WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED
WESTERN HIGHWAYS BUILDER

PUBLISHED MONTHLY
VOLUME XI, No. 2

FEBRUARY, 1936

25 CENTS A COPY
$2.00 PER YEAR

IN THIS ISSUE

Night does not interrupt work on the Grand Coulee dam, where concrete placing is under way, as described on page 31.

GOLDEN GATE PORTLAND CEMENT

LINED with concrete 4 feet thick at the sidewalls and 3 feet at the crown, the Yerba Buena Tunnel takes its place in modern engineering achievement as the largest bore tunnel in the world. It is 76 feet wide, 58 feet high, and 540 feet long. Its double decks provide for 6 lanes of motor traffic, 3 lanes of truck traffic, and 2 interurban tracks.

Appropriate is the fact that the cement chosen for all the concrete is Golden Gate True Portland Cement, produced on San Francisco Bay.

No matter what the job—whether it takes one sack or a trainload—you'll find the right cement for the purpose under the reliable name of Golden Gate.

PACIFIC PORTLAND CEMENT COMPANY
SAN FRANCISCO

FOR SOUND CONSTRUCTION

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

ADAMS Heavy-Duty Motor Graders

with 59 h.p. Gasoline Engine—or 57 h.p. Diesel Engine

STRENGTH, power and traction galore are yours in these new machines—power to do the heaviest job of maintenance, reconstruction, road mix, scarifying and ditch work that you will ever want to do with a motor grader . . . The engine H. P. speaks for itself—Adams Tandem Drive furnishes ample traction to put every bit of it to work under any conditions. The power units are time-tested products of the International Harvester Company on which service is available everywhere . . . The most powerful motor graders ever produced; the strongest and most rigid because of Adams new, all-welded, box-type frame construction, which holds the blade rigidly to a smooth, steady cut. This frame also vastly improves the operator's visibility of his blade . . . Mechanically-operated power controls provide instant and positive adjustments; hydraulic brakes furnish effective braking power . . . Five-forward-speed transmission permits any speed from 1 to 15 m.p.h. to suit the job. Available with dual-tired, two-wheel drive or Adams Tandem Drive, with or without scarifier and with 12, 14 or 16 ft. blade . . . If you are looking for a motor grader that will "go through" on any job, get full particulars on these machines before buying.

ROAD ADAMS MACHINERY

J. D. ADAMS COMPANY San Francisco Los Angeles—Billings

Western Distributors: **Howard-Cooper Corp.**, Portland, Seattle, Spokane; **Lund Machinery Co.**, Salt Lake City; **Niel B. McGinnis Co.**, Phoenix, Ariz; **McKelvy Machinery Co.**, Denver; **McChesney-Rand Equipment Co.**, Santa Fe, N. M.

An impressive demonstration of power—scarifying a hard gravel road while traveling up a steep grade.

A long front axle with adjustable leaning wheel is available as optional equipment on either machine.

Ten Years Ago

Items from the second month's issue of "Western Construction News," February, 1926

Work was nearing completion on the 276-mi. Natron Cut-off of the Southern Pacific Co. in Northern California and Southern Oregon under the direction of Geo. W. Boschke, chief engineer. On the section being built by the Utah Construction Co., H. J. Lawler was general superintendent.

●

Smith Bros., T. E. Connolly and Twohy Bros. Co., were making rapid progress on their separate tunnel contracts on the Mokelumne River aqueduct for the East Bay Municipal Utility District.

●

G. B. Hegardt was named manager and chief engineer for the Port of Oakland, then embarking on a $10,000,000 harbor development program.

●

Walter L. Huber, consulting engineer of San Francisco, was beginning a term as national vice-president of the Am. Soc. C. E.

●

Kuckenberg & Wittman of Portland were starting construction on the Vantage Ferry bridge over the Columbia River in central Washington. Andrew Wittman was in general charge of the work.

●

The Pechstein Dam was well under way as the last unit of the construction program of the Vista Irrigation District near San Diego. Kenneth Q. Volk was chief engineer and manager of the district and J. B. Lippincott was consulting engineer. The contractor was L. J. Turner. After spreading, the earthfill was compacted by a sheeps-foot roller "drawn by a four-mule team."

●

A paper by R. M. Morton, state highway engineer of California, contained the statement that: "The habitual high speed of automobiles in California requires a high standard of alignment and except in the heaviest mountain locations do we use curves of radius of less than 300 ft."

SUBSCRIPTION RATES

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

WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER

J. I. BALLARD, Editor

Contents for February, 1936

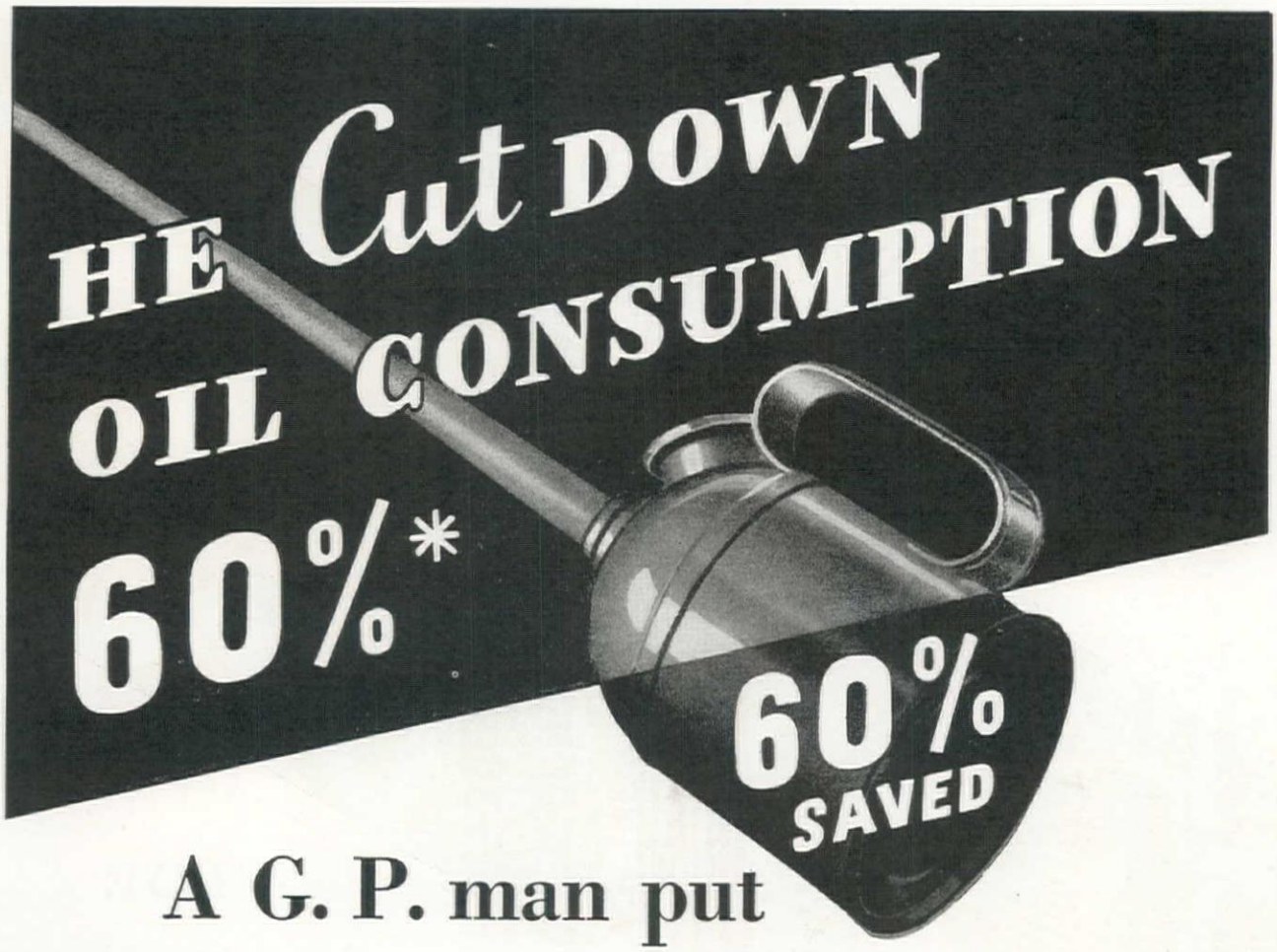
WESTERN CONSTRUCTION PUBLICATIONS, Inc.

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

Southwest Office: 206 S. Spring, Los Angeles, Newton W. Withers, Mgr.
Northwest Office: 2937 N.E. 64th Ave., Portland, Ore., G. E. Bjork, Mgr.
Chicago Office: 6100 N. Winthrop Ave., Stephen H. Babcock, Manager.
New York Office: 509 Fifth Avenue . . . . . Ralph H. Flynn, Manager

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

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



A G. P. man put his finger right on the leak

One of the Socony-Vacuum trained engineers of General Petroleum Corporation was called in to help solve the lubrication problem of a large plant in California.

His advice saved 60% in oil consumption on one operation alone, and provided *better* lubrication than before.

Perhaps you have a lubrication problem the G. P. man may help you solve. The suggestions of these trained engineers frequently result in uncovering hidden profits for plant owners and increased efficiency in plant operation.

Without any obligation whatsoever, General Petroleum, distributors of Socony-Vacuum lubricants on the Pacific Coast, offer the services of these Socony-Vacuum trained engineers. Send for the G. P. man.

* On the large main generating engine of this plant, it was first determined just how little oil could be used before developing abnormal drag and squeak on Corliss valves. With Gargoyle Super Cylinder Oil 600 W, it was possible to obtain these results with oil used in the ratio of 2¼ to 3¾ of oil previously used. Better lubrication is evidenced by piston rod and tail rod appearances, as well as less valve drag.

GARGOYLE
Lubricating Oils

GENERAL PETROLEUM CORPORATION

A Socony-Vacuum Company

PACIFIC COAST MARKETERS OF GARGOYLE INDUSTRIAL LUBRICANTS

LIMA USES SPECIAL STEELS SUITED TO THE WORK THE PARTS ARE TO PERFORM

ALLOYS used in the manufacture of LIMA excavators have been especially developed for the work the parts are to perform. Rigid tests, both physically and chemically, are made to ascertain that the steels are properly annealed and heat-treated. These tests are made in LIMA'S own up-to-the-minute laboratory, under expert supervision of men who are responsible for the steels that go into the manufacture of Lima Locomotives. This highly important feature is but one of the many precautions taken by LIMA to assure the customer that he is getting a machine that will withstand the most severe service with only the minimum delay.

CARBON STEEL CASTINGS

1 Used where maximum strength comb ability to withstand torsional and sho required, such as truck base and revo castings.

CARBON STEEL FORG

2 Used where bulldog resistance under heavy loads is required, su

CHROMIUM NICKEL TREATED STEE

3 Used where shock loa with severe torsional stresses are encounte machinery shafts.

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

LIMA

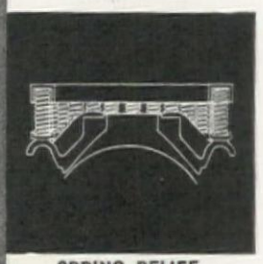
SHOVELS — DRAGLINES — CRANES — CLAMSHE

GREATER TONNAGE *and a* MORE CUBICAL PRODUCT

● Not only does the Telsmith Gyrasphere increase tonnage . . . it turns out a more cubical aggregate which makes stronger concrete and better road material. The reasons—outstandingly superior features of Telsmith design.

❶ CHOKE FEED—Fill the hopper up with rock . . . cover it up . . . pile it deep . . . Telsmith takes an unregulated choke feed. That means steady, reliable, economic, effective reduction capacity. ❷ SPRING RELIEF—Springs relieve momentary packing and compensate for uncrushable material in the crushing chamber . . . allow finer adjustment. ❸ SPHERICAL HEAD and corresponding concave crush like an inverted mortar and pestle . . . rock being caught and broken between two multi-curved surfaces . . . causing an ideal cubing action. The spherical shape of the crushing head greatly reduces the lateral pressures, thereby relieving the load on the bronze eccentric sleeves. Diverted *downward* a large part of the load is concentrated on ❹ THE ROTARY HEAD SUPPORT and roller thrust bearings. Head and shaft are supported on the eccentric by means of the upper roller thrust bearing while the downward pressures are transmitted to the frame by the lower roller thrust bearing (see sectional view) which supports the shaft. As both bearings rotate, wear is uniform and supporting surfaces are always perfectly aligned—shaft breakage is eliminated, eccentric bearings last longer.

❶ CHOKE FEED



❷ SPRING RELIEF

❸ SPHERICAL HEAD

❹ ROTARY HEAD SUPPORT

WRITE FOR BULLETIN Y-30

SMITH ENGINEERING WORKS

4010 N. HOLTON STREET MILWAUKEE, WIS.

California Equipment Co.
Los Angeles, Calif.

Jenison Machinery Co.
San Francisco, Calif.

Clyde Equipment Co.
Portland, Ore.

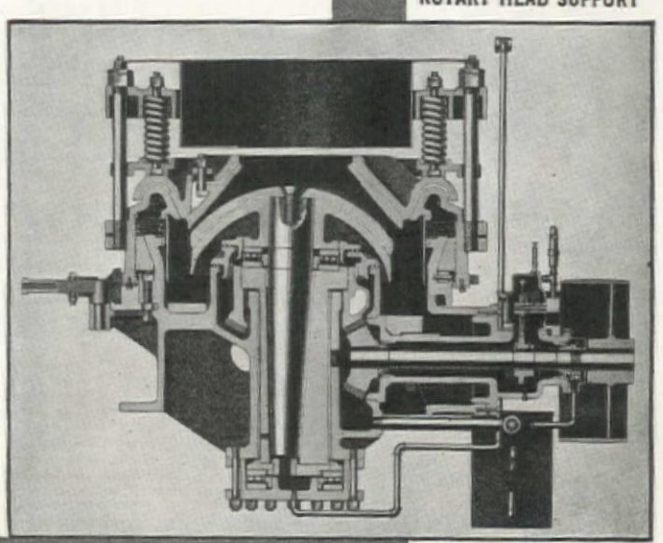
Clyde Equipment Co.
Seattle, Wash.

General Machinery Co.
Spokane, Wash.

General Machinery Co.
Butte, Mont.

Associates in Canada: Canadian Ingersoll-Rand Co., Ltd.
Montreal, Toronto, Winnipeg, Vancouver

Y-8

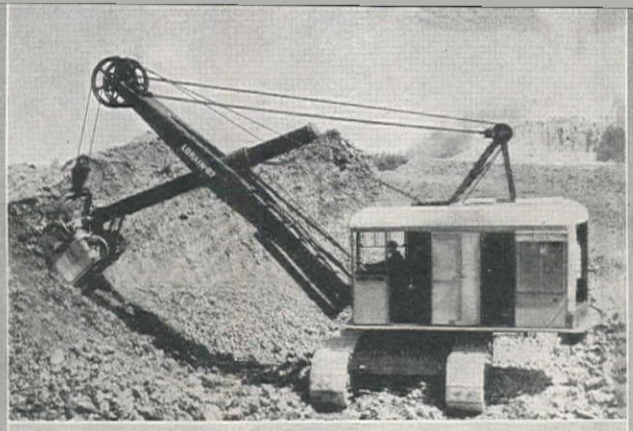


Sectional View of Telsmith Gyrasphere Crusher

TELSMITH GYRASPHERE

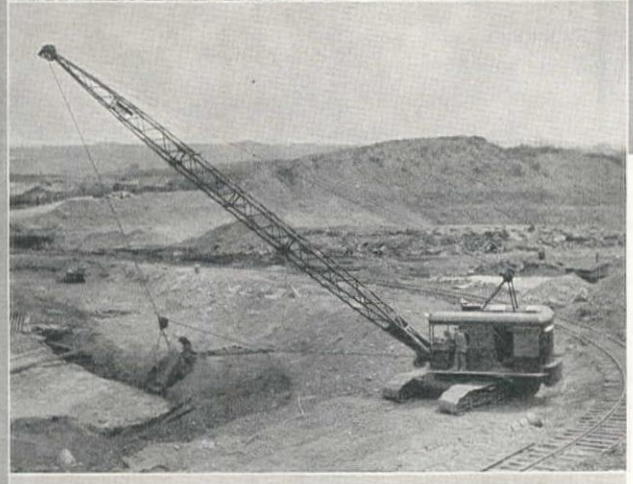
2-YARD LORAIN-87

New from crawler treads to boom tip—a Center Drive, convertible unit with the newest development in shovel booms since the shipper shaft boom.



BIG DRAG LORAIN-95

Specially designed—and Center Drive built—for big capacity, long range, dragline, clamshell or crane service—mounted on a crawler 18 ft. long.



1-YARD LORAIN-55D

A heavy-duty 1-yd. shovel—full 15-ton crane capacity—with longer boom, longer, heavier, crawler; Diesel powered for increased output, lower fuel cost.

3/4-YARD LORAIN-40 Truck Shovel

L-40 minimum weight and balanced design now permits offering you 3/4-yd. shovel output and earnings combined with motor truck mobility.

3/8-YARD LORAIN-27

A 3/8-yd. full-revolving unit, built to a standard of quality equal to or better than that of any excavator, regardless of size or price—with special trailer.

THEW and UNIVERSAL present 5 NEW LORAINS*

★ In presenting these five new Lorains for 1936, Thew and Universal express their confidence in the future of the Construction Industry.

In building these five new Lorains to the tried, tested and proved Center Drive design—and in refining and greatly improving all Lorain models—Thew and Universal again express their confidence in the continued ability of all Center Drive units to move more dirt, faster and at lower costs . . . a fact well proved by Lorain field performance.

5 New Models.. plus these other improved LORAINS

LORAIN · 77
1½-yd. shovel—20-ton crane—Diesel powered

LORAIN · 75D
1¼-yd. shovel—18-ton crane—Diesel powered

LORAIN · 45
Heavy-duty ¾-yd. shovel—Diesel powered

LORAIN · 40
¾-yd. Capacity, Strength, Power; ½-yd. Weight

LORAIN · 37
⅝-yd. Shovel, Crane, Clam, Drag

LORAIN · 30
½-yd. Shovel—with special trailer

THE THEW SHOVEL Co.

355 Fremont Street San Francisco, Calif.

WESTERN DISTRIBUTORS

THE RIX COMPANY
Los Angeles

HALL PERRY MACH'Y CO.
Butte, Mont.

FEENAUGHTY MACH'Y CO.
Portland, Ore.

ASSOCIATED EQPT. CO., Ltd.
San Francisco

WESTERN EQPT. CO.
Boise, Ida.

McCHESNEY-RAND EQPT. COMPANY
Santa Fe, N. Mex.

AMBLER-RITER
Salt Lake City

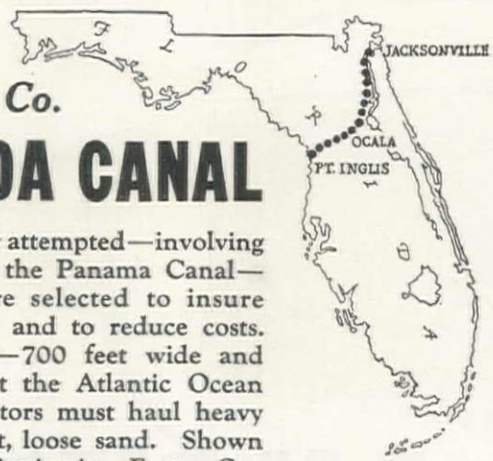
H. W. MOORE EQPT. CO.
Denver, Colo.

A. H. COX & CO.
Seattle, Wash.

CONSTRUCTION EQPT. CO.
Spokane, Wash.


THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.
This is the basis advocated by Roebling, in which rope cost per ton of material handled, or per other unit of service measurement, is based not on the service of a single rope but on the *average* service of several ropes.
John A. Roebling's Sons Co. of Calif.
San Francisco - Los Angeles - Seattle - Portland
TRADE MARK
JAR
REG. U.S. PAT. OFF.
Roebling...
The pacemaker in wire rope development
© R.I. NESMITH

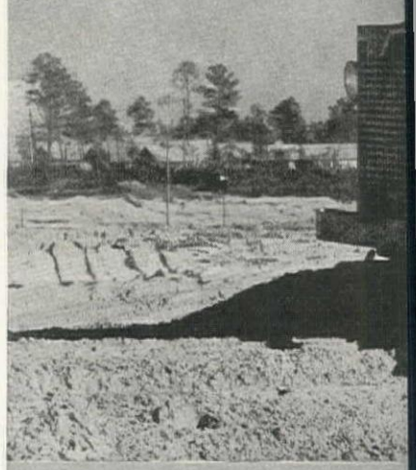
OK! WE'LL TAKE Allis-Ch

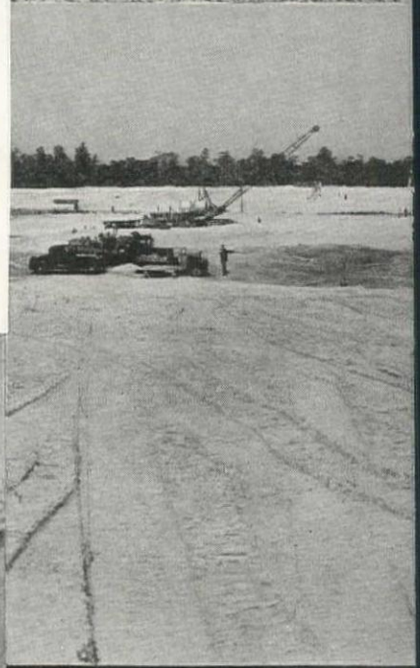


says Benjamin Foster Co.

ON THE FLORIDA CANAL

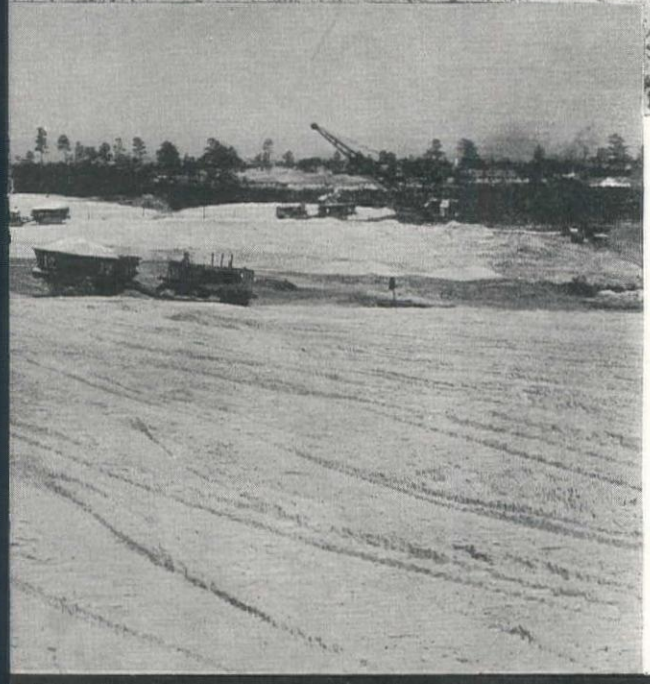
On the largest dirt moving job ever attempted—involving nearly twice as much yardage as the Panama Canal—Allis-Chalmers Oil Tractors were selected to insure completion of the work on time, and to reduce costs. On this gigantic 206-mile canal—700 feet wide and 30 feet deep—which will connect the Atlantic Ocean with the Gulf of Mexico, the tractors must haul heavy loads up 10 per cent grades in soft, loose sand. Shown here are some of the units of Benjamin Foster Co., holder of the largest single contract, involving approximately 5,000,000 yards. A fleet of Allis-Chalmers Model "L-O" Oil Tractors keeps the dirt moving at high speed—with such obvious advantages as instant starting, simplicity of design and less maintenance—due to the low compression system employed in A-C Oil Engines. Allis-Chalmers Wagon Tracks were also chosen—they are mounted on rollers and will resist the grinding wear of sandy conditions. Just as A-C Oil Tractors are setting the pace on the world's largest job—they will set the pace for cutting costs and increasing production on YOUR job.





LOW COST DIESEL FUEL

Allis-Chalmers Oil Tractors have the exclusive advantage of gasoline tractor simplicity combined with Diesel Fuel economy. Low compression means instant starting and less maintenance.



NO. 14 LOADS UP. A fleet of fast-stepping "L-O'S" keeps the shovels busy as the Florida Canal gets under way. This is unit No. 14 of the Benjamin Foster Company fleet. Allis-Chalmers wagon tracks—mounted on rollers—stand up in the sand.

