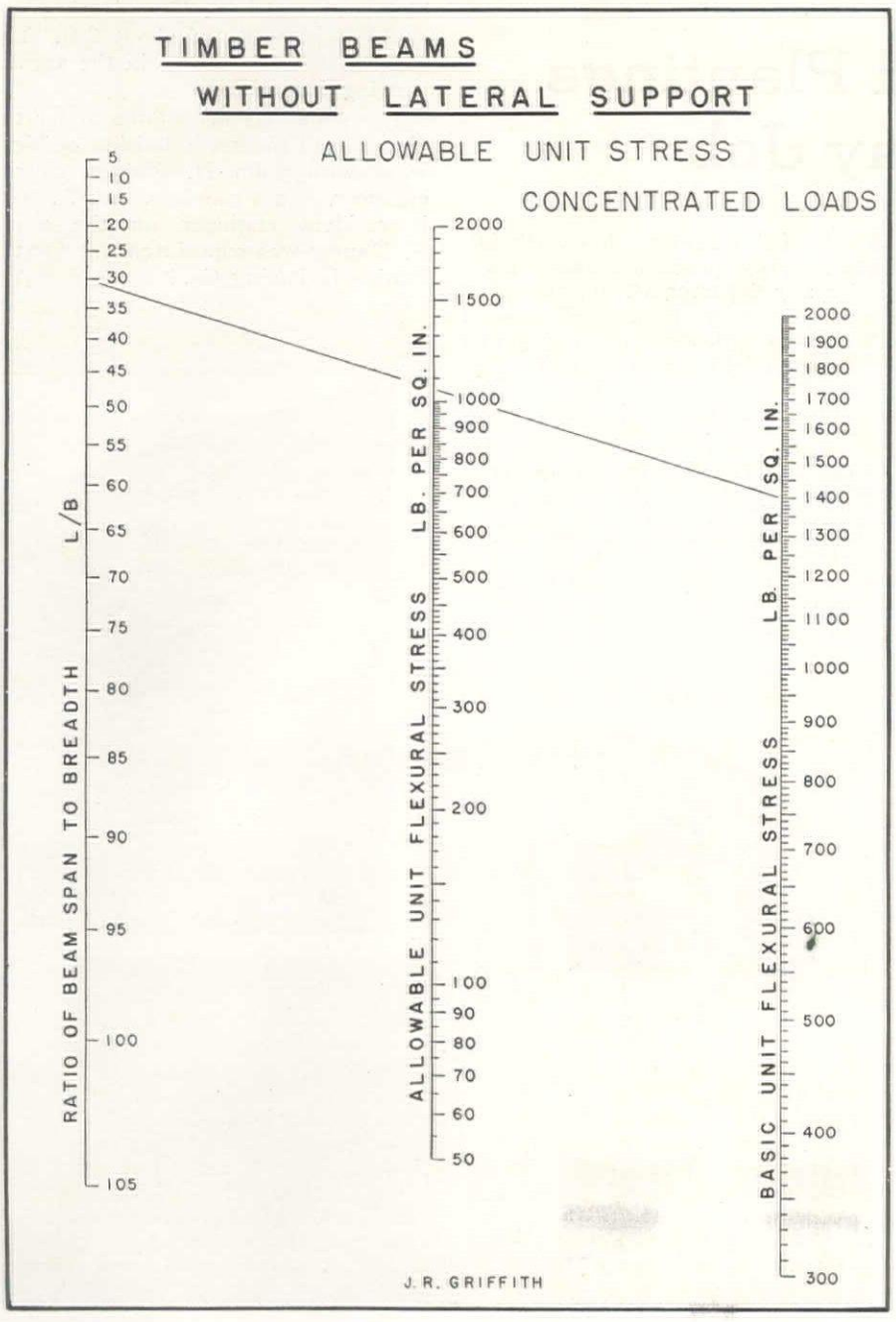
To check this solution by the formula we have

$$f = f_1 \left(1 - \frac{L}{120\,b}\right)$$

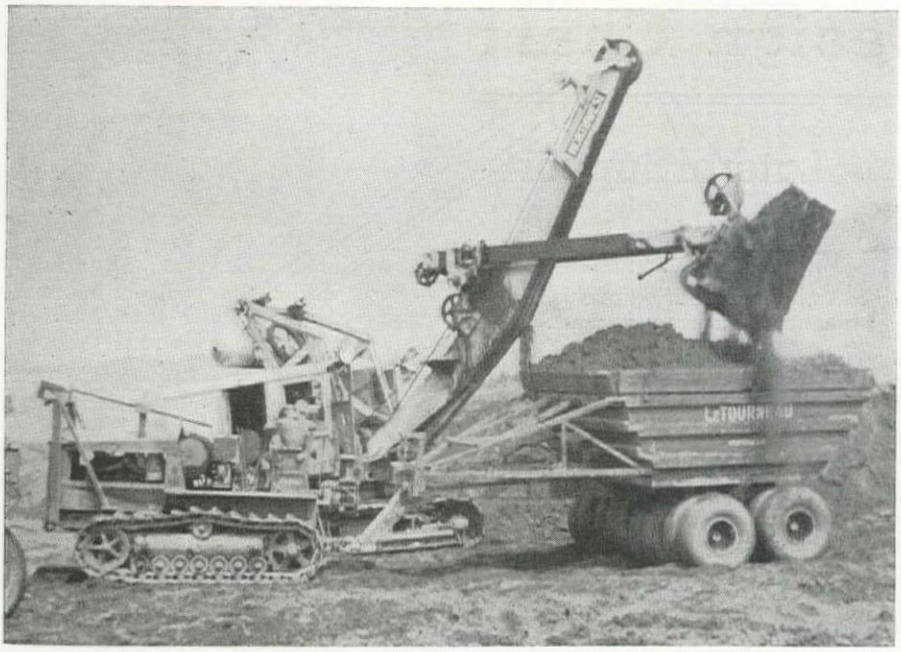
$$= 1{,}400 \left(1 - \frac{15 \times 12}{120 \times 6}\right)$$

$$= 1{,}050 \text{ lb. per sq. in.}$$

This value being greater than the stress used for the original solution, the section is entirely adequate. The unit allowable stress for the original chart was used purposely low, knowing that few such beams have lateral support provided.



NOTE: Next issue Professor Griffith offers the first of a series of charts on the design of forms for concrete, which should be of outstanding value to designers and construction engineers.



Loading material for the fill with a Northwest shovel into LeTourneau carts. This method of moving the sand was used where the haul was not more than about 1,000 ft.

Field Office and Plantings Feature Highway Job

GRADING WORK, totaling 244,000 cu. yd., involved two interesting items on a $114,834 contract of the Peninsula Paving Co. to construct a highway link in the San Francisco boulevard system. The project extends for about 1.7 mi. between Junipero Serra Blvd. and the Skyline Blvd., and will ultimately form a unit in the Ocean Shore highway.

Work was started in April and the principal item was the building of two large fills containing 110,000 and 60,000 cu. yd. The largest fill is 50 ft. high and both have side slopes of 1-½:1. The slopes in the cuts are 1:1. The material handled was practically all sand and the price was 17c a cu. yd. for excavation.

For shorter hauls up to a length of about 1,000 ft., the material was handled by three LeTourneau carryalls of 12 cu. yd. capacity. These scrapers were hauled by Cletrac 80 diesel tractors. For the longer hauls the sand was loaded by a 2-yd. Northwest shovel into and hauled in three LeTourneau 25 yd. carts which were provided with extra side boards to increase their capacity to 30 cu. yd. A 60 h.p. Caterpillar tractor was used with a bulldozer on the fills and a 30 h.p. Caterpillar was used to pull the sheepsfoot roller. Incidentally, all of this equipment, with the exception of the three Cletrac tractors, operates on Butane gas.

One special feature of the work was the lowering of a 54-in. water main which is a vital link in the San Francisco water supply from the Crystal Springs Reservoir. This main was lowered 14 ft. into a trench where it crossed the new location.

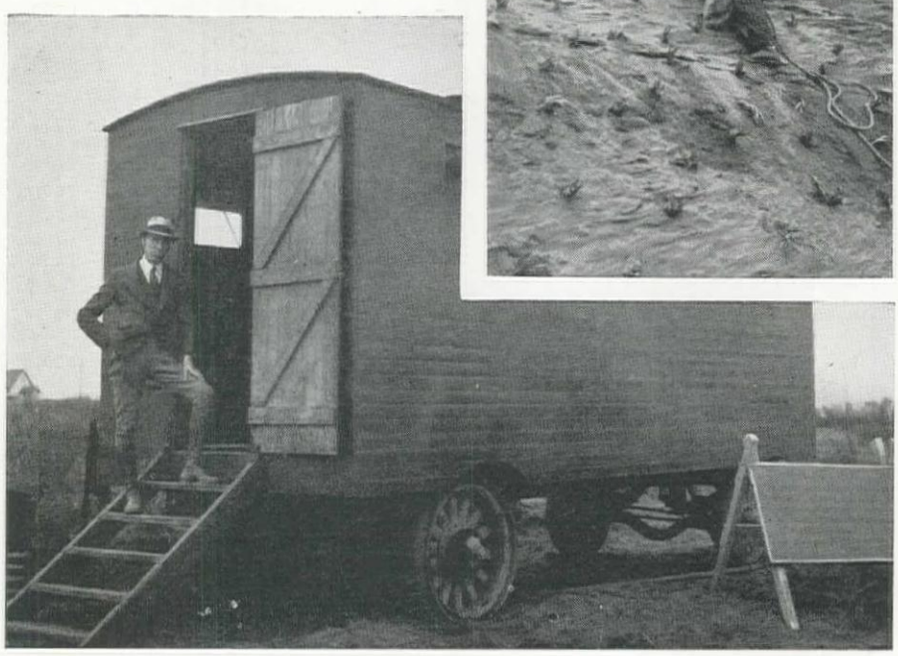
Much of this construction work follower standard procedure and did not involve any departures from the usual practice in excavation, hauling, and building road fill. However, two points of interest might be mentioned.

The Peninsula Paving Co. has the practice of maintaining its field offices and tool sheds on trailers (see illustration). This permits the field office to be moved quickly to the job, completely equipped and located at any convenient point. Further, the office can be moved, if necessary, during the course of the job without difficulty. The same advantages apply to the use of similarly mounted sheds to carry small items of equipment and tools.

The other item was the setting out of plants on the side slopes of the cuts in an effort to reduce wind erosion in the sandy material. This planting is done with a species locally referred to as iceplant (mesembryanthemum). The work is done by hand, using a scaffolding which is drawn up the bank by means of a rope through a pulley at the top. The planter works on this scaffolding and digs holes with an ordinary mason's hammer into which he sets the cuttings. The plantings are made at intervals of about 2-ft. The general set-up is shown in the accompanying illustration.

The work has been done under the direction of the state division of highways with John H. Skeggs, district engineer, San Francisco. W. A. Rice is resident engineer on the work. E. Maurer was superintendent for the Peninsula Paving Co.

Setting out ice plants on the side slopes of the sandy cuts to reduce wind erosion. The simple staging is pulled up the bank by the rope through a pulley at the top, as the planter makes the settings at about 2-ft. spacings.



Trailer mounted field office used by the Peninsula Paving Co. This unit is quickly moved from job to job, and can be moved about on the project as the work progresses.

Valve Maintenance Problems On Distribution Systems

Hints on the inspecting, repair and servicing of gate valves from the Los Angeles water department

THE PROBLEMS involved in the maintenance of gate valves on water distribution systems were reviewed from a practical approach by E. W. Breitkreutz, assistant engineer, Bureau of Water Works and Supply, Los Angeles, in a paper presented at the San Diego convention of the California Section, A. W. W. A. The paper reviewed 22 years of experience in the Los Angeles Water Bureau, and covered several phases of maintenance work, but the principal feature of the paper related to the subject of gate valves and this is reviewed in the following abstract.

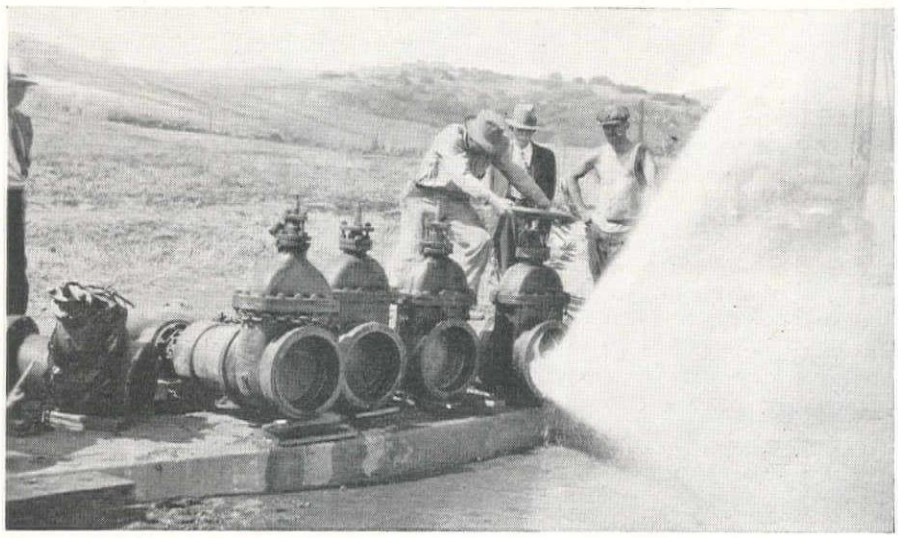
In the Los Angeles water supply system there are in operation about 40,000 shut-off valves or "gates" of about thirty different makes, usually operated in open position in the distribution system. The bronze mounted type of double disc iron valves, in corrosive water, often build up between the discs in their open position and tend to make them difficult to operate. Under ordinary domestic pressure, brass trimmed solid wedge valves operate satisfactorily for all sizes below 12 in. All larger valves should have solid bronze discs with other moving parts made of the same material.

The occasion often arises when it is desirable to shut down the flow of water in certain mains, and this is usually done by partly closing the gate in the line. Gate discs, projecting into the flow of water, tend to set up vibrations which are sometimes annoying to consumers, and if continued long enough may result in undesirable wear. The solution to this problem is to provide a battery of valves in various sizes, so that complete closure of one or more will provide the desired result in reducing the flow of water.

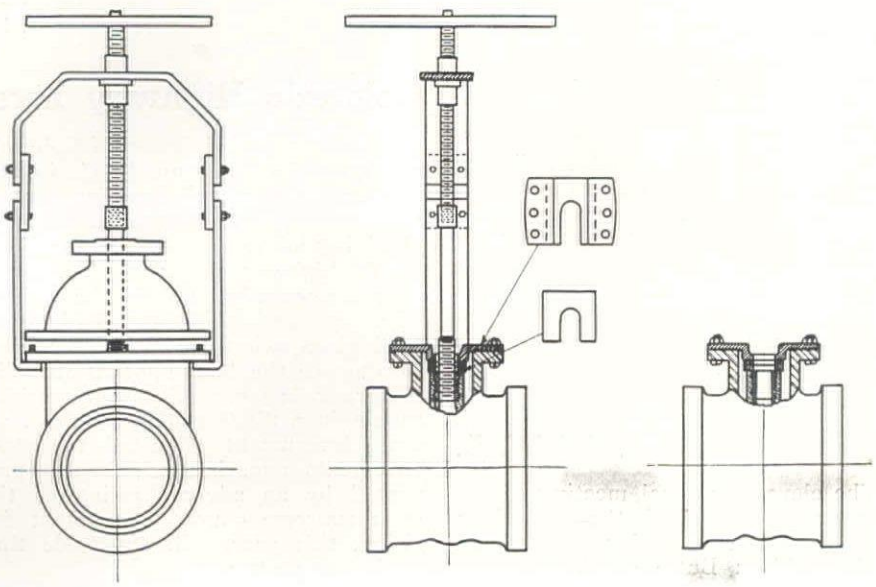
When used as dividing gates between districts of different elevation in a city, valves often result in objectionable dead ends. It is the usual custom to "crack" these gates to permit enough circulation to overcome this objection, but the resulting high velocity will cut the discs and seats so that a tight shut-off cannot be made when required. When the pressure on the high side of the dividing gate is from gravity supplied water, a good procedure is to by-pass the gate with a ½-in. copper service connection, placing the stop-cock in a 6-in. gate well. If the high pressure side of the dividing gate is from a pumped supply, then the by-pass flow should be controlled by an orifice in a blind union, amply protected by a strainer.

Stuffing box troubles

One of the annoying problems is the leaking of gates at the stuffing box, after they have been operated for a shut-off. The packing of the gate stem dries out and shrinks with age. A good flax oil-impregnated packing that remains resilient will overcome this difficulty. Leaky packing may be replaced without tearing up the paving, and removing the gate well, if the stuffing box bolts are within hand-reach from the street surface. This repacking requires the use of a puller for removing the gate key nut from the stem, and operations are greatly facilitated if the stuffing box bolts and nuts are of bronze and the operator has nimble fingers.



Testing a group of 12-in. gate valves attached to a common manifold.



Device for holding disc in valve while removing bonnet and replacing broken stem with full pressure in main.

Frequency of inspection

How often should valves be inspected and operated? In the case of trunk lines, all valves should be operated at least once every six months and inspected every 90 days. Other valves in the system should be operated at least once annually and inspected semi-annually. On the inspection rounds, trunk line valves are usually closed about ⅓ and others are given a few turns. In addition to the regular inspection and operation, all valves are inspected whenever streets are resurfaced or improved.

Personally Speaking . . . . .

Thomas McClure, state engineer of New Mexico was elected president of the Association of Western State Engineers at the organization's recent session in Salt Lake City. J. S. James, state engineer of Montana was named vice-president.

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C. E. Crownover, city engineer of Yakima, Wash., has been designated supervision engineer for the Roza irrigation project to be carried out by the Bureau of Reclamation as the next unit in the Yakima River development in Washington. Mr. Crownover has had previous service with the Bureau, having been engineer on the Keechelus development, another unit of the Yakima development. He also served on the Tieton and Rimrock projects. Work on the Roza project is scheduled to start before the first of the year.

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Earl Stone, who has been serving in government engineering work for the past two years at Durango and Lamar, Colo., has been appointed supervisor of WPA projects in Pueblo and several other southern Colorado counties. Mr. Stone was formerly with the state highway department. In his new position he succeeds Stephen Keating who has been transferred to Alamosa as district WPA director.

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O. S. Warden, newspaper publisher of Great Falls, Mont, was named president of the National Reclamation Association at the organization's annual convention in Salt Lake City, November 15. He succeeds Marshall N. Dana of Portland, Ore., who has been president since the time the organization was formed three years ago and who is PWA director in the Northwest.

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P. C. Croll, assistant resident engineer inspector on tunnel operations on the Moffat water tunnel project of Denver, has been appointed resident engineer inspector in the PWA inspection service. Mr. Croll will continue at his present assignment, being one of the sixty-seven men working out of the inspection division of the PWA for Colorado, Wyoming, Idaho, and Utah.

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C. L. Brown has been placed in charge of construction operations of a section of highway being built by the Nevada Highway Department by force account near Tonopah. Bids submitted were considerably higher than the departments' estimate for this job and decision was made to carry it out by day labor operations.

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John E. Field, widely known consulting engineer of Denver, Colo., has been appointed special engineer for the PWA with headquarters in Washington, D. C. Mr. Field has been connected with PWA work in the Rocky Mountain region since the beginning of this government agency. Born in Denver, he has been active in engineering work in the West practically all his life. He served with the Reclamation Service on several large dams including the Pathfinder Dam in Wyoming. He was the second state engineer of Colorado. In his new position Mr. Field will be concerned with irrigation projects financed by the PWA throughout the entire country.

State Tax Ruling

THE State of Washington secured a state court ruling on Nov. 18 authorizing the collection of business and occupation taxes on the contract operations of the MWAK Co. and David H. Ryan in the construction of the Grand Coulee Dam. The contractors contended that the state had no authority to tax a federal contract and that it could not collect for an operation on property which had been ceded to the Federal Government by the state.

The $29,000,000 contract of the MWAK Co. and the $1,000,000 contract of David H. Ryan would result in taxes aggregating more than $3,000,000 according to existing state levees for business and occupation, if the present court ruling is sustained.

Superior Judge Wilson stated that "the government is in no way affected by the fact that the agents pay or do not pay the tax any more than the government could be affected by the payment of a tax upon an agent's truck or machinery.

"The exemption of the instrumentality by one government from taxation by another must be given such practical construction that it will not unduly impair the taxing power of a taxing government.

"That it was not the intention of the parties that the Federal Government should have exclusive jurisdiction over the ceded area is evidenced by a number of provisions of the specifications of this contract."

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Montana Section A. W. W. A.

The eleventh annual meeting of the Montana Section of the American Water Works Association is scheduled to be held in Butte on April 17-18, 1936, in accordance with a recent decision of the executive committee of the section. The water works school, usually held in conjunction with the annual meeting, will be held April 15 and 16 in the same city. A feature of the convention will be an inspection trip over the system of the Butte Water Co.

Emil Sandquist, national director from the Montana Section, will attend the midwinter meeting of the national board in New York City.

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Colorado PWA Projects

Representing an expenditure of more than $11,000,000, nearly forty PWA projects will be under construction throughout Colorado by the middle of December. Work has already started on nine projects and authorization to start on nine others will be given immediately. There are only about fifteen projects out of the thirty-nine on which bids have not been advertised. Out of the thirty-nine, there are eight for waterworks; three for sewage plants; eight for state institutions; nineteen for schools, and one for a bridge. The fifteen projects yet to be awarded amount to about $1,250,000.

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Recent Bond Elections

The record of bond elections held Nov. 19 to provide for PWA financing of construction projects in the West shows that out of 44 bond issues voted upon, 34 were passed.

The tabulation on these elections by states was recently released by the PWA and the results were:

State	Elections Held	Approved
Arizona	2	2
California	15	11
Colorado	2	2
Idaho	1	1
New Mexico	14	9
Oregon	2	2
Washington	1	1
Wyoming	7	6
	44	34

•

Colorado Highway Loan

Governor E. C. Johnson of Colorado will go to Washington, D. C., in December to confer with President Roosevelt and federal authorities about obtaining millions of dollars for Colorado's highway program. The state supreme court has upheld the validity of a proposed $25,000,000 PWA loan for highways, but the PWA later failed to approve the loan application. The Governor has recently been working to obtain a $10,000,000 loan the Federal Government allocated the state two years ago, but which was prevented by an adverse ruling of the state supreme court. The recent decision, this year, will supersede that made two years ago.

MANUFACTURER and Distributor NEWS

Machinery Dealers Elect Officers

The Western Construction Equipment Dealers and Distributors' Association of San Francisco elected L. E. Murphy of the A. L. Young Machinery Company as president of the organization, succeeding Tracy Harron of the Harron, Ricard & McCone Company.

Frederick Weddleton was chosen to serve as manager of subsequent expositions to be staged by the Association.

Other officers elected at the meeting were H. F. Knox of the Austin-Western Road Machinery Company, first vice-president; C. A. Cowan of the International Harvester Company, second vice-president; Francis H. James of the Contractors' Machinery Exchange, Inc., third vice-president; John Jorgenson of the Western Machinery Company, treasurer; and L. C. Petrie of the Kratz-McClelland Company, secretary.

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Master Vibrator Distributors for California

The Master Vibrator Company of Pittsburgh, Penn., announce the appointment of Smith Booth Usher Company, Los Angeles, California, as their exclusive distributors of their full line of electric vibrators and generator sets. They also announce the appointment of the Edward R. Bacon Co. in San Francisco as their Northern California, Nevada and Honolulu representative.

The vibrators include capacities from one-third horse power to two horse power and at various speeds and cover the enclosed as well as the outside motor types. These units are furnished in diameters from 2¼inches to 5½ inches for narrow reinforced walls as well as mass concrete.

All of these vibrators and generator sets are built completely by the Master Electric Co. in Dayton, Ohio.

•

Worthington Term-Payment Purchase Plan

Worthington Pump and Machinery Corporation is the first manufacturer of industrial equipment to announce a term-payment purchase plan to enable purchasers of its products to take advantage of the provisions of the National Housing Act, as amended for industry. Each individual property is eligible to an insured loan up to $50,000, and such loans may be obtained up to April 1, 1936.

It is not generally understood by users of industrial equipment that the National Housing Act has been amended to enable them to purchase needed equipment. This appears to be because of the emphasis on the word "Housing" in all references to the Act and its administration. This emphasis has led to a belief that funds are available for building operations only.

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United Machinery Changes Name

In order that their now famous product, the Ramsey 3-Speed Hand Winch, might be more closely linked with the name of the company, F. R. Ramsey, president of the United Machinery Company, 1626 Northwest Thurmon Street, Portland, has announced a change in this company's name. The company, headed by Ramsey, will now be known as Ramsey Machinery Company.

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Western Road Machinery Adds New Accounts

According to Edward L. Kropp, manager of the newly organized Western Road Machinery Company, 83 Southeast Belmont, Portland, his company is now representing the Portable Machinery Company, York, Pennsylvania, manufacturers of all kinds of conveying equipment. At the same time, announcement was made that they have secured the line of W. A. Riddell Company, of Bucyrus, Ohio, as well as that of the Cummins Diesel engines, manufactured by the Cummins Engine Company of Columbus, Indiana.

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Lincoln Adds Salesman

To the San Francisco sales personnel of the Lincoln Electric Co. has been added E. H. Weil, who was graduated from Miami University in 1926. In school he was captain of the track team, and is the holder of numerous track records. In 1934 he was awarded a Masters Degree by the University of Cincinnati. After graduation he was with Allis-Chalmers for several years, and in recent years taught and coached in a Technical High School at Cleveland. Under his coaching, Jesse Owens was developed to the point where, after entering Ohio State, he won three world's records. Mr. Weil became connected with the Lincoln Electric Company in 1934.

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Leech Joins Caterpillar Sales Force

W. I. (Bill) Leech, for many years identified with the sale of construction equipment west of the Rocky Mountains, has joined the Western Sales Division of Caterpillar Tractor Co., according to a recent announcement made by the manufacturers. In his new work, he will cover the territory where he is so well known, promoting the sale of the company's track-type tractors, road machinery and power units in the construction and contracting field.

Mr. Leech was formerly associated with the American Tractor Equipment Corporation of Oakland, California, and previous to that covered the Pacific Coast area for La Plante-Choate Manufacturing Company. These two concerns are among the leading manufacturers of earth-moving equipment for use with "Caterpillar" tractors, and his work with them gave him a wide acquaintance with the trade and the sales organization of the firm he now represents.

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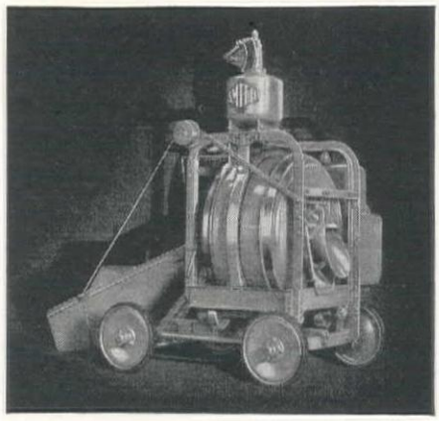

T. L. Smith New Mixer

The T. L. Smith Company, concrete mixer manufacturers since 1900, has recently added to its line a four wheel end discharge model in the 10-S size. The new machine, compact and light in weight, combines the advantages of the two wheel end discharge model with four wheel truck stability. Only 6½ ft. wide, it is ideal for work in narrow places.

The truck design of this new 10-S machine, provides for a 5 ft. wheel base. Automotive type steering axle, 3-point suspension with spring mounting, and balanced weight, permit fast towing speeds. Engine mounting on the right hand side avoids any overhang on the traffic side. The telescopic tow bar folds back while mixer is in use.

Notable among other construction features is the Smith end-to-center mixing action, automatic skip vibrator, and one man end control. A new vertical syphon type water measuring tank with calibrated gauge is accurate to the ounce.

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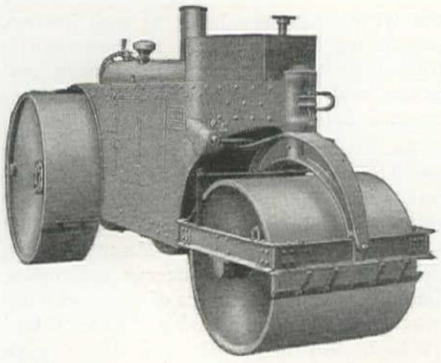
Davenport Diesel Roller

A new Diesel powered roller, announced by the Davenport-Besler Corporation of Davenport, Iowa, is additional evidence of the growing popularity of low fuel cost Diesel power in the realm of mobile equipment.

Davenport Diesel Rollers are furnished in 10- and 12-ton units, powered with Caterpillar D-6100 Diesel engines, and have embodied in them such other Caterpillar standard parts as transmission



gears, clutch, differential, and power take-off for steering and for operating such accessories as scarifier, grader blades, sprinkler system, ironer roller, etc.

The bull-driving gear is centrally located, is completely housed in the transmission case, is sealed against dust and grit, and runs in oil—a feature which, it is claimed, combines with the central application of power to the drive shaft to insure longer life.

One-man operation is claimed for these rollers, which have four speeds forward and four reverse, with a speed range of .92 to 5.02 miles per hour.

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Caterpillar Announces New Models

One of the most important new model announcements has been made by Caterpillar Tractor Co. of Peoria, Illinois, introducing four new Diesel tractors, to be known as the RD-8, RD-7, RD-6 and RD-4, and a spark-ignition machine called the Thirty.

The first three Diesel models succeed the Diesel Seventy-Five, Diesel Fifty and Diesel Forty, and are comparable with them in everything except power. Engines in these three incorporate all the features of the former models and they achieve increased power through an increase in cylinder bore from 5¼ to 5¾ inches and other refinements that have been made in the engine and fuel injection system.

The RD-4 and the spark-ignition Thirty tractors, embracing many new features of design, may be compared with the former Thirty model produced by the company until 1932. The new RD-4 and Thirty are companions in outer dimensions, chassis, transmission, and tracks. Many engine parts are also interchangeable. The new machines have higher ground clearance and less overall height than the old Thirty tractor. The Diesel weighs only 400 pounds more than the new Thirty and almost 300 pounds less than the old.

The RD-4 consumes only 1¼ gallons of low-cost fuel oil an hour. The old Thirty tractor burns about four gallons of gasoline per hour, and its greatest speed is 3.6 miles per hour. The RD-4 and new Thirty have five speeds forward, fifth being 5.4 miles per hour. Drawbar pull for both (the Thirty burning gasoline) is as follows: First, 7,725 pounds; second, 5,475 pounds; third, 4,170 pounds; fourth, 3,195 pounds; fifth, 1,880 pounds, and re-

UNIT BID SUMMARY . . .

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

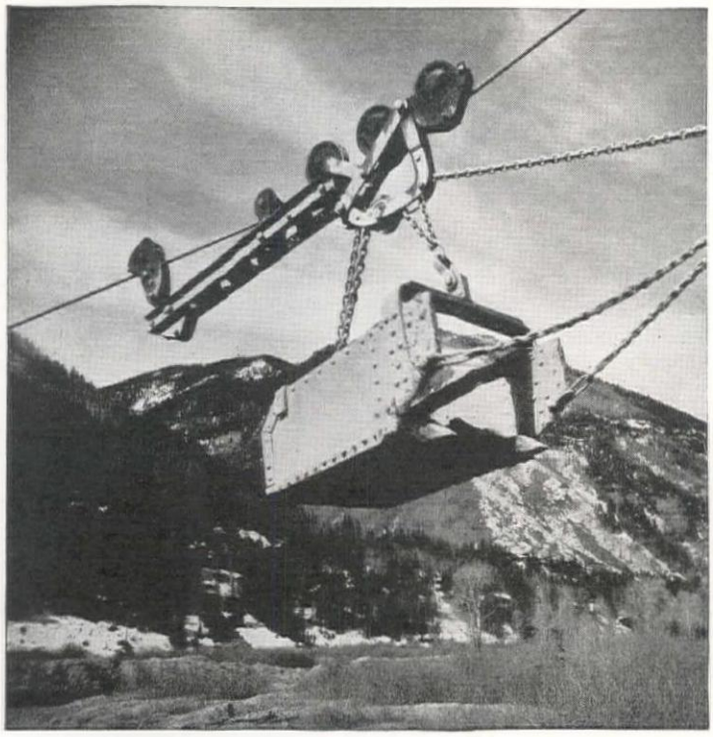
Casper, Wyoming—Government—Tunnels—Casper-Alcova Project

W. E. Callahan Const. Co., and Gunther & Shirley, 206 S. Spring St., Los Angeles, $794,948 low to Bureau of Reclamation, Casper, Wyo., for constructing Tunnels Nos. 3, 4, 5 and 6, Casper Canal, Casper-Alcova Project, Wyo., under Spec. No. 649. Bids from:

	Sched. 1	Sched. 2	Sched. 3	Sched. 4	Totals
(1) W. E. Callahan and Gunther & Shirley, L. A.	$105,656	$157,251	$150,791	$412,150	$794,948
(2) Utah Const. Co., Ogden, Utah	108,459	159,569	153,794	391,287	813,112
(3) Edward Peterson, Omaha, Nebraska	106,388	158,885	160,163	.....	425,436
(4) Morrison-Knudsen Co., Inc., Boise	118,409	167,377	170,607	430,261	886,654
(5) Crook & Henno, Denver, Colo.	.....	.....	180,953	538,931	719,884
(6) Frazier-Davis Const. Co., St. Louis, Mo.	.....	.....	202,222	521,461	723,683

SCHED. 1—Tunnel 3—Sta. 675-50 to Sta. 689-64	(1)	(2)	(3)	(4)	(5)	(6)
40,000 cu. yd. exc. open-cut Class 1	.20	.30	.25	.50	....	....
100 cu. yd. exc. open-cut Class 2	1.00	.40	.65	.75	....	....
8,500 cu. yd. exc. open-cut Class 3	1.00	.90	.65	1.00	....	....
150 cu. yd. backfill	.60	.40	.40	.35	....	....
100 cu. yd. puddle or tamp backfill	.65	.50	.10	.55	....	....
9,500 cu. yd. exc. in tunnel	5.50	6.00	6.00	6.40	....	....
45,000 lb. furn. & inst. perm. steel tunn. supports	.07	.07	.08	.08	....	....
15 MFBM furn. & inst. perm. timb. lagging & sills	60.00	80.00	$100	$100	....	....
50,000 lb. furn. & inst. steel tunn. liner plates	.07	.05	.08	.08	....	....
800 lin. ft. const. 6" tunnel drain	.80	1.00	1.50	.45	....	....
300 lin. ft. const. 8" tunnel drain	.90	1.00	1.50	.60	....	....
100 lin. ft. const. 10" tunnel drain	1.00	1.00	2.00	.70	....	....
114 lin. ft. lay 10" drain pipe (cem. joints)	1.50	.70	2.00	1.05	....	....
250 cu. yd. concrete (portal struc. & transitions)	25.00	17.00	12.50	10.25	....	....
2,000 cu. yd. concrete (tunnel lining)	10.00	8.85	9.00	7.50	....	....
28,000 lb. place reinforcing bars	.02	.02	.025	.02	....	....
200 lin. ft. drill grout holes up to 10 ft.	.40	1.00	.50	.65	....	....
100 lb. place grout pipe & connections	.30	.20	.25	.25	....	....
400 cu. ft. pressure grouting	1.00	1.00	1.00	.80	....	....
200 sq. yd. dry-rock paving	3.00	2.00	1.00	2.50	....	....
SCHED. 2—Tunnel 4—Sta. 751-50 to Sta. 773-64						
21,000 cu. yd. exc. open-cut Class 1	.20	.30	.25	.50	....	....
100 cu. yd. exc. open-cut Class 2	1.00	.40	.65	.75	....	....
8,400 cu. yd. exc. open-cut Class 3	1.00	.90	.65	1.00	....	....
150 cu. yd. backfill	.60	.40	.40	.35	....	....
100 cu. yd. puddle or tamp backfill	.65	.50	.10	.55	....	....
16,000 cu. yd. excav. in tunnel	5.50	6.00	5.90	6.40	....	....
75,000 lb. furn. & inst. perm. steel tunn. supports	.07	.07	.08	.08	....	....
25 MFBM furn. & inst. perm. timb. lag. & sills	60.00	80.00	$100	$100	....	....
80,000 lb. furn. & inst. steel tunn. liner plates	.07	.05	.08	.08	....	....
1,200 lin. ft. const. 6" tunnel drain	.80	1.00	1.50	.45	....	....
600 lin. ft. const. 8" tunnel drain	.90	1.00	1.50	.60	....	....
200 lin. ft. const. 10" tunnel drain	1.00	1.00	2.00	.70	....	....
114 lin. ft. lay 10" drain pipe (cem. joints)	1.50	.70	2.00	1.05	....	....
250 cu. yd. concr. (portal struc. & transitions)	25.00	17.00	12.50	10.25	....	....
3,400 cu. yd. concrete (tunnel lining)	10.00	8.85	9.00	7.50	....	....
28,000 lb. place reinforcing bars	.02	.02	.025	.02	....	....
300 lin. ft. drill grout holes up to 10 ft.	.40	1.00	.50	.65	....	....
150 lb. place grout pipe & connections	.30	.20	.25	.25	....	....
600 cu. ft. pressure grouting	1.00	1.00	1.00	.80	....	....
200 sq. yd. dry-rock paving	3.00	2.00	1.00	2.50	....	....
SCHED. 3—Tunnel 5—Sta. 1772-50 to Sta. 1793-64						
16,000 cu. yd. excav. open-cut Class 1	.35	.30	.25	.50	.38	.35
10,200 cu. yd. excav. open-cut Class 2	.80	.40	.65	.75	.42	.60
12,000 cu. yd. excav. open-cut Class 3	1.00	.90	.65	1.00	.80	1.25
150 cu. yd. backfill	.60	.40	.40	.35	2.00	.50
100 cu. yd. puddle or tamp backfill	.65	.50	.10	.55	1.00	.90
14,500 cu. yd. excavation in tunnel	5.15	5.95	5.93	6.50	7.00	8.25
70,000 lb. furn. & inst. perm. steel tunn. supports	.07	.07	.08	.08	.10	.09
24 MFBM furn. & inst. perm. timb. lagging & sills	60.00	80.00	$100	$100	70.00	85.00
75,000 lb. furn. & inst. steel tunn. liner plates	.07	.05	.08	.08	.10	.11
900 lin. ft. const. 6" tunnel drain	.80	1.00	1.50	.45	.85	1.10
600 lin. ft. const. 8" tunnel drain	.90	1.00	1.50	.60	.85	1.25
400 lin. ft. const. 10" tunnel drain	1.00	1.00	2.00	.70	1.00	1.35
114 ft. lay 10" drain pipe (cemented joints)	1.50	.70	2.00	1.05	1.00	.50
250 cu. yd. concrete (portal struc. & transit.)	23.00	18.00	12.50	11.50	10.00	24.50
3,200 cu. yd. concrete (tunnel lining)	9.10	9.00	10.50	9.00	11.25	9.10
28,000 lb. place reinforcing bars	.02	.02	.025	.02	.02	.02
300 lin. ft. drill grout holes up to 10 ft.	.40	1.00	.50	.65	.50	.60
100 lb. place grout pipe & connections	.30	.20	.25	.25	.10	.20
600 cu. ft. pressure grouting	1.00	1.00	1.00	.80	2.00	1.00
200 sq. yd. dry-rock paving	3.00	2.00	1.00	2.50	3.50	.90
SCHED. 4—Tunnel 6—Sta. 2136-94 to Sta. 2193-10						
40,300 cu. yd. excav. open-cut Class 1	.20	.30	....	.50	.38	.35
9,400 cu. yd. excav. open-cut Class 2	1.00	.40	....	.75	.42	.60
100 cu. yd. excav. open-cut Class 3	1.50	.90	....	1.00	1.00	1.75
450 cu. yd. backfill	.60	.40	....	.35	2.00	.50
200 cu. yd. puddle or tamp backfill	.65	.50	....	.50	1.00	.90
41,500 cu. yd. excavation in tunnel	6.15	5.95	....	6.50	8.00	8.25
200,000 lb. furn. & inst. perm. steel tunn. supports	.07	.07	....	.08	.10	.09
68 MFBM furn. & inst. perm. timb. lagg. & sills	60.00	80.00	....	$100	70.00	85.00
210,000 lb. furn. & inst. steel tunn. liner plates	.08	.05	....	.08	.10	.11
2,000 lin. ft. const. 6" tunnel drain	.80	1.00	....	.45	.90	1.10
2,000 lin. ft. const. 8" tunnel drain	.90	1.00	....	.60	.95	1.25
1,400 lin. ft. const. 10" tunnel drain	1.00	1.00	....	.70	1.10	1.35
114 lin. ft. lay 10" drain pipe (cem. joints)	1.50	.70	....	1.05	1.00	.50
346 cu. yd. concr. (portal struc. & transit.)	24.00	18.00	....	11.50	11.25	24.50
9,150 cu. yd. concr. (tunnel lining)	9.50	9.00	....	9.00	13.75	10.20
32,000 lb. place reinforcing bars	.02	.02	....	.02	.02	.02
900 lin. ft. drill grout holes up to 10 ft.	.40	1.00	....	.65	.50	.60
300 lb. place grout pipe & connections	.30	.20	....	.25	.10	.20
1,800 cu. ft. pressure grouting	1.00	1.00	....	.80	2.00	1.00
200 sq. yd. dry-rock paving	3.00	2.00	....	2.50	3.50	.90
2,300 lb. inst. met. handrailing & guides	.15	.15	....	.25	.10	.09

STIPULATIONS—W. E. Callahan and Gunther & Shirley will not accept any single schedule, will accept Sched. 3 and 4 or all 4 scheds. in which case deduct $30,900. Total as given is with deduction. Utah Const. Co. will not accept any one sched. alone except Sched. 4, will accept Sched. 1 and 2 or Sched. 1, 2 and 4 or Sched. 3 and 4 or all 4 Scheds., but will not accept Scheds. 1, 2 and 3. Edward Peterson will accept Scheds. 1 and 2 or Scheds. 1, 2 and 3, but will not accept any one Schedule alone or any other combination. Morrison-Knudsen Co., Inc., will accept all or none. Frazier-Davis Const. Co., one schedule will not be accepted without the other.



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Actual results on the job—day after day—are what count. Frequent and unexpected wire rope failures not only slow down production, but they also increase operating expense.

You can depend on "HERCULES" (Red Strand) Wire Rope to handle, *consistently*, a large yardage for each dollar of its cost. The exceptional ability of this wire rope to take punishment that is handed out by present day work is not a matter of chance. There are definite reasons which involve materials, manufacturing experience, equipment and methods.

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Western Distributors

Billings . . . . Connelly Machinery Company
Boise . . . . . Olson Manufacturing Company
Glasgow . . . . . Wm. H. Ziegler Co., Inc.
Idaho Falls . . Westmont Tractor & Eqpt. Co.
Los Angeles . . . . . Garlinghouse Brothers
Missoula . . . Westmont Tractor & Eqpt. Co.
Phoenix . . . . . Pratt-Gilbert Hardware Co.
Salt Lake City . . . . . Z. C. M. I.
Seattle . . . . . H. J. Armstrong Company
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verse, 6,800 pounds. Speeds are 1.7, 2.4, 3.0, 3.7, 5.4 and 1.9 (reverse) miles per hour, respectively. Standard tread is 44 inches and for wide-gauge models, 60 inches.

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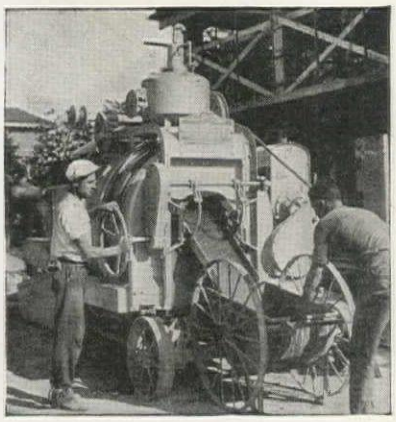

New End Discharge Three-Bag Mixer

A new 14S end discharge mixer, known as the Silverstreak, has recently been announced by the Construction Machinery Company. Designed primarily for bridge work, the new machine is patterned after the 10S Silverstreak which has been in production for some time.

The use of a recently discovered special abrasion resisting steel enables the manufacturer to reduce the weight of the new 14S to little more than that of the 10S size. Because the steel is eight to nine times as resistant to wear, blades, buckets, discharge chute liner and the drum shell itself, while lighter, will last longer.

Automotive steering, roller-bearing wheels, full spring mounting, short wheel base and perfect balance, the new machine is a real trailer or easy to load for hauling. Anti-friction throughout the Timken bearings and self-aligning shafts, as well as diamond type roller chain drive with cut sprockets running in oil. Has true circle steel drum tracks with chilled semi-steel rollers.

This new 14S mixer is pictured and described in a free bulletin just published. A copy will be sent to anyone interested. Construction Machinery Company, Waterloo, Iowa.

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New Welders Combine Safety and Efficiency

Radically improved in design, the new Flexarc d. c. welder, recently announced by the Westinghouse Electric and Manufacturing Company, embodies many improvements. Equipped with a single dial preset control with which the welding current can be set to the exact number of amperes, this welder is able to maintain an absolutely constant arc in spite of speed changes of the driving motor caused by line fluctuations. Open circuit voltage, well below hazardous values, provides safety for the operator, yet retains all the desirable arc characteristics usually associ-

Dam Construction . . . . . .

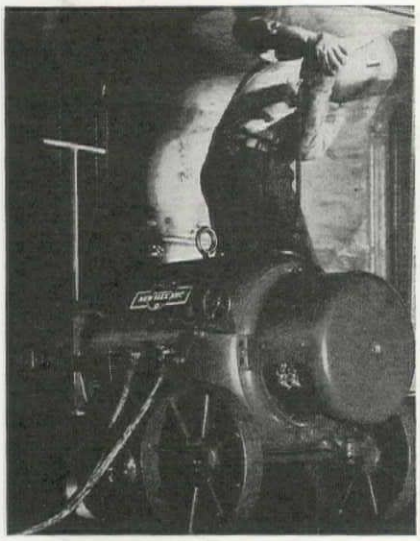
Casper, Wyoming—Government—Seminoe Dam and Power Plant

Morrison-Knudsen Co., Inc., Utah Const. Co., and Winston Bros. Co., 1 Montgomery St., San Francisco, $2,814,459 low to Bureau of Reclamation, Casper, Wyo., for const. the Seminoe Dam and Power Plant, Casper-Alcova Project, Wyo. Work is located on the North Platte River about 37 mi. northeast of Parco, Wyo., under Spec. 630. Bids from:

(1) Morrison-Knudsen, Utah & Winston Bros. Co., S. F. $2,819,459
(2) J. C. Maguire Const. Co., Butte 2,849,883
(3) W. E. Callahan Const. Co. & Gunther & Shirley, L. A. $2,921,567

SCHED. 1—Dam, etc.	(1)	(2)	(3)
L. S. Div. of River	$50,000	$16,145	$50,000
130,000 cy. strip dep.	.15	.01	.12
16,000 cy. exc. (walls)	4.00	4.00	6.20
1,100 cy. com. ex (spilw.)	1.10	3.50	.66
47,000 cy. rk. exc. (spilw.)	2.50	3.50	1.65
22,000 cy. exc. (tunn.)	10.00	17.50	12.40
77,000 cy. com. ex. (dam)	1.50	2.00	1.40
119,000 cy. rk. ex. (dam)	4.00	2.70	2.73
107,000 cy. com. exc.	.75	1.00	1.00
55,000 cy. rk. ex. (tailr)	2.00	1.00	2.83
9,300 cy. com. ex. (roads)	.50	1.00	.50
11,400 cy. rk. ex. (roads)	1.50	1.00	1.50
100 cy. com. ex. (rd. str)	1.00	2.50	2.60
100 cy. rk. exc. (rd. str)	3.00	6.00	5.00
260 cy. gr. surf. (roads)	2.50	2.00	3.30
3,600 cy. backfill	.60	.50	1.10
4,000 cy. riprap	2.00	.50	1.65
400 cy. rub. masonry	10.00	10.50	9.00
6,600 ft. gr. holes, 25′	2.65	2.50	3.05
1,900 ft. gr. holes, 25-50′	2.65	2.50	3.15
4,500 ft. gr. holes, 50-100′	2.65	4.25	3.25
14,000 ft. gr. holes over 100′	2.65	3.00	3.35
32,000 cu. ft. press. gr.	1.00	1.00	1.25
1,500 cu. ft. press. gr.	2.00	1.00	1.40
200 ft. dr. holes, 25′	3.70	1.00	2.90
2,500 ft. dr. holes, 25-50′	3.70	1.00	3.00
180 ft. 4″ sewer drains	1.00	1.00	.55
80 ft. 6″ sewer drains	1.00	1.00	1.10
7,400 ft. concr. dr. tile	.50	.32	.75
90 cu. yd. porous concr.	7.50	8.80	8.80
100 ft. weep holes	1.00	1.00	.90
300 ft. weep holes (tunn.)	1.50	1.00	.90
800 ft. holes (for bars)	1.00	1.00	.90
161,000 cy. conc. (dam)	5.00	3.88	5.42
260 cy. conc. (curbs)	34.35	10.00	16.25
1,600 cy. conc. (struc.)	24.00	15.00	16.00
4,200 cy. conc. (gate str)	13.60	20.00	20.00
320 cy. concr. (gate str)	28.00	10.00	25.00
4,600 cy. conc. (tunnel)	17.00	25.00	13.00
60 cu. yd. conc. (ctwts)	17.00	10.00	11.00
10,400 cy. conc. (power)	10.50	20.00	10.00
1,300 cy. conc. (pw. plant)	$21	10.00	25.00
340 cy. conc. paving	6.00	10.00	10.00
150 cy. conc. (ret. wall)	10.00	20.00	12.00
2,430,000 lb. pl. steel	.02	.025	.025
7,500 sq. yd. spec. finish	.70	.40	.55
6,000 ft. inst. strips	.45	.20	.45
1,700 ft. grout grooves	1.15	.50	.22
29,000 lb. inst. tubing	.14	.075	.11
125,000 lb. ins. tubing	.11	.055	.09
L. S. conc. cooling pl.	$26,000	$29,552	$26,000
800 ft. ins. seal strips	.45	.40	.45
3,800 ft. inst. sealing strips	.45	.20	.45
400 sq. ft. inst. ex. jt. filler	.50	.25	.65
800 ft. inst. 4″ split drains	.45	.40	.65
350,000 lb. inst. gates, etc.	.025	.035	.033
100,000 lb. inst. gate hoists	.03	.085	.044
1,110,000 lb. inst. metalwk.	.01	.035	.027
140,000 lb. inst. bulkh. gate	.025	.05	.028
562,000 lb. inst. Paradox gate	.018	.035	.022
370,000 lb. inst. penstock, etc.	.018	.035	.022
116,000 lb. inst. valves, etc.	.018	.05	.022
178,000 lb. inst. cranes	.02	.07	.022
39,000 lb. inst. track rails	.016	.035	.022
110,000 lb. erect str. steel	.03	.035	.022
171,000 lb. inst. pipe, etc.	.10	.07	.055
8,400 sq. ft. inst. roofing	.20	.10	.22
100 sq. yd. const. hollow wall	$2¼	2.50	2.20
130 sq. yd. const. ceilings	2.25	2.00	3.30
400 sq. yd. paint walls	.50	.50	.55
150 cy. light wt. concr.	9.00	5.50	$18
2,840 sq. yd. floor finish	1.50	2.00	1.10
500 sq. ft. inst. waterpr.	.25	.20	.17
16,000 lb. inst. stairways	.07	.05	.05
36,600 lb. inst. floor plates	.03	.04	.05
3,500 lb. inst. sump pumps	.05	.115	.11
660 sq. ft. inst. accor. doors	.75	.50	.45
460 sq. ft. inst. swing. doors	.75	.50	.45
2,100 sq. ft. inst. windows	.50	.25	.45
4,000 lb. inst. window opr.	.10	.10	.13
150 sq. ft. inst. met. partit.	.50	1.00	.44
67,000 lb. inst. misc. metwk.	.09	.05	.14
200 sq. ft. inst. wood doors	.35	.50	.35
900 lb. inst. plumb. fixtures	.20	.20	.28
12,700 ft. inst. conduit, to 1¼″	.15	.20	.22
11,400 ft. inst. cond. 1¼ to 3″	.20	.25	.28
1,600 ft. inst. fiber conduit	.25	.15	.28
3,000 lb. inst. ground wires	.12	.20	.11
10,000 ft. inst. elec. cable	.08	.15	.11
30,000 cwt. transp. freight	.30	.44	1.10
SUB-TOTALS	$2,759,804	$2,784,458	$2,855,756

SCHED. 2—Bridge & Road	(1)	(2)	(3)
6,300 cy. com. exc. road	.50	.75	.50
20,000 cy. rk. exc. road	1.25	2.00	1.50
1,100 cy. com. exc. struc.	1.00	1.00	1.00
250 cy. rock exc. struc.	5.00	3.00	5.00
100 cy. backfill	.50	.50	1.10
80 ft. lay 18″ cor. met. pipe	.50	1.00	1.25
140 cy. rubble masonry	$10	$20	$10
370 cy. grav. surf. on road	2.50	1.00	3.30
1,500 cy. concr. (piers & abutm.)	$12	8.00	$12
120,000 lb. place steel	.02	.01	.03
170,000 lb. erect str. steel	.035	.01	.03
13 M ft. b. m. install timber	$30	$50	$60



ated with high open circuit voltage. The moment the arc is struck, the set adjusts itself immediately to the required preset value.

The Flexarc welder is designed for general welding service or production work with bare, dust-coated or heavy-coated electrodes. The arc is extremely stable and adjusts itself automatically to varying conditions producing uniform welds on thick or thin gauge metals.

With the elimination of the exciter and its continual power consumption, even when the welder is not operating, no load input to the machine over the entire range has been reduced. Since welding machines actually weld only an average of 50% of the time they operate, the no-load losses are a major consideration in the all-day efficiency. Also, with no exciter it was possible to use a shorter shaft of uniform diameter throughout and with bearings closer together. This shorter shaft reduces vibration throughout the range of the machine.

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New Ways of Obtaining Corrosion-Resistant Surface

After more than four years of developing and testing the application possibilities of heretofore unknown metallic boron crystals, Colmonoy, Incorporated, of Los Nietos, Calif., announce two new methods of economically preparing metallic surfaces against the ravages of wear and corrosion.

One method, known as "sweat-on," is to mix the metallic boron crystals with sodium silicate (water glass) to form a stiff paste; then cover the surface to be processed to the desired thickness (normally, from one-sixteenth inch to one-eighth inch) and apply sufficient heat from an oxyacetylene torch, carbon arc or atomic hydrogen torch, to sink the crystals into the parent metal. This method produces a relatively level surface that is impregnated with diamond-hard, non-oxidizing, corrosion-resistant crystals, which retain their identity and do not fuse into a solid mass.

After such processing, the parent metal is free to expand or contract, be formed

Dam Construction . . . . . .