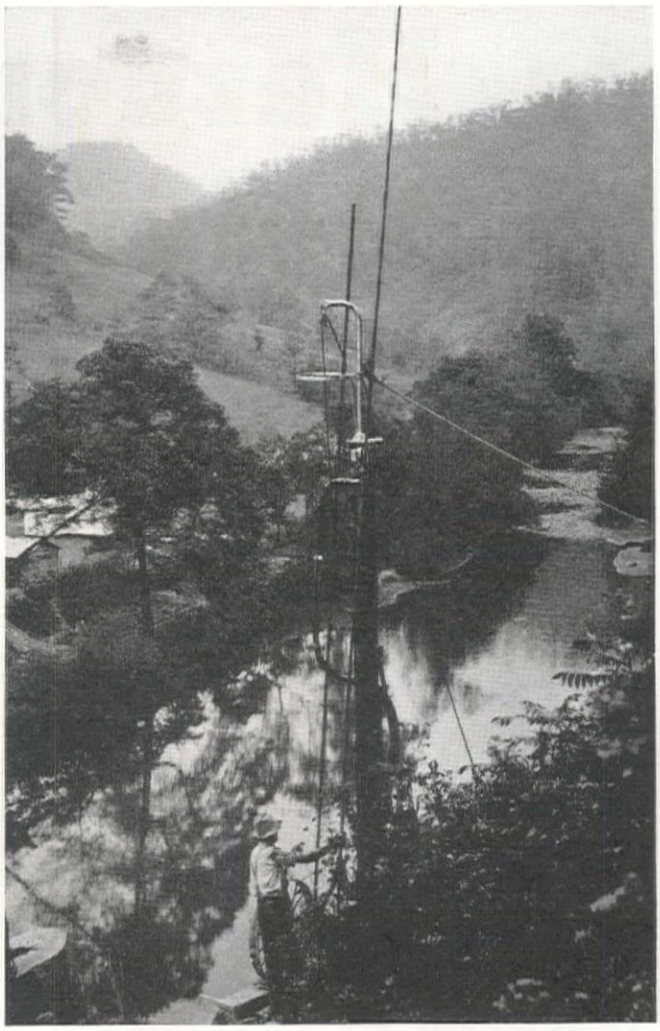
BRANCH HOUSE AND DEALER SERVICE

In addition to a wide-spread dealer organization, extending from coast to coast, Allis-Chalmers has factory branches in every territory to provide A-C owners with prompt, efficient service—UNDER FACTORY SUPERVISION.

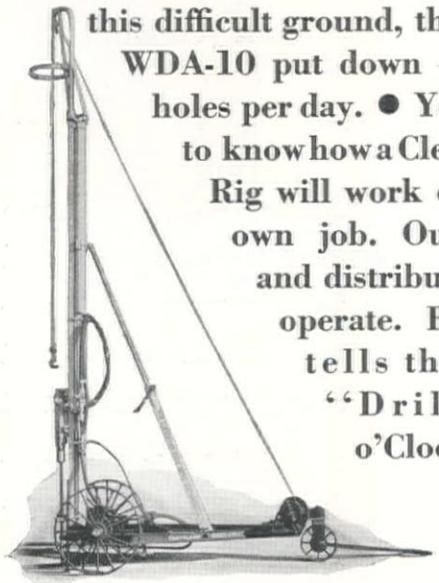
ALLIS-CHALMERS OIL TRACTORS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

GRUNDY



● The drilling on this railroad job near Grundy, Virginia, was as tough as any wagon rig ever tackled. All holes were started in overburden varying from a foot to ten feet in thickness. The ground consists of strata of sandstone—some soft—some hard and abrasive—shale, slate, coal, and hard blue clay. But in this difficult ground, the Cleveland WDA-10 put down 400 feet of holes per day. ● You will want to know how a Cleveland Drill Rig will work out on your own job. Our salesmen and distributors will co-operate. Bulletin 109 tells the story of "Drilling Ten o'Clock Holes in Rock."



Did you get a copy of the "Driller's Handbook"? It will be mailed free to bona fide rock drill owners and operators in return for the coupon filled out with the types and sizes of drills you are using.

THE CLEVELAND ROCK DRILL CO.

3734 East 78th Street Cleveland, Ohio

Besides Drill Rigs, or wagon drills, we manufacture:

HAND HAMMER DRILLS
SINKERS, DRIFTERS, STOPERS
PAVING BREAKERS
PNEUMATIC DIGGERS AND TAMPERS
TRIPODS, COLUMNS
HOSE COUPLINGS
AIR VALVES
DRILL STEEL
PAVING BREAKER STEELS
MISCELLANEOUS AIR TOOLS AND ACCESSORIES

Western Branches

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

Western Distributors

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

THE CLEVELAND ROCK DRILL COMPANY,
3734 East 78th Street, Cleveland, Ohio.
Gentlemen: Please send me the "Driller's Handbook."

Name.....

Company.....

Address.....

We are now using the following makes and types of machines:

Hand Hammer Drills.....

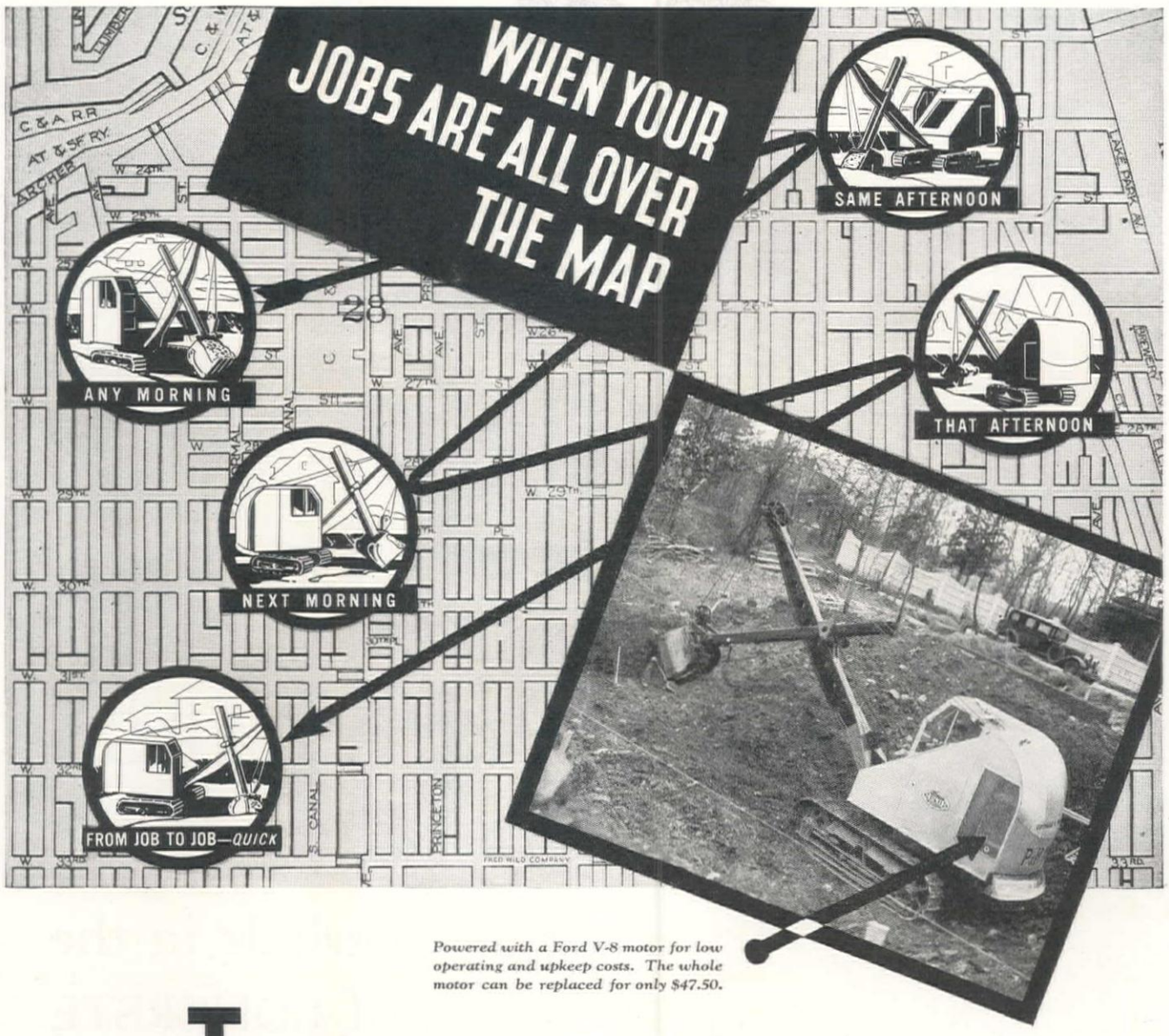
Paving Breakers.....

Clay Diggers.....

Back Fill Tampers.....

Wagon Drills.....

LEADERS IN DRILLING EQUIPMENT



Powered with a Ford V-8 motor for low operating and upkeep costs. The whole motor can be replaced for only $47.50.

THAT'S what counts in a small-job business. If you're setting out on a 20,000-yard dirt-moving job, you may take it a little easy. But when you're going after basement jobs, you've got to get on the job quick and be through with it fast . . . or else! The Bantam-Weight's built for the man who's in a hurry. • Here's a typical job—away from the yard at 7:00 A. M., three miles to the job, excavating 165-yard basement, out of the hole and away again by 12:30 P. M. • How does the Bantam-Weight get such speeds? Because every ounce of excess weight has been stripped off . . . because we've used the newest high-tensile alloys . . . because it's powered with a peppy Ford V-8 motor . . . because it's the most up-to-date machine on cats. If you'd rather compete with speed than against it, find out now about the Bantam-Weight.

HARNISCHFEGER CORPORATION

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

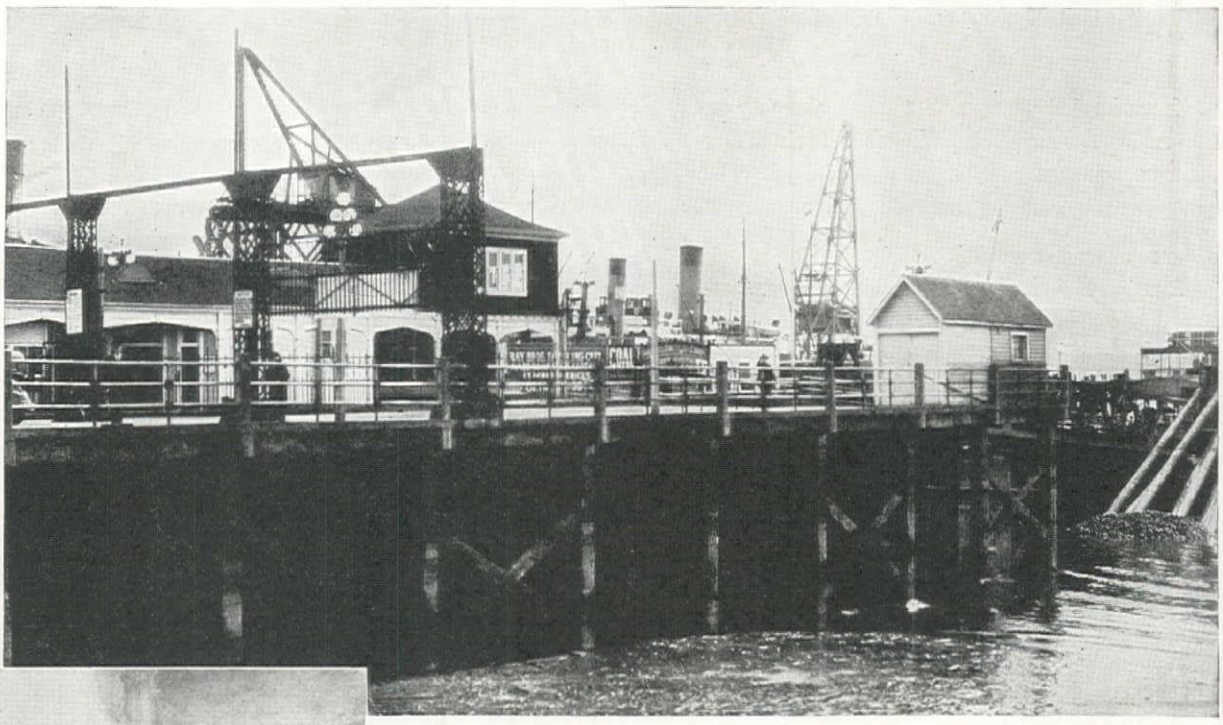
Warehouses and Service Stations: HARNISCHFEGER CORPORATION, 82 Beale St., San Francisco; R. M. Taylor
WESTERN LOGGERS MACHINERY CO., 302 S. W. Fourth Ave., Portland, Oregon
SEATTLE DALLAS LOS ANGELES SAN FRANCISCO

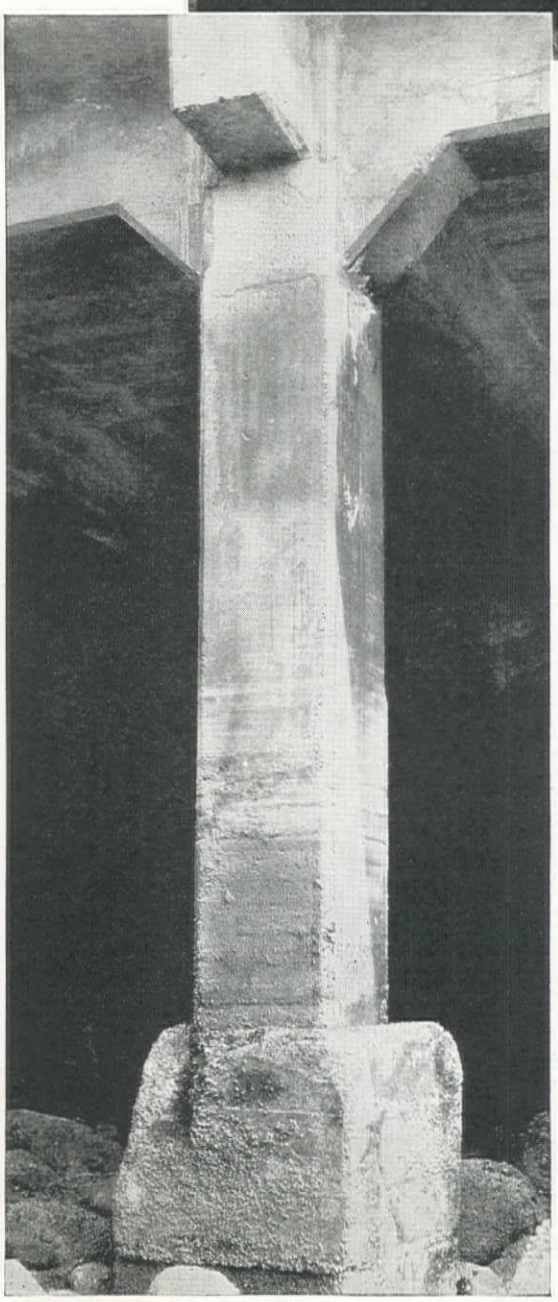
P&H BANTAM WEIGHT

ONE OF THE 22 P&H PACEMAKERS FOR 1936

FIRST TO THE JOB — AND FIRST THRU

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





24 YEARS
in salt water
just an interlude in the life-span of CONCRETE

Twenty-four years ago George S. Hanes, City Engineer of North Vancouver, designed and constructed the reinforced concrete ferry dock that is in use today, and is *entirely free from deterioration.*

That's evidence of the durability of concrete! And its economy? These figures tell the story:

Maintenance cost for concrete dock
—$198.50 for 24 years of service.

Concrete lends itself to all kinds of construction, from skyscrapers to docks, from warehouses to homes. It permits freedom in choice of form and finish . . . is moderate in first cost . . . is proof against fire, storm and decay. Get the facts about concrete. For complete information, write

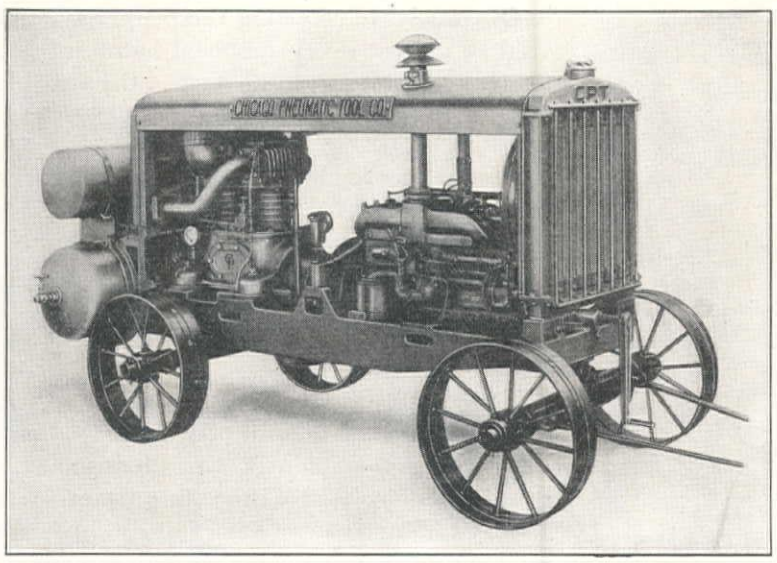
PORTLAND CEMENT ASSOCIATION
Dept. I 2-3, 816 W. Fifth Street, Los Angeles, Calif.
Dept. N 2-2, 564 Market Street, San Francisco, Calif.
Dept. O 2-1, 903 Seaboard Building, Seattle, Wash.

"THE GREATEST VALUE EVER OFFERED"

Over a year ago, this company introduced the CP Two-Stage, Air-Cooled Portable Compressor as "The Greatest Value Ever Offered". Confirmation of the phrase and the fact today stands clearly written, by experienced compressor users themselves, in convincing field performance records and in unprecedented sales.

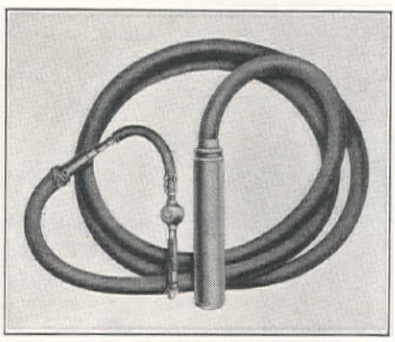
If you did not attend the Road Show, where "The Greatest Value Ever Offered" was displayed, along with the well-known line of CP air-operated equipment so essential to profitable contract work, send for descriptive bulletins gladly furnished on request.

● CP SERVICE has been termed by customers, "THE BEST IN THE BUSINESS"

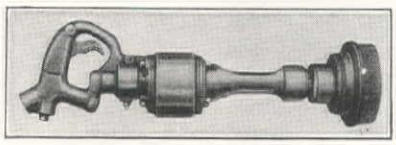


CP TWO-STAGE, AIR-COOLED PORTABLE AIR COMPRESSOR
Available Gasoline, Diesel and Electric Motor Driven
Five Sizes—Six Types of Mountings

CP Equipment for Road Builders shown here is but typical of the complete line available.

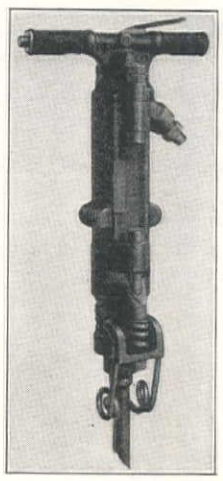


CP No. 315 Shimmy Spade and Standard Equipment

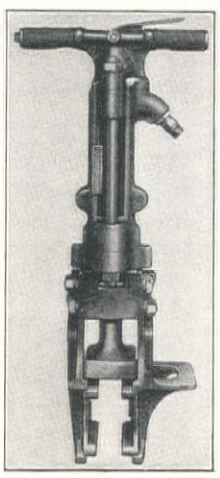


CP No. 351 Concrete Surfacer

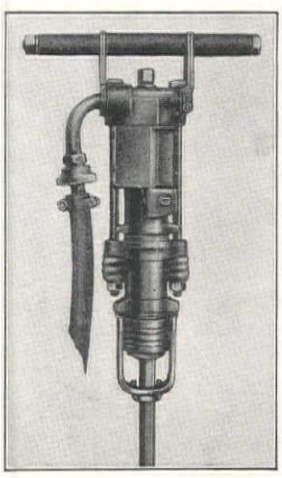
CP-MM Backfill Tamper



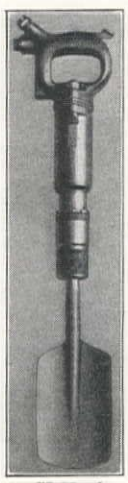
CP-116 Demolition Tool



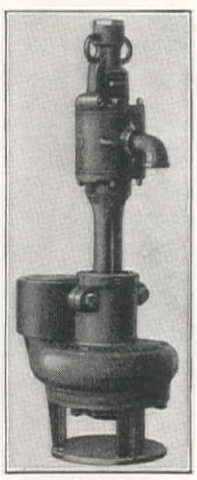
CP-116 Sheeting Driver



CP-10 Sinker Drill



CP No. 3 Clay Digger



CP Quimby Rotary Sump Pump

CHICAGO PNEUMATIC TOOL COMPANY

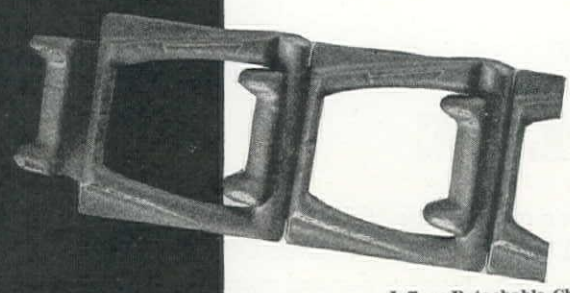
SALES AND SERVICE BRANCHES ALL OVER THE WORLD

6 EAST 44th STREET
NEW YORK • N. Y.

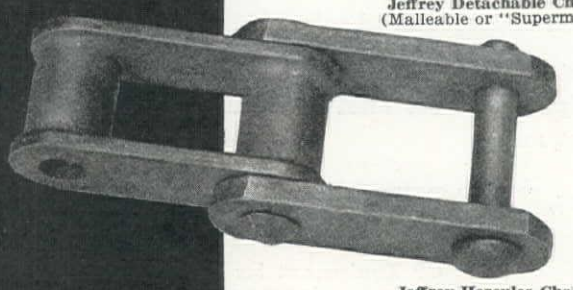
Manufacturers of • AIR & GAS COMPRESSORS • ROCK DRILLS
DIAMOND CORE DRILLS • DIESEL ENGINES • ELECTRIC TOOLS
PNEUMATIC TOOLS • VACUUM PUMPS & CONDENSERS
OIL WELL ROCK BITS, REAMERS & TOOL JOINTS

CHICAGO PNEUMATIC

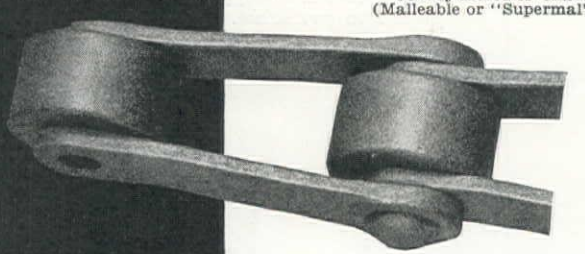
When writing to CHICAGO PNEUMATIC TOOL COMPANY, *please mention Western Construction News*



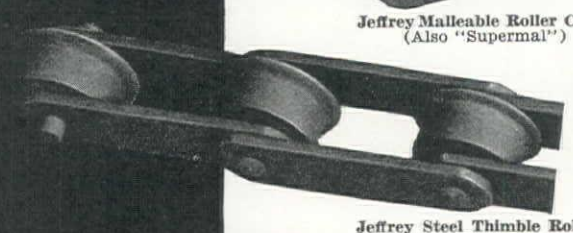
Jeffrey Detachable Chain
(Malleable or "Supermal")



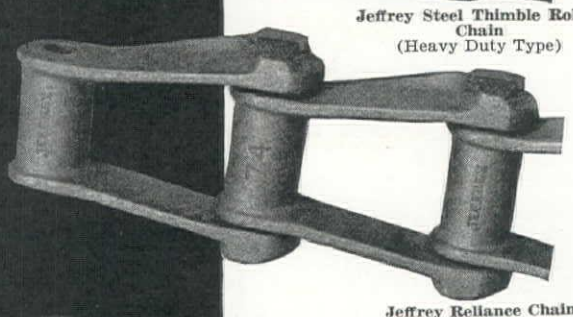
Jeffrey Hercules Chain
(Malleable or "Supermal")



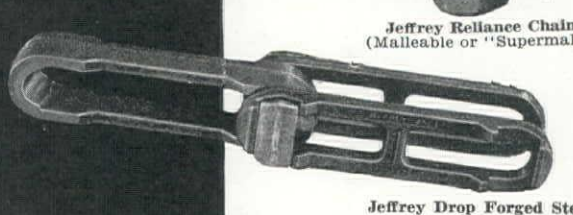
Jeffrey Malleable Roller Chain
(Also "Supermal")



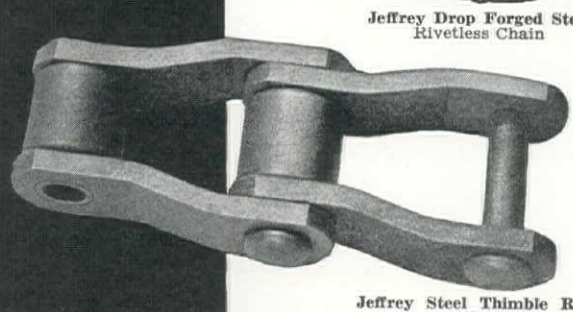
Jeffrey Steel Thimble Roller Chain
(Heavy Duty Type)



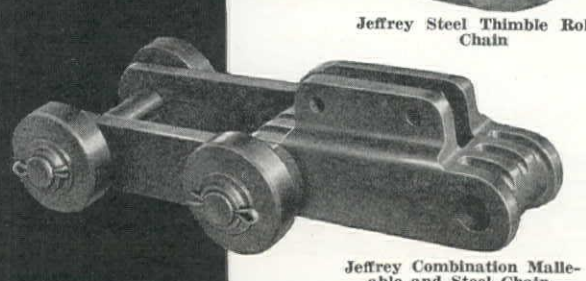
Jeffrey Reliance Chain
(Malleable or "Supermal")



Jeffrey Drop Forged Steel
Rivetless Chain



Jeffrey Steel Thimble Roller Chain



Jeffrey Combination Malleable and Steel Chain

Did You Say . . .

CHAINS?

When you break your leg, do you have a Throat Specialist? Not by a darn sight . . . you have a specialist in setting broken bones.

Obviously, in selecting the proper type of chains . . . so vital to almost every material handling problem in practically every known industry . . . the sensible man selects a Specialist in Chain Building.

That's where Jeffrey comes in. Jeffrey Chains have served industry for over a half century. In fact, Jeffrey conceived and developed the Steel Thimble Roller Chains, Hercules, Flat and Round Link, and many other popular types. Chains were our earliest product . . . we know how to make them exceptionally well.

Too often Chains are treated as secondary items . . . nobody thinks of them until all else is attended to . . . then it is, "Oh, yes—Chains." But Chains are important . . . to get good chains is still more important. When you specify Jeffrey Chains you can have full confidence in them . . . for we have been diagnosing and prescribing for the Chain needs of the nation for years . . . have been solving every conceivable problem . . . and will do it correctly for you.

There is a type and size of Jeffrey Chain for every Elevating and Conveying need . . . and for Drives. Say "Jeffrey Chains" and make no mistake.

Ask one of our Stock-carrying Agents (listed below) to send you a copy of our NEW Chain Catalog No. 417-G, just off the press, and containing the latest and most complete information to be had upon Jeffrey Chains and Sprockets.

Carried in Stock by:

A. H. COATES COMPANY
San Francisco, Calif. . . . Los Angeles, Calif.

BERG-EVANS CHAIN COMPANY
Seattle, Wash.

PORTLAND IRON WORKS
Portland, Ore.

WASHINGTON MACHINERY & SUPPLY COMPANY
Spokane, Wash.

Representing

THE JEFFREY MANUFACTURING COMPANY
951-99 N. Fourth Street, Columbus, Ohio

FFREY CHAINS & MATERIAL HANDLING EQUIPMENT

Consider

THE WHOLE UNIT

"We ain't hollering about no one gadget or feature." After all, every part that goes into Link-Belt machines must be a champion performer. Link-Belt tolerates nothing but the best throughout the entire structure. When choosing, it's the quality of the entire unit that counts.

STABILITY-POWER-SPEED

From ¾ to 3 yds. capacity, heavy-duty built. Gas engine, Diesel, or electric motor drive. All models can be shipped loaded on a flat car without dismantling.

LINK-BE

SHOVEL-CRANE-DRA

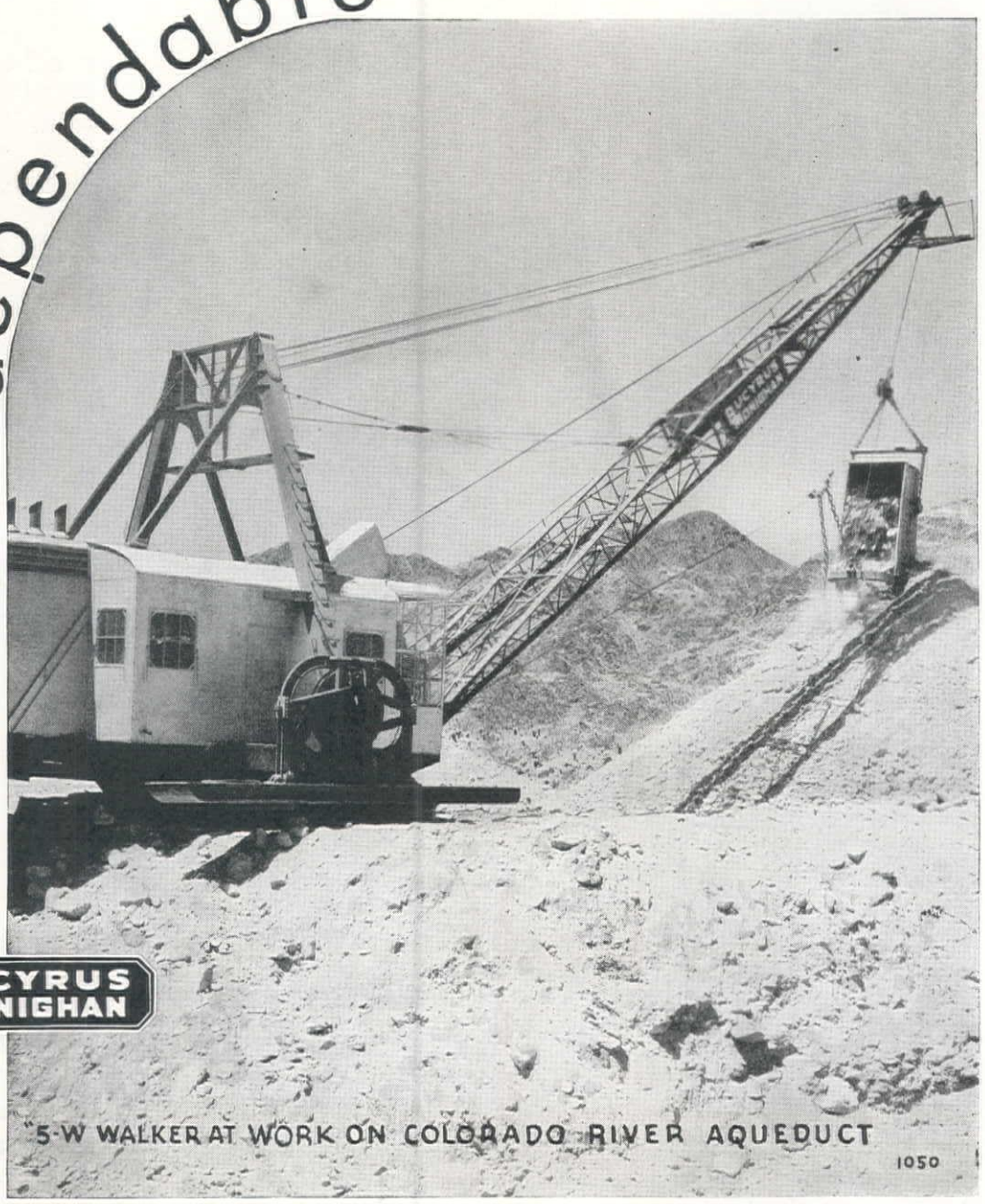
5034

LINK-BELT COMPANY, 300 W. PERSHING ROAD,

San Francisco, Garfield & Co.; *Los Angeles*, Harry C. Collins Machinery Co.; *Los Angeles*, Link-Belt Company; *D*
Company; *Phoenix*, Mine and Smelter Equipment Co.; *Seattle*, A. H. Cox & Co., Inc.

THE Bucyrus-Monighan Walker is dependable from a mechanical standpoint—that's basic and to be expected. But its movement and operation are also exceptionally dependable because of its large-area walking-traction treads and separate circular base. It gives dependable output more days per year, because it moves and digs on soft footing which would otherwise cause delays and reduce yardage output. As shown in the picture, it works effectively and safely at the very edge of the bank. Its low center of gravity and the wide spread of A-frame and the boom base contribute to increase still further its stability and dependability. Investigate this machine for your next dragline job. Manufactured by Bucyrus-Monighan Company, Chicago, Illinois.

dependable



"5-W WALKER AT WORK ON COLORADO RIVER AQUEDUCT 1050

BUCYRUS MONIGHAN

Sold by

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

Master Electric Vibrators and Generator Sets for Placing and Compacting Concrete

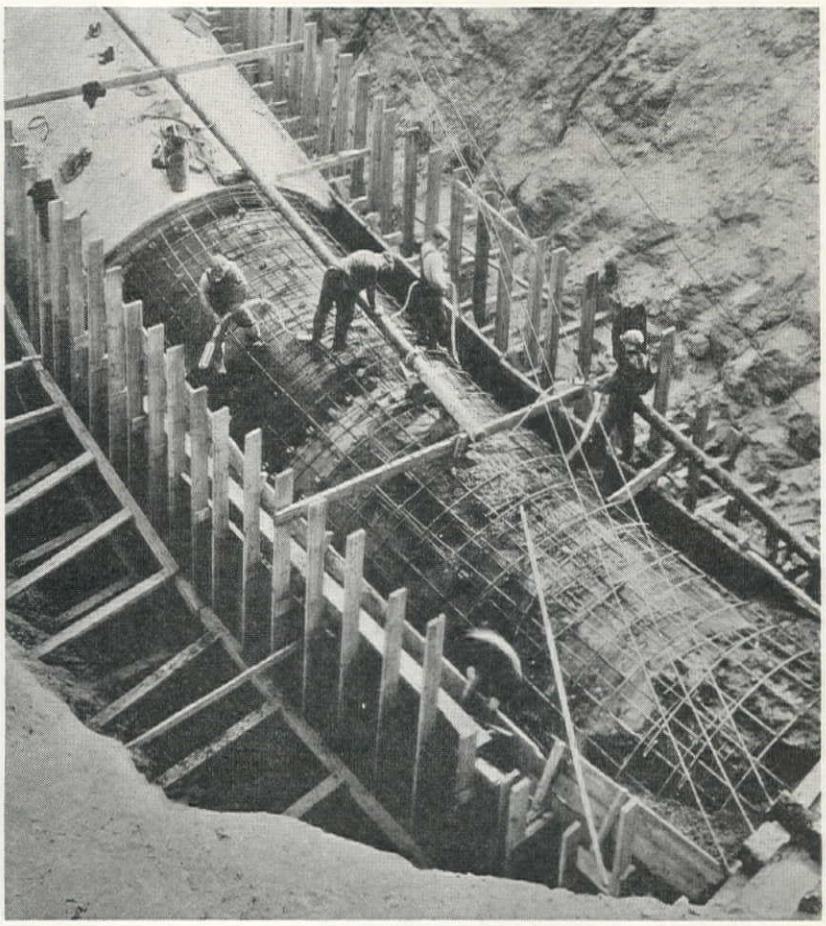
Master Electric Vibrators are built solely and completely by an experienced electrical and mechanical manufacturer of nation-wide reputation—The Master Electric Company of Dayton, Ohio—with 26 Master authorized service stations in the West.

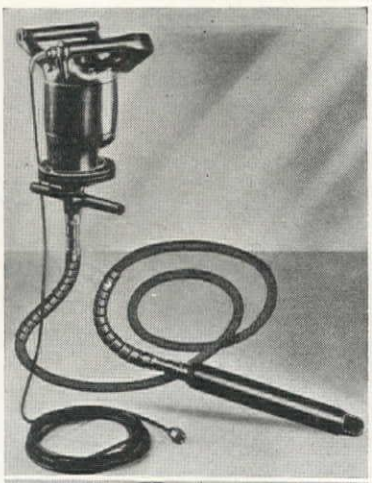
Master Electric Vibrators are modern in design, manufactured of selected materials, made in ten different sizes and types to suit every need.

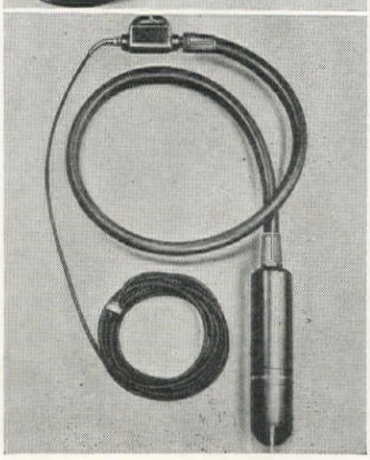
Master Electric Vibrators are the only vibrators designed with Floating Power.

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

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







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

Distributed exclusively by:

EDWARD R. BACON COMPANY... San Francisco—Northern California, Nevada and Hawaii
SMITH BOOTH USHER COMPANY ... Los Angeles—Southern California
NEIL B. McGINNIS COMPANY... Phoenix—State of Arizona
INTERMOUNTAIN EQUIPMENT COMPANY .... Boise—State of Idaho

MASTER VIBRATOR COMPANY

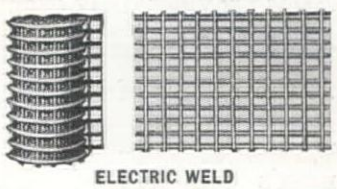
DAYTON, OHIO

EDWARD M. ORNITZ, *Pacific Coast Sales Manager*

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

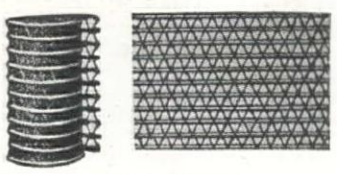
When writing to MASTER VIBRATOR COMPANY, *please mention Western Construction News*

FURNISHED IN ROLLS OR SHEETS



ELECTRIC WELD

There is a right type of wire fabric reinforcement for each job — right in quality and in spacing. You can have it either in rolls or sheets. Give us the facts and we will gladly recommend the style.



TRIANGLE MESH

REDUCES *the labor cost*

SPEEDS UP *the job*

IF YOU want speed with economy in concrete construction specify American Wire Fabric — either Electric Weld or Triangle Mesh — and you'll get it. It lays quickly and easily. It is absolutely uniform. It is the product of more than 100 years of wire making experience. In its many types of application it has proved to be the most efficient and economical reinforcing material.

ELECTRIC WELDED FABRIC is made from cold drawn mild steel in a square or rectangular mesh electrically welded at intersections. Various combinations of sizes and spacings of wire can be furnished according to need.

TRIANGLE MESH REINFORCEMENT is made from cold drawn mild steel having a high breaking strength. The longitudinal or tension members are spaced 4 inches. The diagonal cross wires either 2, 4 or 8 inches.

Write For Illustrated Booklet giving complete data and illustrating its many applications and the economies it can effect.

COLUMBIA STEEL COMPANY

Pacific Coast Distributors for AMERICAN STEEL & WIRE COMPANY

Offices and Warehouses:

San Francisco, Los Angeles, Portland, Seattle, Salt Lake City

United States Steel Corporation Subsidiary

UNITED STATES STEEL

When writing to UNITED STATES STEEL CORPORATION, *please mention Western Construction News*

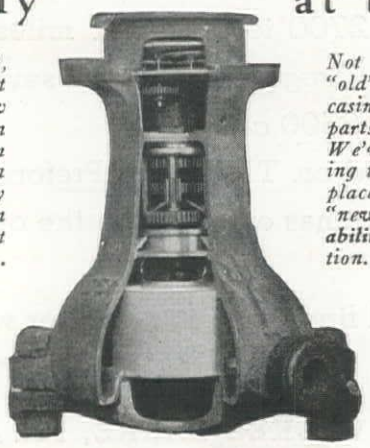
Quality

is the "Buy-Word" among modern Municipalities

EXPERIENCE . . . the experience of the recent past years of hand-to-mouth buying . . . has taught Water Works men the folly of buying water meters on a price basis. Their books are strewn with obsolete and deteriorated meters . . . old meters for which repair parts are unavailable . . . meters suddenly antiquated by some new, improved type . . . in short, Water Meters that lacked that supreme essential . . . QUALITY. Times have changed. In every field of industry men are once more buying on a quality basis, looking ahead to the value of their investment. In the Water Works field men are buying Trident and Lambert Water Meters.

Look closely at this meter

Nearly 40 years ago—in 1899, to be exact—it left our plant and was installed—a new water meter, embodying then all that was new in design and construction. For over a generation it served steadily and accurately. It became an "old" meter—outwardly, at least, until . . . . . .



*Not long ago we took this "old" meter, and into the 1899 casing slipped new, **modern** parts. They fitted perfectly. We've cut away the old casing to show you the parts in place. The old meter became "new"—in short, **interchangeability** wiped out deterioration.*

TRIDENT

and LAMBERT Water Meters

OVER 6 MILLION MADE AND SOLD

Quality of construction cannot be taken for granted....

When we say that Trident and Lambert Meters are quality—we ourselves don't take it for granted!

It's not enough for us that every detail of every meter is precision-checked again and again during manufacture and assembling.

No, sir! Every finished meter is double-checked under actual working conditions. The meters are inspected for appearance, leaks, register and gear changes.

Then they are retested after the meter box has been fastened on. It's because we take nothing for granted that you can take Neptune ***Quality*** as an established fact.

NEPTUNE METER COMPANY (Thomson Meter Corp.), 50 West 50th Street (Rockefeller Center), New York City . . . . also . . . . Neptune-National Meters, Ltd., Toronto, Canada.

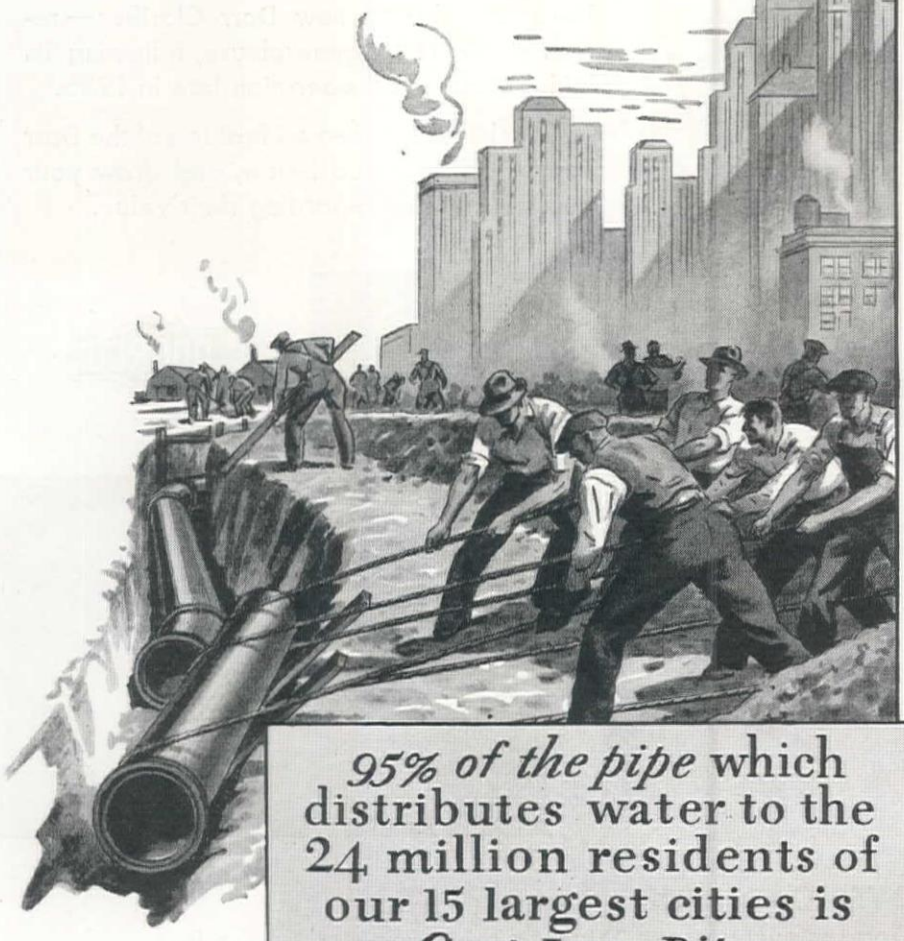
Pioneers in Meter Progress

Yesterday

TODAY

Tomorrow

Why this overwhelming preference?



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

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

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

THE great majority of American cities depend almost exclusively on cast iron pipe for water distribution mains because of its unquestioned economy and long life. With modern traffic conditions and high-cost pavements a pipe line must go down to stay. Engineers rate the useful life of cast iron pipe at 100 years. Its full span of service is yet to be measured. Suffice it to say that the first recorded installation of a cast iron water main, now 271 years old, is still in service.

Cast iron pipe is the standard material for water mains. Its useful life is *more than a century* because of its effective resistance to rust. It is the one ferrous metal pipe for water and gas mains, and for sewer construction, that will not disintegrate from rust.

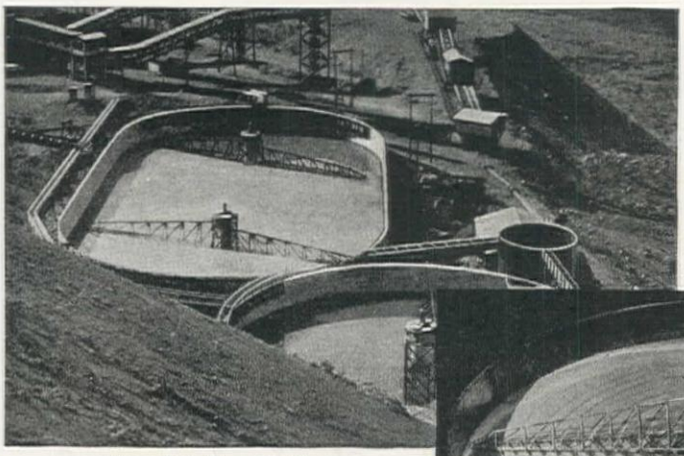
For further information, address The Cast Iron Pipe Research Association, Thos. F. Wolfe, Research Engineer, 1015 Peoples Gas Building, Chicago, Ill.

CAST IRON PIPE

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

For the New Year · 1936

THE DORR *TORQ* CLARIFIER



Three Dorr Torq Clarifiers at Grand Coulee Dam

Here is a brand new Dorr Clarifier — released for 1936 general use, following its initial commercial operation late in 1935.

Check through the new features of the Dorr Torq Clarifier, listed below, and draw your own conclusions regarding their value.

DORRCO

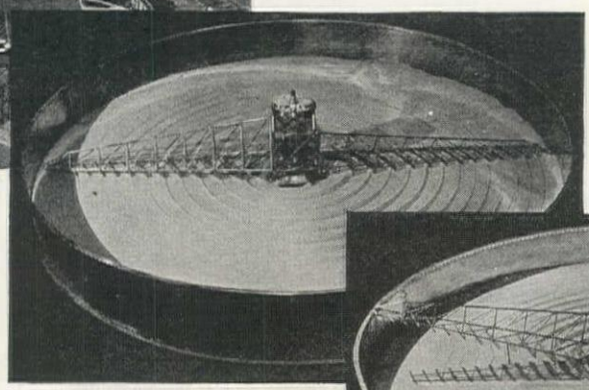
DORR TORQ CLARIFIERS IN OPERATION

Grand Coulee Dam, Coulee, Wash. Three — 125 ft. in diameter.

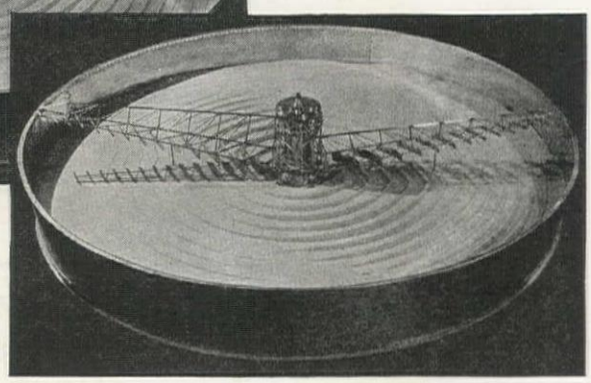
Golden Queen Mining Co., Mojave, Cal. Four — 55 ft. in diameter.

DORR TORQ CLARIFIERS ON ORDER

All American Canal Desilting Plant near Yuma, Ariz. Seventy-two — 125 ft. in diameter.



Above — Scale model with rake arms in normal operating position.



Right — Rake arms jacked up to position held during an overload.

AUTOMATIC OVERLOAD RELIEF

If a heavy raking load is encountered, the rake arms, actuated by the increased torque, swing gradually upward but continue to rake at full capacity in the elevated position.

As the heavy load is reduced, the rake arms, because of reduced torque, swing gradually down to their normal operating position.

All of this is accomplished automatically without the slightest effort or attention of the operator.

CENTREPIER SUPPORT

A stationary central pier supports everything—raking mechanism, driving gears, motor, etc.

SELF-CONTAINED DRIVE UNIT

A vertical gear motor is mounted directly on the centre pier and requires lubrication only twice a year.

In laying your plans for 1936, it will pay you to consider carefully the new Dorr Torq Clarifier.