Yuma, Ariz.—Government—Imperial Dam and Desilting Works

Morrison-Knudsen Co., Inc., Utah Construction Company and Winston Bros., 1 Montgomery St., San Francisco, submitted low bid of $4,374,240 to Bureau of Reclamation, Federal Bldg., Yuma, Arizona, for construction of the Imperial Dam and desilting works, All-American Canal System, Boulder Canyon Project, Arizona-California-Nevada, under Spec. No. 644. Work is located on the Colorado River about 18 mi. northeast of Yuma, Arizona. Bids from:

(1) Morrison-Knudsen Co., Inc., Utah Const. & Winston Bros., S. F.....$4,374,240
(2) W. E. Callahan Co., L. A..... 4,526,961
(3) I. F. Shea Co., Earp..... 4,640,058
(4) Frazier-Davis & G. L. Tarlton.... 4,877,273
(5) Walsh-Atkinson, S. F.....$4,881,250
(6) L. E. Dixon & Company, Bent Bros. & Johnson, Inc..... 5,596,320
(7) Henry J. Kaiser, S. F..... 6,370,164

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
L. S., diversion & care of river	$100,000	$65,000	$100,000	$125,000	$100,000	$250,000	$100,000
10,000 cu. yd. exc. strip. borrow pits	.25	.24	.30	.15	.40	.20	.25
57,800 cu. yd. exc. rock for channels	2.00	1.00	1.25	1.75	1.00	1.60	1.50
330,000 cu. yd. exc. common for dam	.60	.35	.38	.50	1.00	.40	.60
2,500 cu. yd. exc. rock for dam	3.60	6.00	4.00	15.00	10.00	5.20	5.00
22,800 cu. yd. exc. & backf. sheet piling	.70	.71	2.00	1.00	1.50	2.10	3.00
4,500 cu. yd. exc. drain. trench	.60	.60	.75	1.00	1.50	1.00	3.00
155,000 cu. yd. excav. for rk. fills	.40	.26	.60	.30	.65	.45	.50
374,000 cu. yd. excav. com. for channels	.45	.35	.40	.50	1.00	1.00	.75
246,000 cu. yd. exc. rk. basins, etc.	1.10	.90	1.25	.50	1.00	1.30	1.35
12,300 cu. yd. exc. com. trench, etc.	.90	.72	1.00	1.00	1.50	.60	1.50
1,700 cu. yd. exc. rk. trenches, etc.	5.00	7.36	3.50	10.00	10.00	5.20	4.00
1,850 cu. yd. exc. com. trench, etc.	1.20	1.20	1.50	2.50	1.25	1.20	1.50
350 cu. yd. exc. rk. trenches, etc.	5.00	9.60	3.00	10.00	10.00	5.20	4.00
80,200 cu. yd. exc. com. sludge outl.	.35	.48	.80	1.00	.75	.75	.75
13,500 cu. yd. exc. rk. sludge, etc.	1.50	2.40	2.00	2.50	4.00	3.00	3.50
18,500 cu. yd. exc. & backf. below elev.	1.20	1.80	1.75	.90	1.50	1.75	3.00
30,300 cu. yd. exc. sludge pipe out	.40	.52	2.40	1.00	2.00	.60	.60
11,700 cu. yd. exc. com. cut-off trench	.60	.30	.40	.50	.50	.50	.60
1,000 cu. yd. exc. rk. same, etc.	3.00	4.80	2.00	6.00	6.00	3.00	3.00
13,000 cu. yd. exc. com. for roads	.50	.36	.40	.50	1.00	.50	.60
3,000 cu. yd. exc. rock for roads	1.00	1.80	1.25	1.00	1.50	1.50	1.25
1,000,000 cu. yd. exc. borrow pit embk.	.37	.32	.32	.50	.30	.40	.50
69,300 cu. yd. exc. in pit-run, etc.	.40	.37	.40	.30	.30	.35	.50
91,500 sq. yd. prepare earth founda.	.20	.18	.50	.15	.25	.15	.25
60,000 cu. yd. backfill	.30	.62	.40	.10	.45	.50	.55
10,000 cu. yd. puddling, tamp. backf.	.42	.68	.30	.30	.25	.80	.25
370 cu. yd. grav. backf. trenches	1.00	2.40	1.00	1.00	1.50	1.20	1.40
1,065,000 cu. yd. camopact. embank. & fills	.10	.084	.15	.04	.08	.10	.10
181,700 sq. yd. dry-rk. pav. 18" thick	2.30	2.20	2.20	2.50	2.05	2.00	3.50
850 sq. yd. dry-rk. pav. 12" thick	2.10	2.36	3.00	3.00	2.00	2.80	3.00
24,300 cu. yd. riprap	2.00	1.89	1.90	1.00	1.75	3.00	2.25
21,600 cu. yd. placed riprap	3.50	2.48	2.80	3.00	4.00	4.50	3.50
4,500 cu. yd. grav. fill drain. trench	1.40	1.14	1.50	3.00	2.00	2.50	2.90
23,000 cu. yd. grav. ballast in dam	.45	.62	.60	1.50	.50	2.00	1.00
430 cu. yd. grav. blanket under apr.	1.00	1.20	1.00	2.00	1.00	4.00	2.75
47,300 cu. yd. rockf. outside slopes	.70	.50	.60	1.00	1.25	2.50	1.40
9,000 cu. yd. grav. blankets emankm.	.40	.48	.50	.25	.50	1.75	1.00
1,000 cu. yd. grav. surf. on roads	1.20	.60	.50	1.00	1.25	3.00	1.50
1,710 M ft. BM fab. & dr. untr. timb.	60.00	64.80	45.00	20.00	50.00	80.00	$100
950 M ft. BM dr. tr. timb. sheet pl.	45.00	33.22	35.00	10.00	35.00	70.00	60.00
5,230,000 lb. dr. steel sheet piling	.012	.015	.015	.015	.02	.018	.025
182,500 lb. pl. stl. sheet p., conc., etc.	.012	.025	.015	.015	.02	.01	.02
13,300 lin. ft. dr. timb. foundation	.40	.36	.50	.35	.50	.65	.40
113,400 lin. ft. drive concr. piles	1.15	.96	.75	.70	1.00	.75	.70
1,600 lin. ft. drill. grout holes	1.00	1.50	1.00	1.00	2.00	.60	1.00
5,000 lb. install grout pipe & fittings	.10	.12	.10	.25	.15	.05	.08
400 cu. ft. pressure grouting	2.00	3.60	2.00	2.00	2.50	3.00	1.50
10,000 cu. ft. conc. in prec. conc. pls.	13.00	17.00	8.00	6.00	12.00	16.00	15.00
65,200 cu. yd. concr. in dam	8.00	11.00	9.25	12.00	11.00	12.00	15.00
22,600 cu. yd. conc. in upstream apron	5.25	4.50	5.50	9.00	8.00	6.00	9.00
32,200 cu. yd. conc. in downstream	4.00	4.50	4.75	9.00	6.00	6.00	8.10
300 cu. yd. conc. in pav. Ariz. dike	7.50	10.00	10.00	15.00	10.00	8.00	12.00
300 cu. yd. conc. in control houses	23.00	35.00	30.00	35.00	20.00	21.00	30.00
34,700 cu. yd. conc. in desilting wks.	11.00	13.10	10.50	15.00	9.00	17.00	19.00
300 sq. yd. pl. bonded conc. floor	1.75	1.80	1.00	2.00	1.00	1.50	1.35
18,255,000 lb. pl. reinforcement bars	.014	.02	.02	.015	.01	.015	.02
419,300 lb. pl. jt. pipe in prec. conc.	.02	.036	.02	.005	.05	.014	.05
740 piles weld. ext. to reinf. conc.	6.00	7.80	3.00	6.00	5.00	3.00	1.35
18,300 lin. ft. install. felx. jt-seals	.35	.60	.70	1.00	.75	1.00	.70
125 lin. ft. constr. exp. jts. bridge	1.20	.60	2.00	5.00	1.00	1.00	1.35
6,600 lin. ft. install metal water st.	.35	.24	.40	.20	.60	.50	.50
10,900 lin. ft. pl. master filler	.35	.30	1.25	.50	.75	1.25	.55
1,430 lin. ft. lay 12" clay pipe	.50	1.20	.50	.50	.60	.40	.40
870 lin. ft. constr. 4" clay pipe	.50	1.20	.60	.50	1.25	.50	.30
4,650 lin. ft. install timb. crests	.50	.36	1.00	1.00	.20	.25	.30
1,700 sq. ft. intall asph. felt roof	.30	.30	.25	.20	.10	.05	.40
750 sq. ft. inst. same with corkboard	.30	.30	.30	.20	.12	.10	.50
295,000 lb. erect. struc. stl. metal work	.015	.048	.025	.01	.015	.02	.015
84,000 lb. erect struc. stl. mant. bridge	.017	.048	.02	.01	.015	.02	.015
984,000 lb. install roller gates	.023	.024	.04	.03	.015	.02	.0275
200,000 lb. install roller-gate hoists	.025	.034	.02	.02	.015	.02	.0275
1,046,200 lb. install radial gates	.023	.026	.03	.03	.015	.02	.0275
123,500 lb. install radial gate hoists	.023	.06	.03	.02	.02	.02	.0275
503,000 lb. install trash-rack guides	.023	.012	.03	.03	.015	.02	.015
310,000 lb. same & steel gratings	.013	.024	.015	.01	.01	.015	.01
200,000 lb. install metal handrails	.07	.048	.08	.05	.04	.08	.09
1,026,000 lib. install revolv. scrapers	.027	.025	.025	.015	.015	.02	.02
1,028,000 lb. install revolv. scrap. drives	.027	.028	.022	.015	.01	.02	.02
353,000 lb. install metal linings	.023	.036	.02	.02	.02	.05	.025
1,400,000 lb. install metal pipe, fittings	.035	.044	.045	.02	.02	.03	.04
25,000 lb. install sluiceway step	.035	.024	.03	.03	.10	.02	.02
38,300 lb. install track rails	.015	.036	.07	.01	.03	.02	.02
12,500 lb. install travl. etc. crane	.03	.15	.08	.01	.05	.025	.03
1,500 lb. install sump pumps, etc.	.12	.15	.50	.05	.20	.08	.07
900 sq. ft. install metal windows	.50	.60	1.00	.10	.25	.30	.55
230 sq. ft. install metal roll doors	.50	1.20	1.00	.30	.50	.60	.55
270 sq. ft. install metal swing doors	.50	1.20	1.00	.30	.50	.50	.55
17,000 lb. install misc. metalwork	.08	.12	.15	.06	.10	.05	.10
100 lb. install plumbg. fixtures	.60	3.60	1.00	1.00	.50	1.00	.30
23,500 lin. ft. inst. elec. cond. 1½"	.15	.25	.40	.20	.15	.15	.30
47,800 lin. ft. same, 1½"	.20	.25	.50	.40	.20	.20	.40
7,700 lin. ft. lay 4-way clay conduit	.35	.25	.50	.20	.20	.20	.40
5,800 lin. ft. lay 6-way same	.45	.25	.60	.20	.25	.25	.55
10,000 lin. ft. lay parkway cable	.20	.20	.40	.10	.25	.10	.55
30,000 lb. install elec. conductor, etc.	.08	.20	.40	.20	.25	.10	.20
12,000 lb. install auxiliary generator	.08	.05	.10	.10	.05	.07	.05
60,000 lb. install elec. apparatus	.08	.12	.15	.20	.10	.12	.05

12-yard Carryall hauling down a steep grade onto the fill at Calero Dam.

ON THE DAMS AT SAN JOSE . . . 75 LeTOURNEAU UNITS

Calero, Stevens Creek, Coyote, Almaden, Guadalupe—on every one of these dams in the Santa Clara Valley Water Conservation District of California, LE TOURNEAU equipment has helped contractors move more yardage quicker at lower cost. There, nearly 3,000,000 cubic yards were required for fill. LE TOURNEAU equipment handled the bulk of it.

The contractors on these dams chose LE TOURNEAU equipment because they knew its low-cost performance would bring them profits. Typical of the performance there are these figures from Stevens Creek Dam—

750 Feet—79 Yards per Hour

Average time for seven 12-yard CARRYALLS hauling rooted material from a borrow pit on a 750-foot one-way haul was 6.08 minutes per round trip. At eight pay yards per load, that's seventy-nine cubic yards per hour.

Ask our Engineering Department what LE TOURNEAU equipment can do on your job.

R. G. LeTOURNEAU, Inc.

Stockton, California Peoria, Illinois

Cable Address: *"Bobletorno"*

MANUFACTURERS OF:

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

LETOURNEAU

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

or forged, without disturbing the wear-resistant, corrosion-resistant overlay.

The second method, advised for use where it is necessary to have a very smooth or ground and polished surface, is designated as the Colmonoy "cast-on" process. In this process, these same metallic boron crystals are held in a matrix of nickel alloy, which has a lower melting point than steel (approximately 2,000 degrees Fahrenheit), facilitating easy melting and pouring to fill any desired space between a copper or cast-iron mould and the metal to be processed. This cast-on overlay fuses to the parent metal sufficiently to form 100% bond, has a hardness of from 58 to 60 on the Rockwell "C" scale, and is not readily attacked by alkalis or acids. Its resistance to abrasion is quite phenomenal since the metallic boron crystals do not lose their identity in the alloy, but remain firmly held in the alloy matrix to function in accordance with their remarkable properties.

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Northwest Distributor for Chicago Pneumatic

Chicago Pneumatic Tool Company recently moved their Seattle office from 1028 Sixth Avenue South to 1928 First Avenue South. This office for which E. J. Hegre is district manager, covers all of the Northwest territory, including Washington, Oregon, Northern Idaho, and Western Montana.

Recently Union Iron Works of Spokane, Wash., was appointed distributor for Chicago Pneumatic Tool Company for the Inland Empire Territory embracing Eastern Washington and Northern Idaho.

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Sawtooth Company Established

The Sawtooth Company, located at 710 Front Street, Boise, Idaho, was established recently to serve the construction industry. This firm is distributor for the following lines: Broderick & Bascom Rope Company, wire rope; Worthington Pump & Machinery Company, pumps and Diesel engines; Goodyear Tire & Rubber Company, mechanical rubber goods; Gardner-Denver Company, air tools, drills and compressors; The Noro Company, gasoline engines and hoists; W. S. Tyler Company, screens; D. J. Murray Manufacturing Company, the Adjax road machine; and General Electric Company.

Personnel of this new firm include: A. H. Burroughs, Jr., president; S. Bocking, secretary-treasurer; R. S. McBeth, formerly with Ingersoll-Rand and Worthington Pump & Machinery Company, vice-president and general manager; J. E. Parsons, mechanical and construction engineer.

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White Announces New Truck Models

A new series of trucks—including the first truck to be completely streamlined—was announced by the White Motor Co. The new streamlined model was styled exclusively for White by Count Alexis de

Irrigation and Reclamation . .

Yuma, Ariz.—Government—Earthwork—All-American Canal

George Pollock Co., Forum Bldg., Sacramento, $71,407, SCH. 1, and $629,580, SCH. 2, low to Bureau of Reclamation, Yuma, Ariz., for constructing 5 miles of earthwork of the All-American Canal, from Imperial Dam to the Callahan Construction Co. Schedule, under Spec. No. 647. Bids on:

SCHED. 1.—Sta. 150 to Sta. 154

(1) 931,000 cu. yd. com. canal excavation

SCHED. 2.—Sta. 144 to Sta. 245

(2) 141,000 cu. yd. com. canal excavation

(3) 542,000 cu. yd. rock excav. (canal)

(4) 97,000 cu. yd. stripping (embankment)

SCHED. 2—(Continued)

(5) 25,000 cu. yd. excav. (cutoff trench)

(6) 691,000 cu. yd. compact embankment

(7) 8,000,000 sta. yd. haul & plc. rockfill

(8) 17,400 cu. yd. gravel blanket

(9) 1,440 M ft. b. m. timb. sheet piling

	(1)	Totals	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Totals
Geo. Pollock Co., Sacramento	.0767	$71,407	.15	.40	.20	.20	.37	.005	.80	$40	$628,580
Boyce & Igo, Baton Rouge, La.	.0847	$78,855	.12	.55	.12	.12	.345	.005	.32	$50	$685,647
Lewis Const. Co., L. A.			.22	.51	.18	.60	.28	.008	.80	$27	$650,300
Mittry Bros. Const. Co., L. A.	.16	$148,960	.15	.48	.15	.18	.38	.005	.51	$20	$640,650
Jahn & Bressi, L. A.			.215	.61	.15	.20	.335	.004	.75	$20	$685,860
Macco Const. Co., Clearwater	.11	$102,410	.20	.50	.12	.16	.40	.002	.38	$50	$685,884
David H. Ryan, San Diego	.08	$74,480	.18	.55	.18	.18	.365	.0065	.38	$25	$692,303
Rohl-Connolly Co., L. A.			.45	.45	.18	.25	.35	.005	.50	$50	$693,660
Isbell Const. Co., Reno			.15	.58	.25	.25	.35	.003	.80	$44	$709,190
Martin Wunderlich Co.	.10	$93,100	.10	.65	.10	.10	.40	.002	.20	$40	$732,100
Griffith Co., L. A.	.0985	$91,703	.25	.50	.30	.30	.458	.007	.35	$50	$793,478
Hartwick & Horton	.075	$69,825	.15	.67	.12	.26	.43	.004	.95	$35	$798,542
Geo. W. Condon, Dallas Tex.	.115	$107,065	.14	.595	.14	.14	.35	.009	.50	$51	$755,328
Mark C. Walker & Sons Co.	.1074	$99,989									
Morrison-Knudsen & Winston Br.	.13	$121,030	.17	.69	.17	.24	.39	.005	.50	$50	$810,678
Paul J. Tyler, Oroville	.11	$102,410	.19	.55	.24	.50	.48	.006	.39	$50	$831,196
Guy F. Atkinson Co., S. F.			.22	.82	.25	.75	.30	.005	$1	$50	$855,310
V. R. Dennis Const., San Diego	.099	$92,169	.18	.64	.08	.08	.55	.005	.50	$40	$868,386
Callahan Const. Co., L. A.	.08	$74,480	.15	.54	.18	.18	.48	.009	.48	$33	$869,858
S. J. Groves & Sons, Minneapolis			.30	.68	.30	.30	.48	.01	.70	$35	$921,780

STIPULATIONS—Hardwick & Horton, all or none. George W. Condon, Griffith Co., Paul J. Tyler, David H. Ryan, Macco Const. Co., will not accept one without two, but will take Sched. No. 2 alone. V. R. Dennis Const. Co., will accept Sched. No. 1 or No. 2, if awarded Scheds. 1 & 2, deduct .005 unit price, item No. 1, Sched. 1. Boyce & Igo, will accept Sched. 1 alone, but not Sched. 2 alone. Will accept Sched. 1 & 2 together.

Street and Road Work. . . . . .

Sacramento, Calif.—State—Grading and Concrete Paving—Solano and Napa Counties

Contract awarded to Hanrahan Wilcox Corp., Hobart Bldg., S. F., $434,428, by Calif. Div. of Highways, Sacramento, for 11.2 mi. grading & concr. paving betw. 1 mi. north of Carquinez Bridge and Cordelia in SOLANO AND NAPA COUNTIES, Calif. Bids from:

(1) Hanrahan Wilcox Corp., S. F. $434,428

(2) Fredrickson & Wat. and Fredrick. Bros. and Jones & King 439,686

(3) N. M. Ball Son & Bodenhamer Co. 445,707

(4) A. J. Rasich & A. G. Rasich, S. F. ... 460,341

(5) Peninsula Paving Co., S. F. $461,556

(6) Basich Bros., Torrance 461,804

(7) A. Teichert & Son, Sacramento 466,919

(8) Union Paving Co., S. F. 472,338

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2,350	M gallons water	.40	1.50	1.00	1.00	1.00	.35	1.25	.80
69,500	cu. yd. roadw. exc.	.20	.20	.30	.23	.23	.20	.22	.25
1,335	cu. yd. ditch excavation	.35	.70	.90	.75	.60	.25	.80	1.00
4,200	cu. yd. struc. excavation	.80	1.00	.90	.85	.70	.90	.90	1.00
520,000	sta. yd. overhaul	.01	.005	.005	.003	.005	.01	.0025	.005
47	sta. rework embk. surface	39.00	50.00	50.00	$100	55.00	50.00	75.00	50.00
10.3	mi. prepare roadway	$470	$125	$200	$200	$300	$600	$300	$500
9	cu. yd. remove concrete	6.00	5.00	5.00	7.00	5.00	2.00	10.00	10.00
285	tons liq. asph. SC-1A rdb. seal.	9.90	8.50	10.00	10.00	10.00	9.00	11.00	12.00
455	tons asph. cem. Gr. "E" rdb. seal	15.90	16.00	16.00	16.00	16.00	15.00	18.00	20.00
143,000	cu. yd. selected material	.70	.76	.72	.85	.80	.89	.79	.80
142,500	sq. yd. prep. subgr. for pavem.	.06	.07	.09	.04	.06	.08	.08	.07
590	sta. finish roadway	5.00	10.00	5.00	4.00	5.00	8.00	5.00	6.50
353	cu. yd. salv. surf. base	1.40	.80	.60	.80	1.10	1.00	1.00	1.00
1,800	tons crusher run base	2.45	2.30	2.60	2.00	2.50	2.00	2.20	3.00
4	tons liq. asph. MC-2 (pr. ct.)	20.00	18.00	20.00	18.90	23.00	18.00	30.00	20.00
540	tons min. aggr. pl. mix surf.	3.40	4.25	4.50	5.00	5.00	3.90	4.20	5.60
19	tons liq. asph. ROMC 4 or 5	20.00	18.00	17.00	16.00	15.00	18.00	20.00	20.00
3	tons liq. asph. MC3 (seal coat)	20.00	18.00	20.00	18.90	23.00	18.00	30.00	20.00
25	tons screen. seal ct (pl. mix)	2.50	3.20	3.00	3.00	3.50	2.70	4.00	3.00
405	tons liq. asph. ROMC 3 or 4	16.40	15.50	17.00	16.60	16.00	16.00	18.00	20.00
49,200	sq. yd. prep. mix & shp. shlr. or rdb.	.05	.05	.05	.04	.05	.05	.05	.06
192	tons liq. asph. SC2 (penetr. tr).	10.90	9.35	11.50	11.00	10.00	10.00	14.50	13.50
27,620	cu. yd. "B" concr. pavement	7.80	7.50	7.65	8.00	8.36	7.64	8.15	8.00
70	cu. yd. "A" concr. (struc.)	20.00	24.00	20.00	20.00	16.00	23.00	22.50	18.00
145	cu.yd."A" concr. (ditch lining)	15.00	16.00	15.00	20.00	17.00	13.00	20.00	16.50
183,000	lb. bar reinf. steel	.0567	.06	.0575	.06	.04	.065	.06	.05
57,708	ea. pavement dowels	.15	.16	.12	.16	.17	.16	.15	.16
2,300	ea. pav. tie bolt assemblies	.45	.40	.50	.45	.41	.40	.40	.50
1,070	cu. yr. light riprap	2.65	4.00	4.00	5.00	3.25	1.90	4.25	4.00
914	ft. 8" corr. metal pipe	1.10	1.00	.90	.80	.75	.90	1.00	1.20
378	ft. 12" corr. metal pipe	1.40	1.25	1.10	1.15	1.00	1.20	1.25	1.50
546	ft. 18" corr. metal pipe	1.85	1.65	1.75	1.66	1.50	1.60	2.00	2.25
52	ft. 24" corr. metal pipe	2.65	2.55	2.50	2.60	2.25	2.40	3.00	3.00
76	ft. 36" corr. metal pipe	5.20	4.85	4.40	5.20	4.00	4.63	5.00	5.50
106	ft. 48" corr. metal pipe	7.15	6.70	6.50	7.00	6.00	6.45	7.00	8.50
118	ft. 54" corr. metal pipe	8.25	8.00	8.50	7.70	7.00	8.15	8.00	9.50
10,400	ft. 8" perf. met. pipe underdr.	.90	1.00	.80	.75	.80	.90	.90	1.00
1,795	cy. rockfill matl. underdrains	2.72	2.60	2.85	2.80	3.00	2.30	2.75	3.10
16	8" spillway assemblies	12.09	13.80	15.00	12.00	12.00	13.10	15.00	20.00
4	12" spillway assemblies	16.35	16.00	20.00	17.00	15.00	16.92	20.00	25.00
1,609	ft. clean & relay cor. met. pipe	.40	.52	.50	.50	.40	.50	.50	.80
10	cu. yd. A conc. (curbs & sidew.)	17.00	17.25	15.00	15.00	15.00	18.00	20.00	15.00
1,067	ft. rem. & reset guardrailing	.40	.50	.60	.45	.50	.50	.50	.50
0.8	mi. rem. & reset fences	$300	$225	$300	$250	$225	$250	$300	$300
5	ea. drive gates	15.00	16.50	20.00	15.00	20.00	15.00	20.00	15.00
1	Type A10 dbl. traf. lane dev.	178.90	$125	50.00	50.00	90.00	50.00	$125	$100
7	Type B10 dbl. traf. lane dev.	73.80	55.00	75.00	50.00	65.00	50.00	$100	$100
4	Type C single traf. lane dev.	41.00	18.50	40.00	20.00	50.00	31.00	$100	50.00
14	ea. monuments	1.50	3.00	3.00	2.00	2.50	3.00	3.00	2.00

Sakhnoffsky, internationally famed industrial stylist and winner of the Grand Prix in Paris six years straight.

Prediction that manufacture of the new model, the White 704, would double production at the White plant in Cleveland during the four months of the fall period was made by R. F. Black, company president. Production of the new model will amount to approximately 15,000 to 20,000 units next year, Black said.

Count Sakhnoffsky, who styled both the chassis and body, said about the revolutionary truck design:

"Never before has a manufacturer spent money on a truck or bodies designed and styled from the ground up without making compromises in using previous stampings or front ends, and it is a tribute to the courage of the White Motor Co. to have given free hand to an artist in letting him style the outside appearance without any restrictions in interchangeability or such, but with only one limitation—utility to be primarily considered. Such is the product which now is being presented to the public."

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Gasoline Engine Starters For Diesels

For certain Diesel applications a gasoline engine has some advantages for starting the Diesel engine. The Hercules Motors Corporation, Canton, Ohio, have developed and now offer such a starting unit on both the DHXB six-cylinder 5 x 6 in., and the DRXB six-cylinder 4⅜ x 5¼-in. Diesel engines and power units.

The gasoline engine used is the Hercules "Model ZXB," a four-cylinder 2⅝ x 3 in. This gasoline engine is equipped with magneto, air cleaner, governor and other accessories, including a small gasoline tank, ready for instant operation. The controls, switch, choke, crank and throttle are all located on the front of the engine, which is on the right side of the Diesel, looking at the flywheel end where they are easily accessible for starting and operating.

This gasoline engine cranks the Diesel engine by a pinion on the usual flywheel ring gear. The gasoline engine drives the pinion by "V" belts, a flexible yet positive drive. A clutch disengages the gasoline engine from the V-belt drive to facilitate starting.

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Tu-Ton Roller

The C. H. & E. Tu-Ton Roller has been developed for use in rolling sidewalks along highways, playgrounds, and various other types of light rolling work in conjunction with public works program which is now starting. The machine is also very handy for light patching work on roads and streets.

The C. H. & E. Roller is simple, and therefore, is economical in operation and also long lived due to the fact that there are no complicated parts to cause trouble. A bulletin fully describing this roller will be sent free on request to C. H. & E. Manufacturing Company, Incorporated, 120 East Mineral Street, Milwaukee Wis.

Sacramento, Calif.—State—Grading and Concrete Paving and Bridge—Los Angeles and Kern Counties

Contract awarded to Griffith Company, L. A. Railway Building, Los Angeles, $342,975, by Calif. Div. of Highways, Sacramento, for 5.5 mi. grading & concrete paving & const. reinf. concrete bridge between ¼ mi. south of Kern County line and Fort Tejon in LOS ANGELES AND KERN COUNTIES, Calif. Bids from:

(1) Griffith Co., Los Angeles.....$342,975
(2) Granfield, Farrar & Carlin & N. M. Ball Sons, S. F. & Berk..... 368,451
(3) Southern Calif. Roads Co., L. A.....$380,580
(4) Gibbons & Reed, Burbank..... 382,264
(5) Basich Bros., Torrance..... 396,517

		(1)	(2)	(3)	(4)	(5)
L. S.	clearing & grubbing	$8,000	$3,000	$5,000	$4,000	$10,000
9,300	M gallons water	.60	1.00	1.00	.90	1.00
198,000	cy. rdw. exc.	.22	.28	.25	.30	.24
6,250	cy. struc. exc.	.75	1.10	.85	1.00	1.25
1,250	cy. ditch exc.	.75	1.10	.75	.27	.30
160	sta. grader ditch	1.00	6.00	.90	2.00	10.00
53,400	cy. impor. borrow	.45	.50	.42	.45	.40
4,426,000	sta. yd. overhaul	.003	.003	.005	.004	.004
13,500	cy. remov. top soil	.20	.35	.15	.35	.25
97,000	sq. y. prep. subgrade	.09	.09	.09	.10	.09
300	sta. finish roadway	7.00	7.00	10.00	5.00	10.00
4,400	tons min. aggr. (rd. mix. surf.)	1.60	2.55	2.00	2.00	3.00
17	tons liq. asph. SC2 (prime ct)	12.00	12.00	11.00	12.00	20.00
815	tons liq. asph. SC4 (rdm. surf.)	14.00	14.50	15.00	15.50	22.00
65,000	sq. y. prep. mix & shp. shldr., etc.	.06	.08	.06	.05	.06
19,025	cy. B conc. (pavement)	6.96	7.30	8.05	7.75	8.50
222,500	lb. reinc. steel (pav. & struc.)	.05	.05	.05	.052	.05
39,450	ea. pavement dowels	.12	.11	.11	.13	.10
1,135	cy. A concr. (struc.)	22.00	17.00	20.00	24.00	17.00
775	lb. bronze expans. plates	.25	.30	.21	.33	.12
60	cy. light riprap	3.50	2.50	4.00	4.00	5.00
95	cy. B conc. (slope pav.)	14.00	10.00	20.00	12.00	16.00
970	ft. 8" cor. met. pipe	1.00	1.15	.90	1.00	1.40
128	ft. 12" cor. met. pipe	1.50	1.50	1.30	1.20	1.80
2,542	ft. 24" cor. met. pipe	3.00	2.75	2.50	2.40	2.50
540	ft. 24" cor. met. pipe, 12 ga.	3.00	3.35	3.00	3.00	2.75
494	ft. 30" cor. met. pipe	3.00	4.00	3.20	3.15	3.00
86	ft. 30" cor. met. pipe, 12 ga.	4.00	4.15	3.70	3.90	3.25
82	ft. 36" cor. met. pipe	5.00	5.25	6.00	5.00	3.50
300	ft. 72" cor. met. pipe	12.00	14.00	13.00	13.50	10.00
1,582	ft. 8" perf. met. pipe underdr.	1.00	.90	1.10	.80	1.50
300	cy. rock filling matl.	3.00	2.00	4.00	2.00	2.00
115	ea. embankm. protectors	12.00	15.00	15.00	12.00	13.00
900	ft. lam. guardrailing	1.25	1.00	1.10	.90	1.25
312	ft. timb. railing (bridge)	1.50	1.50	2.00	1.50	1.30
550	ea. guide posts	1.50	2.00	2.10	1.25	2.50
60	ea. culvert markers	1.50	2.00	2.00	1.25	2.00
3.5	mi. std. property fences	400.00	450.00	500.00	400.00	400.00
6.5	mi. Type A property fence	500.00	600.00	650.00	450.00	600.00
30	ea. drive gates	15.00	20.00	20.00	15.00	15.00
1.8	mi. property fence, remov.	100.00	100.00	70.00	100.00	300.00
75	ea. monuments	2.50	3.00	3.50	2.50	3.00
360	cy. conc. pav. & str. remov.	1.50	1.50	3.00	2.80	4.50
1	ea. cast stl. frame & grate	30.00	50.00	40.00	36.00	50.00
5	sec. Type A-20 pav. cross. dev.	75.00	75.00	100.00	90.00	60.00
6	sec. B-10 pav. cross. devices	30.00	100.00	50.00	30.00	50.00
25	tons cutb. asph. (slope tr.)	35.00	24.00	40.00	25.00	25.00
1	lot misc. work	$1,600	500.00	600.00	100.00	$1,000

Bridges and Culverts . . . . . .

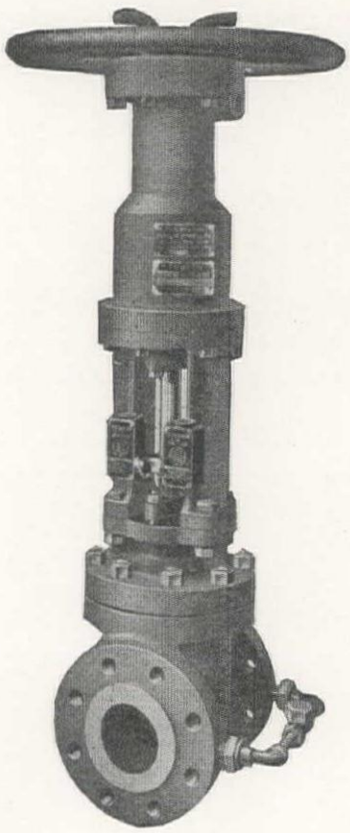
Sacramento, Calif.—State—Overhead Crossing—San Joaquin County

Lindgren & Swinerton, 225 Bush St., S. F., $223,255 low to Calif. Div. of Highw., Sacramento, for overh. crossing over S. P. RR. tracks ½ mi. E. of Tracy, consist. of 1 81' and 2 48' plate girder spans, 2 52' steel beam spans and 29 40' reinf. conc. girder spans on conc. bents & abutm. with wingwalls on timb. pile founda. and 0.3 mi, grad. & conc. pav. in SAN JOAQUIN COUNTY, Calif. Bids from:

(1) Lindgren & Swinerton, S. F.....$223,255
(2) F. O. Bennett, Campbell..... 225,373
(3) Bodenhamer Const. Co., Oak..... 225,638
(4) Rocca & Co., San Rafael..... 225,955
(5) MacDonald & Kahn Co., Ltd., S. F. 239,876
(6) Union Paving Co., S. F.....$241,520
(7) Paul J. Tyler & Lord & Bishop..... 245,692
(8) M. B. McGowan & C. W. Caletti.... 249,538
(9) Healy Tibbitts Const. Co., S. F..... 252,123

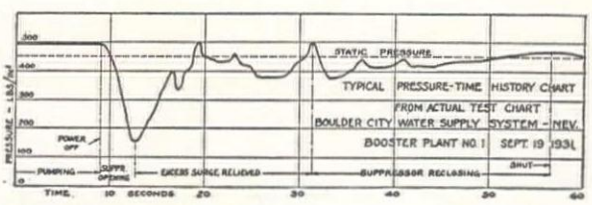
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
630	M gallons water	1.70	1.50	1.00	1.50	2.60	1.00	1.25	2.00	1.00
1,750	cu. yd. roadway excav.	.40	.75	.50	.30	.52	.30	.50	1.00	.80
3,500	cu. yd. struc. excav.	2.60	1.10	1.50	.80	1.30	1.15	.75	2.00	2.50
18,000	cu. yd. imported borrow	.62	.65	.60	.54	.84	.50	.75	.90	1.00
405	cu. yd. salv. surfacing	1.70	1.00	.60	.75	2.60	1.20	2.50	1.00	5.00
216	cu. yd. remov. concr.	7.00	3.00	3.00	1.50	3.90	4.00	3.00	3.00	8.00
3,300	sq. yd. subgrade pavem.	.11	.12	.10	.20	.12	.10	.20	.12	.15
31	sta. finish roadway	8.00	10.00	10.00	7.00	6.50	15.00	10.00	12.00	10.00
2,500	tons untr. cr. gr. or stone	1.40	2.00	1.20	1.00	1.30	1.60	2.00	1.80	2.00
1,420	tons min. aggr. pl. mix	5.20	3.50	3.00	5.06	4.30	3.25	4.00	4.00	3.00
71	tons liq. asph. MC 4 or 5	$20	15.00	20.00	10.00	20.00	17.50	20.00	15.00	20.00
16	tons liq. asph. MC2 (prim. ct.)	23.00	25.00	20.00	25.00	27.00	20.00	20.00	15.00	22.00
7	tons liq. asph. MC3 (seal ct.)	23.00	35.00	20.00	25.00	28.00	20.00	20.00	15.00	22.00
64	tons stone screen (seal ct.)	2.20	3.50	2.50	3.00	4.00	1.80	3.00	3.00	3.00
635	cu. yd. "A" conc. pav.	10.00	9.00	9.50	10.63	10.75	8.50	11.00	10.00	10.00
5,100	cu. yd. "A" conc. struc.	17.00	16.50	18.00	18.00	18.58	18.50	21.50	20.00	21.50
122	cu. yd. "A" conc. railing	44.00	50.00	45.00	80.00	45.00	45.00	50.00	30.00	40.00
868	ea. pavement dowels	.30	.40	.16	.28	.31	.35	.35	.20	.25
840,000	lb. reinf. steel	.04	.047	.045	.044	.0517	.06	.044	.05	.045
448	ea. pav. tie boltassemb.	.32	.50	.45	.50	.65	.50	.60	.20	.50
350,000	lb. struc. steel	.065	.07	.06	.0675	.064	.073	.065	.06	.06
28,000	lb. cast steel	.14	.15	.15	.14	.19	.14	.12	.15	.12
1	cast stl. frame & cover	$110	$100	20.00	80.00	$130	85.00	$100	$100	50.00
27,500	ft. fur. tr. D. F. Piles & T. P.	.52	.55	.60	.50	.45	.60	.55	.50	.40
684	ea. drive D. F. Piles & T. P.	11.00	15.00	15.00	10.00	14.00	12.00	12.00	20.00	15.00
104	ft. 36" reinf. conc. pipe	9.00	10.00	10.00	6.22	7.00	6.50	5.50	5.00	6.00
64	ft. 48" reinf. conc. pipe	12.00	15.00	16.00	8.63	10.30	9.20	7.50	10.00	10.00
28	ft. 12" reinf. conc. pipe	2.00	2.25	2.80	2.68	2.00	2.00	1.75	2.00	3.00
1	reinf. conc. pipe elbow, 12"	$11	10.00	5.00	6.00	20.00	6.00	5.00	3.00	15.00
86	guide posts	2.00	1.50	1.50	1.50	3.25	1.75	.75	2.00	3.00
0.53	mi. new fence	$500	$600	$600	$400	$800	$400	$500	$500	$500
4	drive gates	24.00	20.00	20.00	16.00	20.00	12.50	15.00	25.00	20.00
667	sq. yd. asph. paint binder	.04	.05	.10	.05	.06	.05	.25	.20	.10
16	monuments	3.50	3.00	3.00	3.00	4.00	2.50	2.50	5.00	4.00
1	12" Alfalfa valve	27.00	20.00	20.00	80.00	16.00	12.00	10.00	20.00	20.00
1	lot miscell. work	$2,000	$1,000	$1,000	$3,500	$275	$2,000	$1,000	$732	$500

Pelton Automatic Control Valves Installed in Arizona for 3,153 ft. Static Head

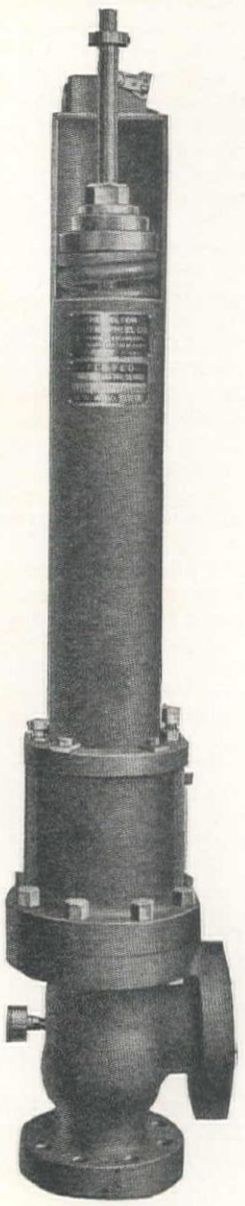


Automatic differential Hydraulic Cylinder-operated gate valve, arranged for auxiliary hand operation.

Grand Canyon Development of A. T. & S. F. Ry. is a Model Example of High Head Automatic Valve Engineering



Pressure-time curve for a Pelton Surge Suppressor similar in design, and for service comparable to that required for the Indian Gardens pumping plant.



Pelton Angle Type Surge Suppressor

WATER for the various requirements of the Atchison, Topeka & Santa Fe Railway at Grand Canyon, Arizona, is taken from the Indian Gardens Springs and pumped against a static head of 3,153 feet. These conditions, under which 75 g. p. m. must be delivered, impose most exacting requirements upon the automatic pressure control valves to assure uninterrupted service and afford full protection to the pumps, motors and other equipment installed.

The complete plan for handling this water from the pumps and providing the necessary safeguards was furnished by Pelton engineers, the valves and auxiliaries being built in our San Francisco works. The plant is completely automatic and arranged for remote control, operation of which has been most satisfactory since the plant was placed in service.

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*

Portable Central Batching Plant

The Portable Station Batch conveyor is a simple portable conveyor rig that operates as a central batching station, developed by the Stephenson-Adamson Manufacturing Company of Los Angeles.

In serving of public works, concreting jobs, the source of supply of aggregate, cement or mixed concrete is sometimes a considerable distance from the work. If the job is being served by ready mix trucks, this means a long haul with expensive equipment. Due to the time that these ready mix trucks are on the road between the source of supply and the point where they are delivering, it means that the company serving the job must have a large number of ready mix trucks. It also means that the cost of supplying the job is increased greatly, not only because of the greater amount of equipment needed, but because of the cost of operating ready mix trucks over long distances.

This conveyor is set up at a convenient place near the job, and the aggregate, already weighed, and the cement in truck and trailer, is hauled to this portable station conveyor, the aggregate being handled in ordinary dump trucks. Due to the fact that the operator only has a short haul from this set-up station to the job, he can use one or two ready mix trucks, where it might have been necessary to use fifteen or twenty.

The Portable Station Batch Conveyor is equipped for road travel, and is arranged so that it can be set up quickly after arriving at the desired site. Hinged platforms are raised on each side of the conveyor that hold a truck and trailer load of bagged cement, a water connection is made and the machine equipped with gasoline power, is ready to run. Cement is brought in and stored on the platforms. The sight gauge water tank is filled with the correct amount of water for one mix, and the batch dump-trucks start dumping into the hopper at the tail-end of the machine.

The machine serves equally well in case of a contractor using a stationary batch mixer. In that case, large ramps that are generally used in order to get truck height for dumping are eliminated. No pit is needed for skip bucket operation in order to get below the mixer discharge. No elevators, bunkers, etc., are needed in order to serve the mixers with the aggregate batch.

Stephenson-Adamson Mfg. Company, 2227 East Thirty-seventh Street, Los Angeles.

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New Wire Cloth Manual

The Audubon Wire Cloth Corp., Richmond St. and Castor Ave., Philadelphia, have recently issued a 56-page Catalog No. 40-23, covering their complete line, which includes illustrations, descriptions, specifications and list prices of their various products together with tables and useful information for selecting and specifying wire cloth.

Copies of this Catalog No. 40-23 may be obtained by writing the manufacturer direct.

Olympia, Wash.—State—Reinforced Concrete Viaduct and Approaches —King County

Contract awarded to Peter P. Gjarde, 430 Lyon Bldg., Seattle, $553,505, by Director of Highways, Olympia, Wn., for a reinf. conc. viaduct & conc. paving approaches on City St., 1st Ave., South overcrossing in Seattle, KING COUNTY, Wn., Proj. WPGM 225-A. Bids from:

(1) Peter P. Gjarde, Seattle.....$553,505
(2) C. L. Creelman, Seattle..... 556,090
(3) Sheble Const. Co., Seattle..... 564,928
(4) General Const. Co., Seattle..... 572,860
(5) Puget Sound Bridge & Dredg. Co...$576,462
(6) A. D. Belanger & Co., Everett..... 595,252
(7) MacRae Bros., Seattle..... 641,814
(8) Thos. Scalzo & Co., Seattle..... 643,548

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lump	Sum clear & grub	$6,000	$18,000	$5,000	$5,000	$7,500	$12,500	$20,000	$23,150
2,500	cu. yds. grading ry. track	1.00	.40	.50	.40	.25	1.00	.60	.50
2,100	cu. yds. earthwork	1.00	.40	.50	.40	.25	1.00	.50	1.00
5,500	cu. yds. struc. excavation	2.00	2.00	3.00	2.50	3.00	2.50	4.00	2.50
32,100	lin. ft. furn. piling (creosoted)	.49	.51	.50	.54	.60	.55	.55	.50
897	ea. driving piles (creosoted) in place	7.00	6.00	10.00	6.00	8.50	8.00	8.00	7.75
33,900	lin. ft. furn. piling (untr.)	.12	.125	.15	.12	.11	.13	.135	.12
1,270	ea. driving piles (untr.)	6.70	4.00	10.00	6.00	9.00	8.00	8.00	6.50
4,970	cu. yds. concrete "A"	14.50	14.00	15.00	16.00	15.00	20.00	16.00	17.00
5,080	cu. yds. concrete "B"	14.00	14.00	15.00	15.00	15.00	15.00	15.00	16.00
3,100	cu. yds. concrete "C"	12.00	12.00	15.00	11.00	12.00	11.00	15.00	14.00
834	M b. m. timber & lumber (creosoted)	58.00	61.50	60.00	62.00	60.00	60.00	67.60	57.50
102	M b. m. timber & lumber (treated)	57.00	48.00	45.00	54.00	60.00	55.00	65.00	51.00
54,000	lbs. galv. hardware	.10	.04	.10	.10	.10	.08	.10	.12
1,380,000	lbs. steel reinf.	.04	.04	.04	.04	.04	.04	.04	.041
2,442,000	lbs. struc. silicon steel	.052	.053	.05	.055	.053	.05	.062	.061
655,000	lbs. struc. carbon steel	.052	.053	.05	.055	.0493	.054	.05725	.061
201,000	lbs. dismantling & re-erect span	.02	.02	.01	.01	.012	.02	.015	.025
63,500	lbs. steel castings	.12	.10	.12	.14	.13	.13	.13	.12
5,592	lin. ft. copper-steel pipe in handrails	.75	.60	.40	.45	.40	.50	.50	.40
5,700	lbs. copper seals	.30	.30	.40	.40	.50	.35	.45	.35
600	lin. ft. 4" galv. steel pipe	1.00	1.50	.70	1.50	1.15	1.25	.75	1.00
6,800	lbs. galv. fastenings	.10	.12	.10	.15	.15	.10	.16	.10
4	ea. warning beacons	100.00	110.00	90.00	100.00	100.00	100.00	100.00	100.00
400	lin. ft. conduit with cable wiring	.50	.60	.50	.55	.60	.57	1.00	.60
16,960	lin. ft. traffic markers, 4" wide	.10	.10	.08	.15	.12	.20	.10	.20
2,800	lin. ft. untr. cedar poles	.40	.25	.20	.50	.50	.20	.40	.40
2,500	sq. yds. conc. pavement	2.00	2.20	1.50	2.00	1.75	2.20	2.00	2.75
1,354	cu. yds. stand. 14-day mix for tracks	9.00	8.00	6.00	8.00	11.00	9.00	9.50	16.00
960	lin. ft. 6" integral conc. curb	.35	.30	.30	.25	.35	.75	1.00	.30
1,450	ea. dowel bars without caps	.14	.16	.15	.14	.25	.15	.15	.18
450	ea. dowel bars with caps	.20	.25	.20	.20	.30	.20	.20	.25
1,000	lin. ft. 8" conc. or vitr. drain pipe	.45	.60	.40	.75	.70	.45	.75	.75

Los Angeles, Calif.—State—Grading and Concrete Paving— Ventura County

Contract awarded to Mittry Bros. Const. Co., 5531 Downey Rd., Los Angeles, $466,036, lowest regular bid to Calif. Div. of Highways, Los Angeles, for 4.8 mi. grad. and asph. concrete and concr. paving and placing mix. surf. betw. Newbury Park and Conejo Creek, VENTURA COUNTY. Bids from:

(1) Granfield Farrar & Carlin (Irreg.)..$463,719
(2) Mittry Bros., Los Angeles (Low).. 466,036
(3) J. E. Haddock, Pasadena..... 495,261
(4) Gibbons & Reed, Burbank..... 516,532
(5) Mundo Engr. & Sander Pearson.....$526,340
(6) Lewis Constr. Co., L. A..... 554,227
(7) Geo. Pollock, Sacramento..... 468,710

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
256	sta. clearing & grubbing	$18.00	$8.00	$20.00	$12.50	$15.00	$7.00	$50.00
13,000	M gals. water	.20	1.00	.90	.75	1.50	.80	1.00
770,000	cu. yd. roadway excav.	.365	.35	.39	.42	.40	.47	.48
1,700	cu. yd. imp. select material	.50	.50	.50	.55	.65	.50	.50
3,850	cu. yd. struc. excav.	1.25	1.50	2.00	1.35	2.00	1.20	1.00
3,200	cu. yd. ditch & channel excav.	.50	.60	.75	.60	1.00	.60	.50
5,300,000	sta. yd. overhaul	.004	.003	.005	.004	.005	.004	.005
70	tons liq. asph. 90-95	22.00	12.00	18.00	22.00	22.00	21.00	20.00
20	tons spec. asph. emuls. subgr.	33.00	25.00	40.00	40.00	30.00	35.00	26.00
1,600	sq. yd. prep. mix & shape roadb.	.07	.15	.15	.06	.05	.15	.15
37,000	sq. yd. subgr. for pavement	.08	.08	.12	.10	.12	.08	.15
256	sta. finish roadway	10.00	7.00	5.00	8.00	5.00	10.00	10.00
7,500	tons min. aggr. plant mix	2.85	2.50	2.35	2.90	3.50	3.00	2.60
400	tons liq. asph. MC5 or ext. hvy.	18.50	20.00	18.00	13.00	18.00	22.00	18.00
50	tons liq. asph. MC2 prime coat	24.00	19.00	23.00	25.00	20.00	24.00	20.00
35	tons liq. asph. MC3 seal coat	26.00	19.00	23.00	25.00	20.00	24.00	20.00
38,000	sq. yd. prep. mix & shape shldrs.	.05	.08	.09	.05	.06	.06	.05
40	tons liq. asph. SC2 prime coat	11.00	12.50	10.00	10.00	10.00	14.00	10.00
460	tons liq. asph. SC2 shoulders	10.00	12.50	10.00	10.00	10.00	14.00	10.00
40	tons, liq. asph. 90-95 seal coat	22.00	12.00	18.00	21.00	20.00	21.00	20.00
1,050	tons screenings, seal coat	2.10	3.00	3.00	2.00	3.50	2.75	2.50
4,800	sq. yd. asph. paint binder	.03	.02	.03	.03	.04	.05	.05
1,720	tons asph. conc. base & lev. crs.	3.75	3.50	3.00	3.50	4.15	3.50	4.00
900	tons asph. conc. Type "A" surf.	4.00	3.75	3.25	3.75	4.15	3.70	4.00
6,660	cu. yd. "A" conc. pavement	8.30	9.50	7.50	9.00	8.00	8.00	7.00
13,500	ea. pavement dowels	.14	.13	.12	.14	.20	.16	.15
63,800	lb. reinforcing steel	.06	.05	.06	.05	.05	.05	.07
420	cu. yd. "A" conc. structure	18.00	18.00	20.00	24.00	18.00	18.00	20.00
1,900	lin. ft. 8" corr. metal pipe	.90	1.10	.86	.85	1.00	1.00	1.00
3,080	lin. ft. 24" corr. metal pipe	2.32	3.10	2.40	2.40	2.40	2.50	2.25
180	lin. ft. 24" corr. metal pipe, 12 ga.	3.00	3.20	3.20	3.00	3.25	3.00	2.75
360	ft. 30" corr. metal pipe	3.20	3.75	3.10	3.00	3.00	3.60	3.00
60	ft. 36" corr. metal pipe	4.15	6.50	4.70	4.50	5.00	5.00	4.10
240	ft. 36" corr. metal pipe, 10 ga.	5.60	7.50	5.75	4.00	6.50	6.25	5.00
11	spillway assemblies	11.80	16.00	15.00	14.00	22.00	15.00	11.00
28	ea. corr. metal tapers	9.20	13.00	12.50	13.00	12.00	12.00	7.50
50	ft. clean & relay C. M. P.	1.00	4.00	1.00	.90	2.00	1.50	1.00
50	ft. clean & salv. C. M. P.	1.00	4.00	1.00	.60	1.00	1.00	1.00
110	lin. ft. laminated guardrail	1.10	2.00	1.00	.90	1.00	1.50	1.00
90	lin. ft. solid timb. wheel guard	1.25	2.00	2.00	1.00	1.00	1.50	2.00
45	culvert markers	2.00	2.10	2.00	1.50	3.00	3.00	2.00
810	guide posts	1.50	2.10	2.00	1.50	3.00	2.00	2.00
5.5	mi. new fence	$500	$550	$600	$450	$750	$450	$500
2.0	mi. move and reset fence	$300	$450	$400	$150	$300	$450	$400
20	drive gates	14.00	18.00	20.00	15.00	35.00	20.00	15.00
3,100	lb. miscell. iron and steel	.10	.06	.09	.15	.20	.16	.12
400	cu. yd. remove concrete	1.50	1.50	4.00	3.00	2.00	2.00	2.00
1	only remove bridge	$800	$200	$200	$400	$700	$500	$400

CONSTRUCTION

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

Large Western Projects . . . . .

WORK CONTEMPLATED

Repairs and additions to waterworks system for Sheridan, Wyo. Est. cost $793,500. Bids soon.

CALLS FOR BIDS

16.47 mi. precast conc. and steel pipelines for Metropolitan Water Dist., L. A., bids to January 7th.

Iron Mountain Pumping Plant for Metropolitan Water Dist., L. A., bids to January 14th.

Earthwork, canal lining and structures, Ogden-Brigham Canal for Bureau of Reclamation, bids to December 20th.

Overhead crossing over S. P. and L. A. Ry. tracks at Figueroa St., L. A., for Calif. Div. of Hgwys., bids to December 19th.

BIDS RECEIVED

Imperial Dam and Desilting Works on All American Canal for Bureau of Reclamation, Morrison-Knudsen Co., Utah Const. Co., and Winston Bros., S. F., $4,374,242, low.

5 mi. earthwork on All American Canal for Bureau of Reclamation, Geo. Pollock Co., Sacramento, $760,987, low.

Wash siphon structures on All American Canal for Bureau of Reclamation, Frazier-Davis Const. Co., St. Louis, $489,527, low.

Tunnels 3, 4, 5, and 6, on Casper-Alcova Proj. for Bureau of Reclamation, W. E. Callahan and Gunther & Shirley, L. A., $794,948, low.

Seminoe Dam and Power Plant, Casper-Alcova Proj. for Bureau of Reclamation, Morrison-Knudsen Co., Utah Const. Co., and Winston Bros., S. F., $2,819,460, low.

Overhead crossing over S. P. tracks at Tracy for Calif. Div. of Hgwys., Lindgren & Swinerton, S. F., $223,255, low.

Cement, 340,000 bbl. for Boulder Dam for Bureau of Reclamation, Riverside, Calif., and Southwestern Cement Co.'s, L. A., $679,800, low.

Steel and conc. overhead crossing over A. T. & S. F. Co. tracks at Wilmington for Calif. Div. of Hgwys., Sharp & Fellows Contr. Co., L. A., $202,941, low.

CONTRACTS AWARDED

4.8 mi. grad. and asph. conc. and conc. paving betw. Newberry Park and Conejo Creek for Calif. Div. of Hgwys. to Mittry Bros. Const. Co., L. A., $466,036.

Bridge and approaches over Monument Creek in Colorado Springs for Colorado Highway Dept. to M. E. Carlson, Denver, $145,214.

Reinf. conc. R. R. undercrossing on St. Road No. 1 for Director of Hgwys, Olympia, to C. L. Creelman, Seattle, $176,763.

Two 115,000 HP. 180 rpm verti-shaft hydr. turbines for Boulder Dam, for Bureau of Reclamation to Pelton Water Wheel Co., S. F., $551,000.

Two 82,500 kv-a, 180 rpm vertical-shaft alternating current generators for Boulder Dam by Bureau of Reclamation to General Electric Co., Schenectady, N. Y., $1,330,600.

Overhead crossing over S. P. Co. tracks near El Cerrito Hill by Calif. Div. of Hgwys. to J. F. Knapp, Oakland, $249,281.

5.5 mi. grad., conc. paving and bridge betw. ¼ mi. south of Kern County line and Ft. Tejon by Calif. Div. of Hgwys. to Griffith Co., L. A., $342,975.

Reinf. conc. T-beam bridges and approaches on St. Rd. No. 1, by Director of Hgwys., Olympia to Rumsey & Co., Seattle, $376,727.

Reinf. conc. viaduct and conc. pave. approaches on 1st Ave. So., Seattle, by Director of Hgwys., Olympia, to P. P. Gjarde, Seattle, $553,505.

10½ mi. grading and surf. on Ft. Huachuca-Bisbee Hgwy by Ariz. Hgwy. Comm. to Pleasant-Hasler Co., Phoenix, $187,873.

11.2 mi. grad. and concr. paving betw. 1 mi. north of Carquinez Bridge and Cordelia by Calif. Div. of Hgwys. to Hanrahan Wilcox Co., S. F., $434,428.

Moccasin Diversion works for San Francisco to MacDonald & Kahn Co., Ltd., S. F., $213,968.

Intake and Gene. Pumping Plant Bldgs. for Metropolitan Water Dist., L. A., to Winston Bros. and Wm. C. Crowell, L. A., $1,731,781.

Street and Road Work . . . . .