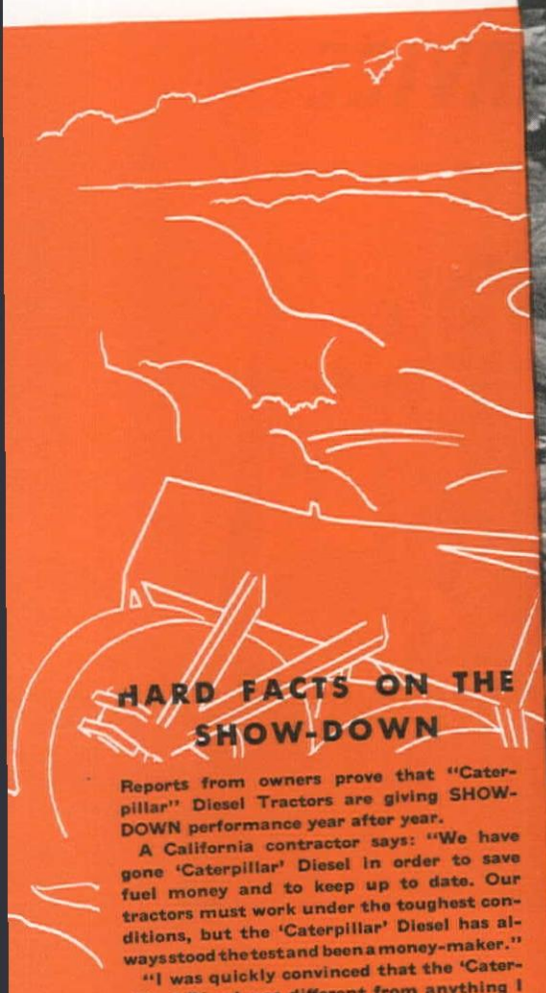
THE DORR COMPANY INC.

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

FIRST—AND WHY



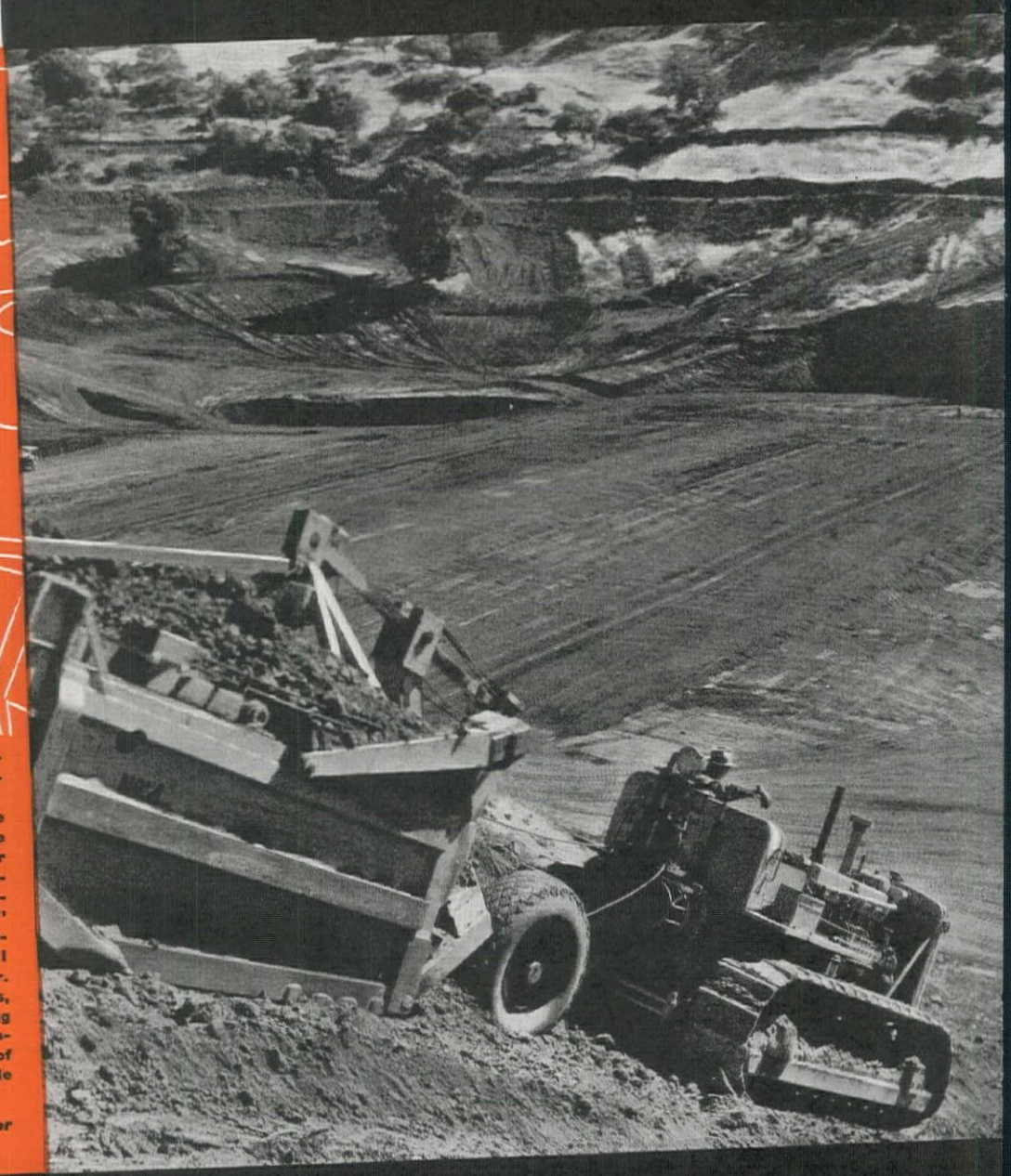
HARD FACTS ON THE SHOW-DOWN

Reports from owners prove that "Caterpillar" Diesel Tractors are giving SHOW-DOWN performance year after year.

A California contractor says: "We have gone 'Caterpillar' Diesel in order to save fuel money and to keep up to date. Our tractors must work under the toughest conditions, but the 'Caterpillar' Diesel has always stood the test and been a money-maker."

"I was quickly convinced that the 'Caterpillar' Diesel was different from anything I had ever seen," says a St. Louis contractor. "It accelerates as rapidly as other types, and has the additional advantage of being able to carry a large overload when necessary. This means many additional yards of dirt a day for me, as fewer stops are made and less time is lost."

Only the products of Caterpillar Tractor Co. are "Caterpillar"



This "Caterpillar" Diesel Tractor works with a scraper on the Calero Dam project in Santa Clara County, Calif., handling big loads on steep grades.

In only four years, "Caterpillar" Diesel Tractors have become first choice for all kinds of projects. They star on the country's biggest jobs. They make possible lower bids, faster schedules, more profitable contracts. They head the list for economy in operating and up-keep costs, rugged dependability, and dollar-for-dollar investment. Over 10,000 owners have tested "Caterpillar" Diesel performance--and know it is the SHOW-DOWN. Get the facts from your dealer. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR DIESEL

REG. U. S. PAT. OFF.

WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER

February, 1936 — Vol. 11, No. 2

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

Elwood Mead Dies; The West Loses a Friend

COMBINING far-sighted vision, an engineering approach to problems and unusual administrative ability, Elwood Mead devoted a long life of service to the West, in the conserving and utilizing of our greatest natural asset—water. In his death the West lost a true friend and one of its foremost engineers. Beginning with the establishing of water law in Wyoming, which subsequently formed the basis of the code for most arid states and several foreign countries, and culminating with the directing of the Boulder Dam project, in his position as head of the Bureau of Reclamation, he spent half a century in bringing order to the struggle for water, building conservation works and making it available for productive use. His work was essential in building up the agricultural hinterland of this region, which provides the balance for permanent western progress.

Dr. Mead had a capacity for working with an effective combination of broad plans and details, and not getting the two confused. His ability to establish and carry forward a constructive policy is best indicated by his service as head of the Bureau of Reclamation for twelve years through several administrations. The West has lost a valued counselor, intimately familiar with its water problems, from the directorship of a federal agency devoted entirely to the solution of these problems.

•

Federal Highway Aid Essential to the West

THE recommendation of President Roosevelt to omit the regular Federal Aid highway program for the coming fiscal year, contained in his recent budget message, is a serious threat to the orderly continuance of the well-established plan for building a national highway system. Possibility of holdover emergency funds, to take the place of the regular $125,000,000 Hayden-Cartwright Federal appropriation during 1936, is scarcely a logical substitute, for it has been amply demonstrated that relief funds are poor producers of results in highway work and the breaking of the established Federal Aid highway program would have a serious disrupting effect. At present the 1 cent federal gas tax could properly be considered as financing for the federal program and, to be consistent with the demands on states, the Government should maintain these funds for highway work. In the West, the result of any break in the regular Federal Aid program would be far more serious than in the East. Several smaller eastern states have virtually completed their highway programs, while many western states with long mileage and scant population are still trying to provide a preliminary surfacing on a skeleton system of major routes. Further, these same states contain vast areas of federal lands, national forests and national parks which are a direct federal responsibility in a national road program. This region needs the regular federal highway construction and improvement program to be continued to complete the western section of the national system. All interests should unite in demanding the continuance of the regular Federal Aid program and the end of highway work as a stepchild of relief.

•

Reports from the A. G. C.

REPORTS from the annual conventions of western chapters and branches of the Associated General Contractors indicate healthy growth during 1935 and good prospects for 1936. Among other things the reports show increases in membership, an active interest in the national affairs of the A.G.C., and the results of intelligent and aggressive leadership. No organization can go far without ideals, leaders and staunch support; with these there is no limit to growth and benefit to members, with the ultimate opportunity for public service. "Skill—Integrity—Responsibility" provide the ideals; sincere and alert managers furnish leadership and members who understand and appreciate the services rendered by the organization constitute the necessary support. Here in the West the A.G.C. is fortunate in having able and far-sighted leaders who deserve the active support of members and the coöperation of all branches of the construction industry, for the common good.

•

Western Dams Are High

OUT of the sixty-six high dams in the United States, fifty-two are in the West. This is the region where large dams and big reservoirs are essential to growth; this is the region where the art, or science, of dam building has been developed and established as a world standard; this is where the engineers and constructors are trained and operate, who specialize in designing and building these structures. The reasons underlying the distinctly regional character of high-dam building and the explanation of why the West is preëminent in this field of civil engineering are obvious. The conservation of our water resources by means of these structures has been essential to western growth, and more and bigger dams will continue to mark the progress of the Western Empire. Statistics on existing dams, recently summarized by the Bureau of Reclamation, are published on another page of this issue. This information is passed along to the readers of *Western Construction News* because it is primarily a tabulation of local interest and because it provides the answers to many questions frequently asked by our subscribers.

This month we are discontinuing the publishing of "Where to Buy in the West," a service feature instituted several issues ago, because reports indicate that it has not proved of sufficient reader interest. The space, we believe, can be of more service to the readers of *Western Construction News* if devoted to other types of editorial material. Except for the convenient arrangement, the same information is to be found in the "Equipment and Materials Section" and the individual advertisements appearing in this, and subsequent issues.

EXTRA VALUES

IN THE GRADER ITSELF

plus.. SUPERIOR A-W HYDRAULIC CONTROLS

This Blade Grader is the product of more than 60 years continuous improvement and development by Austin-Western. It is the favorite grader of leading officials and contractors in every state because of its excellent performance and freedom from repairs.

Extra values are to be found in its great strength, due to choice of steel and welded one-piece frame construction. This gives greatest flexibility and resistance to strains, distributing stresses to all parts of frame.

The design of the Austin-Western adds greatly to its utility. Oversize circle keeps blade secure. Scientific weight distribution holds blade to the work. Leaning wheels offset varying side thrust of blade. Unit welded frame clears away obstructions to a full view of the blade.

Austin-Western is equipped with hydraulic controls which eliminate points of wear, lost motion, and breakage, giving instant fingertip control. The operator is free to turn out a faster, better job. A descriptive catalog on Austin-Western Blade Graders is free on request. Send for it.

The Austin-Western Road Machinery Co.
Home Office: Aurora, Ill. Cable Address: AWCO, Aurora, Ill.
Branches in 14 Principal Cities

Austin-Western

ROAD GRADERS · MOTOR GRADERS · ELEVATING GRADERS · DRAGS
ROAD ROLLERS · DUMP WAGONS · DUMP CARS
SCARIFIERS · BULLDOZERS · TRAILERS · SCRAPERS · PLOWS
BITUMINOUS DISTRIBUTORS · ROAD-MIX MACHINES · CULVERTS
CRUSHING AND WASHING PLANTS · SWEEPERS AND SPRINKLERS · SHOVELS · CRANES · ETC · SNOW PLOWS

The Austin-Western Road Machinery Co.
2, Aurora, Illinois
Please send details on hand control ☐
hydraulic control ☐ Blade Graders.

Name.....
Address.....608-C
City.....State.....

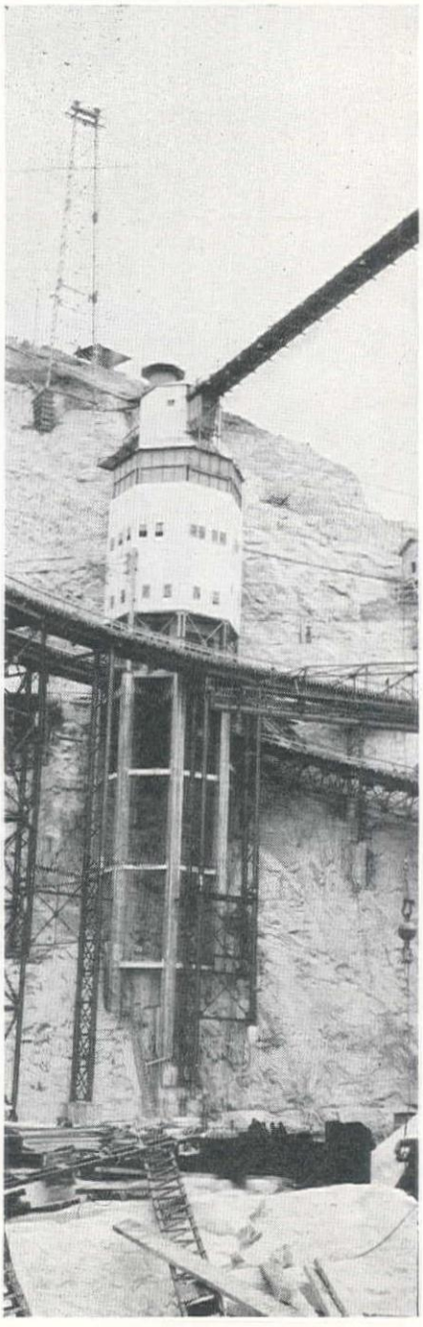
BRANCHES AND WAREHOUSES: Brown-Bevis Equipment Co., 4900 Santa Fe Avenue, Los Angeles, Calif.; San Francisco, Calif.; Portland, Ore.; Seattle, Wash.; Spokane, Wash.; Billings, Mont.; Denver, Colo.; Salt Lake City, Utah; Phoenix, Ariz.

WESTERN CONSTRUCTION NEWS
FEBRUARY, 1936

Grand Coulee Dam Concreting Plant Is Notable For Design Efficiency

Bins, batching equipment, and four 4-yd. mixers arranged in compact tower structure on west abutment—Capacity of 6,000 cu. yd. per day—Placing trestles and methods described

By CHARLES THOMPSON
Engineer, Mason-Walsh-Atkinson-Kier Co.
Grand Coulee Dam, Wash.



Almost 250 ft. high from lowest footing to roof, this west side plant houses four 4-yd. mixers. Aggregate is moved to the plant over the conveyor system entering the top of the plant from the right. The tower on the abutment supports the suspension bridge across the river, carrying the aggregate conveyor.

PLACING the concrete that will form the world's largest dam when completed is now the main activity of the Mason-Walsh-Atkinson-Kier Co., general contractors at Grand Coulee Dam. Following fifteen months of preliminary work which included the moving of 13,000,000 cu. yd. of common excavation, building of a $3,000,000 steel sheet piling cofferdam and a million dollar aggregate plant, a concrete mixing and handling system is in active production that represents the very latest developments in mass concrete production. The general plan calls for two mixing plants, one on each abutment, and two construction trestles connecting the mixing plants. At present the west mixing plant of 6,000 cu. yd. daily capacity, has been completed and put in operation, and the two construction trestles have been built out about 800 ft. from the west abutment. Work will begin on the east mixing plant and trestles as soon as rock work has been completed on the east abutment.

Aggregate production at the gravel deposits about 1½ mi. from the damsite and the storage and conveying system were fully described in *Western Construction News*, November, 1935, and a list of the major articles reviewing other design and construction features of this gigantic project being constructed by the Bureau of Reclamation in Western Washington appears in the accompanying table. This article is confined to the concrete mixing plant and the placing methods.

The west mixing plant is located about 200 ft. below the axis of the dam on the sheer rock slope of the west abutment. The foundation for the plant was obtained by blasting out small benches in the ½:1 granite slope. Eight concrete columns, forming an octagon, were built on footings on these benches. The lowest column footing is at El. 903 and the highest one is at El. 996, the others being at intermediate elevations. At El. 1,024, the columns are capped with reinforced concrete beams, cross connected with other concrete beams to form the support for the first floor of the mixing plant, and to carry the columns supporting the mixer floor.

Above El. 1,024, the mixing plant building is of steel construction, with the exception of the concrete mixer floor at El. 1,045, which is independent of the steel construction. The octagon shape of the building continues up to the top.

Aggregate moves across the river from the live storage piles on a 36-in. belt conveyor carried by a suspension bridge and is dumped at El. 1,126. It falls into a hand-operated swivel chute which distributes the aggregate to the various storage bins below. One man operates this chute and maintains the supply in the bins. By an automatic control system, he can start delivery of any size aggregate from live storage. There are five aggregate bins located around two cement storage bins. They have the following capacities:

Classification	Size (Inches)	Bin (Cu. Yd.)
Sand	.....	288
Fine gravel	¼– ¾	288
Medium gravel	¾–1½	288
Coarse gravel	1½–3	144
Cobbles	3 –6	144

The two cement bins each have a capacity of 675 bbl. Cement is blown from the blending silos through an 11-in. steel pipe to the de-aerating tank on top of the mixing plant. Maximum rate of delivery is 1,000 bbl. per hour. As air leaves, the cement falls into the hopper, and is directed to either of

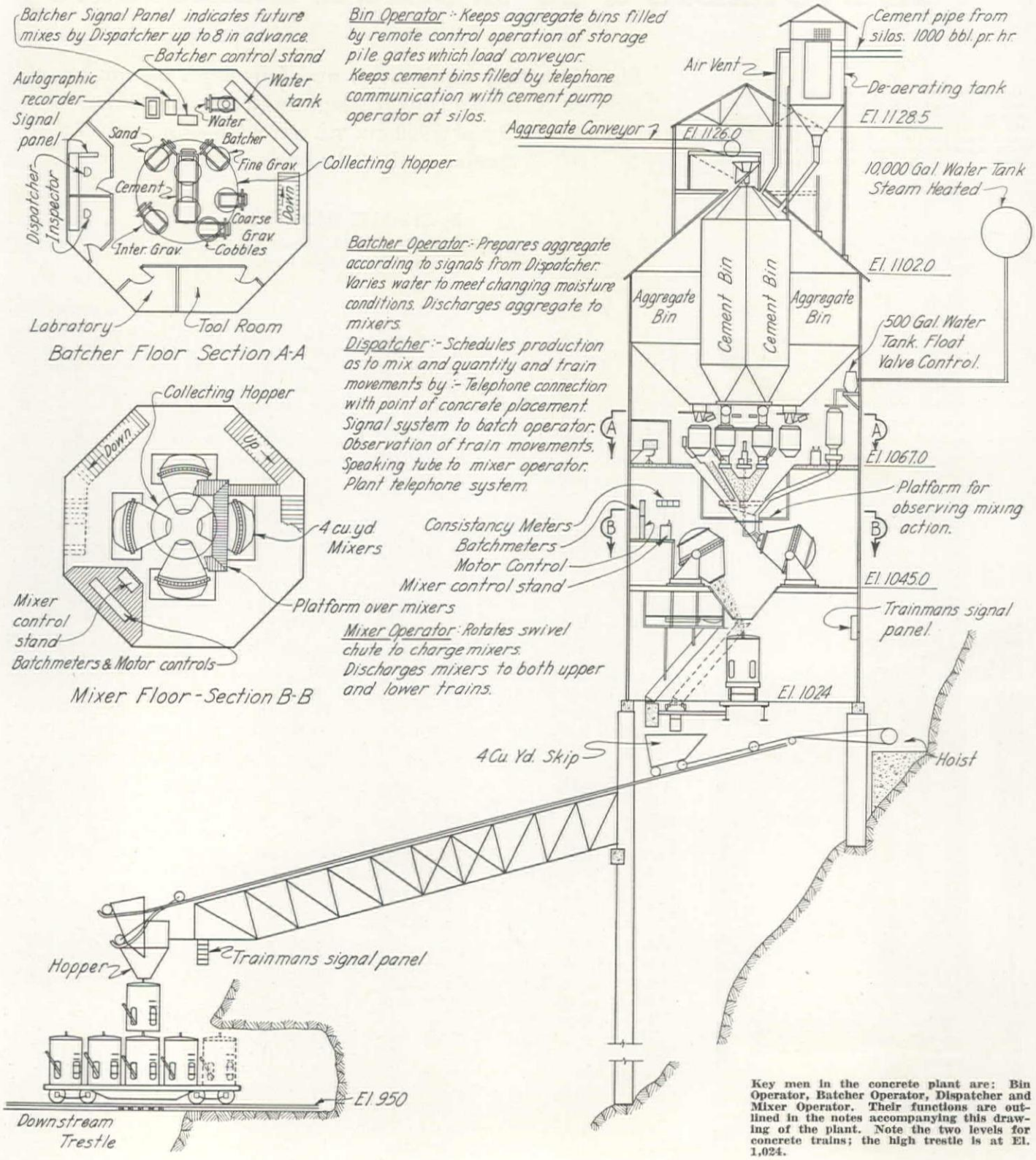
the two storage bins. All storage bins are of steel plate and channel construction and are built to reduce wear to a minimum.

Batching

Directly beneath the storage bins is the batching floor. On this floor are eight C. S. Johnson weighing batchers, one for each size of aggregate, two for cement and one for water. These batchers are cylindrical hoppers suspended on individual scales, which are so constructed that the batcher operator has an instantaneous selection of one of five possible mixes.

The aggregate from the storage bins is admitted to the batchers by means of electrically controlled air gates, using solenoid air valves. As the material starts to flow into the batcher, the gates are wide open. When approximately the right amount of aggregate has entered the batcher, the gates close and the remainder necessary to balance the scales is admitted by a dribble-flow actuated by a secondary control. By this system the batches are weighed out to about 1% of the specified weight. A screw feeder delivers the correct amount of cement in the cement batchers.

A 1,500 g.p.m. pump delivers mixing water from the river to a 100,000-gal. wooden tank on the hill downstream from the concrete plant. From the storage tank it is piped to a 10,000-gal. steam-heated tank where the water is warmed to the proper temperature for mixing. This tank is connected to a 500-gal. tank inside the mixing plant, with float-valve control. Water from



Key men in the concrete plant are: Bin Operator, Batcher Operator, Dispatcher and Mixer Operator. Their functions are outlined in the notes accompanying this drawing of the plant. Note the two levels for concrete trains; the high trestle is at El. 1,024.

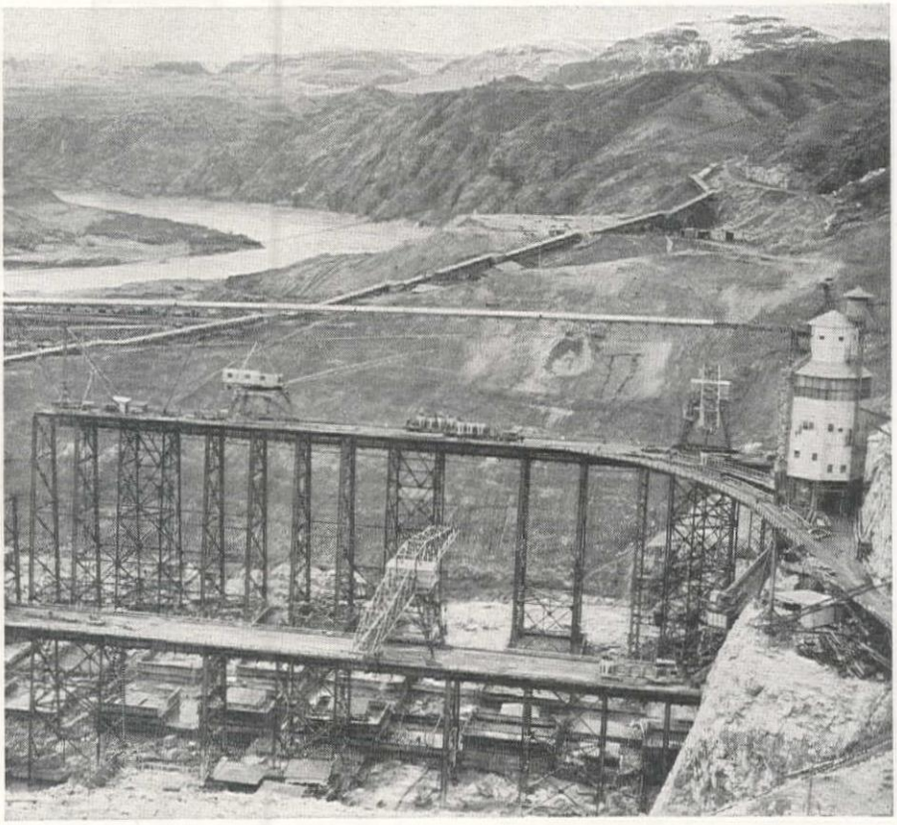
this tank discharges into the water batcher, which operates on the same general principle as the others.