CALLS FOR BIDS

PHOENIX, ARIZ.—Bids to 10 A. M., December 17th, by Bureau of Public Roads, Phoenix, for 25.277 miles placing a bitum. tr. surf. on Sections A, B, C, D and E, of FLHP No. 2, the Kingman-Boulder Dam Highway, MOHAVE COUNTY, Ariz. Work involves: 5,319 tons cr. grav. for shoulders, 40,879 tons bitum. tr. cr. gravel, 861.5 M gallons water for a plant mixed surf. course ALTERNATE OR 23,016 tons cr. grav. for shoulders and base course, 38,954 tons cr. grav. surface course. 11-25

LOS ANGELES, CALIF.—Bids to 2 P. M., December 23rd, by County Board of Superv., Hall of Records, Los Angeles, for improvements to Long Beach Blvd., from north boundary of Southgate 0.59 mi. northerly to Florence Ave., involving: 28,500 sq. ft. 3" one course sidewalk. Work under Cash Contract No. 485. 11-30

LOS ANGELES, CALIF.—Bids to 2 P. M., December 19th, by Calif. Div. of Highways, Los Angeles, for 2.2 miles grading and a steel stringer bridge in San Gabriel Canyon, between Camp Bonita and Follows Camp (VII-L. A. San Gabriel Canyon Feeder Road) in LOS ANGELES COUNTY, Calif. Work involves: 171,500 cu. yd. roadway excavation, 107,000 lb. reinf. steel. 11-26

SACRAMENTO, CALIF.—Bids to 2 P. M., December 18th, by Calif. Div. of Highways, Sacramento, for 0.5 mi. grad., surf. with bitum. macad. on crusher run base and const. two bridges through the town of Ben Lomond, SANTA CRUZ COUNTY, involving: 3,000 cy. excav., 2,200 tons cr. run base, 56,000 lb. reinf. steel, 250,000 lb. struc. steel and other items. 11-26

NEWS SUMMARY

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

SACRAMENTO, CALIF.—Bids to 2 P. M., December 18th, by Calif. Div. of Highways, Sacramento, for 14.5 mi. grad. bet. Longvale and Dos Rios in MENDOCINO COUNTY, involving: 325,000 cu. yd. roadway excavation and other items. 11-26

OLYMPIA, WN.—Bids to 10 A. M., December 17th, by Director of Highways, Olympia, Wn., for: (1) ASOTIN CO. (WPH 124-B)—0.9 mi. grad. and surf. with cr. stone on St. Rd. No. 3, Clarkston West, Sec. 1, involving: 41,030 cu. yd. excavation and other items. (2) PACIFIC CO. (WPMH 187-C)—0.3 mi. const. bitum. macadam Class D penetration type on St. Rd. No. 13, City of Raymond, involving: 1,130 cu. yd. cr. stone surf. and mineral aggregates (oil rock) and other items. (3) JEFFERSON CO. (WPSO 243-A)—1.0 mi. grad. and surf. with cr. stone on County Road, Quilcene Vicinity, involving: 16,320 cu. yd. excavation, 2,600 cu. yd. cr. stone surfacing and other items. (4) COWLITZ CO. (WPMS 267-A)—0.6 mi. const. bitum. surf. and tr. timb. bridge on city streets, City of Longview, Sec. 1, Sacajewea Lake Bridge and Sec. 2, Washington Way, 32nd Ave. to West City limits, involving: 870 cu. yd. cr. stone surf. and mineral aggreg. (5) FRANKLIN CO. (WPSO 238-A)—2.7 mi. grad. and surf. with cr. stone on Co. Road, Mesa to Kahlotus, involving: 21,740 cu. yd. excavation, 3,800 cu. yd. crushed stone, and other items. 11-29

PROSSER, WN.—Bids to 2 P. M., December 16th, by Benton County Comm., Prosser, Wn., for grading of Nine Canyon Road, Secondary Highway project No. 19, near Kennewick in Benton County, Wn., involving: 18,770 cu. yd. "A" excavation. 11-30

BIDS RECEIVED

PHOENIX, ARIZ.—Bids received as follows by Ariz. State Highway Comm. for: (1) MARICOPA COUNTY—W. E. Hall Co., Phoenix, $132,863 low for grad., etc., Buchanan St., South. (2) APACHE COUNTY—Packard Const. Co., Phoenix, $101,573, low, for grad., etc., Navajo-Apache County line, Showlow-Springerville Highway. 11-23

PHOENIX, ARIZ.—Arizona Sand and Rock Co., Phoenix, $113,614 low to Arizona State Highway Comm. for 6.3 mi. widening existing pavement with concrete and other allied work, beginning at Christy Road and extending northwest on the Phoenix-Prescott Highway, in MARICOPA COUNTY, Project WPMH 33. 11-23

GLENDALE, CALIF.—Southwest Paving Co., 11402 Radford Avenue, Roscoe, $12,648 low to City Clerk, Glendale, for improvements to Verdugo Road from Colorado St., south. 11-6

LOS ANGELES, CALIF.—Bids received as follows by Calif. Div. of Highways, State Bldg., L. A., for: (1) RIVERSIDE CO.—R. E. Hazard & Sons, P. O. Box 1438, San Diego, $28,456 low for 5.4 mi. pl. mix surf. placed betw. 1.4 mi. S. of Thermal and Junc. with Rt. 26. (2) LOS ANGELES CO.—Southwest Paving Co., Inc., 11,402 Radford Ave., Roscoe, $18,529 low for 0.6 mi. asph. conc. pav. betw. San Fernando Rd. and Central Ave. in Glendale. 11-29

LOS ANGELES, CALIF.—Bids received as follows by Calif. Div. of Highways, State Bldg., L. A., for: (1) SAN BERNARDINO CO.—Geo. Bock Co., 1120 N. Las Palmas Ave., L. A., $80,512 low for 2.5 mi. grad. and rd. mix surf. betw. 1 mi. NW. of Lake Arrowhead and Lake Arrowhead Dam. (2) VENTURA COUNTY—Daley Corp., 4430 Boundary St., San Diego, $97,029 low for 2.4 mi. grad. and rd. mix surf. tr. betw. W. Casitas Pass and E. Casitas Pass. (3) ORANGE COUNTY—Sully Miller Contr. Co., 1500 W. 7th St., Long Beach, $44,651 low for 2.9 mi. grad., surf., etc., on Bolsa Ave. betw. Bay Blvd. and Bolsa-Chica Road. 11-29

OAKLAND, CALIF.—Union Paving Co., Call Bldg., San Francisco, $66,712 (ASPH. CONNCR.) and N. M. Ball Sons, 1889 Yosemite Road, Berkeley, $69,260 (CONCR. PAVING) low bids on each alternate to City Clerk, Oakland, for improving Foothill Blvd. betw. 14th and 23rd Aves. 11-22

OAKLAND, CALIF.—Lee J. Immel, 1031 Evelyn Ave., Berkeley, $13,560 low to City Clerk, Oakland, for impr. Adeline St. betw. Aileen St. and Stanford Ave. 11-22

OAKLAND, CALIF.—Heafey Moore Co., 344 High St., Oakland, who bid $27,109 low to City Clerk, Oakland, for paving Middle Harbor Road betw. 1st and Ferro Streets and betw. Middle Harbor Road and Oakland Municipal Garbage Works. 11-15

OAKLAND, CALIF.—Heafey Moore Co., 344 High St., Oakland, $8,979 low to City Clerk, Oakland, for improving 22nd Street between Cypress and Adeline Sts., Oakland. 11-30

OAKLAND, CALIF.—Ransome Co., 4030 Hollis St., Oakland, $16,320 low to City Clerk, Oakland, for improving Telegraph Avenue, betw. 40th and 51st Streets, Oakland. 11-30

SACRAMENTO, CALIF.—Hemstreet & Bell, 501 11th St., Marysville, $146,014 low to Calif. Div. of Highw., Sacramento, for 14.8 mi. widen. roadbed and widen strip const. consist. of pl. 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. 11-27

SACRAMENTO, CALIF.—Union Paving Company, Call Bldg., San Francisco, $104,233 low to California Div. of Highways, Sacramento, for 3.4 mi. grad. and surf. with road mix surf. or untr, cr. grav. or stone base betw. Sullivan Creek and 3½ miles easterly in TUOLUMNE COUNTY, Calif. 11-27

SACRAMENTO, CALIF.—Stewart & Nuss, Inc., and John Jurkovich, 3530 Balch Ave., Fresno, $30,244 only bid to Calif. Div. of Highways, Sacramento, for 1.6 mi. grad. between Junction with Route 41 and 1½ mi. west, Fresno-Sand Creek Road, FRESNO COUNTY, Calif. 11-27

SACRAMENTO, CALIF.—N. M. Ball Sons, 1889 Yosemite Road, Berkeley, $38,488 low to Calif. Div. of Highways, Sacramento, for 1.7 mi. grad. and cr. run gravel surf. and treat with asphalt at the Oaks and Clow Creek, Mendocino 48 A and B, MENDOCINO COUNTY, Calif. 11-27

SACRAMENTO, CALIF.—Union Paving Co., Call Bldg., S. F., $147,771 low to Calif. Div. of Highways, Sacramento, for 6.6 mi. graded, portions surfaced with crushed run base and road mix surface and portions treated with liq. asph. by road-mix method betw. Yokohl and 1 mi. north of Lemon Cove in TULARE COUNTY, Calif. 11-27

PORTLAND, ORE.—Bids received as follows, by Ore. Satte Highway Comm., Portland, Ore., for: (1) JEFFERSON COUNTY (FLH 2-B)—M. L. O'Neil & Son, Eugene, $41,779 low for 2.07 mi. grading on Agency Sec. of Warm Springs Highway. (2) UMATILLA CO. (FAP 32-A)—James Crick, Realty Bldg., Spokane, $123,244 low for 4.3 mi. grading on Pendleton Hill Sec. of Old Oregon Trail. 11-12

OLYMPIA, WN.—Bids received as follows by the Director of Highways, Olympia, Wn., for: (1) STEVENS CO.—Elliott & Co., Inc., 2155 Northlake, Seattle, $99,465 low for 4.9 mi. grading, draining and surfacing on St. Rd. No. 3, Inklers Point to Chewelah. (2) CLALIAM CO.—All bids submitted for 5.6 mi. grading, draining and surf. on St. Rd. No. 9, Squim to Blyn, Wn., have been rejected. 11-7

SEATTLE, WN.—Northwest Const. Co., 3950 6th N. W., Seattle, Wn., $31,619 low to King County Comm., Seattle, Wn., for conc. paving and surf. on 1.25 mi. of the Military Road south of Seattle. 11-21

CONTRACTS AWARDED

JUNEAU, ALASKA—To Siems-Spokane Co., 412 Realty Bldg., Spokane, $107,034 by Dist. Engineer, Bureau of Public Roads, Juneau, Alaska, for 6.8 mi. grading and surfacing the Lawing-Moose Pass section of the Seward Highway, Chugach Natl. Forest, Alaska. 11-20

PHOENIX, ARIZ.—To Pleasant-Hasler Co., 324 Luhrs Bldg., Phoenix, $187,873 by Arizona State Highway Comm., Phoenix, for 10½ mi. grading, draining roadway, placing select material and SC-2 plant mix about 12½ mi. south of U.S. Military reserve and extending east toward Bisbee on the Ft. Huachuca-Bisbee Highway, WPSO 108-B, COCHISE COUNTY, Ariz. 11-16

PHOENIX, ARIZ.—Awards as follow by Ariz. State Highway Comm., Phoenix, Ariz., for: (1) COCHISE COUNTY (PSS-114-C)—To J. A. Casson, Box 2293, Phoenix, $91,894 for 10.2 mi. grad., drain and plac. aggreg. base course in town of Elfrida about 25 mi. north of Douglas on the Douglas-Safford Highway. (2) YAVAPAI COUNTY—To Skousen Bros., 205 Springer Bldg., Albuquerque, N. M., $136,655 for 10.8 mi. grading, draining and placing aggregate base course at the Hualpai Indian Reservation eastern boundary about 60 mi. N.E. of Kingman and extends south on the Ashfork-Kingman Highway. 11-16

PHOENIX, ARIZ.—Awards as follow by Arizona State Highway Comm., Phoenix, Arizona, for: (1) PIMA COUNTY (WPSO 110-C)—To Borderland Const. Co., Phoenix, $140,410 for 8.7 mi. grading, dr. and furn. pl. mix about 15.9 mi. west of the Tucson-San Xavier Mission Road junction on the Ajo-Tucson Highway. (2) YAVAPAI COUNTY (WPMH 12)—To All Ariz. Engineering Co., Phoenix, $70,709 for 1.8 mi. grading, dr. and aggr. base course from the southern city limits of Jerome southwest, on the Prescott-Jerome Highway. (3) APACHE COUNTY (FA 78-G)—To R. C. Tanner, Phoenix, $102,847 for 5.3 mi. grad. drain., aggr. base course and dust palliative, SC-2 road oil, at the south boundary of the Petrified Forest Natl. Monument, on the Holbrook-St. Johns Highway. (4) YUMA COUNTY—To Tiffany Const. Co., Flagstaff, Ariz., $38,115 for const. 1¼ mi. of new alignment, including draining, grading, aggr. base course and SC-2 road mix, located near the town of Mohawk. 11-19

PHOENIX, ARIZ.—To E. L. Yeager, P. O. Box 470, San Bernardino, $38,791 by Ariz. State Highway Comm., Phoenix, for grading, draining and furn. and place select material, gravel side w. curb and gutter and cutb. plant mix within city limits of Winslow, NAVAJO COUNTY. 11-21

BISHOP, CALIF.—To Basich Bros. Constr. Co., 20530 S. Normandie Ave., Torrance, $9,864, by Dist. Engr., Calif. Div. of Highways, Bishop, for 7.3 mi. grad. betw. Death Valley Junc. and Calif.-Nevada St. Line, INYO COUNTY, Calif. 11-27

LOS ANGELES, CALIF.—Awards as follow by Calif. Div. of Highways, State Bldg., Los Angeles, for: (1) LOS ANGELES COUNTY—To C. O. Sparks, 2309 E. 9th St., L. A., $116,866 for 3.5 mi. grad. and concr. pav. on Rosemead Blvd. betw. San Gabriel and Ramona Blvd. (2) SAN DIEGO COUNTY—To Basich Bros. Const. Co., 20530 S. Normandie Ave., Torrance, $30,430 for 0.7 mi. grading at Santa Margarita River. 11-5

LOS ANGELES, CALIF.—To Mundo Engr. Co., 2305 E. 9th St., L. A., $154,922 by Calif. Div. of Highways, Los Angeles, for const. grade separation struc. and 0.8 mi. grading and asph. conc. and conc. pav. at Newport Beach Bridge in ORANGE COUNTY, Calif. 11-8

LOS ANGELES, CALIF.—To Mittry Bros. Const. Co., 5531 Downey Road, Los Angeles, $466,036 by Calif. Div. of Highways, Los Angeles, for 4.8 miles grading and asph. concrete and concrete paving and placing mix. surfacing between Newbury Park and Conejo Creek, in VENTURA COUNTY, Calif. (See Unit Bid Summary.) 11-27

SACRAMENTO, CALIF.—Awards as follow by the Calif. Div. of Highways, Sacramento, for: (1) LOS ANGELES and KERN COUNTIES—To Griffith Co., L. A. Railway Bldg., L. A., $342,975 for 5.5 mi. grading and concr. paving and const. reinf. concr. bridge betw. ¼ mi. south of Kern County Line and Fort Tejon. (See Unit Bid Summary). (2) MONTEREY COUNTY—To A. Teichert & Son, Inc., P. O. Box 1113, Sacramento, $29,316 for 0.2 mi. grad. and cr. run base surf. and Natural rock asph. surf. across Thompson Gulch, 3 mi. N. of King City. 11-14

SACRAMENTO, CALIF.—To Hanrahan Wilcox Corp., Hobart Bldg., San Francisco, $434,428 by Calif. Div. of Highways, Sacramento, for 11.2 mi. grad. and concr. paving betw. 1 mi. north of Carquinez Bridge and Cordelia in SOLANO and NAPA COUNTIES, Calif. (See Unit Bid Summary). 11-18

SACRAMENTO, CALIF.—To Granfield, Farrar & Carlin, 65 Hoff Ave., San Francisco, $77,586 by Calif. Div. of Highways, Sacramento, for 1.8 mi. grading and bitum. tr. screen. river grav. surf. (roadmix method) betw. 3 mi. North of Big Sur and Molera's Ranch, in MONTEREY COUNTY, Calif. 11-26

SACRAMENTO, CALIF.—To Healy Tibbitts Construction Co., 64 Pine St., San Francisco, $28,802 by Calif. Div. of Highways, Sacramento, for 0.4 mi. riprap slope protection betw. Courtland and Freeport in SACRAMENTO COUNTY, Calif. 11-26

SACRAMENTO, CALIF.—To Harms Bros., 5220 21st Ave., Sacramento, $127,322 by Calif. Div. of Highways, Sacramento, for 9.2 mi. grad. and bitum. seal coat applied betw. Long Valley Creek and 2.8 mi. N. of Rt. 21 in LASSEN COUNTY, Calif. 11-26

SAN FRANCISCO, CALIF.—To A. G. Raisch, 1 deHaro St., S. F., $52,571 by Dept. of Pub. Wks., S. F., for const. Sec. "D" of Alemany Blvd., from San Jose Ave. to Orizaba Ave. 11-20

SAN JOSE, CALIF.—To A. J. Raisch, 358 Lincoln Ave., San Jose, $34,759 by City Clerk, San Jose, for improving 1.37 mi. of North 13th St., betw. North city limits and Santa Clara Street. 11-27

DENVER, COLO.—To Taggart Const. Co., Cody, Wyo., $114,040 by Bur. of Public Roads, Denver, Colo., for 2.595 mi. earthgraded and drained highway on Proj. 10-D1, E1 of the Buffalo-Tensleep Forest Highway Route, located in Big Horn Natl. Forest, BIG HORN and WASHAKIE COUNTIES, Wyo. 11-5

DENVER, COLO.—To Armstrong & Armstrong, Roswell, New Mexico, $79,791 by Bureau of Public Roads, Denver, Colo., for 8.41 mi. bitum. surf. and 0.36 mi. earthgraded, drained and surf. highway on Proj. RTEC A of Walnut Canyon Highway located in Carlsbad Caverns Natl. Park, New Mexico. 11-18

DENVER, COLO.—To J. B. Claybaugh, 910 Main St., Grand Junction, Colo., $69,748 by State Highway Engineer, Denver, Colo., for 4.109 mi. gravel surfacing betw. Grand Junction and Whitewater on State Highway No. 6, WPMH 299-H in MESA COUNTY, Colo. 11-18

DENVER, COLO.—Awards as follow by State Highway Dept., Denver, for: (1) OTERO COUNTY (WPMH 267J)—To Driscoll Const. Co., P. O. Box 733, Pueblo, Colo., $133,175 for 10 mi. gravel surf. betw. LaJunta and Rene. (2) PHILLIPS COUNTY (WPGH 15-H)—To Garner Bros. Co., Longmont, Colo., $69,121 for 8.609 mi. grav. surfacing crossing elimination betw. Holyoke and Paoli on State Highway No. 14. 11-29

BOISE, IDAHO—Awards as follow by the Comm. of Public Works, Boise, Idaho, for: (1) OWYHEE COUNTY (FAP 189-ABC and FLP 6-ABC)—To Triangle Const. Co., Boise, Idaho, $116,378 (metal pipe) for 19.540 mi. const. cr. grav. surf. amd. 7.061 mi. const. roadbed, drain. struc. and cr. grav. surf. on the Owyhee Highway betw. Oregon Line and Marsing. (2) BEAR LAKE COUNTY (WPH 97-D)—To Olof Nelson, Box 413, Logan, Utah, $83,371 for 6.202 mi. const. roadway and drainage struc. and placing pit run subbase matl. full width of roadway and from 6" to 18" thick on Bear Lake Highway from Utah State Line toward St. Charles. 11-4

BOISE, IDAHO—To A. O. Thorn, Springville, Utah, $52,142 by Comm. of Public Works, Boise, Ida., for 2.113 mi. const. roadbed and drainage struc. on the Malad Valley Highway from Summit north in BANNOCK and ONEIDA COUNTIES, Idaho, Proj. WPH 156-D. 11-12

BOISE, IDAHO—To W. C. Burns, Idaho Falls, $52,161 by Comm. of Pub. Works, Boise, Idaho, for 6.386 mi. const. roadbed, drain. and irriga. struc. and cr. grav. surf. on the Preston-Fairview road between Preston and the Utah State Line in FRANKLIN COUNTY, Idaho, Proj. WPMS 216 and Misc. Proj. No. 561. 11-12

BOISE, IDAHO—To Carl Myberg, Realty Bldg., Spokane, Wash., $53,863 (resiliflex) by Comm. of Pub. Works, Boise, for 2.830 mi. grading, draining and surf. with cr. rock on the Moscow-Bovill Highway betw. Moscow and Joel, in LATAH COUNTY (NRS 190-A) Idaho. 11-18

BOISE, IDAHO—To A. O. Thorn, Springville, Utah, $73,394 by Comm. of Public Works, Boise, Idaho, for 4.707 mi. roadbed, draining and irrig. struc. placing subbase matl. 6" and 12" thick. and cr. grav. surf. on Old Oregon Trail, McCammon East in BANNOCK COUNTY, Idaho. Proj. WPGH 60-AC. 11-18

BOISE, IDAHO—To Nic Burggraf and J. W. Brennan, Idaho Falls, Idaho, $57,446 by Commissioner of Public Works, Boise, Ida., for 7.568 mi. const. roadbed, drainage struc., includ. a 24.3' timber bridge and a 32.0' concr. bridge and cr. gravel surfacing on the Roosevelt Highway from Aberdeen north in BINGHAM COUNTY, Idaho, Proj. WPSS 186-B and WPMS 186-C. 11-25

BUTTE, MONTANA—Awards as follows by State Highway Comm. of Montana, for: (1) GARFIELD COUNTY (WPH 157 G, 247A and 256 H)—To Inland Const. Co., 3867 Leavenworth, Omaha, Nebr., $70,989 for 7.276 mi. grad. and const. small dr. struc. on the Grass Range-Jordan-Circle road; also 0.748 mi. on wye connection involving grad. and const. small drain. struc. on Grass Range-Jordan-Miles City Road about ¾ mi. S. of Jordan. (2) PHILLIPS COUNTY (WPSO 337)—To Carl Braathen, Glasgow, Mont., $39,829 for 3.556 mi. grad., surf., etc., incl. tr. timb. pile trestle bridge on Malta North Road. (3) BLAINE COUNTY (WPSO 340)—To Woodward, Johnson & Shannon, Butte, $39,120 for 4.388 mi. grad., surf., const. small dr. struc., etc., on Chinook-Bear Paw Road. (4) TETON COUNTY (WPSO 341)—To Nilson-Smith, Great Falls, $38,839 for 5.458 mi. grad. surf., etc., on Choteau-Dutton Road. (5) POWELL COUNTY (WPSO 343)—To Clifton & Applegate, Hutton Bldg., Spokane, $38,871 for 2.777 mi. grad. surf. and const. small drain. struc. incl. const. tr. timb. pile trestle bridge on Avon-Helmville Road. (6) SILVER BOW COUNTY (WPSO 364)—To Clifton & Applegate, Hutton Bldg., Spokane, $40,891 for 3.761 mi. grad. and const. sm. drain. struc. on Roosevelt Drive Road. (7) DEER LODGE COUNTY (WPMS 371)—To J. C. Maguire, Butte, $115,219 for 2.019 mi. const. pl. mix bitum. tr. cr. grav. surf. course and small dr. struc. on city st. known as Fourth St., Anaconda Highway project. 11-5

MISSOULA, MONT.—To J. A. Gudgel Sons, Inc., Kalispell, Mont., $61,757 by Bureau of Public Roads, Missoula, Mont., for 6.639 mi. const. or improving the Georgetown Lake surf. slide removal and oil surf. project FHEC 17 A1, located in Deer Lodge Natl. Forest, DEER LODGE and GRANITE COUNTIES, Montana. 11-5

CARSON CITY, NEVADA—To Pacific Const. Co., Call Bldg., S. F., $48,081 by Nev. St. Highw. Comm., Carson City, for 0.90 mi. grad. and grav. surf. in City of Yerington, Rt. 3, Sec. A1, in LYON COUNTY, Nevada. 11-13

CARSON CITY, NEVADA—Contract awarded as follow by Nevada State Highway Comm., Carson City, for: (1) DOUGLAS COUNTY (WPSO 137)—To Pacific Const. Co., Call Bldg., S. F., $61,451 for 3.88 mi. gravel surf., etc., from Centerville to Gardnerville. 11-13

SANTA FE, N. M.—Awards as follow by State Highway Engineer, Capitol Bldg., Santa Fe, New Mexico, for: (1) SIERRA COUNTY (WPMH 68)—To Hayner & Burn, Las Cruces, New Mex., $76,189 for 4.469 mi. grading, minor drain. struc., one conc. and steel bridge of 2 50' spans, plating and misc. const. on U.S. Highw. Rt. 85, betw. Hot Springs and Socorro. (2) GUADALUPE COUNTY (FAP 180-A)—To Skousen Bros., Albuquerque, $103,078 for 11,836 mi. grading, minor drainage struc. and 2 course surf. on U.S. Highway Rt. 285, betw. Vaughn and Roswell. (3) GUADALUPE COUNTY (WPH 180-B)—To B. R. Carrico, Albuq., $58,395 for 9.277 mi. grading, minor drain. struc., conc. box culvert and misc. const. on U.S. Highway Rt. No. 285, betw. Vaughn and Roswell. 11-9

SANTA FE, N. M.—To Capitol Const. Co., Santa Fe, New Mexico, $89,572 by State Highway Engr., Santa Fe, N. M., for 12.079 mi. grading, minor drain. struc., 1 course surf. and misc. const. on St. Highway Rt. No. 16, betw. Carlsbad and Hobbs. 11-13

PORTLAND, ORE.—Awards as follows, by Oregon State Highway Comm., Portland, Ore., for: (1) BAKER COUNTY (FAP 169-F)—To McNutt Bros., 351½ E. Broadway, Eugene, $101,898 for 3.43 mi. grading on Gales-Tunnel Sec. of Old Oregon Trail. (2) DOUGLAS COUNTY (FAP 189-B)—To Jacobsen-Jensen Co., 517 N.E. Stanton St., Portland, $119,296 for 1.68 mi. grading and paving Turkey Hill Section of Pacific Highway. (3) GRANT COUNTY (St. Pr.)—To Edlefsen-Weygandt Co. & E. Hefty, Peninsula Ave. and Columbia Blvd., Portland, $42,521 for 11.05 mi. resurf. and oil mat surf. treatm. on Branson Creek-Rock Creek Sec. of John Day Highway. 11-12

PORTLAND, ORE.—Awards as follows by Oregon State Highway Comm., Portland, for: (1) BAKER COUNTY (FAP 169-F)—To Oregon Contr. Co. & T. Arenz, 10509 N.E. Sandy Blvd., Portland, $55,793, for 4 bridges over Burnt River and 1 culvert over Chicken Creek, on Old Oregon Trail near Weatherby. (2) LINN COUNTY (WPH 196-A)—To Averill & Corbin, Rt. 10, Portland, $15,557 for a concr. bridge over Soda Fork of the Santiam River, 11 mi. E. from Cascadia on the Santiam Highway. (3) SHERMAN COUNTY (WPGH 25)—To Joplin & Elon, P. O. Box 5686, Kenton, Sta., Portland, $64,884 for concr. bridge over Spanish Hollow Creek and the O. W. RR & N Co.'s tracks and 0.46 mi. grad., surf. and bitum. macad. wr. surf. on Columbia River Highway 20.5 mi. easterly from The Dalles. (4) WASCO COUNTY (WPGH 37)—To Park Schram Co., Couch Bldg., Portland, $142,371 for concr. and steel bridge over the O.W.R.R. & N. Co.'s tracks and grad. surf. and place bitum. macad. on 1.19 mi. of highway on the Big Eddy Overcrossing sec. of Columbia Highway. 11-12

PORTLAND, ORE.—Awards as follows, by Oregon State Highway Comm., Portland, Oregon, for: (1) GRANT COUNTY (FAP 92-B)—To Oregon Contr. Co., and Theo. Arenz, 10509 N.E. Sandy Blvd., Portland, $85,885 for 7.85 mi. regrad. surf. and oil mat surf. treatm. on Valades Ranch-Stewart Bridge Section of John Day Highway. (2) JACKSON COUNTY (St. Proj.)—To A. S. Wallace, Roseburg, $15,265 for 8,500 cu. yd. cr. rock in stockpiles on Ashland-Jenny Creek Rock Prod. Project on Green Springs Highway. (3) LAKE COUNTY (FAP 100 A & B)—To Babler Bros., 2407 N.W. 28th St., Portland, $107,952 for 1.23 mi. grading, 14.6 mi. grade widening, 15.8 mi. grav. surf., and 16.0 mi. roadmix surf. on Paisley-Chewaucan Narrows Section of of Fremont Highway. (4) LINN COUNTY (WPH 196-C)—To Myers & Goulter, 3227 S. First St., Seattle, $108,165 for 1.15 mi. grading on Grade Creek, Storm Creek Section of Santiam Highw. (5) WHEELER COUNTY (FAP No. 6)—To Edlefsen-Weygandt Co. and E. Hefty, Peninsular Ave. & Columbia Blvd., Portland, $86,460 for 7.92 mi. cr. grav. surf. on Service Creek-Burton Co. Unit and 4.49 mi. regrading, surf. and oil mat surf. treatm. on Burton Canyon-Spray Unit, Service-Creek-Spray Sec. of John Day Highway. 11-12

OGDEN, UTAH—To Tony Marrazzo, E. 618 Dalton St., Spokane, Wash., $114,427 by Bureau of Public Roads, Federal Bldg., Ogden, Utah, for 6.368 mi. const. or improv. the Idaho City-Stanley Road, Proj. FHEC 25-J, located in Boise Natl. Forest, BOISE COUNTY, Idaho. 11-5

SALT LAKE CITY, UTAH—To J. W. Whiting, Springville, Utah, $23,047 by Utah St. Road Comm., Salt Lake City, Utah, for 6.449 mi. graded earth road betw. Cedar and Kanarraville in IRON COUNTY, Utah, Proj. WPMH 54-A.

SALT LAKE CITY, UTAH—Awards as follow by Utah State Rd. Comm., Salt Lake City, Utah, for: (1) DAVIS COUNTY (WPMS 166)—To Wheelwright Const. Co., 2434 Monroe Ave., Ogden, $20,791 for 1.314 mi. const. grav. surf. road extending from Kaysville westerly. (2) MORGAN COUNTY (WPH 41-A)—To Ora Bundy, Kiesel Bldg., Ogden, Utah, $13,100 for 1.001 mi. const. grav. surf. road at Preston on U.S. 30-S. 11-9

SALT LAKE CITY, UTAH—Awards as follow by the Utah State Road Comm., Salt Lake City, Utah, for: (1) DUCHESNE COUNTY (WPH 94-C)—To Reynolds-Ely Const. Co., Springville, Utah, $21,349 for 8.216 mi. earth graded road betw. Myton and Roosevelt. (2) SAN JUAN COUNTY (WPMS 141-C)—To J. W. Whiting, Springville, Utah, $14,736 for 2.320 mi. grav. surf. road betw. Monticello and Blanding. (3) SALT LAKE COUNTY (WPSO 131-B)—To L. A. Young, Richfield, $30,908 for 1,792 mi. grav. surf. road including const. a 31′ concr. bridge betw. 48th St., South, and Vine St. on Highland Drive. 11-16

MT. VERNON, WN.—To Robt. Nordlund, Mt. Vernon, Wn., $8,329 by Skagit County Comm., Court House, Mt. Vernon, Wn., for grading and draining of a section of Cascade Highway (Skagit County Secondary Road project No. 41). 11-21

OLYMPIA, WN.—To J. F. Forbes, 110 E. Union Ave., Olympia, Wn., $26,580 by County Auditor, Olympia, Wn., for const. a bitum. macadam surf. Type D, 2" mat. on 0.79 mi. on Carlyon Ave.; 1.51 mi. on South Union (Tilley) Road; and 2.16 mi. on Skookumchuck Road. 11-14

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) STEVENS and FERRY COUNTIES—To Standard Asphalt Paving Co., Chronicle Bldg., Spokane, $121,016 for 64.7 mi. stockpiling cr. stone surf. and min. aggreg. and const. bitum. surf. tr. on St. Rd. No. 3, Clayton to Kettle Falls Bridge, PWP 1268. (2) SPOKANE COUNTY—To Triangle Const. Co., 1220 Ide St., Spokane, $98,982 for 7.3 mi. grad and surf. with cr. stone on St. Rd. No. 11, Tyler to Cheney, WPH 133-C & WPH 20. (3) KLICKITAT COUNTY—To J. C. Papin, Carson, Wn., $10,569 for 1.0 mi. grad. County Rd. White Salmon to Husum, WPSO 247-A. 11-15

OLYMPIA, WN.—To A. Milne, 7253 North East Broadway, Portland, Oregon, $23,244 by Director of Highways, Olympia, Wn., for 1.8 mi. grading and surfacing with crushed stone on State Road No. 12, Bear River Dyke betw. Greenhead Slough and Bear River, Proj. FAP 73, in PACIFIC COUNTY, Washington. 11-13

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) SKAGIT and WHATCOM COUNTIES (FAP 191-A)—To N. Fiorito, Inc., 844 W. 48th St., Seattle, Wn., $106,320 for 3.5 mi. concr. paving on St. Rd. No. 1 (Lake Samish Road Branch) Sec. 1, State Gravel Pit to State Fish Hatchery and Sec. 2, Lake Samish Vicinity Paving, Wn. (2) COWLITZ COUNTY (FAP 32)—To F. E. Wilder, Rt. 2, Olympia, Wn., $34,574 for 0.6 mi. grad. and bitum. surf. tr. (plant mix type) and non-skid seal treatment on St. Road No. 1, Toutle River Bridge Approaches. (3) STEVENS COUNTY (WPSO 260-A)—To N. A. Degerstrom, Peyton Bldg., Spokane, Wn., $14,777 for 1.5 mi. grad. and surf. with cr. stone on County Road, Colville to Tiger, Narcisse Creek Section. (4) PEND OREILLE COUNTY (WPSO 253-A)—To James Tobin & Sons, 1904 W. 2nd St., Spokane, Wn., $8,948 for 1.0 mi. grading on County Road, Sacheen Lake Vicinity. (5) WHITMAN COUNTY—To C. C. Weipart, 1016 Carlisle Street, Spokane, Wn., $16,451 for 1.4 mi. grading and surf. with cr. stone on County Road, Whelan Road, Junc. Inland Empire Highway, Eastern Route, Easterly, Wn. 11-21

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) GRANT CO. (NRS 217-A)—To Max J. Kuney Co., 102 E. Augusta St., Spokane, Wn., $56,484 for 18.2 mi. surf. with cr. stone and 31.5 mi. light bitum. surf. treatm. in County Road, Burke to Neppel. (2) CHELAN CO. (WP 1253)—To Washington Asphalt Co., 17 W. Lander St., Seattle, Wn., $70,590 for 37.2 mi. surf. and const. bitum. retread surf. on St. Rd. No. 10, Junc. St. Rd. No. 2, North of Wenatchee to Chelan. 11-29

CHEYENNE, WYOMING—Awards as follow by State Highway Comm., Capitol Bldg., Cheyenne, Wyo., for: (1) SHERIDAN CO. (WPMH 20)—To S. F. Ronde, Sheridan, Wyo., $23,583 for 1.234 mi. grad., dr., surf. and misc. work on the Sheridan-Buffalo Road. (2) CONVERSE CO. (WPMH 56)—To D. M. Gulliford, Wheatland, Wyo., $71,097 for 4.553 mi. grad., dr., surf. and misc. work on the Casper-Douglas Road. (3) CARBON CO. (WPH 59-B)—To A. H. Read Co., Cheyenne, Wyo., $101,197 for 4.550 mi. grad., dr., surf. and misc. work and const. 1 tr. timb. bridge on the Rawlins-Bosler Road. 11-25

Bridges and Culverts . . . . . .

CALLS FOR BIDS

LOS ANGELES, CALIF.—Bids to 2 P. M., December 19th, by Calif. Div. of Highways, L. A., for undergr. crossing on Soto St., under tracks of Union Pac. RR. in City of Los Angeles, consist. of reinf. concr. abutments on timb. pile foundations with steel superstructure; also approx. 0.22 mi. roadway to be graded and concr. paved, in LOS ANGELES COUNTY, involving: 38,000 cu. yd. roadway excavation, 1,400

cu. yd. A concr. (pavement), 100,000 lb. reinforcing steel, 2,400 cu. yd. A concr. (struc.), 875,000 lb. structural steel, 7,320 ft. furn. tr. D. F. piles and test pi., and other items. 11-26

LOS ANGELES, CALIF.—Bids to 2 P. M., December 19th, by Calif. Div. of Highways, L. A., for: (1) LOS ANGELES CO.—Overh. crossing over Valley Blvd. and tracks of S. P. RR. in L. A. at Soto St., consist. of concr. piers and abutments with steel superstruc. and approx. 0.62 mi. grad. and asph. conc. pav. roadway, involving: 23,000 cu. yd. roadway excavation, 3,450 tons asph. conc., 190,000 lb. reinforcing steel, 1,650 cu. yd. A concr. (struc.), 575,000 lb. structural steel, 5,750 ft. furn. tr. D. F. Piles and T. P. (2) LOS ANGELES CO.—Const. undergrade crossing under tracks of Pac. Elec. Ry. at Mission Road in L. A., involving: 1,300 tons asph. concrete pavement, 5,360 cu. yd. A concr. (structures), 669,000 lb. bar reinforcing steel, 1,000,000 lb. fabric. struc. steel. 11-26

LOS ANGELES, CALIF.—Bids to 2 P. M., December 19th, by Calif. Div. Highways, L. A., for overhead crossing over tracks of S. P. RR. and L. A. Ry. at Figueroa St. in L. A., consist. of 1 127', 1 200' and 1 103' steel plate girder span and 5 75' concr. girder spans on concr. piers and abutments; also approx. 0.23 mi. roadway to be graded and asph. concr. paved in LOS ANGELES COUNTY, involving: 23,000 cu. yd. struct. excav., 45,000 cu. yd. imported borrow, 3,800 tons asph. conc, 2,810 cu. yd. A conc. (footing blocks), 11,600 cu. yd. A conc. (structures), 1,430,000 lb. reinforcing steel, 880,000 lb. structural silicon steel, 710,000 lb. structural carbon steel, 4,400 ft. furn. conc. piles and test piles. 11-26

OLYMPIA, WN.—Bids to 10 A. M., December 17th, by Director of Highways, Olympia, Wn., for: (1) GRANT CO. (WPH 219-B & WPGH 219-A)—Const. steel girder undercrossing of the Great Northern Railway Co., 3 miles west of Ephrata, involving: 31,970 cu. yd. excavation, 297 cu. yd. concr., 221,000 lb. struc. steel, and other items. (2) SKAMANIA CO. (FAP 112-G)—Const. 280' steel span with reinf. conc. approach on west end and pile and timb. appr. on east end of St. Rd. No. 8, Cook East, Little White Salmon River Bridge, involving: 1,520 cu. yd. concrete 396,000 lb. carbon struc. steel, 159,000 lb. silicon struc. steel, 7,140 ft. untr. piling. (3) KING COUNTY (WPGM 227-A)—Const. a steel girder overcrossing on city street, West Dravus St. Overcrossing in Seattle, involving in main: 1,835 cu. yd. concrete. 174,000 lb. steel reinf. bars, 83,000 lb. carbon steel. 11-29

BIDS RECEIVED

PHOENIX, ARIZ.—F. D. Shufflebarger, Phoenix, Arizona, who bid $19,970 low to Arizona State Highway Commission, Phoenix, for repairs to the existing bridge, consisting of the addition of 2 spans, lighting system, protection and other miscell. work. 11-23

LOS ANGELES, CALIF.—Byerts & Dunn, 1131 N. Orange Grove Ave., Los Angeles, $51,838 low to Calif. Div. of Highways, Los Angeles, for const. overhead crossing over S. P. Co.'s tracks in RIVERSIDE COUNTY, Calif. 11-22

LOS ANGELES, CALIF.—B. G. Carroll, 4396 Maryland St., San Diego, $105,829 low to Calif. Div. Highw., L. A., for girder overh. crossing over S. P. RR. tracks, 2.2 mi. W. of Indio, consist. of 1 61' clear span and 2 45 ft. 6" clear spans and 0.54 mi. grad. and conc. pav. roadw. in RIVERSIDE COUNTY, Calif. 11-29

LOS ANGELES, CALIF.—Sharp & Fellows Contr. Co., Central Bldg., L. A., $202,941 low to Calif. Div. of Highw., L. A., for const. steel and concr. overhead crossing over A. T. & S. F. RR. at Wilmington, consist. of 4 61' 6" spans, 2 42' spans and 2 39' spans and grad. and asph. conc. pav. appr. and conc. pav. strips in LOS ANGELES COUNTY, Calif. 11-29

OAKLAND, CALIF.—J. E. Branagh, 116 Monticello Ave., Piedmont, $9,192 low to County Clerk, Oakland, for constructing the Redwood Road Culvert, located ½ mile of Hayward. 11-19

SACRAMENTO, CALIF.—Lindgren & Swinerton, 225 Bush St., S. F., $223,255 low to Calif. Div. of Highw., Sacramento, for overh. crossing over S. P. RR. tracks ½ mi. E. of Tracy, consist. of 1 81' and 2 48' plate girder spans, 2 52' steel beam spans and 29 40' reinf. conc. girder spans on conc. bents and abutm. with wingwalls on timb. pile founda. and 0.3 mi. firad. and conc. pav. in SAN JOAQUIN COUNTY, Calif. 11-27

PORT ANGELES, WN.—Angeles Gravel and Supply Co., Port Angeles, Wn., $114,856 low to City Clerk, Port Angeles, Wn., for const. two bridges on 8th St. over Valley Creek Gulch and Tumwater Creek Gulch. 11-30

SEATTLE, WN.—Rumsey & Co., 3821 Airport Way, Seattle, Wn., $39,432 low to Board of Public Works, Seattle, Wn., for a steel railroad bridge at Devil's Elbow on the City of Seattle's Skagit River Railroad under Ord. No. 65684. 11-25

CONTRACTS AWARDED

PHOENIX, ARIZ.—To Daley Corp., 4430 Boundary St., San Diego, $39,900 by Ariz. State Highw. Comm., Phoenix, for concr. overpass struc. and approaches on Ft. Huachuca-Bisbee Highway, COCHISE COUNTY, Ariz. 11-16

SACRAMENTO, CALIF.—To J. F. Knapp, 1401 Park Ave., Oakland, $249, 281 by Calif. Div. of Highways, Sacramento, for an overhead crossing over the tracks of the Southern Pacific Company near El Cerrito Hill in the City of Albany, consisting of a reinf. concr. girder span and steel girder spans with concr. deck having a total length of approx. 1500 ft. in ALAMEDA COUNTY, Calif. 11-14

SACRAMENTO, CALIF.—Award as follows by Calif. Div. of Highways, Sacramento, for: (1) CONTRA COSTA COUNTY—To A. T. Howe, 111 Stanford Ave., Santa Rosa, $17,702 for reinf. concr. girder overhead struc. over the A. T. & S. F. R.R., 3½ mi. N. of Concord, consisting of one 32' span and two 29' spans and 0.18 mi. grad. and plant mix medium curing type surf. 11-18

SACRAMENTO, CALIF.—To A. J. Raisch, 358 Lincoln Ave., San Jose, $70,766 by Calif. Div. of Highways, Sacramento, for undergrade crossing under S. P. Co.'s tracks at San Jose, consisting of 2 concrete abutments and steel superstruc. and .14 mi. grading and concr. paving approaches in SANTA CLARA COUNTY, Calif. 11-26

DENVER, COLO.—To H. P. Jones, La Junta, Colo., $12,114 by State Highway Dept., Denver, for timb. bridges and grav. surf. approaches on 0.625 mi. betw. Alamosa and La Sausses on St. Highw. No. 158 in CONEJOE COUNTY, Colo., WPSS 411. 11-18

DENVER, COLO.—To Henry Shore, P. O. Box 658, Grand Junction, Colo., $59,427 by Colorado State Highway Dept., for a timber bridge and approaches betw. Strasburg and Anton in ADAMS AND ARAPAHOE COUNTIES, Proj. ERP 10, Colorado. 11-25

DENVER, COLO.—To M. E. Carlson, 4483 Newton St., Denver, Colo., $145,214 by State Highway Dept., Denver, Colo., for const. bridge and approaches over Monument Creek in Colorado Springs, Proj. FAP 1178 and ERP 5 in EL PASO COUNTY, Colo. 11-29

BOISE, IDAHO—To Hoops Const. Co., Twin Falls, Idaho, $54,796 by Comm. of Public Works, Boise, Idaho, for conc. viaduct 126' long over Oregon Short Line R.R. and grading and draining and surf. approaches on 0.998 mi. on Old Oregon Trail in Soda Springs, CARIBOU COUNTY, Idaho, Proj. WPGM 35-B & WPMH 35-B. 11-12

BOISE, IDAHO—Awards as follow by Comm. of Public Works, Boise, Idaho, for: (1) BANNOCK COUNTY (WPH 111-A & WPGH & WPGM 111A)—To Olof Nelson, Logan, Utah, $90,248 (resiliflex) for 587.7' concr. struc. over Oregon Short Line R.R. and the Portneuf River and grad. and surf. appr. on 0.789 mi. of Old Oregon Trail Highway at McCammon. (2) BOUNDARY COUNTY (WPGH 20-A)—To Colonial Const. Co., W. 326 1st Ave., Spokane, $88,483 for const. 501.6' concrete overhead struc. over the Great Northern R.R. and grad. and surf. approaches on 0.333 mi. N. and S. Highway at Naples. 11-16

BOISE, IDAHO—Awards as follow by Comm. of Public Works, Boise, Idaho: (1) NEZ PERCE COUNTY (NRH 33-B)—To G. D. Lyon & Co., 503 W. 14th Ave., Spokane, Wn., $33,132 for const. undergr. pass under the Camas Prairie Branch of the Northern Pacific R.R.; const. concr. pavement under the struc. and grading, etc., approaches on 0.459 mi. of Lewis and Clark Highway and raising the grade and placing cr. rock surf. on 0.126 mi. of the North and South Highway at Spalding. (2) NEZ PERCE COUNTY (MISC. 595 & 608)—To G. D. Lyon & Co., 503 W. 14th Ave., Spokane, Wn., $30,690 for reflooring and painting a 965.3' steel bridge on the Lewis & Clark Highway in Lewiston and reflooring a 507.7' steel bridge on Clearwater River on North and South Highway at Spalding. 11-18

BUTTE, MONT.—Awards as follows by State Highway Comm. of Montana, for: (1) YELLOWSTONE COUNTY (FAP 134-A)—To W. P. Roscoe, Billings, Mont., $119,095 for a 496' steel and conc. bridge across Yellowstone River about 1½ mi. S. of City of Laurel, incl. 0.184 mi. grad. and surf. approach road. (2) SHERIDAN COUNTY (FAP 251 C & E)—To Walter Mackin, Billings, Mont., $35,530 for const. 1 std. treated timber stockpass and 10 treated timber pile trestle bridges on Sections "C" and "E" of the Scobey-Plentywood Road. (3) GARFIELD COUNTY (FAP 247-A & B & 256-H)—To Prahl & Sawtelle, Miles City, Mont., $63,345 for const. 5 treated timber pile trestle bridges and 2 treated timber and steel bridges on the Grass Range-Jordan Circle Road. (4) SILVER BOW COUNTY (WPGH 70-B)—To Edw. Stamsos, Butte, Mont., $24,851 for a 43' steel girder underpass under the C.M.ST. P. & P. R.R. Co.'s tracks about 13½ mi. West of Butte on the Butte-Anaconda Road, incl. 0.08 mi. grade and surf. approach road. (5) BIG HORN COUNTY (WPGH 187-E)—To Inland Const. Co., 3867 Leavenworth, Omaha, $55,417 for a 5-span, 232' 10" reinf. conc. viaduct over CB & Q R.R. Co. 1 mi. E. of town of Toluca and 0.381 mi. grad. and surf. appr. road. (6) FLATHEAD COUNTY (WPGH 257-D)—To T. G. Rowland, 1558 Yale Ave., S.L.C., $24,414 for steel I-Beam girder underpass under Gr. Northern tracks 1 mi. East of Kalispell. (7) YELLOWSTONE COUNTY—To James Crick, Realty Bldg., Spokane, $11,864 for 3-span 269 ft. steel deck girder viaduct over Northern Pacific tracks at Mossmain and 1.147 mi. grade and surf. approach road, Project WPH 228-C and WPGH 228-F. (8) DEER LODGE and POWELL COUNTIES (WPGH 261 A & B)—To Clifton & Applegate, Hutton Bldg., Spokane, Wn., who bid $78,025 for const. a 5-span 182.4 ft. reinforced concrete overpass over the C.M.St. P. & P. R.R. company's tracks about ¼ mile of Race track, including 0.395 miles grading, surfacing and const. small drain. structures on approach road. 11-5

CARSON CITY, NEVADA—To Nevada Rock & Sand Co., Box 692, Winnemucca, Nevada, $34,273 by Nev. State Highway Comm., Carson City, Nev., for underpass under S.P.R.R. tracks near Winnemucca and 0.4 mi. approaches, Rt. 1, Sec. A4, in HUMBOLDT COUNTY, Nev. 11-13

PORTLAND, ORE.—To Edlefsen-Weygandt Co., Peninsular Ave. and Columbia Blvd., Portland, $64,849 by Oregon State Highway Comm., Portland, for an underpass under O.W.R.R. & N. Co.'s tracks and 0.49 mi. grading and paving on 122nd Ave. (Buckley Road) just east of Portland and 0.75 mi. S. of Sandy Blvd., in MULTNOMAH COUNTY (WPGS-255). 11-20

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia Wn., for: (1) SPOKANE COUNTY—To Chas. A. Power, E. 27 8th Ave., Spokane, Wn., $158,475 for const. steel girder undercrossing of Great Northern tracks and paving .3 of a mi. approaches on State Road No. 2, near Galena. (2) SPOKANE COUNTY—To J. H. Collins & Co., Box 678, Walla Walla, Wn., $67,772 for const. a reinf. concrete girder overhead crossing and paving .8 mi. on State Roads No. 2 and 3, Sec. 1, 6th Ave. grade separation, betw. 7th Ave. and Cannon St. and Sec. 2, Spokane west in City of Spokane. 11-7

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) THURSTON & PIERCE CO.—To C. L. Creelman, 1079 25th North, Seattle, Wn., $176,763 for const. pile and timber embankm. protection and revetments, pile and timb. trestle county road overcrossing and steel through girder and reinf. conc. railway undercrossing, also grading on 2.0 mi. of St. Rd. No. 1, Olympia to Nisqually-Sec. 3, Proj. PWP 7767. (2) ADAMS CO (WPGH 180-B & WPGH 180-C)—To Geo. F. Price, Dayton, Wn., $31,929 for 0.4 mi. grad., surf. and const. a steel and timber trestle on St. Rd. No. 11, C. M. St. P. & P. RR. overcrossing at Lind. 11-29

CHEYENNE, WYOMING—Awards as follow by State Highway Comm., Cheyenne, Wyo., for: (1) FREMONT CO. (WPH 159-G)—To Leach Bros., Ranchester, Wyo., $169,025 for 11.019 mi. grad., dr., const. 4 reinf. conc. culv. and misc. work on Dubois-Riverton Road. (2) CAMPBELL CO. (FAP 209-D)—To Blanchard Bros., Denver, Colo., $78,339 for 17.878 mi. grad., dr., and misc. work on the Gillette-Douglas road. (3) ALBANY CO. (NRS 29)—To A. H. Read Co., Cheyenne, Wyo., $57,895 for 24.983 mi. base course stabiliz. on Laramie-Woods Landing road. 11-25

CHEYENE, WYOMING—Awards as follow by State Highway Comm., Cheyenne, Wyo., for: (1) SHERIDAN CO. (WPMH 20)—To J. E. Crum, Casper, Wyo., $21,752 for const. 3 40' I beam spans on Sheridan-Buffalo Road. (2) CAMPBELL CO. (FAP 209-D)—To Treaster & Peterson, Casper, Wyo., $49,609 for const. 5 tr. timber bridges, 1 steel bridge and 5 reinf. concr. culverts on Gillette-Douglas Road. 11-25

Water Supply Systems . . . . .

WORK CONTEMPLATED

ANTIOCH, CALIF.—Bonds in amount of $88,000 carried by a vote of 595 to 26 at an election held by Antioch, Calif., for const. a new pipe line between the city and the new reservoir south of the city. 11-26

WATSONVILLE, CALIF.—Bonds in amount of $50,000 carried by a vote of 765 to 60 at an election held by Watsonville, Calif., to help finance improvements to the city water system. PWA grant of $41,000 has been approved. 11-21

CALLS FOR BIDS

LOS ANGELES, CALIF.—Bids to 10 A. M., January 7th, by Metropolitan Water District, Los Angeles, for precast concrete pipe and steel pipe lines, a 3-span through truss bridge and appurtenant works of the Colorado River Aqueduct distribution system betw. Stations 31-50 and 926-00 of the Upper Feeder, under Spec. No. 137. Work is located in RIVERSIDE AND SAN BERNARDINO COUNTIES, Calif., and comprises approx. 16.47 mi. of pipeline construction between Cajalco Reservoir and a point on the line of the Upper Feeder, about 10 miles west of the City of San Bernardino. 11-29

LOS ANGELES, CALIF.—Bids to 10 A. M., January 14th, by Metropolitan Water District, Los Angeles, for constructing the Iron Mountain pumping plant of the Colorado River Aqueduct, under Spec. No. 136. Work is located in SAN BERNARDINO COUNTY, on the line of the Colorado River Aqueduct, about 15 miles northwest of the town of Rice. 11-29

BIDS RECEIVED

DOS PALOS, CALIF.—P. L. Burr, 320 Market St., San Francisco, $58,620 low to City Clerk, Dos Palos, for improvement to water works system, involving filter plant, 100,000 gal. elevated storage tank, 4", 6" and 8" cast iron pipe for distribution system. 11-26

SACRAMENTO, CALIF.—Peter J. McHugh, 3854 24th St., San Francisco, $96,300 low to City Clerk, Sacramento, for installation of new water mains to replace old mains on various streets within the city. 11-22

SACRAMENTO, CALIF.—Campbell Const. Co., 800 "R" St., Sacramento, $36,929 low to City Clerk, Sacramento, for reconst. the old pretreatment works. 11-22

SAN FRANCISCO, CALIF.—G. W. Williams Co., 315 Primrose Road, Burlingame, Calif., $35,183 low to Public Utilities Comm., S. F., for const. 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. 11-29

CAMBRIDGE, IDAHO—Hartenbower Bros., Boise, Idaho, $24,675 low to Village Clerk, Cambridge, Idaho, for const. waterworks system. 11-25

AMITY, ORE.—Schmitt Const. Co., 4749 N. E. Union Ave., Portland, Ore., $25,861 low to City Recorder, Amity, Ore., for const. waterworks improvements. 11-30

ST. GEORGE, UTAH—E. K. Ferguson, Spanish Fork, Utah, $50,000 low to City Recorder, St. George, Utah, for improvements to waterworks system. 11-4

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To Winston Bros., Title Guarantee Bldg., Los Angeles, and William C. Crowell, 495 E. Broadway, Pasadena, $1,731,781 by Metropolitan Water District, 306 West 3rd St., Los Angeles, for construction of the Intake and Gene pumping plant buildings, together with their inlet works, outlet structures, electrical switching stations and other appurtenant works, under Spec. 133. 11-23

SAN FRANCISCO, CALIF.—To M. J. Lynch, Barneveld & Oakdale Streets, San Francisco, $15,560 by Public Utilities Commission, San Francisco, for extensions to the Upper Alameda Tunnel Outfall located in Santa Clara County at westerly end of the Upper Alameda Tunnel about 1½ mi. southeasterly of Calaveras Dam and 12½ mi. southeasterly of the Town of Sunol, ALAMEDA COUNTY, Calif., under Specification No. WD 92. 11-14

SAN FRANCISCO, CALIF.—To Sibley Grading & Teaming Co., Ltd., 165 Landers St., S. F., $13,921 by Public Utilities Comm., San Francisco, for laying 36" steel feeder mains on 17th Street from Bryant to Potrero, under Spec. WD 93. 11-14

SAN FRANCISCO, CALIF.—To MacDonald & Kahn Co., Ltd., Financial Center Bldg., San Francisco, $213,968 PROP. "A" by Public Utilities Comm., San Francisco, for constructing the Moccasin Diversion Works, under Hetch Hetchy Water Supply Contract No. 156. (See Unit Bid Summary). 11-19