The batchers are all controlled from a single stand by the batcher operator. This operator prepares the batches of aggregate according to signals from the dispatcher; he observes the apparatus and an autographic recorder during batching, varies water quantity to meet changing moisture conditions, and discharges batches of aggregate upon signal from mixer operator. Beside the batcher control stand is the batcher signal panel, which indicates future mixes ordered by the dispatcher up to eight in advance. For the operator's observance also, is an autographic recorder which makes a continuous record of batch weights, consistency, and mixing time. This record not only serves as a guide to govern future mixes, but also as a permanent record of every batch of concrete that goes into the dam. The autographic recorder is operated by electrical connections to the batcher scales and the mixers. The power required to turn a mixer is used as the indicator of the consistency of the concrete it contains.

The key man in the organization of the mixing plant force is the dispatcher. His office is located on a platform just outside the mixing plant, overlooking the forms and construction trestles. The dispatcher schedules concrete production as to mix and quantity, to meet demand and train movement. He uses the following controls: telephone connection with point of concrete placement, signal system to batcher operator, observation of train movements, speaking tube to mixer operator, and plant telephone system. In his office is the dispatcher's signal panel. This indicates: (1) the mix contained in each mixer, (2) when a mixer has been tilted, (3) which mixers are empty, (4) the mixes ordered for the succeeding batches, and (5) when an ordered mix has been batched. Five productimeter counters keep track of the number of batches of each kind of concrete produced.

The signal panels in the batcher control room and the dispatcher's office consist of a board with five rows of eight lights each. The five rows represent the five different mixes of concrete that can be ordered, and the eight lights in each row represent the number of batches that can be ordered in advance. The five kinds of concrete are termed A, B, C, D, and G mixes, and may represent different mixes from day to day. For instance, D concrete might represent a 4-yd. batch of 6-in. concrete one day and a 2-yd. batch of 2.0 grout the next day. A small testing laboratory is also located on the batcher floor.

Beneath the aggregate and cement batchers, which are centrally located on the batcher floor, is a large collecting hopper. At the bottom of the hopper is a dust-tight retractable charging chute, which is air-operated and connects with the collecting hopper by a swivel. This apparatus conveys the batched material to the mixer room.



Extending east toward the river from the mixing plant, these two construction trestles provide for the operation of concrete trains to the point of pour. The 4-yd. buckets on the trains are lowered by derricks into the forms. Trestles, which will be gradually extended across the river, are to be embedded in the concrete.

Mixing

Centrally located on the mixer floor are four heavy-duty 4-yd. Koehring mixers, operated by 75 h.p. electric motors. The four mixers are arranged on the sides of a square, pointing toward the center. Air jacks operating under 100-lb. per sq. in. pressure and a 50-lb. per sq. in. differential pressure are used to dump the mixers. Air cushioning valves give a smooth action to discharge and return. When a mixer has been emptied and returned to its normal position, the mixer operator engages the retractable chute from the collecting hopper with the mixer. He then signals the batcher operator who discharges the batchers into the collecting hopper and from there into the mixer. Special tubes allow the water and cement batchers to discharge near the mouth of the mixer. A vibrator insures complete cleaning of the aggregate and cement from the chute. When the batch has been delivered to the mixer, the retractable chute is withdrawn and engaged with the next empty mixer.

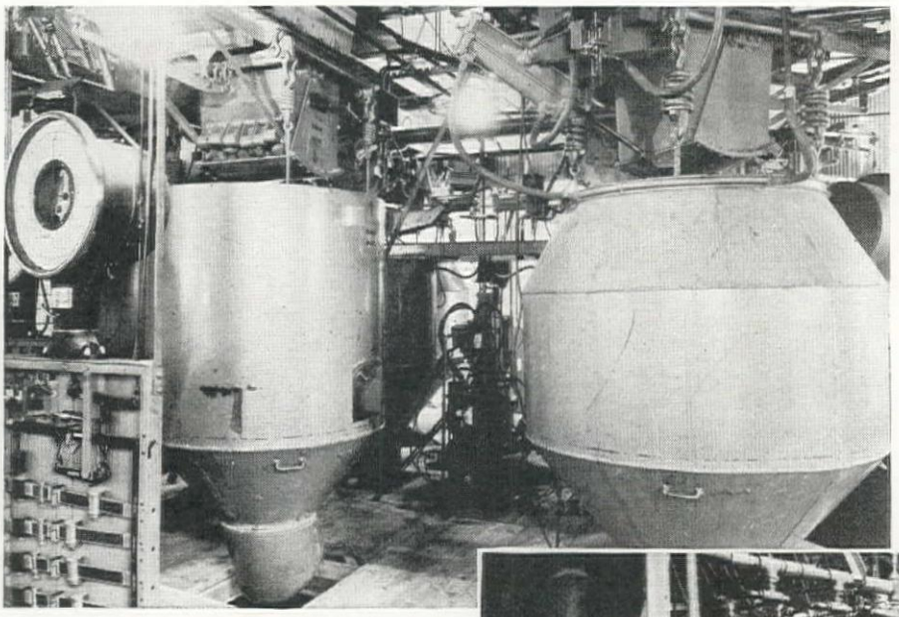
The mixers are charged in rotating order. The minimum allowable mixing time for a 4-yd. batch is 2½ min. Ordinarily, it takes about 4 min. from the time the batcher operator begins to make up the batch until the mixer operator is dumping the batch from the mixer. Just above the mixers is a small walkway for observing mixing action. One man operates the four mixers. To guide his operations he has a set of consistency meters and batchmeters.

Concrete handling

Below the mixers is a large conical collecting hopper. Concrete cars on the high construction trestle are spotted under the hopper and the concrete loaded directly from the hopper into the buckets. A skip hoist operating on a sloping runway connects the mixing plant with the lower construction trestle. When concrete is to be diverted to the low trestle, an air operated concrete chute, controlled from the mixer stand, is engaged with the concrete hopper, allowing the concrete to flow into a 4-yd. skip. Two skips are used, connected to the ends of a single piece of cable, wound on the drum of a hoist. While one skip is being loaded, the other is dumping. The skips discharge into a hopper and the concrete is dumped into a surge bucket and then into the buckets on the cars on the lower trestle.

To back cars under the skip discharge, it was necessary to blast out a tunnel in the abutment. Trainmen's signal panels at the loading points on the high and low trestles tell the trainman what kind of concrete is being placed in each bucket of concrete. In this way, no mistakes are made in delivering the right bucket to the proper place on the dam.

A compressor plant located on the El. 1,024 floor of the mixing plant furnishes air at 100 lb. for operating all the numerous air controls of the mixing plant. About eight men are required to operate the west mixing



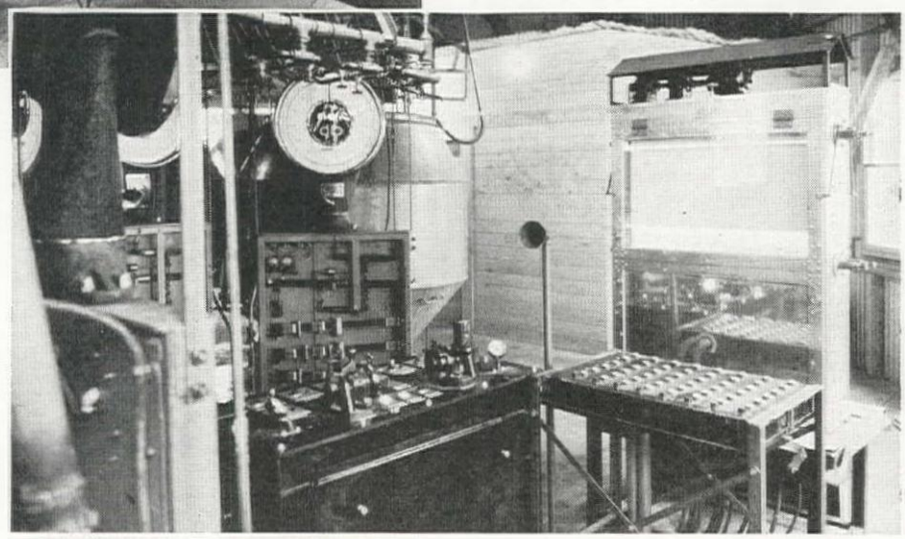
Looking across the batcher floor (above) where the Johnson batchers weigh out five grades of aggregate, cement and water to within 1% of the specified quantities. Batchers are fed through electrically controlled air gates from the bins on the floor above.

CHARACTERISTICS OF MASS CONCRETE MIX

Classification	Grading	Weight per 4-yd. Batch
Cobbles	6 –3 in.	3,100 lb.
Coarse gravel	3 –1½ in.	2,800 lb.
Inter. gravel	1½x ¾ in.	2,110 lb.
Fine gravel	¾– ¼ in.	2,660 lb.
Sand		930 lb.
Cement		1,505 lb.
Water		856 lb.

Ratio of materials: Cement 1.00
Sand 2.70
Gravel 7.00

Water-cement ratio is 0.56.
Slump is 2½ in.



Standing at the control table (below) the batcher operator selects the mix signaled by the dispatcher. The panel indicates the mixes to be used for the next eight batches.

plant, which is capable of producing about 6,000 cu. yd. of concrete every 24 hr.

Construction trestles

Two construction trestles for placing concrete have been built parallel to the axis of the dam. One is 93 ft. downstream from the axis and has a base of rail at El. 1,024. The other is 328 ft. downstream from the axis with the base of rail at El. 950. Under the present contract concrete will be poured to El. 950, ultimate crest (high dam) will be El. 1,260.

When complete, the two trestles will extend from the west abutment to the east abutment, connecting the east and west mixing plants. As concrete is placed, the two trestles will be imbedded in the dam.

All the concrete, under the present contract, can be placed from the two trestles. If, however, the high dam is authorized, the high trestle will have to be raised. Footings for the trestles were laid out to fall inside all expansion joints of the dam, and anchor bolts for the footings were doweled into bedrock. Bents for the high trestle, which is about 150 ft. high, are spaced at from 40 to 60 ft. The legs are heavy H sections, with a ¾-in. per foot batter. All bents of the high trestle are cross-braced and longitudinal bracing is used between all bents. They are connected at the top with six I-beam stringers. The floor consists of 12x12-in. timbers, spaced at 24 in. and covered with 3x12-in. planks.

Bents for the low trestle, which is about 80 ft. high, are similar to those of the high trestle. The cross-bracing follows the same plan, but the longitudinal bracing connects only every other span. The outside stringers of alternate spans are plate girders. Three I-beam stringers are spaced between the plate girders. Five I-beam stringers are used on spans not containing the plate girders. The floor of the low trestle is the same as the high trestle. The high trestle is being constructed by means of a stiff leg derrick which moves out on the trestle as each bent is erected. Erection of the low trestle is being done by a whirley derrick. Designing the bracing for these trestles has been complicated by the fact that the irregular rock necessitates many of the bents having unequal legs.

Concrete placing

Concrete is being placed by two hammerhead cranes, furnished by the Colby Steel and Engineering Co. of Seattle, and two Clyde Wiley whirleys. One hammerhead crane and one whirley are used on each trestle. The hammerhead crane is a steel truss 230 ft. long, mounted rigidly on a carriage that runs on rails on the trestle. A system of hoists and pulleys provides for picking up the buckets of concrete under the middle of the crane, and carrying them out to any point on either arm and lowering into the forms. The cranes are always at right angles to the trestles and their reach enables concrete to be placed in any part of the concreting area of the dam. The whirleys are used as auxiliaries to the hammerhead cranes. A trolley wire under the trestle furnishes power for the cranes. Two more hammerhead cranes and whirleys will be put in operation when the east mixing plant starts production. A track has been laid from the mixing plant, along the tailrace, to the top of the cofferdam for hauling concrete to Block 40, the block of the dam immediately behind the cofferdam. The buckets are lifted from the cars by a stiff leg derrick and lowered into the forms by two Clyde Wiley whirleys.

On the deck of each trestle are three standard gauge tracks, besides the outside crane rails. Specially built flat cars which have practically no overhang of the rails, pulled by diesel-electric engines, are used to transport the concrete from the mixing plant to the cranes. The locomotives were built by the Davenport Locomotive Works. Each car carries five 4-yd. buckets. Sixteen locomotives and cars will be in use when both mixing plants are in operation.

Four-yard Blaw-Knox bottom dump concrete buckets are used. These buckets have frames 8 ft. high enclosing cylindrical containers, with conical bottoms. A rubber sheet held in place by steel rollers, covers the opening in the bottom of the container. The

rollers are connected to a hand lever which is operated by the man dumping the bucket in the form. About sixty of these buckets will be necessary to handle the output of the two mixing plants. A crew of eight men is required to do the work at each concrete placing point.

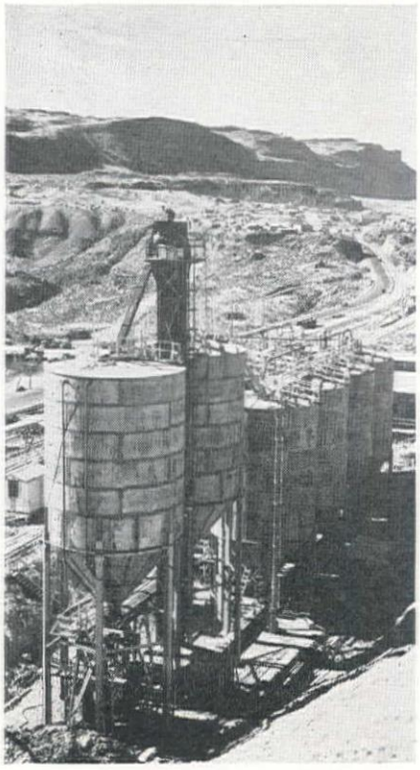
The construction units are rectangular, varying in size from the common 40x50-ft. dimensions. The concrete is poured in 5-ft. lifts, and a system of cooling pipes, somewhat similar to those used for Boulder Dam, is installed in each lift. After a 5-ft. lift has been placed, it is covered with a canvas held in place by a portable steel frame. If the temperature is low, steam is injected under the canvas. The concrete must be kept above 40° F. Lumber for the forms is being furnished by the Weyerhauser Lumber Co., and much of it is fabricated directly at the mills.

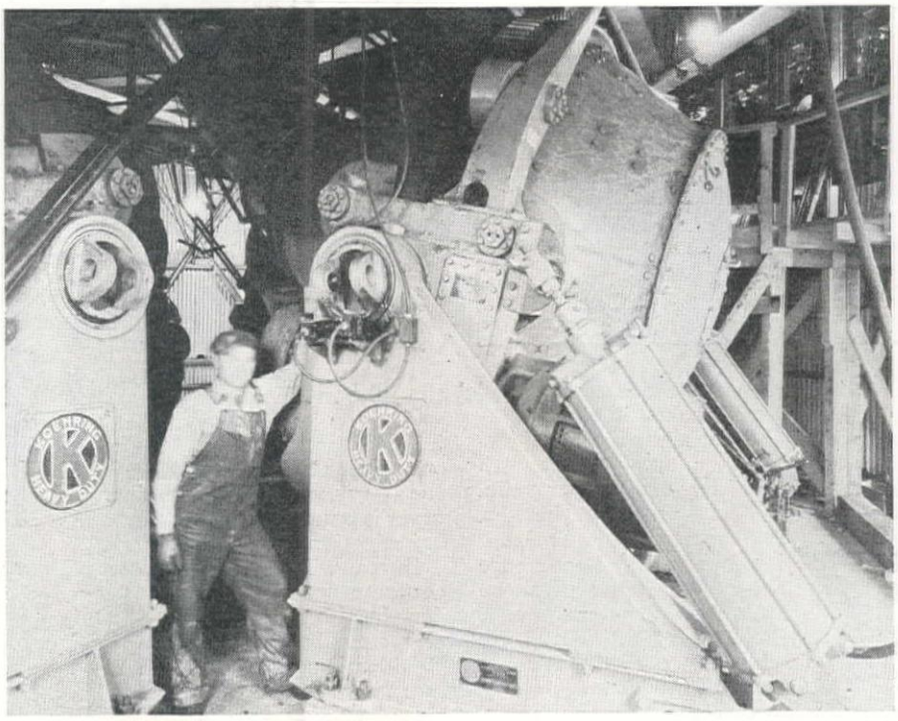
Cement and handling

Five different cements are used, all manufactured in Washington. Superior cement (47.6%) is manufactured at Concrete; Olympic cement (19.1%) is made at Bellingham; Lehigh cement (13.6%) is milled at Metaline Falls; Northwest cement (10.2%) comes from Grotto; Spokane cement (9.5%) comes from Irvin.

The MWAK cement silos are located about 1,000 ft. southwest of the west abutment of the dam on the brink of the river canyon. The cement plant is composed of a large compressor house,

Cement silos where five commercial brands are stored prior to blending. These cements are removed from the small silos in the proper proportions, mixed in a screw conveyor and delivered into the two large silos, from where the blended product is pumped to the mixing plant.





On the mixing floor these four 4-yd. heavy duty Koehring mixers are arranged in a square around a central discharge hopper. Mixers are charged through a retractable chute attached to the collecting hopper from the batchers. Air jacks, cushioned at the end of their stroke, dump the mixers.

an unloading platform, eight storage silos and two blending silos. The bulk cement is delivered to the dam site in box cars via the government construction railroad from Odair. Several sidings and storage tracks have been built near the silos by the MWAK Co. When a car has been spotted at the platform, a Fuller-Kinyon unloading machine is put in operation to handle the 240-250 bbl. load. The machine, with a 40 h.p. motor, picks up the cement and conveys it by air (40 lb.) through a 5-in. pipe to the top of the silo. The cylindrical silos, supported by steel columns, are of steel construction and each one has a capacity of 5,000 bbl. The ten silos are arranged in two rows of four each, and two in a single row. Two silos are used for Superior cement and one for each of the other four brands. Two are used for the blended cement. At the bottom of each silo is a Reeves variable drive feeder (16 to 200 r.p.m.) to allow the right per cent of each cement to be drawn from each silo to create the proper blend. Beneath one row of silos, runs a 20-in. 200-ft. screw conveyor. The feeders above this conveyor feed directly and those from the other four silos feed into four 16-in., 30-ft. screw conveyors, which deliver the cement to the 20-in. screw. The cement is blended as it moves through the 20-in. conveyor. At the end, the blended cement is discharged into a continuous bucket elevator that carries the cement to the top of the blended silos. Cement is diverted to either of the silos by a flop gate.

Directly under the blended silos is a Fluxo pump. One silo feeds into the receiving tanks of the pump by gravity, and the other by an 18-in. twin screw. There are two receiving tanks, each having a capacity of 50 bbl. and when one tank is full of cement the intake from the silo automatically closes and the pump begins to move the cement through the 11-in. delivery pipe to the mixing plant. Air pressure of 100 lb. per sq. in. is used for pumping the cement and the contents of the 50-bbl. tank can be delivered to the mixing plant in 2 min. 45 sec. Under normal operating conditions, 750 bbl. per hr. are delivered to the mixing plant. Two men operate the pumps and silos, and about six men are required for unloading cement from cars. Three Chicago Pneumatic Tool Co., 2-stage compressors, each powered with a 400 h.p. electric motor, provide air at the rate of 1,880 cu. ft. per machine.

Concrete testing

Sampling and testing of aggregate and concrete is done by inspectors of the Bureau of Reclamation. At least once every 24 hr. when mixing is in progress, 25-lb. samples of each type of aggregate are taken. Once every 8 hr. three samples of concrete are taken from the mixers, screened through a 1½-in. screen and placed in 6x12-in. test cylinders. All samples of aggregate and concrete are tested in the modern laboratory in Mason City.

Of the three concrete samples, two receive the customary 28-day test and the other is given an accelerated "8-hr." test. The 8-hr. test is used as a control. The sample is placed in an insulated chest with an inside water jacket, electrically heated. As the sample is placed in the chest, the water in the jacket is at boiling temperature. The heater is then disconnected and the water gradually cools. At the end of 7 hr., when the sample is removed, the water is at about 170° F. Steam from the hot water surrounds the sample as

MAJOR ARTICLES ON GRAND COULEE DAM

Plans and Specifications.....April, 1934
Bid Opening and Unit Bids....July, 1934
Conveyor System for Excavation.....March, 1935
Cofferdam and General Progress.....June, 1935
Slides at West Abutment.....Sept., 1935
Aggregate Preparation .....Nov., 1935

it cures. Between the seventh and eighth hour, it is broken in the Southwark 200,000-lb. testing machine. Eight-hour samples show a breaking strength ranging from 1,300 to 2,000 lb. per sq. in. The conversion factor between the 8-hr. and the 28-day concrete is about 3.0.

This test is of particular importance in allowing the concrete strength to be determined and controlled so promptly. The two cylinders used for the 28-day test are cured in a standard fog room at 70° F. for 28 days. They show a strength of from 4,000 to 6,500 lb. per sq. in. In all of the 6x12-in. test cylinders, only aggregate up to 1½ in. is permitted. The mass concrete of the dam contains aggregate up to 6-in. cobbles. Tests made on large test specimens in the Denver testing laboratory indicate that the mass concrete including cobbles has about three-fourths the strength of the wet screened specimens. The minimum allowable stress for the 28-day 6x12-in. cylinders is 3-800 lb. per sq. in.

Organization

The concrete plant, with the exception of the batching room, the cement silos and construction trestles was designed by the engineering staff of the Mason-Walsh-Atkinson-Kier Co. under the direction of C. D. Riddle, job engineer. Construction was carried out under the supervision of H. M. Slocum, general superintendent. H. L. Myer is general manager of the MWAK organization.

Bureau of Reclamation control over concrete production and testing is under the direction of O. G. Patch, who also served as concrete technician on Boulder Dam. Frank A. Banks is construction engineer in charge of the Grand Coulee project; A. F. Darland is field engineer. R. F. Walter is chief engineer of the Bureau and Elwood Mead is commissioner of reclamation.

Water Main Contamination Traced to Jute Packing

Recurrence following original sterilization leads to special study of joint packing—Tests outlined and results presented

By G. E. ARNOLD
Water Purification Engineer
San Francisco Water Department

ON a number of occasions contamination has been noticed in the water distribution system in San Francisco following the installation of new pipes, notwithstanding the precautions taken by the water department to sterilize new mains. A survey of the affected areas showed the water entering the system to be of satisfactory quality, but after passing through the new pipes contamination was present. Recalling that such contamination had been caused by the jute used in packing the joints of cast iron pipe in other cities, a special investigation of this contamination was conducted in the field and in the laboratory of the department. This investigation has extended over a period of nine months and has involved a large number of tests.

Field tests were made of water entering areas where new pipes had been laid and additional samples were obtained after the water had passed through these new pipes. It was found that the water entering the pipes was free from contamination, but that after passing through the new pipes considerable contamination was present. Over a period of several months this contamination gradually diminished, but did not entirely disappear.

Samples of the jute used in packing the joints were picked up on various jobs around the city, taken to the laboratory and tested for contamination present. Samples of the jute about 1 in. long were cut from the coils and placed in sterilized water, being allowed to stand at room temperature for lengths of time varying from 1 hr. to 4 days. Samples of the water taken from these bottles were tested according to the standard methods for bacteriological analysis. Portions of the water taken from these sample bottles were then chlorinated with varying doses from 1/10 to 10 p.p.m. of chlorine, allowing varying contact time of from 5 min. to 24 hr.

Additional samples containing small amounts of jute in sterile water were chlorinated using the same doses and contact periods. Parallel tests were run using ammonia and chlorine to form a chloramine, contact time being extended to 4 days. These examinations indicated that all the water samples became contaminated on contact with jute, plate counts running as high as 13,000 bacteria per cubic centimeter. The chlorinated waters were rendered sterile with the higher doses of chlorine, but the chlorinated jute did not become sterile with even the maximum dose, residual counts running as high as 800 per cubic centimeter.

To simulate water main conditions, samples of jute were placed in bottles through which a stream of tap water flowed continuously, these flows continuing for nine months. At intervals during this time samples of the water were taken from these bottles and tested for the presence of bacteria. In some cases the samples were withdrawn without disturbing the bottles, in other cases the bottles were shaken up before removing the sample. In addition to this, some of the jute samples were placed in bottles filled with water and allowed to remain stagnant for the same length of time, being tested in the same manner as the tests of the flowing water. It was found that contamination persisted in most cases to the full nine months of the test.

In an attempt to effectively sterilize the jute, samples of jute were placed in sterile water and chlorinated with varying doses of chlorine from 1/10 of a p.p.m. to a maximum dose of 100 p.p.m., contact time being varied from 5 min. to 5 hr. with the varying chlorine doses. Parallel tests were conducted, neutralizing the chlorine with sodium thiosulphate at the end of the contact period. The results of these tests are shown in Table I. In addition to this, samples of jute were sterilized in the auto-clave under a steam pressure of 20 lb. for a period of 35 min. Samples

TABLE I—CHLORINATION TESTS FOR STERILIZING JUTE SAMPLES

Sample	Treatment	Bacteria Count	Coli-Aerogenes Group
Jute, chlorinated	1/10 p.p.m.—10 min.	54,400	Positive
Jute, chlorinated	1 p.p.m.— 1 min.	8,000	Positive
Jute, chlorinated	10 p.p.m.—10 min.	19	Positive
Jute, chlorinated	10 p.p.m.— 1 min.	0	Negative
Jute, chlorinated	10 p.p.m.— 5 hours	0	Negative
Jute, chlorinated	100 p.p.m.— 1 hour	0	Negative
Jute, chlorinated	1/10 p.p.m.—10 min. neutralized	8,300	Positive
Jute, chlorinated	1 p.p.m.— 1 hour neutralized	60,000	Positive
Jute, chlorinated	10 p.p.m.—10 min. neutralized	200	Positive
Jute, chlorinated	10 p.p.m.— 1 hour neutralized	100	Positive
Jute, chlorinated	10 p.p.m.— 5 hours neutralized	1,500	Positive
Jute, chlorinated	100 p.p.m.— 1 hour neutralized	20	Positive

TABLE II—ADDITIONAL TESTS ON THE STERILIZATION OF JUTE

Sample	Treatment	Bact. Count	Coli-Aerogenes Group
Jute, steam sterilized	Control	0	Negative
Jute, steam sterilized	Inoculated with Coli-Aerogenes	20,000	Positive
Inoculated jute	Chlorinated— 1 p.p.m.—15 min.	14,000	Positive
Inoculated jute	Chlorinated—10 p.p.m.—15 min.	0	Negative
Inoculated jute	Chlorinated— 5 p.p.m.— 1 hr.	25	Positive
Inoculated jute	Chlorinated—10 p.p.m.— 1 hr.	0	Negative
Inoculated jute	Chlorinated—10 p.p.m.— 5 hrs.	0	Negative
Inoculated jute	Chlorinated— 1 p.p.m.—15 min. neutralized	68,000	Positive
Inoculated jute	Chlorinated—10 p.p.m.—15 min. neutralized	200	Positive
Inoculated jute	Chlorinated— 5 p.p.m.— 1 hr. neutralized	29,000	Positive
Inoculated jute	Chlorinated—10 p.p.m.— 1 hr. neutralized	36	Positive
Inoculated jute	Chlorinated—10 p.p.m.— 5 hrs. neutralized	20,000	Positive

of this sterilized jute were tested for control and additional samples were inoculated with known cultures of coli and aerogenes. Additional samples of the jute were immersed in tap water without inoculations. The results of these tests are shown in Table II on this page.

In all cases where the jute was sterilized under steam pressure, it was found to be entirely sterile with plate counts of zero and no gas production in lactose broth. However, upon being inoculated with cultures of coli and aerogenes, the bacteria multiplied rapidly and this contamination withstood subsequent chlorination. This sterile jute immersed in tap water produced some contamination, which did not persist more than 14 days. In all cases the jute sterilized with chlorine did not maintain its sterility over a period of four days and contamination recurred upon being immersed in tap water. Neutralizing the chlorine with thiosulphate simulated field conditions in that the jute when placed in service would lose its chlorine residual with the first flow of water.

In a number of instances the contamination of the water supply flowing through new mains has been definitely traced to the use of jute or other packing material in the joints of the pipe. This organic material seems to provide an excellent breeding ground for bacteria and is sufficiently protective that effective sterilization of the line is extremely difficult. The raw jute, when placed in the pipe, undoubtedly contains many bacteria which tend to multiply and in addition to this the jute is effective in trapping and protecting additional bacteria, which may be present in the water. Sterilization of new mains with chlorine is not effective in overcoming this source of contamination.

Apparently the only satisfactory method for sterilizing jute is by means of heating, boiling a quantity of the jute in water for several hours or placing the material in a pressure sterilizer where it may be steamed under pressure for 30 min. or longer, are apparently effective means by which the material may be sterilized. Using sterilized jute, however, does not necessarily dispose of after-growth in new mains. Opportunities for contamination are plentiful and unless carefully handled, even sterilized jute is apt to continue affecting the water. If a sterile jute is used, however, and reasonable care is exercised to prevent its becoming contaminated while being placed in the pipe and the first water run through the pipe carries a chlorine residual, it is felt that much of the contamination attendant with new mains will be eliminated.

Commercial jute is prepared under rather unsanitary conditions and while it probably is not dangerous from a health standpoint in contaminating the water flowing through a pipe, it is apt to mask or cover up some other source of contamination, which may be dangerous to health. There are numerous ways by which a water supply may be contaminated in the distribution system and it is the purpose of routine bacteriological analyses to detect these contaminants. If, however, routine bacteriological analyses show the water to be more or less regularly contaminated, and the tendency is to consider this as being caused by jute packing, some dangerous contamination may be encountered which would be overlooked. From this standpoint jute may become a menace to health.

It is the policy of this department to place a quantity of chloride of lime in each joint of pipe as the pipe is laid. Upon completion, the pipe is filled with water and allowed to stand under pressure for some time. This first filling is then flushed out and the pipe placed in service. This means of sterilization is effective in the destruction of dangerous bacteria.

Conclusions

In conclusion, it may be stated that: (1) jute is a source of contamination in new mains; (2) chlorination of the main is not satisfactory in destroying this contamination; (3) chlorination of the jute itself is not a satisfactory means of sterilizing it; (4) steam pressure sterilization is probably the most effective means of avoiding this source of contamination.

Boulder Dam Penstock Passes Test At 1½ Times Operating Head

THE FIRST of the four penstock systems at Boulder Dam has successfully passed a test which involved a head 1½ times the maximum head which the penstock will withstand under operating conditions. "All parts of the penstock system," stated Ralph Lowry, construction engineer for the Bureau of Reclamation, "successfully withstood the pressure; only a few extremely small leaks were apparent during the test and these will be readily tightened by additional caulking."

This penstock system (*Western Construction News*, March, 1934, and June, 1935) will convey water from the reservoir to four 82,500 k.v.a. generators in the Nevada power house at the base of the dam. The system consists of a 30-ft. diameter header which receives water from the intake tower and delivers it into four 13-ft. diameter branch lines to the turbines. The header also connects with six 8½-ft. pipes leading to the needle valves discharging into the canyon below the power house. All of these pipe sections were fabricated out of steel plate by electric welding.

During the test the pipe openings were closed by steel bulkheads and the canyon wall outlets were closed at the needle valves. The system was then filled with water by pumps located in the river. It required three days to pump the 9,000,000 gal. of water into the penstock system. After this water had been pumped in, an additional 25,000 gal. was required to replace the volume lost through the compression of the air in the water and the expansion of the steel pipe under pressure.

Pressure of 360 lb.

After the penstock system had been filled, additional head was applied by filling a standpipe to a height of 648 ft. above the header and 831 ft. above the outlets at the power house. This resulted in a pressure of about 280 lb. per sq. in. on the header and 360 lb. per sq. in. on the 13-ft. branch penstocks. The maximum operating pressure on these 13-ft. lines when the reservoir is at capacity will be 248 lb.

This test was applied to the first penstock system completed and the other three, which are approaching completion, will be tested in turn. All of the pipe has been fabricated and most of it has been placed.

The first of the 82,500 k.v.a. generators, twice the size of any previously installed in this country, is now being placed in the power house.

Transmission Line to Carry Power From Boulder Dam

Los Angeles builds 2,700 steel towers to support 270-mi. line for delivering first 240,000 kw. block of power

TO BRING Boulder Dam power to the City of Los Angeles, the Bureau of Power and Light has practically completed a 270-mi. transmission line which will be used to deliver the first block of 240,000 kw. This line was built on an almost direct route from Boulder Dam to the city and provides two 3-phase circuits. Power will be carried on single circuit steel towers for 230 mi. across the desert and mountains, with 40 mi. at the western end of the line supported on double circuit steel towers.

The towers were designed for an average spacing of 1,000 ft. with a minimum clearance of 27 ft. for the conductor above the ground. The single circuit towers are 109 ft. high and the double circuit towers are 144 ft. high. Design requirements include stability against one broken conductor, one broken ground wire, ½ in. of ice on the conductors and an 8-lb. wind load.

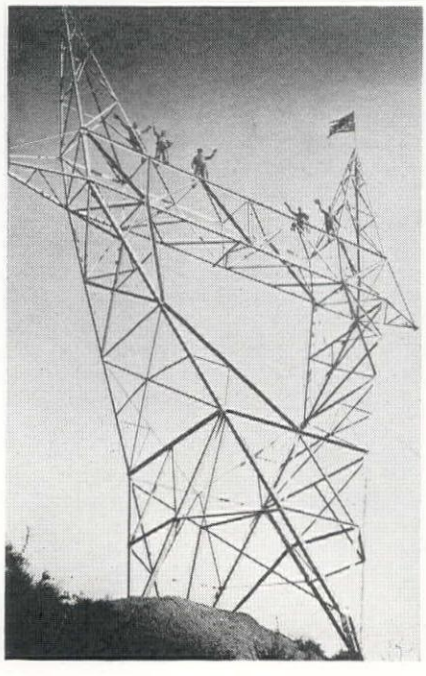
Preliminary construction operations included the building of 265 mi. of road and seven 200-man camps. Field headquarters were near Barstow. Wells for water supplies were required at five of the construction camp sites.

Holes for tower footings, wherever possible, were dug by tractor-mounted boring machine. Operating as shown in the accompanying illustration, these machines, equipped with 36-in. bits, put down 20 to 35 holes per 8-hr. day, depths averaging between 6 and 9 ft.

Excavating (top) for tower footings with a tractor mounted boring machine, putting down 20 to 35 holes per 8 hr.

Stringing the hollow copper conductors, formed from ten interlocking segments. The reels hold 1 mi. of the 1.4-in. diameter conductor which weighs 1.57 lb. per foot.

Steel towers 144 ft. high to carry the double circuit lines for the last 40 mi. at the Los Angeles end.



At some locations drilling and shooting was necessary to excavate for footings.

With the holes dug, the assembly of foundation reinforcing steel and tower leg stubs, which were tack-welded in the shop, were moved to the site and lowered into place. These four footing assemblies were held at the top by a steel template to insure correct alignment.

Concrete was poured from truck-mounted 10-S mixers in most of the rugged area. Each mixer was accompanied by a 1,200-gal. water tank trailer. This transportation equipment was principally Ford V-8 6-wheel trucks. Local aggregates were used and the concrete was vibrated as placed.

Each of the single circuit towers, of which there were 2,422 in the line, were fabricated in the field from 328 structural steel parts, assembled by 1,150 bolts. An advance gang laid out and assembled the lower units, followed by the erection gang using a truck-mounted double-drum hoist. A 50-ft. collapsible floating gin pole was used for raising the members. The plan of operation was based on one tower being erected per gang per day.

For the first time in this country, hollow copper conductors, formed from ten interlocking segments were used for this transmission system. These conductors are in the form of a self-supporting tube 1.4 in. in diameter and weigh 1.57 lb. per foot. A total of about 1,600 mi. of this conductor was required. Reels holding 1 mi. of conductor cable were set up and unwound by tractor pulling through sheaves on the towers, with a tension machine designed and built by the Bureau of Power and Light to control the unreeling.

Total cost of the project including substations in Los Angeles and equipment in the Builder Dam power plant was about $23,000,000 and during maximum construction operations, 1,200 men were employed. All of the 230 mi. of single circuit line has been completed and the remaining work is on the 40 mi. of double circuit line on the Los Angeles end.

The 2,422 single circuit towers were supplied by Tower Builders, Inc. at a contract price of $1,957,737. This organization is composed of Consolidated Steel Corp., Western Pipe & Steel Co., and Blaw-Knox Co. The 272 double-

circuit towers were furnished by McClintic-Marshall Corp. on a $322,088 contract. The conductor cable was supplied by the General Cable Corp. on a bid of $2,399,600.

The Los Angeles Bureau of Power and Light will operate five 82,500 kva. generating units at the Boulder Dam power plant and transmit this energy from the plant at 287 kv. E. F. Scattergood is chief electrical engineer and general manager of the Los Angeles Bureau of Power and Light. H. C. Gardett is engineer of design and construction and C. P. Garman is assistant design engineer. James F. Moran is general superintendent of construction, and R. R. Robertson engineer of construction. Construction of tower footings, tower erection and cable stringing were carried out by forces of the Bureau of Power and Light.

Seattle Replaces Old Dam At Cedar River Intake

City builds new concrete diversion structure at head of municipal water supply conduit—Provisions for sluicing to protect intake characteristics

By H. D. FOWLER
Superintendent, Water Department
Seattle, Washington

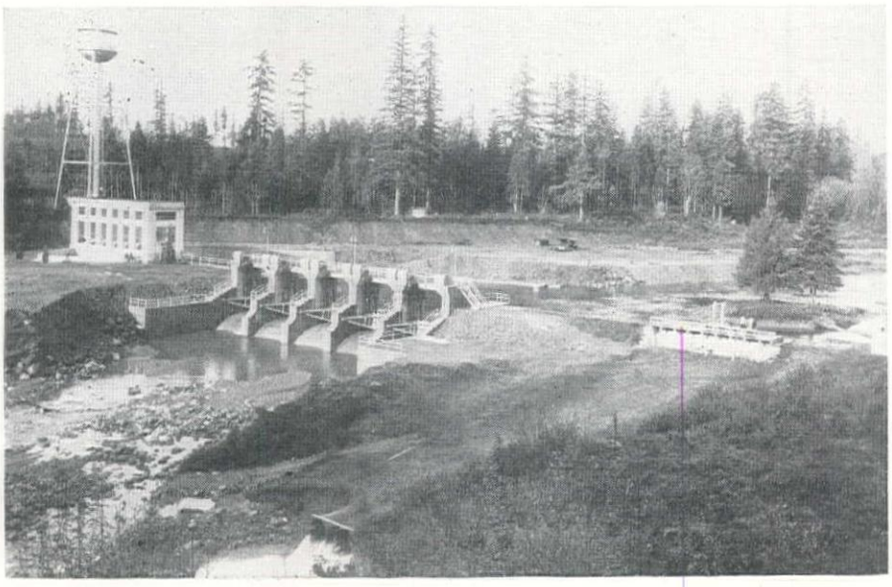
SEATTLE has completed the construction of a new diversion dam and head works at the intake of the municipal water supply conduit on Cedar River about 23 mi. from the city. The original intake, constructed in 1899, was a timber crib structure built to provide a stilling basin for the inlet to the two 60-in. wood-stave lines. The spillway was constructed as a weir, and was used as a government gauging station for several years.

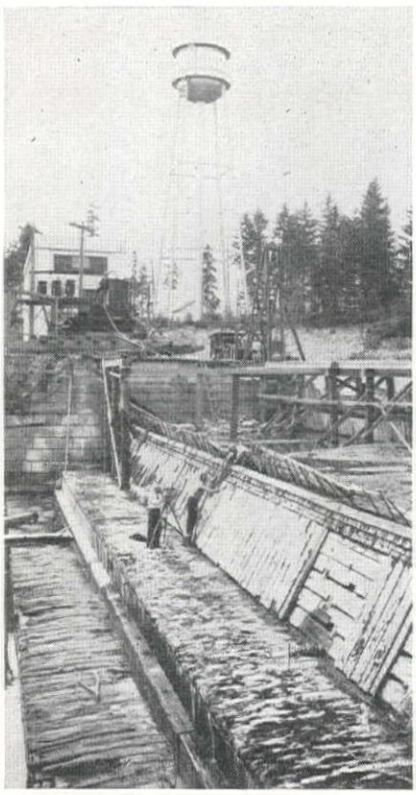
This arrangement continued in use until 1930, when an 8-ft. concrete pipeline, supplanting the old wood-stave lines, was constructed, together with a new forebay and screenhouse. These works were built on the opposite side of the river with diversion from the same basin.

The crest of the old dam was at El. 536, which fixed the minimum level of the water in the forebay, and also fixed the minimum elevation to which sand and gravel could be washed or carried from the forebay. There was no means of controlling the velocity of flow over the dam, and consequently sand and gravel carried downstream during high water periods was deposited behind the dam as well as in the forebay, until it had built up to the crest of the weir. Naturally, this deposit of sand and gravel interfered with the water flowing into the 8-ft. pipeline, and periodic removal of these deposits proved to be an expensive maintenance operation.

Due to these hydraulic problems and the age of the timber structure, the water department decided to build a new dam. This project was authorized in 1932, and a contract was let in 1935 to D. Nygren and the Puget Sound Machinery Depot for removal of the old dam and the construction of a concrete structure with an over-all length of 150 ft., containing five steel Tainter gates, together with hoists and other appurtenances. The total cost to the water department was $83,000.

Completed Cedar River intake dam built at cost of $83,000, replacing 35-yr. old timber crib structure.



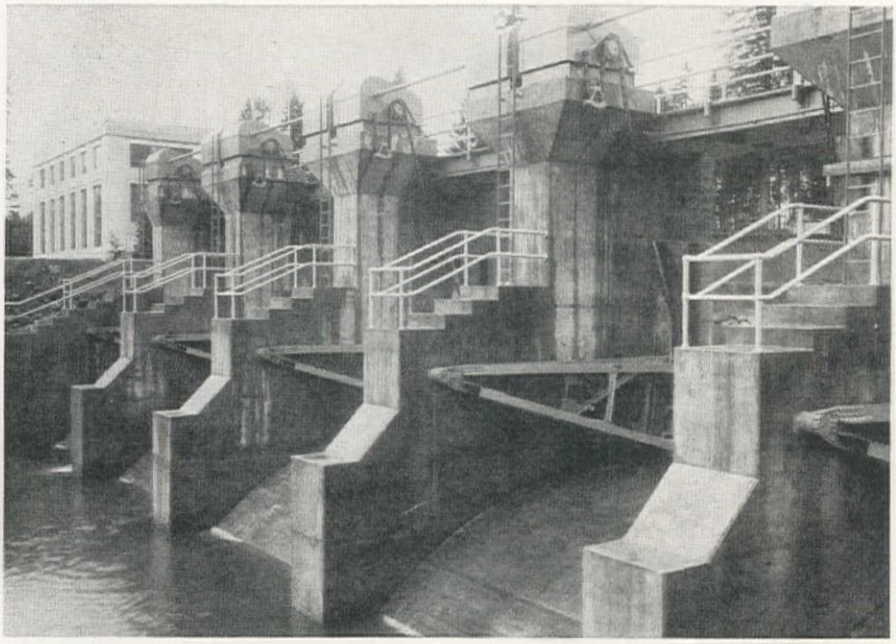


Condition of old timber dam at the time the new work was started. Trestle on the right was built by the contractor to support equipment.

The condition of the downstream face of the original dam at the time of replacement is shown in the accompanying illustration. The iron rods projecting above the crest had been installed several years ago, to support temporary flash boards and provide additional head on the inlet to the pipelines. The Wakefield pile cofferdam used in the construction of the new dam may be seen a few feet upstream from the old structure. The pile trestle was built by the contractor to support construction equipment during the construction of the dam.

The Tainter gates in the dam are 6 ft. high by 20 ft. long, and are operated by two hoists located on piers between the gates. These piers, which extend to El. 555, also support an operating deck and bridge the full length of the dam. Each hoist is driven by a 2 h.p. back-geared electric motor, which raises the gate at a rate of about 1 ft. per min. The ends of the gates are faced with rubber belting that provides a water seal and the bottom is fitted with a wood sealing strip which bears on a steel beam set flush with the floor of the spillway. During the short time the dam has been in operation, leakage through the gates has been negligible.

The flow line on the new spillway is at El. 532, and when the gates are closed the overflow is at El. 538. This increases the head by 2 ft. over that provided by the old dam. The channel above the forebay has been straightened and deepened, and with the control of the velocity of flow through or under the gates, by means of their manipula-



Details of the 6x20-ft. Tainter gates designed to permit flushing sand and gravel from the forebay. Motors in the piers raise the gates at the rate of 1 ft. per min.

tion, it is expected that sand and gravel can be sluiced downstream through the spillway sections.

The concrete building at the left (see illustration) houses the revolving screens and gates at the entrance of the 8-ft. conduit. The 50,000-gal. elevated tank furnishes water for washing the screens. The old inlet and headgates for the two 60-in. pipelines is shown at the right of the dam.

No unusual conditions were encountered in the construction of the dam. The contractor drove Wakefield sheet piling upstream through sand and gravel to refusal to form a cofferdam for diverting the water from the site during construction. A flume was built over the dam to take care of any unusual flow, but was needed only occasionally.

Normally, the draft by the city, together with the flow through the old 60-in. pipes which were cut open a short distance below the dam, took care of all the stream flow. It was expected that there would be considerable seepage, but very little developed, and it was taken care of by the intermittent operation of a 6-in. centrifugal pump.

Plans and specifications were prepared and construction supervised by Thomas R. Beeman, city engineer of Seattle, and his staff. The author represented the water department on the project.

River Levee Sets Record For Culvert Installation

By OWEN G. STANLEY
Senior Engineer, U. S. Engineer Office
Sacramento, Calif.

Sacramento River flood control project uses 1,750 ft. of 66-in. corrugated pipe as outlet works

A FEATURE of the Sacramento River Flood Control project, being carried out by the Corps of Engineers, U. S. Army, is the control structure recently completed at the mouth of Butte Slough, which involved the use of 1,750 ft. of 66-in. corrugated outlet pipes. Seven lines of pipes were installed through the earthfill and equipped with gates at both ends to provide for release of flood water from the slough and prevent back-flow from the river. The work cost about $109,000 and the structure replaced the former inadequate control works.

Butte Slough and Butte Creek drain into the Sacramento River about 5 mi. below Colusa. The problem involved the controlled discharge of water from these branches into the river and the prevention of return flow when the river stage was high. Existing rights made it necessary for the design to permit the passage of water at low as well as flood stages.

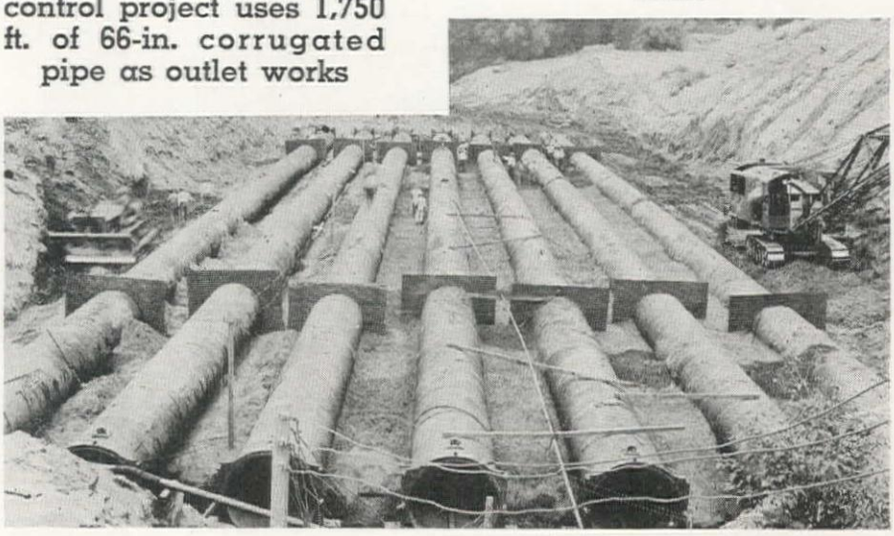
On account of the foundation conditions at the Butte Slough site, and because of the function of the structure just mentioned, a concrete structure would have been unduly expensive. An earthfill dam, with metal pipes through the base, was selected as the most suitable construction for the particular foundation, which was not absolutely solid. Accordingly, a dam about 500 ft. long was designed with a 30-ft. crown, 2½:1 side slopes on both sides, seven lines of 66-in. pipe and cobblestone riprapping at both toes extending some distance up the slopes. The crest can be used for a highway location. Riprapping consists of cobblestones 32 in. deep at the toes and 15 in. deep on the slopes and aprons, resting on a 4-in. gravel base. One line of 78-in. pipe was specified for the nearby high water drain.

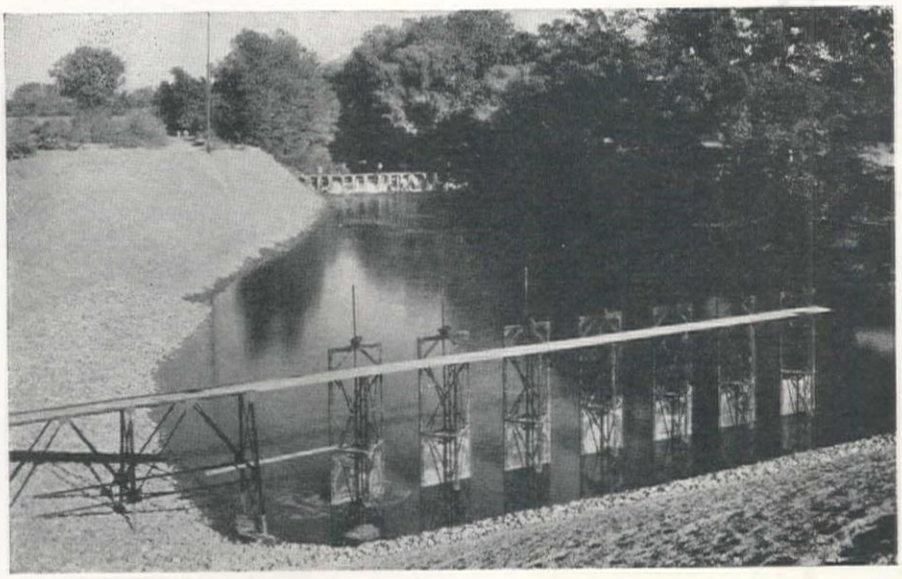
Details of pipes

The 66-in. pipe lines are each 250 ft. long and are equipped with gates on each end; the 78-in. line is 178 ft. long and is equipped with a gate on the riverward end. Each pipe is provided with two bulkheads or cut-off walls 30 ft. on either side of the center line of the dam to prevent seepage along the pipe. To support the gates, the ends of pipes rest on wooden saddles, supported on two wooden piles about 20 ft. long.