SAN FRANCISCO, CALIF.—Awards as follow by Public Utilities Comm., City Hall, S. F., for: (1) To W. J. Tobin, 3701 Balfour Ave., Oakland, $31,069 for laying 6" and 8" cast iron mains in Hunters Point District, under Spec. W. D. 85. (2) To W. J. Tobin, 3701 Balfour Ave., Oakland, $20,116 for laying 6" and 8" cast iron mains in area of Willard St., from 18th Ave. and Lincoln Way to Quintara St., under SFWD Spec. 84. (3) To M. J. Lynch, Barneveld and Oakdale Sts., S. F., $46,572 for laying 12" and 16" cast iron feeder mains on Greenwich St., Brunswick, Washington, Gottingen, California, 16th St. and 6th St., under Spec. W. D. 91. (4) To MacDonald & Kahn Co., Ltd., Financial Center Bldg., S. F., $59,995 for const. the Crystal Springs Outfall Tunnel to be 9' x 10' horseshoe with concr. lining, 630 ft. long. Work is located at Crystal Springs Dam (Tunnel No. 2) 4 mi. southwesterly from San Mateo adjacent to Skyline Blvd. under Contract W. D. No. 90. (5) To M. J. Lynch, Barneveld and Oakdale Sts., S. F., $8,385 for reconst. the Calaveras Intake screens and adits at the Calaveras Dam, 10 mi. S. of Sunol, under Spec. W. D. 96. 11-26

SAN MATEO, CALIF.—To W. K. Van Bokkelen, 354 Hobart St., Oakland, by Calif. Water Service Co., Federal Bldg., S. F., for a water softening plant in City of San Mateo. Est. total cost $50,000. 11-14

SOUTH LAGUNA, CALIF.—To O. U. Miracle Co., 4751 Monroe St., San Diego, $14,635 by Sect'y South Coast Co. Water Dist., So. Laguna, for const. of water mains and appurtenances. 11-23

TORRANCE, CALIF.—Awards as follow by City Clerk, Torrance, for completion of the water supply system, subject to PWA approval: UNIT "B"—To Hoagland Const. Co., 1st Natl. Bank Bldg., Long Beach, who bid $34,970 for Pumping Plant. UNIT "C"—To Pittsburgh-Des Moines Steel Co., $19,900 for a 1,800,000 gal. steel storage tank. UNIT "D"—To Fred W. Weber, 8442 Calif. Ave., South Gate, who bid $49,676 for B. & S. cast iron pipe, hydrants, valves, etc. 11-6

DENVER, COLO.—To Busselle & Douglas Co., Colorado Springs, Colo., $96,845 by Bd. of Water Comm., Denver, Colo., for const. bench flume, flumes No. 3 and No. 4, transitions, vortex sections, anchor, expansion and intermediate piers for siphons No. 4 and 5, and timber trestles of the South Boulder Diversion Conduit. 11-4

LEWISTON, IDAHO—To J. D. Beery, Clarkston, Wn., $7,652 (subject to PWA approval) by City Clerk, Lewiston, Id., for labor only on improvements to Water Works System. 11-12

EUREKA CITY, UTAH—Awards as follows by City Council, Eureka City, Utah, for improvements to water works system: (1) To Bernstein & Kuhre, 2336 21st So., Salt Lake City, $8,411 for labor. (2)—To Pacific Cast Iron Pipe Co., Provo, Utah, $3,304 for pipe, $1,419 for fittings. (3)—To Salt Lake Hardware Co., 105 No. 3rd West, Salt Lake City, $2,476 and $153.75 for valves and meters. 11-12

MONROE CITY, UTAH—Contract awarded (subj. to PWA approval) to Salt Lake Hardware Co., 105 N. 3rd West, Salt Lake City, Utah, $2,433, (less 2%, 10 days) by City Clerk, City Hall, Monroe City, Utah, for furnishing 300 water meters for improvement of waterworks system. 11-16

KETTLE FALLS, WN.—To Herber & Sheldon, Tacoma, Wn., $5,086 by City Clerk, Kettle Falls, Wn., for furnishing all labor and materials for the replacement of 6,525 lin. ft. 8" wooden watermains in Town of Kettle Falls. 11-4

PATEROS, WN.—To A. L. Watkin, 220 Hudson St., Seattle, Wn., $14,120 by Town Clerk, Pateros, Wn., for laying 2,763 ft. 8" and 3,470 ft. 6" and 2,460 ft. 4" cast iron water mains, including hydrants, valves, fittings, service changes and hauling of earth and stone, under PWA Docket No. 1839. 11-25

Sewer Construction . . . . . .

WORK CONTEMPLATED

JACKSON, CALIF.—Bonds carried at an election held Nov. 5th by Jackson, Calif., to vote $50,000 in bonds to help finance construction of an intercepting and outfall sewer and a sewage disposal plant. Total estimated cost is $76,600 of which 45% has been applied for from the PWA. 11-8

BIDS RECEIVED

SACRAMENTO, CALIF.—Bids received as follows by City Clerk, Sacramento, for: (1) J. W. Terrell, 2765 Donner Way, Sacramento, $20,401 low for const. storm sewers on "W" and "X" Sts. betw. 18th and 27th Sts. (2) Gogo & Rados, 10024 S. Figueroa St., L. A., and A & B Const. Co., 912 S. Atlantic Blvd., Hynes, Calif., $41,900 low for const. storm sewer on "L" St. betw. 9th and 18th Sts. (3) Lord & Bishop, Native Sons Bldg., Sacramento, $17,550 low for const. extensions of the main sewer line into Sacramento River. 11-22

SACRAMENTO, CALIF.—Lord & Bishop, Native Sons Bldg., Sacramento, $54,900 low to City Clerk, Sacramento, for constructing storm sewer on 13th and "G" Sts., in Sacramento. 11-22

POCATELLO, IDAHO—West Coast Const. Co., Lloyd Bldg., Seattle, Wn., $42,425 low to City Clerk, Pocatello, Idaho, for const. an extension to the present trunk sewer. 11-4

CALIENTE, NEVADA—Mullins & Wheeler, 22½ E. 1st So., Salt Lake City, $38,153 low to City Clerk, Caliente, Nev., for const. comp. sewer system and sewage treatm. plant. 11-4

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To Mike Radich, 410 N. Formosa Ave., Los Angeles, $6,739.11 by Board of Public Works, Los Angeles, for constructing a storm drain in La Salle Avenue, between Florence Ave. and 74th St., under Spec. 137. 11-5

SANTA MARIA, CALIF.—Contract awarded (subject to PWA approval) to F. C. Stolte Co., San Simeon, who bid $26,900. Prop. No. 2, to City Clerk, City Hall, Santa Maria, for construction of a sewage disposal plant. 11-22

SONORA, CALIF.—Award recomm. (subj. to PWA approv.) to W. J. Tobin, 3701 Balfour Ave., Oakland, $40,000 approx. total) by City Clerk, Sonora, Calif. for const. sewers complete and sedimentation and sludge digestion tanks. Other items of original bids being eliminated. 11-23

VALLEJO, CALIF.—To W. J. Tobin, 3701 Balfour Ave., Oakland, $12,824 by City Clerk, Vallejo, for const. a storm sewer in Virginia St. betw. Branciforte St. and City Bulkhead. 11-18

Irrigation and Reclamation . .

CALLS FOR BIDS

PHOENIX, ARIZ.—Bids to 10 A. M., December 21st, by Showlow Silver Creek Water Conservation and Power Dist., Navajo County, Ariz., for const. of 9 separate units, all part of the Showlow-Silver Creek Water Conservation and Power District Project, involving: Construction of small masonry dam; two small earth fill dams (15,000 cu. yd. ea.); const. of 45 mi. small canals; 125 HP hydro-elec. plant; and 12 mi. of 11,000-volt transmission line. Bids will also be received direct from manufacturers for supplying: One 125 HP hydro-elec. turbine; one alternator for above turbine; miscell. power plant equip; elec. equip. for 11,000-volt transmission line; transformers, etc. Est. cost is $85,000. 11-26

OGDEN, UTAH—Bids to 10 A. M., December 20th, by Bureau of Reclamation, Ogden, Utah, for const. 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. No. 659. Work is located near Ogden, and Brigham, Utah, and involves: 240,000 cu. yd. all cl. exc. for canal, 115,000 sq. yd. trim earth sec. (conc. lining), 4,060 cu. yd. concrete in struc., 9,390 cu. yd. concrete in canal lining; 1,001,000 lb. reinf. bars (place), and other items. 11-25

BIDS RECEIVED

PHOENIX, ARIZ.—Vinson & Pringle, Phoenix, $147,400, low to Maricopa County Municipal Water Conservation District No. 1, Phoenix, for 2,200,000 sq. ft. canal lining. 11-6

PHOENIX, ARIZ.—Allied Bridge & Const. Co., Union State Bank Bldg., Omaha, Nebr., and Central Bridge & Const. Co., Omaha, Nebr., $150,723 low to Bureau of Reclamation, care of Salt River Valley Water Users' Assn., Phoenix, for const. spillway for Stewart Mt. Dam, Salt River proj. located 25 mi. N. E. of Mesa, Ariz., under Spec. 651. 11-25

YUMA, ARIZ.—Morrison-Knudsen Co., Inc., Utah Const. Co., and Winston Bros., 1 Montgomery St., San Francisco, $4,374,242 low to Bureau of Reclamation, Federal Bldg., Yuma, Ariz., for const. the Imperial Dam and Desilting Works, All-American Canal System, Boulder Canyon project, Arizona-California-Nevada, under Spec. No. 644. Work is located on the Colorado River about 18 mi. northeast of Yuma, Ariz. (See Unit Bid Summary). 11-21

YUMA, ARIZ.—Geo. Pollock Co., Forum Bldg., Sacramento, Sch. 1—$71,407; and Sch. 2—$629,580 low to Bur. of Reclam., Yuma, Ariz., for 5 mi. earthw. All-Amer. Canal, under Spec. 647. (See Unit Bid Summary). 11-23

YUMA, ARIZ.—Frazier Davis Const. Co., 1458 Arcade Bldg., St. Louis, Mo., $489,527 low to Bureau of Reclamation, Yuma, Ariz., for constructing wash siphon structures at 120 Wash, 424 Wash, Unnamed Wash and Picacho Wash, located between 5 and 12 miles northeast of Yuma, Ariz., under Spec. 645. 11-25

BONNERS FERRY, IDAHO.—Morrison-Knudsen Co., 319 Broadway, Boise, $183,165 (Complete Work) low to Kootenai Valley Drainage Dist.'s, care of Attorney O. C. Wilson, Bonners Ferry, Idaho, for clearing

right-of-way, dike reconst., drain ditch excavation, division ditches, log boom, pumping units and other necessary work in various Drainage Districts. 11-13

CASPER, WYOMING—Morrison-Knudsen Co., Inc., Utah Const. Co., and Winston Bros. Co., 1 Montgomery St., San Francisco, $2,819,460 low to Bureau of Reclamation, Casper, Wyoming, for const. the Seminoe Dam and Power Plant, Casper-Alcova Project, Wyoming. Work is located on the North Platte River about 37 miles northeast of Parco, Wyoming. (See Unit Bid Summary.) 11-26

CONTRACTS AWARDED

TURLOCK, CALIF.—To Ed. Erickson, Rt. 4, Box 744, Modesto, $20, 934 by Turlock Irrig. Dist., Turlock, Calif., for 351,842 sq. ft. 2" conc. levee lining on Ceres Main Canal from Drop No. 3 to Alexander Bridge. 11-6

TURLOCK, CALIF.—To Lloyd W. Terrell, 221 9th Avenue, Turlock, Calif., $5,634 by Turlock Irrigation Dist., Turlock, for 83,000 sq. ft. 2" concr. lining on Main Canal, near Drop. No. 4. 11-6

ONTARIO, ORE.—To Otis Williams & Co., 9151 N.E. Glisan St., Portland, Oregon, $19,918 by Bureau of Reclamation, Ontario, Ore., for constructing structures, North Canal Laterals, N.C. 37.6 to 38.7-1.2, Mitchell Butte Division, Owyhee Project, Oregon-Idaho, under Spec. 725-D. 11-15

ONTARIO, ORE.—To Geo. B. Henly, Nyssa, Oregon, $18,178 by Bureau of Reclamation, Ontario, Oregon, for const. earthwork and structures, North Canal Laterals, Dead Ox Flat Division, Owyhee Project, Oregon-Idaho, under Spec. 726-D. 11-15

ONTARIO, ORE.—To Brent Sturgill Co., Cascade Locks, Oregon, $53,639 by Bureau of Reclamation, Ontario, Ore., for const. earthwork and struc., South Canal, Sta. 1340 to Sta. 2016, Succor Creek Division, Owyhee Project, Oregon-Idaho, under Spec. 646. 11-19

River and Harbor Work. . . . .

WORK CONTEMPLATED

SAN DIEGO, CALIF.—Application has been made by the City of San Diego, Calif., to U. S. Engineer Office, 751 S. Figueroa St., Los Angeles, for War Permit to dredge an area, lying betw. the established U. S. Bulkhead and Pierhead Lines and extending from the foot of "E" to the foot of Columbia Sts., to a depth of 15' below mean lower low water, and deposit the dredged material, approx. 436,200 cu. yd. behind the adjacent Bulkhead Line for the purpose of park development. 11-20

BIDS RECEIVED

PORTLAND, ORE.—Lynch Brothers, 3635 Woodland Park, Seattle, Wn., $6,920 low to U. S. Engineer Office, Portland, Ore., for drilling in the area along the north bank of Columbia River at North Bonneville, Wn., under Sched. Form. A-694-36-123. 11-12

PORTLAND, ORE.—Pacific Construction Co., Seattle, Wn., $40,730 low to U. S. Engineer Office, Portland, Ore., for loading, hauling and placing loose and hand placed riprap on the slopes of the lower lock approach canal at Bonneville, Oregon, under Invit. for Bids No. 694-36-134. 11-21

CONTRACTS AWARDED

RICHMOND, CALIF.—To Edwin Anderson, 998 Gilman Ave., S. F., $10,218 by City Clerk, Richmond, for guniting substructure at wharf No. 1, Outer Harbor. 11-22

SAN FRANCISCO, CALIF.—To Healy Tibbitts Const. Co., 64 Pine St., S. F., $66,720 (subject to PWA approval) by Board of State Harbor Commissioners, San Francisco, for constructing a connecting wharf and shed at Piers 24 and 26, involving jacketed piles, timber deck, etc. 11-21

SAN FRANCISCO, CALIF.—To Healy Tibbitts Const. Co., 64 Pine St., S. F., $101,400 (subject to PWA approval) by Board of State Harbor Commissioners, San Francisco, for constructing a reinf. concrete bulkhead wharf extending across Piers 44 and 46, involving concr. jacketed piles and reinf. concrete deck. 11-21

SEATTLE, WN.—To Manson Const. & Engineering Co., Canadian Natl. Dock, Seattle, Wn., $16,749 by Board of Public Works, Seattle, Wn., for improvement of Railroad Avenue, Madison Street to Spring St. by driving timber piling. 11-12

SEATTLE, WN.—Awards as follow by Seattle Port Comm. for: (1) To Carl Bjork, 2437 W. 63rd St., Seattle, Wn., $44,859 for reconst. apron and wharf and lay conc. and asph. floors at Pier 41. (2) To General Const. Co., 3840 Iowa Ave., Seattle, Wn., $42,000 for reconst. and extending the north apron at Spokane St. terminal, involving 30,000 lin. ft. creosoted piling. 11-27

Tunnel Construction . . . . . .

BIDS RECEIVED

CASPER, WYOMING—W. E. Callahan & Gunther & Shirley, 206 S. Spring St., Los Angeles, $794,948 (all schedules) low to Bureau of Reclamation, Casper, Wyoming, for construction of Tunnels Nos. 3, 4, 5, and 6, Casper Canal, Casper-Alcova Project, Wyoming, under Spec. No. 649. 11-25

Miscellaneous. . . . . .

CONTRACTS AWARDED

PHOENIX, ARIZ.—Awards as follows by City Manager, Phoenix, for: (1)—To ARIZONA CONCRETE CO., who bid $12,000 for construction of a swimming pool in James Park. (2)—To NEW STATE ELECTRIC CO., who bid $7,312 for const. of lighting and power distribution system in James Park. (3)—To SCOTT COBURN, who bid $8 per foot for drilling well in James Park. 11-19

HAYWARD, CALIF.—Awards recommended (subject to PWA approval) as follows, by City Clerk, Hayward, for const. a Municipal Natatorium: GENERAL CONTRACT—To DeLuca & Son, 1745 Filbert St., S. F., $59,494. MECHANICAL WORK—To M. J. Reeves, 959 Natoma St., S. F., $16,242. ELECTRICAL WORK—To Abbett Elec. Works, 126 Spear St., S. F., $2,561. EQUIPMENT—To Trask & Squier Co., 39 Natoma St., S. F., $1,353. 11-8

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.

Backfillers
Austin-Western Road Mchy. Co.
Harnischfeger Corp.
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co.

Batchers, Concrete Aggregates
Western Pipe & Steel Co.

Bearings, Roller
Timken Roller Bearing Co.

Bins, Storage and Hopper
Western Pipe & Steel Co.

Bits, Rock Drilling
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Timken Roller Bearing Co.

Blades, Grader and Scraper
Adams, J. D., Co.
Allis-Chalmers Mfg. Co.
Austin-Western Road Mchy. Co.
Caterpillar Tractor Co.

Blasting Supplies
Apache Powder Co.
Atlas Powder Co.
Halafax Explosives Co.
Trojan Powder Co.

Bridges
Columbia Steel Co.

Buckets
American Manganese Steel Co.
Bucyrus-Erie Co.
Electric Steel Foundry Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Northwest Engineering Co.
Page Engineering Co.
Wellman Engineering Co.

Bulldozers
Austin-Western Road Mchy. Co.
LeTourneau, R. G., Inc.

Cable, Highway Guard Rail
Columbia Steel Company
Leschen, A., & Sons Rope Co.

Cableways
Columbia Steel Co.
Leschen, A., & Sons Rope Co.

Castings, Steel and Alloy Steel
American Manganese Steel Co.
Columbia Steel Company
Pacific Coast Steel Corp.
Electric Steel Foundry Co.

Cement
Pacific Portland Cement Co.
Portland Cement Association

Cement Pumping Equipment
Fuller Co.

Cement, Tan
Pacific Portland Cement Co.

Chemicals
Great Western Electro-Chemical Co.

Chlorinators
Wallace & Tiernan Co., Inc.

Chlorine
Great Western Electro-Chemical Co.

Clarifiers, Water
Link-Belt Co.

Compressors, Air
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Worthington Pump & Mchy. Co.

Conveyors, Belt
Jeffrey Manufacturing Co.
Link-Belt Co.

Cranes, Diesel, Electric, Gas and Steam
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Industrial Brownhoist Corp.
Harnischfeger Corp.
Koehring Co.
Lima Locomotive Works, Inc.
Link-Belt Co.
McKiernan-Terry Corp.
Northwest Engineering Co.
Thew Shovel Co.
Universal Crane Co.

Crushers
Austin-Western Road Mchy. Co.
Pioneer Gravel Equipment Mfg. Co.

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
Harnischfeger Corp.
McKiernan-Terry Corp.

Digestors
Chicago Bridge & Iron Works

Drills, Diamond
Chicago Pneumatic Tool Co.

Drills, Rock
Chicago Pneumatic Tool Co.
Ingersoll-Rand Company
Worthington Pump & Mchy. Corp.

Dynamite
Apache Powder Co.
Atlas Powder Co.
Halafax Explosives Co.
Trojan Powder Co.

Elevators, Bucket
Jeffrey Manufacturing Co.
Link-Belt Co.

Engines, Diesel, Gasoline and Steam
Caterpillar Tractor Co.
Chicago Pneumatic Tool Co.
Ingersoll-Rand 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.
Lima Locomotive Works, Inc.
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co.

Excavators, Dragline
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Lima Locomotive Works, Inc.
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co.

Explosives
Apache Powder Co.
Atlas Powder Co.
Halafax Explosives Co.
Trojan Powder Co.

Fence Posts
Columbia Steel Company

Fence, Wire
Columbia Steel Company

Ferric Chloride
Great Western Electro-Chemical Co.

Fire Hydrants
Columbian Iron Works

Flumes, Metal
California Corrugated Culvert Co.
Chicago Bridge & Iron Works
Hardesty Mfg. Co.
Pure Iron Culvert & Mfg. Co.
Toncan Culvert Mfrs. Assn.
Washington Corrugated Culvert Co.
Western Pipe & Steel Co.

Flumes, Wood Stave
Federal Pipe & Tank Co.

Forms, Concrete
Western Pipe & Steel Co.

Gasoline
General Petroleum Corp.

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.
Pioneer Gravel Equipment Manufacturing Co.

Grinding Machines, Concrete
Mall Tool Company

Hoists, Diesel, Gas, Electric and Hand Power
Chicago Pneumatic Tool Co.
Harnischfeger Corp.
Ingersoll-Rand Company
Link-Belt Co.
McKiernan-Terry Corp.
United Machinery Co.
Wellman Engineering Co.

Hoppers, Steel
Chicago Bridge & Iron Works
Link-Belt Co.
Standard Steel Works
Western Pipe & Steel Co.

Hose, Air, Steam and Water
Chicago Pneumatic Tool Co.

Hydrants
Columbian Iron Works
Pac. States Cast Iron Pipe Co.

Lighting Plants
General Electric Co.
Harnischfeger Sales Corp.

Liner Plates
Western Pipe & Steel Co.

Loaders, Power, Truck and Wagon
Austin-Western Road Mchy. Co.
Link-Belt Co.

Locomotives
Fate-Root-Heath Company

Lubricants, Oils and Greases
General Petroleum Corp.

Lumber
Baxter, J. H., & Co.

Lumber, Redwood
California Redwood Assn.

Lumber, Treated
Baxter, J. H., & Co.

Meters
Neptune Meter Co.

Mixers, Concrete
Koehring Co.

Motors, Electric
General Electric Co.
Harnischfeger Sales Corp.

Paints, Protective
General Paint Corp.

Paving Breakers
Chicago Pneumatic Tool Co.
Gardner-Denver Company
Ingersoll-Rand Company
Worthington Pump & Mchy. Corp.

Penstocks
Chicago Bridge & Iron Works
Western Pipe & Steel Co.

Pile Drivers
Harnischfeger Corp.
Industrial Brownhoist Corp.
McKiernan-Terry Corp.

Piling, Creosoted
Baxter, J. H., & Co.

Piling, Steel
Columbia Steel Co.
National Tube Company
Pacific Coast Steel Corp.

Piling, Wood
Baxter, J. H., & Co.

Pipe, Cast Iron
Pacific States Cast Iron Pipe Co.

Pipe, Riveted Steel
Chicago Bridge & Iron Works
Western Pipe & Steel Co.

Pipe, Steel
Columbia Steel Co.
National Tube Co.
Western Pipe & Steel Co.

Pipe, Steel, Cement Lined
National Tube Company

Pipe, Welded Steel
California Corrugated Culvert Co.
Chicago Bridge & Iron Works
Columbia Steel Co.
Hardesty Mfg. Co.
Toncan Culvert Mfrs. Assn.
Washington Corrugated Culvert Co.
Western Pipe & Steel Co.

Pipe, Wood
Federal Pipe & Tank Co.

Powder
(See Explosives)

Pumps
Chicago Pneumatic Tool Co.
Layne & Bowler Co.
Pelton Water Wheel Co.
Pomona Pump Co.
Worthington Pump & Mchy. Corp.

Rails and Rail Specialties
Columbia Steel Co.

Reinforcing, Steel Bar and Fabric, for Concrete
Columbia Steel Co.
Pacific Coast Steel Corp.

Road Oils
General Petroleum Corp.

Rollers, Compacting
LeTourneau, R. G., Inc.

Rollers, Road
Austin-Western Road Mchy. Co.

Rope, Wire
Columbia Steel Co.
Leschen, A., & Sons Rope Co.
Roebling's Sons Co., John A.

Scarifiers
Adams, J. D., Co.
Austin-Western Road Mchy. Co.
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Scrapers
Adams, J. D., & Co.
Austin-Western Road Mchy. Co.
LeTourneau, R. G., Inc.

Screens, Sand and Gravel
Austin-Western Road Mchy. Co.
Link-Belt Company
Pioneer Gravel Equipment Manufacturing Co.

Second Hand Equipment
(See Opportunity Section)

Sewage Disposal Equipment
Link-Belt Company
Wallace & Tiernan Company

Sharpeners, Drill
Chicago Pneumatic Tool Co.
Ingersoll-Rand Company
Worthington Pump & Mchy. Corp.

Shovels, Power
Austin-Western Road Mchy. Co.
Bucyrus-Erie Company
Harnischfeger Sales Corp.
Koehring Company
Lima Locomotive Works, Inc.
Link-Belt Company
Northwest Engineering Co.
Thew Shovel Company

Smoke Stacks
Chicago Bridge & Iron Works

Stand Pipes
Chicago Bridge & Iron Works

Steel, Abrasion Resisting
American Manganese Steel Co.
Columbia Steel Company
Electric Steel Foundry Co.
Pacific Coast Steel Corp.

Steel, Hollow Drill
Ingersoll-Rand Company
Pacific Coast Steel Corp.

Steel, Reinforcing
Columbia Steel Company
Pacific Coast Steel Corp.

Steel, Sheet-Galvanized Corrugated
California Corrugated Culvert Co.
Columbia Steel Company
Pacific Coast Steel Corp.
Toncan Culvert Mfrs. Assn.

Steel, Structural
Western Pipe & Steel Co.
Chicago Bridge & Iron Works

Tanks, Metal
California Corrugated Culvert Co.
Chicago Bridge & Iron Works
Western Pipe & Steel Co.

Tanks, Wood
Federal Pipe & Tank Co.

Timber, Creosoted
Baxter & Company, J. H.

Tools, Pneumatic
Chicago Pneumatic Tool Co.
Ingersoll-Rand Company
Worthington Pump & Mchy. Corp.

Torches, Carbide
Air Reduction Sales Co.

Tractors
Allis-Chalmers Mfg. Co.
Caterpillar Tractor Company
International Harvester Company of America

Tramways, Aerial
Columbia Steel Co.
Leschen, A., & Sons, Rope Co.
Roebling's Sons Co., John A.

Trucks, Motor
International Harvester Company of America

Tubing
National Tube Company

Turbines
General Electric Co.
Pelton Water Wheel Co.

Valves
Columbian Iron Works

Valves, Gate
California Corrugated Culvert Co.
Columbian Iron Works
Pacific Pipe Co.
Pelton Water Wheel Co.

Vibrators, Concrete
Chicago Pneumatic Tool Co.
Electric Tamper & Equipment Co.
Mall Tool Company

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.
Harnischfeger Corp.

Welding Rods and Wire
Adams, J. D., Co.

PROFESSIONAL DIRECTORY

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

Goodrich, B. F., Co.,
2nd St. and Van Buren
3-6168

McGinnis, Neil B., Company,
1401 South Central Ave.
4-1493
Adams, J. D. Co.
Gardner-Denver Company
Northwest Engineering Co.

Mine & Smelter Equipment Co.,
110 South Third Ave.
3-6418
Link-Belt Co.
Page Engineering Co.

Motor Supply Co., The,
315 N. Central Ave.
4-1153
Lincoln Electric 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.
Columbia Steel Co.
Gardner-Denver Company

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
Toncan Culvert Manufacturers' Association

Tucson

Baum & Adamson,
296 North Stone Ave.
4050
B. F. Goodrich Co.

Corbett, J. Knox, Lumber & Hdw. Co.,
340 North Sixth Ave.
2140
Austin-Western Road Machinery Co.
Fuller, W. P. & Co.,
219 East Congress St.
2278
Reilly Tar & Chemical Corp.

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.

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
Electric Tamper & Equipment Co.
Page Engineering Co.

California Redwood Association,
117 West Ninth St.
MUtual 8156

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
American Cable Co., Inc.
Bucyrus-Erie Co.

Diesel Motor Sales & Service Corp.,
2331 East Ninth St.
TRinity 4967
Cummins Engine Co.

Door Company, The,
108 West 6th St.
TUcker 8562

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.

Gardner-Denver Company,
845 East 61st St.
ADams 4115

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

B. F. Goodrich Co.,
1000 East 8th St.
TRinity 1075

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.
Gardner-Denver Company
Harnischfeger Corp.—Welders
Koehring Co.
Wellman Engineering Co.

Hercules Powder Co.,
Fidelity Bldg.
MUtual 6397

Lincoln Electric Co.
812 Mateo St.
TUcker 6261

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 Coast Steel Corporation
E. Slauson Ave. and Downey Road
LAfayette 1161

Pacific Portland Cement Co.,
633 East Gage Ave.
ADams 6103

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.