Pipes, bands, and bulkheads are made of corrugated, galvanized Armco Iron, the pipes and bulkheads being No. 8 gauge and the bands of No. 10 gauge. The gates on the riverward end of pipes are Calco, cast steel, automatic drainage gates, and the gates on the landward end of pipes are Calco cast iron slide gates, with steel gate towers and gate lifting devices. All the pipe

The seven 250-ft. lines of 66-in. pipes installed with bulkheads before start of earthfill.





Slide gates installed on the inlet of the pipes to control outflow from behind the levee. Automatic drainage gates were provided at the river ends to prevent back-flow.

was extra-close riveted, and sections 30 ft. long at the ends of each line had the seams soldered. Pipes were dipped in asphalt and, to provide resistance to erosion, the inverts were paved with a bituminous compound.

The original material in the slough bed was excavated and much of it, which was found to be unfit for backfill, was wasted. The foundation for the pipe battery was thoroughly consolidated and beds were prepared by excavating shallow trenches formed to the shape of the pipes, with a depth equal to about one-fifth of their diameters.

Strutted out of round

When the pipes were in place they were first strutted to increase their vertical diameters approximately 5%. These timber struts were 4 x 4-in. on 6-ft. centers, resting on a continuous 4 x 4-in. lower sill. Across the tops of the struts were placed 4 x 4-in. transverse soft compression caps 12 in. long, on which rest two 4 x 4-in. longitudinal upper sills. Jacks are used to install these struts.

Material for back filling around the pipes was carefully selected and thoroughly compacted by hand tamping up to the ¾-point. The fill was then completed to a height of about 40 ft. above river elevation. The struts were subsequently removed and the pipes have resumed an approximately circular form.

The heavy duty Calco slide gates were installed at the inlet ends of the pipes to control outflow. The automatic drainage gates were placed at the outlet ends to prevent back-flow from the river, which under certain conditions would otherwise occur during high water. During the low water flow the water level in the slough is under complete control, as the flow is then always toward the river. During the high water season the slide gates are raised and free flow toward the river to the full capacity of the pipes is permitted.

Work was begun in the fall of 1934, but flood conditions in the late fall and spring delayed the construction work. It was resumed in July, 1935, and finished in October, 1935. The entire construction cost approximately $109,000. Work was carried out under contract held by S. H. Palmer Co. and A. J. Grier of San Francisco.

Colorado Gets $25,000,000 Highway Loan

Colorado expects to have $25,000,000 available for immediate highway construction some time in February, under a federal loan negotiated by Governor Ed C. Johnson. The loan has been approved and money will be available as soon as final details of interest and repayment are worked out. This loan will bring the state's financing for highways during the next two years up to about $37,500,000. The plan is to spend $15,000,000 in 1936 and the balance in 1937. The program is designed to develop a complete system of hard-surfaced arterials for the state.

The tentative program, which has been worked out in detail, has yet to be approved by the highway advisory board; this action will be taken as soon as the loan money is available. Governor Johnson hopes to speed the progress on this new program through the creation of a new highway department official known as the "expediter" whose duties will be to follow every job from start to finish to see that there is no delay. Major Ralph O. Baird has been appointed to fill this position. He will report directly to the governor.

Portland Has Program of Major Street Improvement

A plan for a major street improvement project which will provide an arterial route around the congested business section is an important item on the 1936 construction program of the City of Portland. The purchase of necessary rights of way by the city is estimated to involve $3,000,000 and the present plans call for the grading and paving to be done by the state highway department. The work involves the widening and extension of Front Ave. to a width of 100 ft. from N. W. Glisan St. to a connection with S. W. Barbur Blvd., together with the extension of Foot Hills Blvd., from S. W. Front Ave. to S. W. 18th Ave. and W. Burnside St.

Another important project consists of a proposed connection between S. E. McLaughlin Blvd. (East Side Pacific Highway) and S. E. Union Ave., a distance of about 1¾ mi. Present plans call for the state highway commission to provide right of way and construct this thoroughfare which would include a viaduct over the Southern Pacific tracks as part of the project.

Denver's Diversion Project Advanced at Rapid Rate

With the holing through, late in January, of the last of the five tunnels on the Denver water supply extension project canal, extending from El Dorado Springs toward Denver, the Fraser River water diversion project from the West Slope is about two-fifths complete.

The last two tunnels, No. 4, which is 3,000 ft. long, and No. 5, 3,200 ft., were holed through the same week. Work is progressing rapidly on lining the necessary portions of the five tunnels, which have a combined length of about 1½ mi. Original estimates placed the necessary lining at about 30% of the total, but lining is actually being required on a slightly higher percentage of the footage.

Pouring of concrete for the diversion dam in South Boulder Creek at El Dorado Springs has been completed and rapid progress is being made on the open canal work. The conduit work to the reservoir on Ralston Creek is well started. Transitions, flumes and highway bridges are under way. Only surveys have been made on the Ralston Creek reservoir, no actual work yet being under way.

The first part of the program, which started last year, is now about 75% complete. The extension project, which includes ten individual projects, will be well under way in every unit before summer and completion is expected by the end of the year. So far, only four of the ten contracts have been awarded.

The general features of this program for transmountain diversion of a supplemental water supply for Denver were reviewed in *Western Construction News*, December, 1935, p. 343.

Record Trickling Filter at Oxnard Sewage Plant

California city installs unit 145 ft. in diameter designed for 1 m. g. d.—Imhoff tank digester located directly under primary clarifier

By E. O. IMUS
City Engineer, Oxnard, Calif.

A TRICKLING FILTER 145 ft. in diameter, the largest installation of this type in California and equaled by only two in the United States, is the outstanding feature of the sewage treatment plant recently completed by the City of Oxnard. The 1 m.g.d. plant includes a primary clarifier, dosing tank, trickling filter, secondary clarifier, primary and secondary chlorination, Imhoff tank digester and sludge drying beds. The project cost $72,000 and was financed by the PWA, through the purchase of $54,000 of local bonds and an $18,000 grant.

Oxnard, Calif., situated 45 mi. northwest of Santa Monica on the new Coast Highway, is the distribution center for an extensive agricultural region. The climate is moderate throughout the year due to proximity of ocean. The city has a population of about 6,500. The sewer system and a septic plant were constructed in 1905 at a cost of $45,000 and since that time $61,325 has been spent on extensions, making a total expenditure of $106,325. The system consists of 19 mi. of 6 to 21-in. vitrified pipe mains, 171 manholes, 60 flush tanks and a septic tank of a design developed in 1900. In 1912 the sewer flow was 473,000 gallons per 24 hr. The present average daily flow is 750,000 gallons, with a maximum hourly rate of 960,000 g.p.d. The flow equals 72% of all water pumped at the municipal water plant. This increased flow far exceeded the maximum capacity of the septic tank and created an unsanitary condition, complicated by heavy gas action.

New plant planned

The city council after a thorough investigation of various plants in Southern California, concluded that a trickling filter plant similar to the one at Signal Hill, near Long Beach, would most nearly meet requirements. The Signal Hill sewage treatment plant, designed and constructed by the engineering department of Signal Hill and the Currie Engineering Co. in 1930, has rendered excellent service with very nearly complete automatic operation and has no outlet other than the sale of water to oil companies and for irrigation. There is no noticeable odor.

The city submitted an application for financing to the Public Works Administration for an estimated project cost of $72,000. The plan called for $54,000 to be raised by local bond issue and $18,000 by federal grant, with the provision that the Federal Government purchase the bonds bearing interest at the rate of 4% until maturity in 20 years. After approval of this application, the contract for construction was awarded to J. C. Hickey of Alhambra, Calif., on Jan. 10, 1935. Due to delay in securing approval of the bonds and transfer of funds, work did not start until April 23. The plant was completed on Oct. 19.

The control room contains two 7½ h.p. variable speed motors, 500 to 1,000 r.p.m., controlled by float switches, and one Navo plunger pump for sludge, provided with relief valve and discharge on side of pump for sampling, directly connected to the sump in the secondary clarifier, top and bottom of Imhoff digester tank and sludge drying beds. Two Wallace & Tiernan chlorinators, solution feed vacuum type are provided, capable of delivering 100 lb. per day. At present 25 lb. are being used, 12½ lb. in the dosing tank at the primary clarifier and 12½ lb. into the flow from the trickling filter to the secondary clarifier. Motor units have push button control at the motor, and all conduits are concealed in the concrete walls or floor.

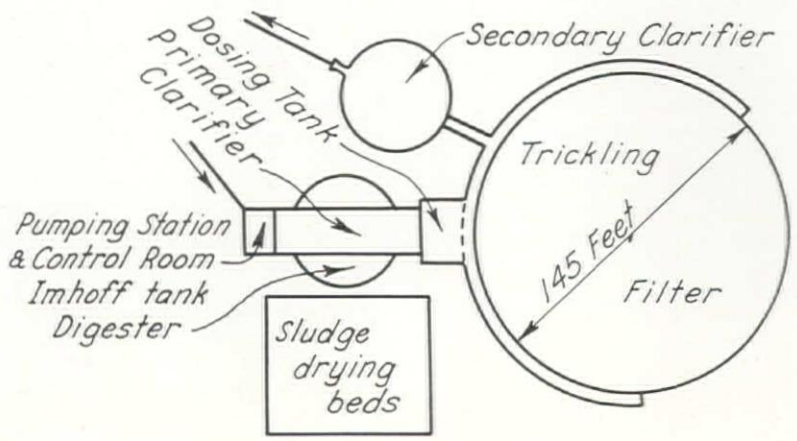
Two vertical centrifugal sewage pumps furnished by the Chicago Pump Co. are located in the pumping station under the control room and are capable of delivering from 800 g.p.m. each to a minimum of 300 g.p.m., depending upon the speed of the variable speed motors in the control room, with which they are directly connected. The motors, together with the pumps and floats, are so designed and installed that sewage is pumped from the wet well (also located in the pump station) to the primary clarifier, a raise of 15 ft., at the same rate as the incoming sewage.

The float control synchronizes the rate of pumpage to the rate of inflow so that there is no "hunting" by the mechanism, and also is designed so that one pump will automatically serve as a standby or emergency unit should the operating pump become either stopped or unable to handle the incoming sewage flow. The station is also equipped with a hot water heater and tank automatically controlled with thermostatic pilot control, burning gas taken from the gas domes on the Imhoff tank digester. This equipment is capable of delivering 25 g.p.m. to the heating coils in the Imhoff digester.

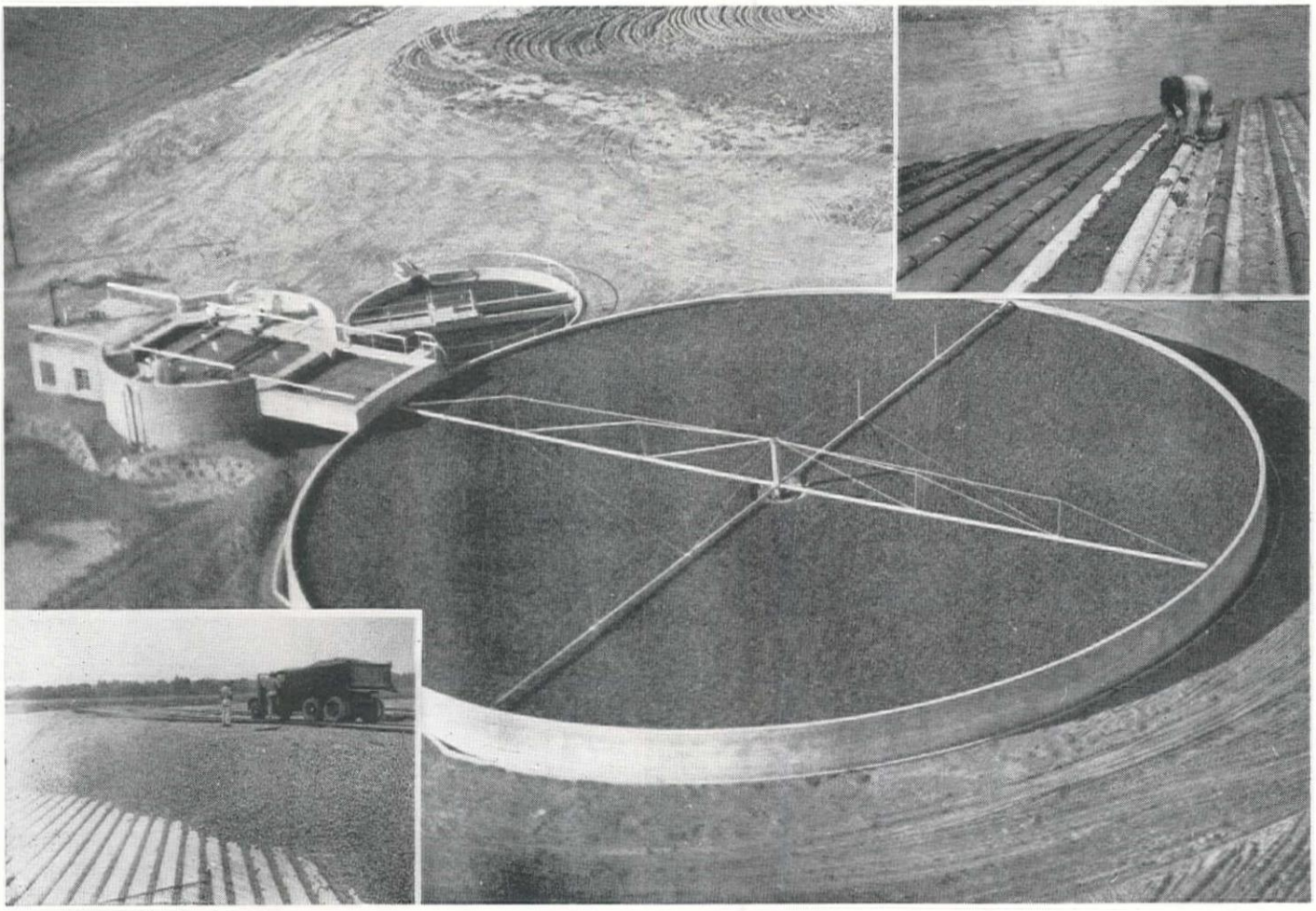
Treatment process

The primary clarifier, which is rectangular in shape, 34x18 ft. and 10 ft. deep with an open V-shaped slot bottom provides a 45-min. detention period for the maximum hourly rate of flow and has air skimmers arranged to skim toward the inlet. All skimmings pass into the digester. This equipment was furnished by Stephens-Adamson Co.

The Imhoff tank digester will provide a capacity of 2 cu. ft. per capita and is 36 ft. in diameter and 15 ft. deep, constructed underground with cone-shaped bottom for sludge concentration. This tank is located directly under the primary clarifier and has a slot and closing mechanism in the bottom equipped with a timing device to deposit sludge, settled in the clarifier, into the Imhoff digester at predetermined intervals; the design provides against back flow or circulation between the incoming sewage in the primary clarifier and the sludge in the digester. This equipment was furnished by the Stephens-Adamson Co. and is considered an important improvement in the successful operation of an Imhoff tank digester. The digested sludge flows by gravity or can be pumped to the drying beds. It can also be circu-



General arrangement of units in the Oxnard plant. Note the location of the Imhoff tank digester directly beneath the primary clarifier.



With a diameter of 145 ft. this trickling filter is the largest in California and only equaled by two others in the United States. It is 7 ft. deep, designed to handle over 1 m.g.d. with a head of 2 ft. above the filtering media. Filter material, trucked in (lower left), consisted of crushed gravel passing a 2½-in. screen. On the floor were installed (upper right) rows of 4-in. Plymouth Aerators at 18-in. centers.

lated from the bottom of the Imhoff to the top if necessary to quiet foaming.

The dosing tank is 15x17 ft. and 2 ft. deep, and will fill and flush approximately every 15 to 20 min. allowing the effluent to flow to the circular distributors of the trickling filter.

The trickling filter is 145 ft. in diameter and 7 ft. deep, designed to handle over 1 m.g.d. with maximum head of 2 ft. above the filter media. This material is composed of 4,200 cu. yd. of hard, crushed gravel screened to pass a 2½-in. circular opening screen and be retained on a 1½-in. circular screen, with 40% fractured surfaces. On the bottom of the filter is 11,330 ft. of 4-in. Plymouth Aerators, or drain tile at 18-in. centers to collect and carry the effluent to the secondary clarifier. The circular sewage distributors including the center distributor pillar, four distributing arms with spray nozzles and automatic dosing siphon operate under a 2-ft. head was furnished by the Water Works Supply Co.

The secondary clarifier is central feed, radial flow type designed for a 35-ft. diameter by 7-ft. side water-depth tank, equipped with central baffle plates to diffuse inflowing sewage. The mechanism for moving the settled sludge to the center sump, where it can be pumped to the digester, is supported by I-beams with a walkway and railing. This tank will provide a 1½-hr. detention for 750,000 g.p.d. Equipment was furnished by the Water Works Supply Co. The effluent passes through a Venturi meter for measuring.

Sludge drying beds 60x65 ft. are equipped with under drains of 6-in. vitrified clay tile laid on 10-ft. centers covered with pea gravel and sand. Concrete aprons 6 ft. square are used at the discharge end of the sludge line.

It is proposed that during certain seasons of the year, the effluent from this plant be used for irrigation; however, in the winter the effluent will flow through the present ocean outfall. All sludge, which contains about 5½% nitrogen, is dried and will be sold for fertilizer.

With the use of 25 lb. of chlorine no noticeable odor is apparent, but reduction of the chlorine to 15 lb. per day creates a slight odor.

Frank S. Currie of the Currie Engineering Co., San Bernardino, Calif., was consulting engineer for the plant.

Arizona Suit Contested by Other States

Through an agreement reached at a conference in Salt Lake City, December 16, the six signatory states to the Colorado River compact will unite in defending the suit brought by Arizona, now before the U. S. Supreme Court, seeking to adjudicate Arizona's rights to Colorado River water. The Arizona suit sets forth a claim to 7,500,000 ac. ft. of water annually as its share of the Colorado River supply, plus all of the flow in the Gila River.

According to the agreement, the attorney generals, or legal counsels of each of the six states, were scheduled to file a brief answering the claims of Arizona. This was to be done during January with state representatives scheduled to hold a further meeting in Salt Lake City during February.

The December meeting was called by Governor Blood of Utah at the request of California and Nevada, the states most directly concerned with the Arizona suit. At the meeting, Attorney General U. S. Webb of California pointed out that the six states were bound together by the pact and must unite to protect their rights to Colorado River water. The delegates from the upper basin states were concerned with the suit only to the extent that it would involve their rights, in addition to the interests of California and Nevada.

Conchas Dam Project Opens In Eastern New Mexico

Preliminaries under way as designs are being completed for $8,700,000 project on Canadian River, to be built by U. S. Engineers

CONSTRUCTION preliminaries are under way on the Conchas Dam located on the Canadian River in eastern New Mexico, which is being built by the Corps of Engineers for flood control, and irrigation and municipal water supply. The estimated cost of the project is $8,690,000 not including works necessary for the distribution of the 800,000 ac. ft. of storage. A WPA allotment provides for about half of this financing and the construction period is estimated to be three years. Present field operations include surveys and exploratory work, construction of a road to the site, and the erection of camp buildings and utilities.

Design of the structure has not yet been completed, pending additional field studies, but preliminary plans indicate that the main dam will be about 230 ft. high and 1,100 ft. long. A spillway about 2,000 ft. long is planned and the usual provisions for diversion of the river and permanent outlet works will be included. With two long wing dams included, the entire length of the structure will approach 5 mi. The reservoir will have a storage capacity of about 800,000 ac. ft. with an area of almost 25 sq. mi. It will extend about 15 mi. up the South Canadian River and about 7 mi. up the Conchas River.

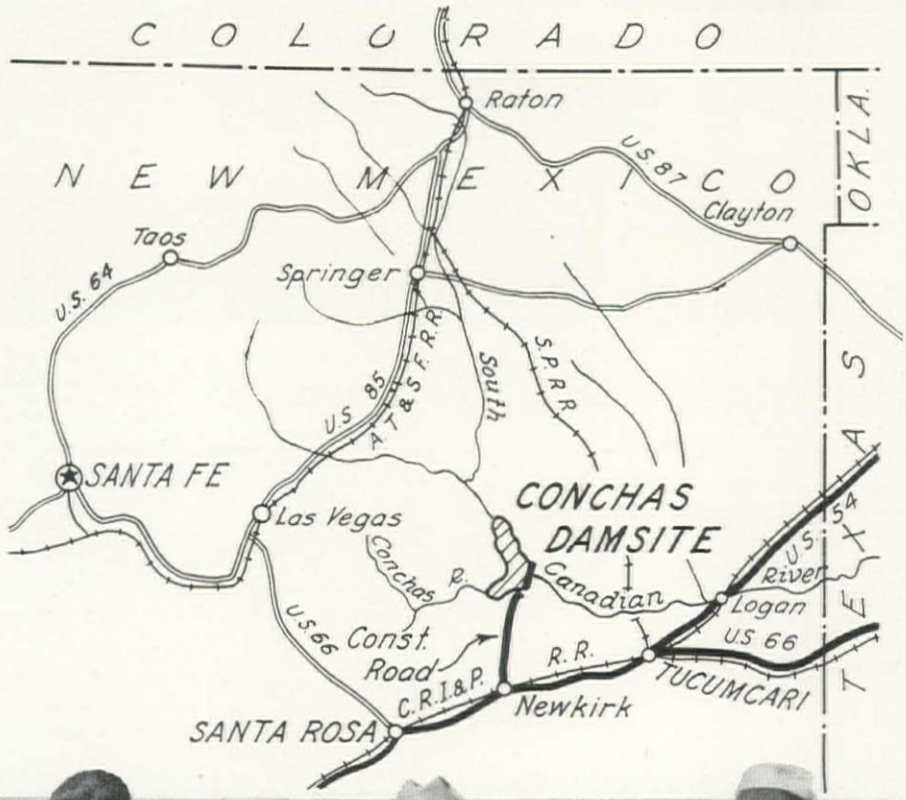
The Conchas Dam site is located on the South Canadian River just below the junction with the Conchas River in San Miguel County, N. M. Access to the site is by highway (U. S. 66) from Tucumcari or Santa Rosa to Newkirk, N. M., and then by construction road for about 25 mi. The main line of the Southern Pacific R. R. goes through the town of Newkirk.

The project was officially authorized by President Roosevelt July 29, 1935, as part of the WPA program and an allotment of $4,500,000 made for the project. Employment is expected to reach a peak of about 4,000 during the three-year construction period. Usual WPA employment rules require 90% of the labor to be taken from relief rolls.

Present activity

On November 18 a board of consultants inspected the dam site and project area. Members of the board are shown in the accompanying photograph, taken

Map showing location of Conchas Dam site in eastern New Mexico.



The consulting board inspects the dam site (left to right): Wm. Gerig, head engineer, office of the Chief of Engineers; Joel D. Justin, consulting engineer; Louis C. Hill, consulting engineer; Capt. Hans Kramer, district engineer, Corps of Engineers; H. T. Carey, consulting engineer; W. H. McAlpine, head engineer, office of the Chief of Engineers; G. H. Matthes, principal engineer, Mississippi River Commission.

Conchas Dam site on the South Canadian River looking upstream. A dam 230 ft. high at this location will store 800,000 ac. ft. for flood control, irrigation, and municipal use.

at the time of their visit. Members of this party include (left to right): Wm. Gerig, head engineer, office of the Chief of Engineers; Joel D. Justin, consulting engineer; Louis C. Hill, consulting engineer; Capt. Hans Kramer, district engineer, Corps of Engineers; H. T. Carey, consulting engineer; W. H. McAlpine, head engineer, office of the Chief of Engineers; G. H. Matthes, principal engineer, Mississippi River Commission.

With rights of way being procured by the United States, highway and camp construction are under way. The present plan calls for the state to repurchase this land at a later date and also assume responsibility for maintaining the completed structures. Surveys and explorations are in progress. An interesting feature of the camp work is the extensive use of adobe bricks, manufactured on the site by local labor, in the construction of buildings. Further, at least one of the dormitory structures is being built of stone masonry.

The project is being carried out by the Corps of Engineers, U. S. Army. Capt. Hans Kramer, Corps of Engineers, is the district engineer in direct charge of the project, with offices at Tucumcari.

Intermountain News . . .

JANUARY, 1936, found PWA construction projects well under way in the Mountain states. The following is a review of some of the most important projects.

Colorado

The Schwartz Construction Co. of Colorado Springs has just started work on a $90,000 contract for construction of a sewage disposal plant at Greeley, Colo. Schwartz also started work Nov. 27 on a $260,000 sewage disposal job at Colorado Springs. This work was about 5% complete on Feb. 1.