John A. Roebling's Sons Co.
216 South Alameda St.
TRinity 1261

Shepherd Tractor & Equipment Co.,
150 West Jefferson St.
PRospect 0247
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.
John A. Roebling's Sons Co.

Smith Booth Usher Co.,
2001 Santa Fe Ave.
TRinity 6911
Lima Locomotive Works, Inc. (Shovel and Crane Division)
Page Engineering Co.
Worthington Pump & Machinery Corp.

Saint Louis Power Shovel Co.,
322 West Third St.
MUtual 2885

St. John, A. S., Co., Inc.,
126 West Third St.
VAndike 8865
Apache Powder Co.

Stevenson Chemical Co.,
641 Gibbons St.
Gt. Western Electro-Chemical Co.

United States Pipe and Foundry Co.,
504 Subway Terminal Bldg.
VAndike 5166

Victor Welding Equipment Co.,
2032 Santa Fe Ave.
JEfferson 6246
General Electric 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

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
Page Engineering Co.

Fuller, W. P., & Co.,
259 10th St.
GLencourt 0167
Reilly Tar & Chemical Corp.

B. F. Goodrich Co.,
254 23rd St.
GLencourt 1803

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.

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.
Roebling, J. A., & Sons Co.

Where to Buy in the West

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.

General Paint Corp.,
11th and R
Capital 2121

B. F. Goodrich Co.,
12th and I Sts.
MAin 454

Harron, Rickard & McCone Co.,
1431 2nd St.
CApitol 1514
Elec. Steel Foundry Co.
Harnischfeger Corp.
Koehring Co.
Wellman Eng. Co.

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.
Gardner-Denver Company
LeTourneau, R. G., Inc.

Western Pipe & Steel Co.,
Care of Sutter Club
Main 217
Toncan Culvert Manufacturers' Association

San Diego

Charles N. Bottiger
209 West E.
Main 1657
Lincoln Electric Co.

Contractors Equipment & Machinery Co.
1344 National Ave.
Main 8833
John A. Roebling's Sons Co.
Worthington Pump & Machinery Co.

Fuller, W. P., & Co.,
803 7th Ave.
Main 0181
Reilly Tar & Chemical Corp.

General Electric Co.,
206 W. Market St.
Main 4288

B. F. Goodrich Co.,
7th and Market Sts.
FRanklin 6258
Gardner-Denver Company

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 5126
Adams, J. D., Co.

Air Reduction Sales Co.,
313 6th St.
SUtter 4582

American Cable Co., Inc.,
630 Third St.
SUtter 1708

Associated Equipment Co., Ltd.,
355 Fremont St.
KEarny 1181
Thew Shovel Co.

Atlas Powder Co.,
1 Montgomery St.
GArfield 8640

Austin-Western Road Mchy. Co.,
435 Brannan St.
DOuglas 2183

Bacon, Edward R., Co.,
17th and Folsom Sts.
HEmlock 3700
LeTourneau, R. G., Inc.
McKiernan-Terry Corp.
Page Engineering Co.
John A. Roebling's Sons Co.

Bucyrus-Erie Co.,
989 Folsom St.
GArfield 8192

California Redwood Association,
Financial Center Bldg.
EXbrook 7880

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.

Gardner-Denver Company,
250 Seventh St.
UNderhill 3280

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

B. F. Goodrich Co.,
11th and Howard Sts.
UNderhill 1801

Great Western Electro-Chemical Co.,
9 Main St.
GArfield 8323

Harnischfeger Sales Corp.,
82 Beale St.
DOuglas 2313

Harron, Rickard & McCone Co.,
2070 Bryant St.
ATwater 2202
Electric Steel Foundry Co.
Gardner-Denver Company
Harnischfeger Sales Corp.
Koehring Co.
Wellman Engineering Co.

Hercules Powder Company, Inc.,
Standard Oil Bldg.
DOuglas 2330

Kratz & McClelland, Inc.,
522 Bryant St.
SUtter 6807
Electric Tamper & Equipment Co.

Leitch & Company,
1222 Mission St.
HEmlock 0980

Leschen, A., & Sons Rope Co.,
520 Fourth St.
GArfield 8134

Lincoln Electric Co.,
894 Folsom St.
GArfield 5507

Link-Belt Co.,
400 Paul Ave.
DElaware 6400

Neptune Meter Co.,
320 Market St.
GArfield 8144

Northwest Engineering Co.,
255 Tenth St.
HEmlock 5060

Pacific Coast Steel Corp.,
20th and Illinois Sts.
MArket 3200

Pacific Pipe Co.,
207 Folsom St.
EXbrook 6255

Pacific Portland Cement Co.,
111 Sutter St.
GArfield 4100

Pacific States Cast Iron Pipe Co.,
Rialto Bldg.,
KEarny 5075

Portland Cement Association
564 Market St.
SUtter 8159

Robinson Tractor Co.,
1175 Howard St.
MArket 8020
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

John A. Roebling's Sons Company,
646 Folsom St.
GArfield 6490

Thew Shovel Co.,
355 Fremont St.
KEarny 1181

United States Pipe and Foundry Co.,
907 Monadnock Bldg.
GArfield 5140

Victor Welding Equipment Co.,
844 Folsom St.
GArfield 5727
General Electric Co.

Wallace & Tiernan Co., Inc.,
171 Second St.
KEarny 5072

Welding Service, Inc.,
954 Howard St.
DOuglas 3292
Harnischfeger Corp.—Welders

Western 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.

Cederberg, C. R.,
5531 East 14th Ave.
YOrk 0604
Wallace & Tiernan Co., Inc.

Clinton & Held Co.,
1637 Wazee St.
TAbor 3291
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Corson, Ray, Machinery Co.,
1646 Wazee St.
KEystone 6632
Bucyrus-Erie Co.
Page Engineerig Co.

Denver Oxygen Co.,
901 Navajo
TAbor 4725
Air Reduction Sales Co.

Door Company, The,
1009 17th St.
TAbor 1281

Fitzgerald, Paul,
U. S. Natl. Bank Bldg.
TAbor 1841
Harnischfeger Corp.—Welders

Gardner-Denver Company,
1727 East 39th Ave.
KEystone 0181

General Electric Co.,
650 17th St.
KEystone 7171

General Machinery & Supply Co.,
635 Walnut St.
KEystone 1500
Worthington Pump & Machinery Co.

Great Northern Tool & Supply Co.,
2125 Blake St.
TAbor 0197
Lincoln Electric Co.

B. F. Goodrich Co.,
14th and Glenarm Sts.
KEystone 0175

Hardesty Mfg. Co.,
3063 Blake St.
MAin 4156

Hendrie & Bolthoff Mfg. & Supply Co.
1639 17th St.
KEystone 4111
Gardner-Denver Company
General Electric Co.
John A. Roebling's Sons Co.

Hercules Powder Co., Inc.,
1822 California St.
TAbor 5386

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
Gardner-Denver Company,
McKiernan-Terry Corp.
Northwest Engineering Co.

Moore Hardware & Iron Co.,
1529 15th St.
TAbor 2251
Harnischfeger Corp.—Welders

Moore, H. W., Equipment Co.,
Sixth and Acoma Sts.
TAbor 1361
Thew Shovel Co.
Wellman Engineering Co.

Neptune Meter Co.,
1700 15th St.
MAin 3221

Pacific States Cast Iron Pipe Co.,
1921 Blake St.
MAin 0697

Steinbarger, Herbert N., Co.,
1711 Market St.
MAin 3460
Lima Locomotive Works, Inc.

Thompson Mfg. Co.,
3001 Larimer
KEystone 8196
Toncan Culvert Manufacturers' Association

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
Gardner-Denver Company,
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

Where to Buy in the West

Hardesty Mfg. Co.,
223 South Third St.
3031

Intermountain Equipment Co.,
Broadway and Myrtle St.
171
Bucyrus-Erie Co.
General Electric Co.
John A. Roebling's Sons Co.

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.

Stockton-Regan, Inc.,
10th and Grove Sts.
78
B. F. Goodrich Co.

Western Equipment Company,
Box 1406
Gardner-Denver Company

Montana

Billings

Austin-Western Road Mchy. Co.,
2413 First Ave. N.

Connelly Machinery Co.,
2706 Montana Ave.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Leschen, A., & Sons Rope Co.,
LeTourneau, R. G., Inc.

Freeman Auto Service,
B. F. Goodrich Co.

Great Northern Tool & Supply Co.,
Box 957
2141
Lincoln Electric Co.

Hardie, W. C.,
1121 N. 32nd St.
5548
Adams, J. D., Co.

Midland Implement Co.,
2300 Montana Ave.
Koehring Co.
Page Engineering Co.

Butte

Atlas Powder Co.,
412 West Broadway
2-4868

Daugherty, H. H.,
420 South Idaho St.
3884
Bucyrus-Erie Co.

Gardner-Denver Company,
P. O. Box 1367
6376

General Electric Co.
20 West Granite St.
5479

Hall-Perry Machinery Co.,
812 East Iron St.
6376
American Cable Co., Inc.,
Gardner-Denver Company,
Page Engineering Co.
Thew Shovel Co.

Lowney & Williams,
202 South Montana St.
3352
B. F. Goodrich Co.
John A. Roebling's Sons Co.

Wright, S. P., & Co., Inc.
48 East Broadway
2-3221
Lima Locomotive Works, Inc.

Great Falls

Connelly Machinery Co.,
315 2nd Street S.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Leschen, A., & Sons Rope Co.
LeTourneau, R. G., Inc.

Hoidal, Milton
1306 Second Ave. South
3320

Northwest Equipment Co., Inc.,
Great Northern Tracks
3982
Koehring Co.

Taylor Chevrolet Co.,
802 Central Ave.
8467
B. F. Goodrich Co.

Missoula

Hardesty Mfg. Co.
Star Garage,
B. F. Goodrich Co.

Wells, Walker J.
Austin-Western Road Machinery Co.

Westmont Tractor & Equipment Co.,
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Leschen, A., & Sons Rope Co.
LeTourneau, R. G., Inc.
Wellman Engineering Co.
Worthington Pump & Machinery Corp.

Nevada

Reno

Bacon, Edward R. Co.,
649 John Fremont Drive
Reno 4043
LeTourneau, R. G., Inc.
McKiernan-Terry Corp.
Page Engineering Co.

Bell, O. C.,
649 John Fremont Drive
Reno 4043
Adams, J. D., Co.

Collier Tractor & Equipment Co.,
502 East Fourth St.
Reno 6107
American Cable Co., Inc.
Caterpillar Tractor Co.
Gardner-Denver Company,
Harnischfeger Corp.
LeTourneau, R. G., Inc.

Flanigan Warehouse Co.,
408 Eureka St.
Reno 3852
Columbia Steel Co.
Pac. Portland Cement Co.,
Western Pipe & Steel Co.

Hinckley Tire Service, Inc.,
145 W. 2nd St.
REno 6792
B. F. Goodrich Co.

Reno Motor Supply Co.,
15 West Plaza
REno 4108
Air Reduction Sales Co.

New Mex.

Albuquerque

Calhoun Independent Oil Co.,
1801 North 4th St.
3516
B. F. Goodrich Co.

Harrison, R. L., Co., Inc.,
211 North 4th St.
3300
American Cable Co., Inc.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Gardner-Denver Company,
LeTourneau, R. G., Inc.
McKiernan-Terry Corp.
Wellman Engineering Co.

McChesney-Rand Equipment Co.,
Adams, J. D., Co.
Thew Shovel Co.

Santa Fe

McChesney-Rand Equipment Co.,
Adams, J. D., Co.
Thew Shovel Co.

Santa Fe Motor Co.,
B. F. Goodrich Co.

Oregon

Klamath Falls

Locke Motor Co.,
522 South Sixth St.
49
B. F. Goodrich Co.

Lorenz Co.,
Sixth & Broad Sts.
371
John A. Roebling's Sons Co.

Miller Tractor & Equipment Co.,
719 Market St.
314
Caterpillar Tractor Co.

People's Warehouse,
1425 South Sixth St.
704
Air Reduction Sales Co.

Portland

Air Reduction Sales Co.,
2878 N. W. Sherlock
BRoadway 2501

American Manganese Steel Co., Inc.,
Foot of Sheridan St.
ATwater 7425

Atlas Powder Co.,
833 Pacific Bldg.
BEacon 2845

Beall Pipe & Tank Corp.,
1945 N. Columbia Blvd.
WAlnut 3171
Toncan Culvert Manufacturers' Association

Clyde Equipment Co.,
1631 N. W. Thurman St.
BRoadway 5561
Bucyrus-Erie Co.
Electric Tamper & Equipment Co.

Columbia Steel Co.,
2345 N. W. Nicolai St.
BEacon 7261

Consolidated Supply Co.,
139 S. W. Stark
ATwater 6511
Air Reduction Sales Co.

Cramer Machinery Co.,
Lewis Bldg.
ATwater 3852
Koehring Co.

Diesel Engine Sales & Service Corp.,
1329 S. W. Morrison St.
BEacon 9050
Cummins Engine Co.

Electric Steel Foundry Co.,
2458 N. W. York St.
BEacon 6344
American Cable Co., Inc.

Firestone Tire & Rubber Company,
416 N. W. 14th Ave.
BRoadway 2651

Feenaughty Machinery Co.,
112 S. E. Belmont St.
EAst 2187
Gardner-Denver Company,
LeTourneau, R. G., Inc.
Page Engineering Co.
Thew Shovel Co.

General Electric Co.,
621 S. W. Alder St.
ATwater 0281

General Paint Corp.,
838 S. W. 2nd Ave.
ATwater 5205

B. F. Goodrich Co.,
Union and Stark Sts.
EAst 4148

Haag, A. C., & Co.
931 S. E. Sixth Ave.
EAst 2388
Worthington Pump & Machinery Corp.

Harmer Steel Products & Supply Co.,
120 S. W. Front
ATwater 2957
John A. Roebling's Sons Co.

Haseltine, J. E., & Co.,
115 S. W. Second Ave.
ATwater 7511
General Electric Co.

Howard-Cooper Corp.,
307 S. E. Hawthorne Ave.
EAst 8188
J. D. Adams Co.
McKiernan-Terry Corp.

Leschen, A., & Sons Rope Co.,
Foot of S. W. Sheridan St.
ATwater 7425

Lincoln Electric Company,
1631 N. W. Thurman St.
BRoadway 5561

Link-Belt Co.,
1637 N. W. 14th Ave.
ATwater 6481

Loggers & Contractors Machinery Co.,
211 S. E. Madison St.
EAst 4128
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.
Wellman Engineering Co.

Neptune Meter Co.,
1519 N. W. Johnson St.
BRoadway 0100

Pacific Coast Steel Corp.,
American Bank Bldg.
BEacon 7238

Pacific Portland Cement Co.,
701 Lewis Bldg.
ATwater 6656

Pacific States Cast Iron Pipe Co.,
Spaulding Bldg.
ATwater 5465

Pure Iron Culvert & Mfg. Co.,
2321 S. E. Gladstone
SEllwood 2275

John A. Roebling's Sons Co.,
14th and Marshall Sts.
BRoadway 6411

Western Loggers Mchy. Co.,
302 S. W. 4th Ave.
ATwater 7491
Harnischfeger Corp.—Welders

Western Steel & Equipment Co.,
734 N. E. 55th Ave.
TAbor 2370
Lima Locomotive Works, Inc.

Texas

El Paso

Car Parts Depot, Inc.,
810 Texas St.
Main 9000
Harnischfeger Corp.—Welders

Gardner-Denver Company,
301 San Francisco St.
MAin 2777

General Electric Co.,
109 North Oregon St.
Main 5500

General Engineering & Equipment Co.,
Worthington Pump & Machinery Corp.

B. F. Goodrich Co.,
501 Texas St.
MAin 262

Magnolia Airco Gas Products Co.,
Old Fort Bliss
MAin 1390
Air Reduction Sales Co.

Mine & Smelter Supply Co.,
410 San Francisco
Main 5720
Worthington Pump & Machinery Corp.

Momsen-Dunnegan-Ryan Co.,
800 East Overland St.
Main 7100
Apache Powder Co.

Where to Buy in the West

Tri-State Equipment Co.,
500 East Overland St.
Main 1507
American Cable Co., Inc.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Gardner-Denver Company,
LeTourneau, R. G., Inc.
McKiernan-Terry Corp.
Wellman Engineering Co.

Western Metal Mfg. Co.,
6th and S. St. Vrain
Main 1226

Worthington Pump & Machinery Corp.,
206 San Francisco St.
Main 863

Zork Hardware Co.,
309 North El Paso St.
Main 1040
Leschen, A., & Sons Rope Co.

Utah

Salt Lake City

Ambler & Ritter
Kearns Bldg.
Wasatch 1132
Thew Shovel Co.

Arnold Machinery Co.,
149 West Second South St.
Wasatch 8973
Northwest Engineering Co.
Page Engineering Co.

Atlas Powder Co.,
822 Continental Natl. Bank Bldg.
Wasatch 4027

Columbia Steel Co.,
1606 Walker Bank Bldg.
Wasatch 1076

Gallgher Company
228 South West Temple St.
Wasatch 900
Gardner-Denver Company
General Electric Co.

Gardner-Denver Company,
113 West Second South St.
WAsatch 6210
John A. Roebling's Sons Co.

General Electric Co.,
200 S. Main St.
Wasatch 735

B. F. Goodrich Co.,
131 East First South St.
WAsatch 5024

Hardesty Mfg. Co.,
631 South Third West
Wasatch 3141

Harrison & Company
Dooley Block
Fuller Co.

Hercules Powder Company, Inc.,
910 Kearns Bldg.
WAsatch 815

Jones, C. H., Co.
134 Pierpont Ave.
Wasatch 2580
Lima Locomotive Works, Inc.

Landes Tractor & Equipment Co.,
245 West South Temple St.
Wasatch 4020
Caterpillar Tractor Co.
Harnischfeger Corp.—Welders and Hoists
LeTourneau, R. G., Inc.

Lang Company, The
267 West First South St.
Wasatch 6693
Austin-Western Road Machinery Co.
Gardner-Denver Company,

Lund Machinery Co.
49 North Second West St.
Wasatch 5581
Adams, J. D., Co.
Gardner-Denver Company,
Koehring Co.

Mine & Smelter Supply Company,
121 West 2nd South St.
WAsatch 404
Gardner-Denver Company,

National Equipment Co.
101 West Second South St.
Wasatch 1722
American Cable Co., Inc.
Wellman Engineering Co.

Newman, Wm. E., & Sons Company,
Ogden, Utah
Toncan Culvert Manufacturers' Association

Smoot Machinery Co.,
165 East Fourth South St.
WAsatch 1050
Gardner-Denver Company,
Le Tourneau, R. G., Inc.,

Waterworks Equipment Co.
149 West Second South St.
Wasatch 2465
Neptune Meter Co.
Pacific States Cast Iron Pipe Co.

Whitmore Oxygen Co.,
430 East South Temple
WAsatch 3181
Air Reduction Sales Co.

Z. C. M. I.
351 Z. C. M. I. Ave.
Wasatch 1010
Leschen, A., & Sons Rope Co.

Washington

Seattle

Air Reduction Sales Co.,
3623 East Marginal Way
ELliott 4720

American Manganese Steel Co., Inc.,
4785 First Ave. South
GLendale 3100

Armstrong, H. J., Co.
2244 First Ave. So.
ELliott 5940
Leschen, A., & Sons Rope Co.
Lima Locomotive Works, Inc.
(Shovel and Crane Division)
Page Engineering Co.

Atlas Powder Co.
1320 Jos. Vance Bldg.
MAin 5110

H. A. Cheever Co.,
1962 First Ave., S.
ELliott 6188
Lincoln Electric Co.

Clyde Equipment Co.
3410 First Ave. South
MAin 1235
Bucyrus-Erie Co.
Electric Tamper & Equipment Co.

Columbia Steel Company
1054 Fourth Avenue South
MAin 1972

Cox, A. H., & Co., Inc.
1757 First Ave. South
MAin 1121
Austin-Western Road Machinery Co.
Link-Belt Co.
Wellman Engineering Co.

Door Company, The,
2820 34th Ave., South

Electric Steel Foundry Co.
2724 First Ave. South
ELliott 1084
American Cable Co., Inc.

Feenaughty Machinery Co.
1028 Sixth Ave. South
ELliott 7808
Gardner-Denver Company
LeTourneau, R. G., Inc.
Page Engineering Co.
Thew Shovel Co.

Firestone Tire & Rubber Company,
958 Harrison St.
MAin 8300

Gardner-Denver Company,
2244 First Ave., South
ELliott 5940

General Electric Co.
821 Second Ave.
MAin 9790

General Paint Corp.
1406 Dearborn St.
PRospect 7600

B. F. Goodrich Co.,
535 First Ave. South
MAin 8080

Grant Auto Electric Co., Inc.,
1425 12th
EAst 0525
Air Reduction Sales Co.

Harnischfeger Sales Corp.
2911 First Ave. South
MAin 5576

Haseltine, J. E., & Co.
440 Holgate St.
SEneca 0626
General Electric Co.

Howard-Cooper Corp.
1520 Fourth Ave. South
ELliott 0740
J. D. Adams Company
McKiernan-Terry Corp.

Lima Locomotive Works, Inc.
(Shovel and Crane Division)
2244 First Ave. South
ELliott 5940

Link-Belt Co.
820 First Ave. South
ELliott 5554

Pacific Coast Steel Corp.
28th Ave. S.W. and W. Andover St.
WEst 1131

Pacific Hoist & Derrick Co.
3200 Fourth Ave. South
ELliott 1860
Northwest Engineering Co.

Pacific Portland Cement Co.
1871 16th Ave. S.W.
ELliott 4033

Portland Cement Association
903 Seaboard Bldg.
SEneca 0916

Purcell, Hugh G., Co.
Colman Bldg.
MAin 6835
Industrial Brownhoist Corp.
United States Pipe and Foundry Co.

Reilly Tar & Chemical Corp.
Central Bldg.
SEneca 1191

John A. Roebling's Sons Co.,
900 First Ave., South
MAin 4992

Smith, R. G.
3223 61st Avenue S.W.
WEst 2416
Adams, J. D., Co.

Snow, L. A., Co.
1032 Sixth Ave. South
ELliott 4188
Koehring Co.

Wallace & Tiernan Co., Inc.
917 Terminal Sales Bldg.
MAin 0201

Washington Corrugated Culvert Co.
4327 Roosevelt Way
EVergreen 0660

Western Tractor & Equipment Co.
2230 First Ave. South
MAin 5180
Caterpillar Tractor Co.

Worthington Pump & Machinery Corp.
922 First Avenue South
MAin 4220

Spokane

Atlas Powder Co.
1131 Old Natl. Bank Bldg.
Main 4733

Austin-Western Road Mchy. Co.
N. 1405 Ash St.
Broadway 1294

Broadway Welding & Mach. Works,
1021 Broadway
BRoadway 0120
Air Reduction Sales Co.

Bucyrus-Erie Co.
1805 Ninth Ave.

Construction Equipment Co.
1118 Ide
Broadway 5076
Wellman Engineering Co.

Columbia Steel Company
W. 914 Ninth Avenue
Riverside 3695

Feenaughty Machinery Co.
N. 715 Division St.
Broadway 5606
Gardner-Denver Company
Thew Shovel Co.

General Electric Co.
421 Riverside Ave.
Main 5201

General Machinery Co.
E. 3501 Riverside Ave.
Lakeview 1134
Lima Locomotive Works
John A. Roebling's Sons Co.
Worthington Pump & Machinery Corp.

General Paint Corp.
713 First Avenue
Main 2166

B. F. Goodrich Co.,
829 Second St.
RIverside 0064

Geo. Gibson,
c/o Pacific Hotel
RIverside 3141
Lincoln Electric Co.

Harnischfeger Sales Corp.
S. 1314 Bernard St.
Main 6805

Howard-Cooper Corp.
134 Spokane International Rt. of Way
Main 1812
J. D. Adams Company
McKiernan-Terry Corp.

Hofius-Ferris Equipment Co.
728 Mallon Ave.
Broadway 1954
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Hughes & Co.
S. 119 Howard St.
Main 4277
Neptune Meter Co.

Lundy, A. L.
Culmstock Arms Apt. Hotel
Riverside 7181
Columbia Steel Company

Nott-Atwater Co.
S. 157 Monroe St.
Main 4377
Leschen, A., & Sons Rope Co.

Snow, L. A., Co.
S. 151 Madison St.
Main 4226
American Cable Co., Inc.
Koehring Co.

Spokane Welders Supply Co.,
919 1st
MAin 2044
Air Reduction Sales Co.

Washington Corrugated Culvert Co.
N. End Division Bridge
Broadway 3537

Tacoma

American Cable Co., Inc.,
2312 East E St.

General Electric Co.
1019 Pacific Ave.
Main 2832

B. F. Goodrich Co.,
21st and Pacific Ave.
MAin 9173

Wyoming

Cheyenne

Carrolls, Geo., Scout Super Service,
202 East Lincoln Highway
4312
B. F. Goodrich Co.

Moss, Glenn
423 West 19th
Austin-Western Road Machinery Co.

Wortham Machinery Co.
410 West 19th St.
4649
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

OPPORTUNITY SECTION

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF THE INTERIOR

Bureau of Indian Affairs
(Irrigation Division)

Construction of Arch Dam, Owyhee River, Owyhee, Nev.

Washington, D. C., December 2, 1935.

U. S. Indian Irrigation Service, 751 So. Figueroa St., Los Angeles, Calif. Sealed bids will be received at this office until 2:00 p. m., P. S. T., January 14th, and then publicly opened, for the furnishing of part of the material and all labor and performing all work for the construction of an arch dam containing approximately 3,500 cubic yards of concrete, located approximately 70 miles north of Elko, Nevada, at the Wild Horse Site, on the Owyhee River. Bid security in the amount of five per cent of the bid and performance bond in the sum of fifty per cent of the contract price will be required. The charge for copies of specifications and plans is $5.00, payable to the Special Disbursing Agent, not returnable. Further information may be secured from the Supervising Engineer, at the above address.

C. A. ENGLE,
Supervising Engineer.

NOTICE TO CONTRACTORS

Sealed proposals will be received at the office of the East Bay Municipal Utility District, 512 Sixteenth Street, Oakland, California, until 5:30 p. m., Wednesday, December 18, 1935, and will at that hour be opened for furnishing 195,000 sq. ft. of Galvanized and Welded Steel Wire Fabric.

Proposal No. 708, covering same, may be obtained upon application at Room 312 of the office of the District.

JOHN H. KIMBALL,
Secretary.

Oakland, California,
December 5, 1935.

OFFICIAL BIDS

PUMPING PLANT BUILDING

Los Angeles, California

Bids January 14, 1936

Subject to the condition set forth in the official Notice Inviting Bids, a copy of which may be obtained at the address herein stated, sealed proposals for constructing the Iron Mountain pumping plant building and appurtenant works of the Colorado River Aqueduct will be received by The Metropolitan Water District of Southern California at its office building, 306 West Third Street, Los Angeles, California, until 10:00 a. m., January 14, 1936.

The work is located in San Bernardino County, on the line of the Colorado River Aqueduct, about 15 miles northwest of the town of Rice, California, and comprises the construction of a pumping plant building together with its inlet works, outlet structures, steel delivery pipes, electrical switching stations, and other appurtenant works. The building is to be of reinforced concrete and steel construction and the switch and bus structures of galvanized structural steel erected on concrete foundations. No proposal will be considered for less than the whole of the work.

Each proposal must be accompanied by a certified or cashier's check for $100,000. The bidder to whom contract is awarded must furnish a faithful performance bond in an amount not less than 50 per cent of the estimated payments to be made under the contract, and a materialmen and laborers' bond in the amount required by the California statutes, and must pay not less than the prevailing rates of per diem wages as set forth in the Notice Inviting Bids referred to above.

Printed copies of plans and specifications for this work may be purchased from the District, express charges prepaid, for $5.00 per copy. This payment will in no event be refunded.

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA.

By F. E. WEYMOUTH,
General Manager and Chief Engineer.

November 29, 1935.

POSITIONS WANTED

CONSTRUCTION ENGINEER—Twenty years' experience in all types of building construction in all parts of the country. Have had entire charge of construction and contract work on many of the largest and fastest erected structures in the Middle West. Member of A. S. C. E., best of references, will go anywhere. Box 465, *Western Construction News*, 114 Sansome Street, San Francisco, Calif.

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