Thomas Bates has the labor contract for $100,000 worth of work in replacing several bridges at Colorado Springs, taken out in last spring's flood there. The American Bridge Co. is supplying materials. Both firms use Denver addresses. Work started Nov. 4.

A $60,000 addition to the State Hospital at Pueblo has been completed and work was started Dec. 9 on a new $350,000 project which includes construction of new dormitories, a dining hall and nurse's home. Thomas Bates is the contractor.

Work started Dec. 13 on a new $500,000 high school building at Boulder, Colo. The first contract, amounting to about $20,000, covering excavation and foundations, is the only one let to date. It is held by C. N. Note of Boulder.

Idaho

On Nov. 21 work started on a $43,000 sewage disposal plant at Pocatello, Idaho, the contract for which is held by the West Coast Construction Co. of Seattle.

Work was started Jan. 6 on a $55,000 water works project at Kimberly, Idaho. A. J. Schoonover of Burley, Idaho, holds the contract for well-drilling, the only one let to date. The balance of the work will be contracted for as soon as this work is completed.

The first part of a $100,000 drainage project at Caldwell, Idaho, amounting to $12,000 was started Jan. 15 on a force account basis. The balance of the work will be started in the spring.

Morrison-Knudsen Co., Boise, Idaho, is handling eight drainage projects near Bonner's Ferry. Work on the first one was started Nov. 5 and on the last one Dec. 15. The largest contract in the group is for $50,000 and the smallest for $15,000.

Winter weather has stopped operations on a $9,000 water works job at Clifton, Idaho, being handled by Mullins and Wheeler of Salt Lake. Charles Zollinger and Co. of Rexburg, Idaho, has also been forced to suspend operations on his $20,000 water works job at Victor, Idaho.

Part of the work on a $30,000 water works job at Lewiston, Idaho, was started Nov. 21 under contract to A. D. Berry of Clarkston, Washington. The rest is being done by force account. Hartenbower Bros., of Caldwell, Idaho, started work Dec. 14 on a $27,000 water works project at Cambridge, Idaho.

Utah

Winter weather put a quick stop to operations started Dec. 1 on a $30,000 sewage disposal job at Farmington, Utah. The main contract is held by Mullins and Wheeler of Salt Lake. E. K. Ferguson Sons Co. of Spanish Fort, Utah, will resume work in the spring on a $156,000 water works job at Price, Utah, which was also stopped by bad weather.

Logan, Utah, has a $200,000 school program, the first unit of which was started on Nov. 29 by Moser and Hill of Logan. The Campion Co. of Ogden started excavation work Nov. 7 as the first unit in a $300,000 school program at Ogden. Work was started Dec. 14 on a $10,000 water works project at Woods Cross, Utah, but has been stopped by bad weather. Contractors are Mullins and Wheeler of Salt Lake.

An unusual arrangement has been made with the Lock Joint Pipe Co. of Denver to fabricate the pipe during the winter for a $30,000 water works job at Vernal, Utah, distributing needed employment during the winter months. Installation cannot be started until spring.

Wyoming

John A. Howard of Cheyenne started work Dec. 11 on the $350,000 supreme court building in that city. Operations started Dec. 23 at Sundance, Wyoming, on a $36,000 waterworks project have already been suspended because of winter weather. The contractor is the Northwest Construction Co. of Rapid City. Three major irrigation projects in Wyoming, ranging from one-half million dollars to more than a million, one at Meteetse in Big Horn and Park counties, another in Unita County and a third in Washakie-Needles have been halted because of litigation.

•

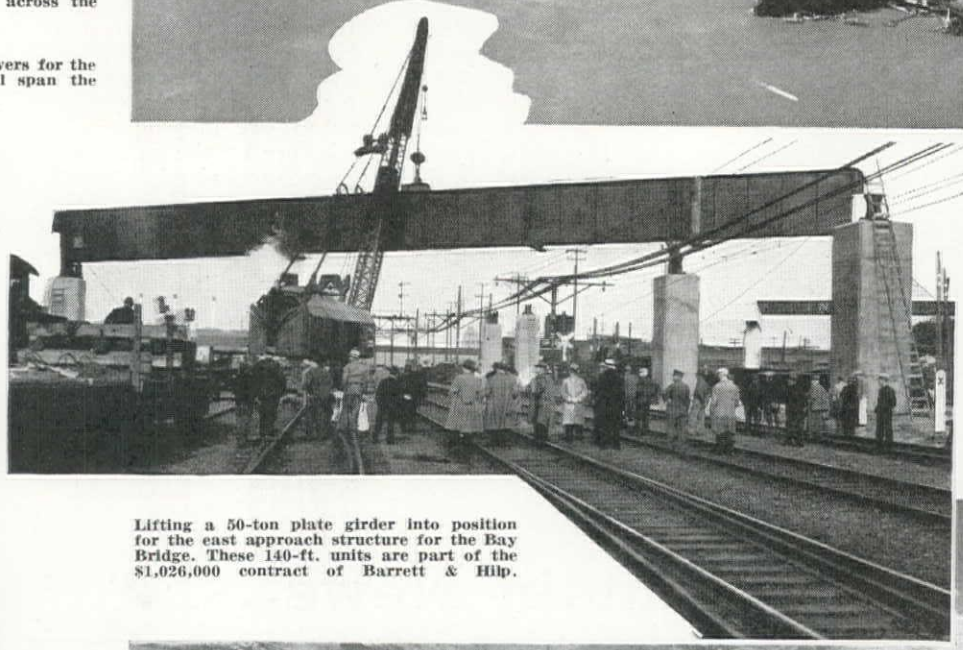
Colorado Engineers Elect Officers for 1936

Herbert S. Sands was elected president of the Colorado Society of Engineers at the annual meeting of the organization held in Denver, Jan. 25. John Burgess is vice-president and C. M. Lightburn, secretary-treasurer. New directors are: C. M. Coberly, S. A. Ionides, F. C. Carstarphen, H. S. Sanderson, J. S. Marshall, H. C. Wiley, E. B. Debler and R. J. Tipton.

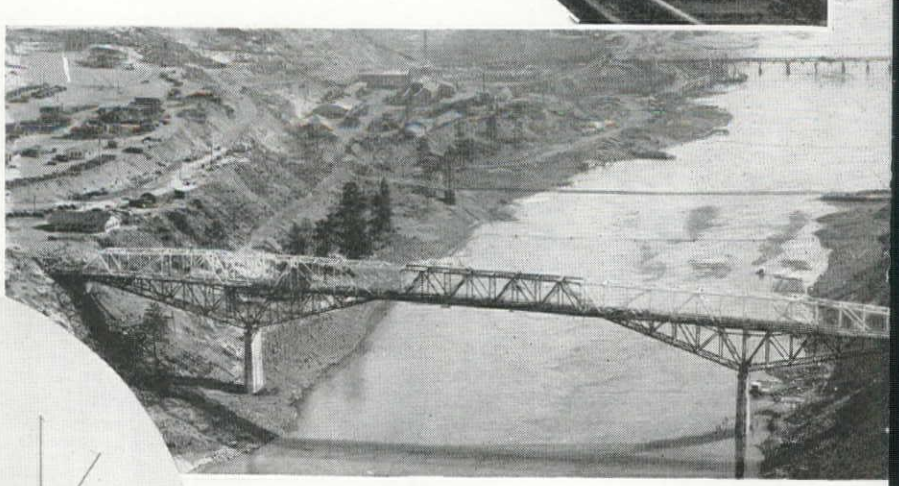
Big Bridges Are Featuring Work In the West

Looking down on San Francisco (right) with the Bay Bridge, its twin suspension spans and island tunnel in the foreground, and the world's record 4,200-ft. suspension span across the Golden Gate in the distance.

The saddle (below) on top of one of the 746-ft. towers for the Golden Gate Bridge, where the 30-in. cable will span the 4,200 ft. to the other tower in the distance.



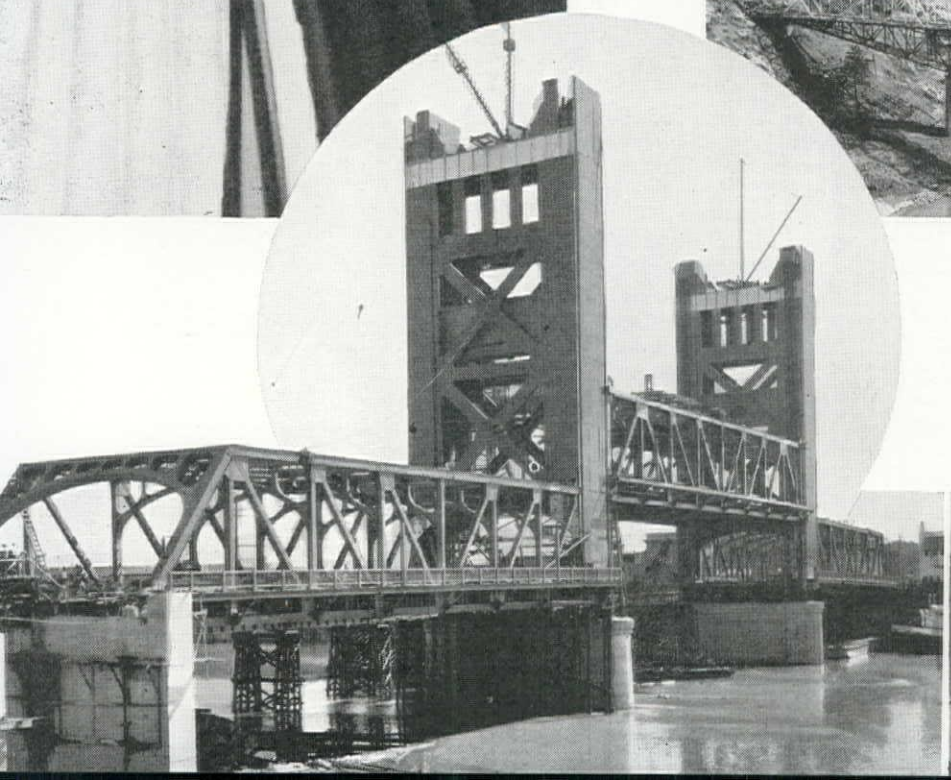
Lifting a 50-ton plate girder into position for the east approach structure for the Bay Bridge. These 140-ft. units are part of the $1,026,000 contract of Barrett & Hilp.



As one feature of the Grand Coulee Dam project, this highway bridge (above) was built across the Columbia River immediately below the dam site.

Dedicated in December, the new M Street bridge at Sacramento (circle) modernizes the approach to the city from the west.

New Mexico is improving its highway system (below) by the construction of grade separation structure, such as this modern underpass at Lordsburg.



Montana Begins Program of State Water Development

Comprehensive plan being developed and construction started on storage reservoirs to conserve state's water resources and supplement supplies to existing irrigated areas

By FRED E. BUCK
Chief Office Engineer
State Water Conservation Board
Helena, Mont.

UNDOUBTEDLY the most neglected and undeveloped natural resource in Montana is the state's water supply. The area is rich in possibilities for both power and irrigation if the proper utilization could be applied. Records show that there is enough water leaving the state through its two watersheds, the Missouri River and Yellowstone combined, on the eastern slope of the Rocky Mountains, and the Clark's Fork of the Columbia, which flows to the Pacific, to double the present irrigated area, if the flood water and the winter flow could be reservoired and conserved for use when needed. The present irrigated area has been estimated from two to five million acres depending upon the interpretations placed upon the word "irrigated" by the various estimators.

The history of water use in Montana dates back to the first settlers, who came in search of gold, and the resultant demand for garden and agricultural products, which could not be successfully raised without irrigation. The first projects were constructed by pioneers who built small ditches to irrigate limited areas along stream beds. Later, coöperative organizations and corporations undertook covering larger tracts by larger and longer canals. As these enterprises were financed locally, there was a limit to their extent, and eventually the possibilities of this system were exhausted.

The legislative session of 1907 passed the first irrigation law which permitted the formation of irrigation districts under the jurisdiction of county commissioners. This was changed in 1909 to place the jurisdiction with the district courts, the purpose being to strengthen the security and encourage outside finances. Projects profited at first through the enthusiasm of financiers, but gradually adverse court decisions cooled the ardor of investors until the system became no longer operative.

The crisis came after the unprecedented dry summer of 1919, when a special session of the legislature was called to draft new laws to meet the drought situation. As a result, the Montana Irrigation Commission was created to investigate irrigation possibilities and carry the feasible projects through the stages of initiation, financing, and construction. Formal application was made for twenty-four projects under this system, only one of which was fully completed. Two years later the legislature sought to further strengthen the security by creating the Irrigation District Bond Commission composed of the State Engineer, Attorney General, and State Examiner. Only three projects were financed and completed by this board before investors refused completely to consider any kind of irrigation bond in their portfolios. In all of the above systems the bonds were made a lien against the lands and after a few foreclosures, it became very evident that the issues were not attractive.

Federal financing

It seemed that Montana had just about reached its limit so far as legislative assistance or financial help was concerned when the present national administration came into power and set up the Public Works Administration which provided for loans and grants on self-liquidating projects. Through the foresightedness of the late Governor Cooney, Montana was quick to take advantage of the opportunity of securing financial aid from the Federal Government for the purpose of developing its water resources. Accordingly, a bill was passed in the special session of the legislature in the fall of 1933 to create a State Water Conservation Board, composed of the Governor, State Engineer, and three other members appointed by the Governor, whose duties were to coöperate with federal agencies in matters of financing projects. To make the system operative, $100,000 was appropriated to carry on the work, and later on, through cooperation with the FERA, $28,000 more was secured from that source.

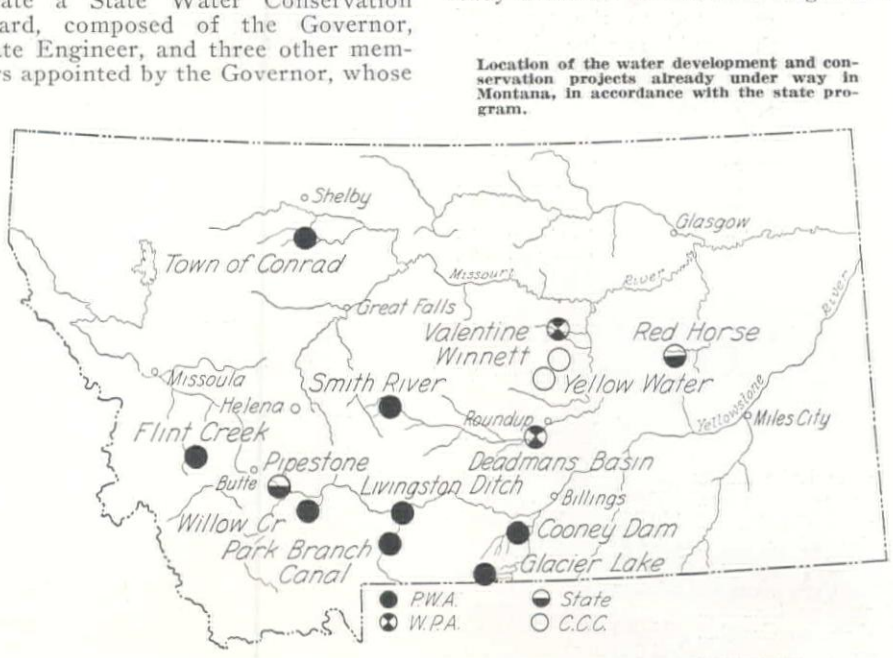
The measure also made the same board, ex officio, the State Planning Board with powers and duties to cooperate with national agencies of similar character. County planning boards were then voluntarily formed to function with the state agency. Twenty thousand dollars was appropriated to carry on the state planning work. The following regular session of the legislature in 1935 extended the powers of both boards, and liberally appropriated funds to fully carry out the scope and purpose for which the Water Conservation Board was created.

Its powers were extended to include the building of reservoirs, irrigation and drainage projects, flood control projects, water works systems, development and sale of electric power, rural electrification systems, etc. The board has been given jurisdiction over all surplus and unappropriated water in the state. It may institute adjudication suits. It may condemn water systems or land, and in fact, has almost unlimited powers in prosecuting the purposes for which the board was created, excepting that it cannot involve the state in debt. It may issue bonds for development work, but these must be of a revenue nature, and the proceeds therefrom are placed in a revolving fund to further other developments as fast as the bonds are redeemed.

At the present time the board is putting forth every effort to secure financial aid from both PWA and the WPA, and as soon as time will permit, it will begin the construction of many projects which are too small to be built in any other way than by means of the board's revolving fund.

A large volume of information relative to irrigation possibilities was already available in the state engineer's

Location of the water development and conservation projects already under way in Montana, in accordance with the state program.



office, and this was used as a nucleus around which to begin the program. In order to supplement these data and bring them up to date, questionnaires were addressed to each county planning board, board of county commissioners, county agent, and county surveyor, asking them to submit a brief of each known water conservation project in their respective counties. After this information had been assembled and catalogued, the projects were inspected on the ground by members of the board and competent engineers, who eliminated all but the most feasible. Originally the list was composed of about 350 projects. Engineering parties were next put in the field to secure definite data upon which to work out development plans and the office engineers finally assembled the information down to the question of costs.

As a result of this work, there were fifty-two applications submitted to the PWA before the deadline of Sept. 2, 1935. These included two municipal water works projects, a cold storage refrigeration plant, a state-wide water resources study, and forty-eight irrigation and water storage projects. The fifty-two applications totaled an expenditure of $14,372,000. In addition to these there were thirty applications submitted to the WPA totaling an expenditure of $2,141,315. Out of this list, there was one each for a trail, grazing district, and water well; all the other twenty-seven were for storage and irrigation works of various kinds.

In these irrigation projects it has not been the intent to encourage the development of new land, but rather to supplement the water supply for lands already under irrigation. It is this type of development that is the most vital to Montana's agricultural and livestock industries. A state-wide water supply will mean the stabilization of these industries in perfecting an economic and social security. As it has been in the past, on many of these so-called irrigated tracts, the farmer has been restricted to the types of crops which would survive drought through the late summer when the normal water supply is at its lowest. But with the development of reservoirs to augment the insufficiency, the farmer can feel secure in greater diversification of crops, with resultant increase in income.

Reservoired water will help the stockman, also, not only by keeping the streams alive and the water holes filled, but by giving him an opportunity to raise enough winter feed to carry his herds through the winter months without sacrifice. In the past, there has been an insufficient quantity of winter feed raised in the state to support its livestock, and as a result these stockmen have had to go out in the market and purchase feed from out of the state or else accept sacrifice prices for their cattle in the fall of the year, and thus temporarily glut the market with an oversupply.

Up to the present time, there have been nine contracts let, or in the process of being let, which will be financed by the PWA. In round numbers, the total amount of these loans and grants is $1,800,000. The construction of one storage reservoir was begun late last summer and will be completed next fall. Bids have been opened on all of the other eight projects and details are being cleared up so that the contractors can start work as soon as the weather permits in the spring. These jobs are all to be finished on or before Jan. 1, 1937.

To guarantee the repayment of the loans on these projects, the farmers are required to sign water contracts and the total water available must be contracted for by the time construction work begins. These contracts are not necessarily restricted to only those persons owning land, a feature making it possible for business men living within the district to assist in making the project possible. The loans, therefore, are not liens upon the land but upon the credit of the purchaser. The success of the projects and the market value of the water contracts are going to depend largely upon the efficiency of operating management. This type of financing and security behind the loans is entirely a new venture in the State of Montana in building irrigation projects.

Building reservoirs and the use of stored water brings to light a new feature of exchanging water rights. It makes it possible for farmers who have poor rights and who live above the reservoir to buy stored water which they will exchange for good normal flow rights below the reservoir. In this way, farmers living above the reservoir are as vitally interested as are the farmers living below, so the market for water contracts is not confined to farmers who can use only the water in the reservoir.

At the present time, the board is constructing two projects through its revolving fund. Two more projects are under construction which are being financed by the WPA, and two others are being built through the coöperation of CCC camps working under the soil conservation program. It is anticipated that the majority of the lists of projects applied for under the WPA and the PWA will be approved. The accompanying table lists the projects to be financed by the PWA upon which bids have already been opened.

Note: The author of this article is a well-qualified authority on the subject of irrigation and water conservation in Montana. He is a graduate of the University of Montana, 1906, and received his professional degree in civil engineering from Montana State College in 1930. He has served as city engineer of Missoula, Mont.; assistant city engineer of Butte, Mont.; engineer with the Bureau of Reclamation on the Salt River project in Arizona; city engineer of Juneau, Alaska.

When the Montana Irrigation Commission was formed in 1919 he was appointed chief engineer, serving in that capacity until 1925 when he was appointed chief engineer for the Montana Public Service Commission, continuing in that capacity until 1933. Since the organization of the present Water Conservation Board in January, 1934, he has served as its chief office engineer.—Editor.

FIRST GROUP OF PROJECTS FINANCED BY THE PWA

(Contract awarded or bids opened)

Project	Construction Cost	Type of Dam	Height (Feet)	Crest Length (Feet)	Volume (Cu. Yd.)	Storage (Ac. Ft.)
Glacier Lake	$ 82,731	Rockfill, conc. face	52	730	.....	3,000
Cooney Reservoir	472,486	Earth and rockfill	90	2,250	1,150,000	30,000
Willow Creek	159,233	Earth and rockfill	105	440	142,000	18,000
Smith River	198,846	Earth and rockfill	81	1,000	365,800	11,000
Flint Creek, dam	231,945	Earthfill	85	1,150	365,000	16,000
Flint Creek, canals	225,000					
Park Canal	85,000					
Livingston Canal	25,000					
Conrad	145,000					

Data on High Dams Presented by Bureau

ON the opposite page is presented a table of statistics on the "high" dams in the United States prepared by the U.S. Bureau of Reclamation. Twenty-five of the dams are located in California; eight are in Arizona (including two on the Colorado River, the interstate line); five are in Washington; three are in New York on the water supply system of New York City.

Of the sixty-six high dams, seventeen have been built by the Bureau of Reclamation, including Boulder Dam with its record breaking height of 727 ft. and the Grand Coulee Dam, now under construction which will ultimately have the unprecedented volume of 10,500,000 cu. yd. of concrete.

Boulder Dam, as indicated in the accompanying tabulation, is by far the highest and is of concrete arch-gravity design; Salt Springs Dam is the highest rockfill structure of a height of 332 ft.; Cobble Mountain Dam (Massachusetts) is the highest earthfill at 262 ft.; a composite design of rockfill and rolled earthfill is being used for the San Gabriel No. 1 Dam (under construction) which will be 381 ft. high; Lake Pleasant Dam in Arizona is the highest multiple-arch structure and the only one in the present list. With a volume of 100,000,000 cu. yd., the Fort Peck Dam is the largest of these structures.

High Dams in the United States

A tabulation prepared by the Bureau of Reclamation, from "The Reclamation Era," January, 1936

USING a height of at least 200 ft. as an arbitrary standard to distinguish "high dams," there are sixty-six of these structures in the United States and fifty-two of these are in states west of the Mississippi River, according to a review and compilation of data which appeared in the January issue of "The Reclamation Era," the official publication of the U. S. Bureau of Reclamation. A summary of these data appears on the preceding page.

Name	State	River	Year Completed	Type (Concrete, unless otherwise noted)	Maximum Height Feet	Crest Length Feet	Volume Cu. Yds.
Boulder	Arizona-Nevada	Colorado	1935	Arch-gravity	727	1,282	3,250,335
Grand Coulee[1]	Washington	Columbia	*	Gravity, straight	[2] 550	4,200	10,500,000
Kennett[1]	California	Sacramento	*	Gravity, straight	[3] 420	2,430	3,420,000
Owyhee	Oregon	Owyhee	1932	Arch-gravity	405	840	550,000
Diablo	Washington	Skagit	1931	Constant radius arch, grav. wings	389	1,180	350,000
San Gabriel No. 1	California	San Gabriel	*	Earth and rockfill	381	1,520	10,260,000
Pacoima	California	Pacoima	1929	Variable radius arch	372	640	226,140
Pardee	California	Mokelumne	1929	Arch-gravity	358	1,337	617,700
Arrowrock	Idaho	Boise	1915	Arch-gravity	349	1,100	585,130
Hetch Hetchy	California	Tuolumne	1931	Arch-gravity	[4] 344	605	398,516
Parker	Arizona-Calif.	Colorado	*	Constant radius arch	340	800	260,000
Salt Springs	California	N. Fork Mokelumne	1931	Rockfill, concrete face	332	1,300	3,000,000
Exchequer	California	Merced	1926	Arch-gravity	330	960	396,000
Shoshone	Wyoming	Shoshone	1910	Constant radius arch	328	200	78,576
Morris	California	San Gabriel	1934	Gravity, straight	325	756	480,860
Ariel	Washington	Lewis	1931	Gravity and variable radius arch.	313	1,250	307,000
Kensico	New York	Bronx	1916	Gravity, straight	307	1,843	900,000
Elephant Butte	New Mexico	Rio Grande	1916	Gravity, straight	306	1,155	618,536
Horse Mesa	Arizona	Salt	1927	Variable radius arch	305	784	147,357
New Croton	New York	Croton	1927	Gravity, straight	297	710	855,000
Don Pedro	California	Tuolumne	1923	Arch-gravity	288	1,040	296,552
San Gabriel No. 2	California	San Gabriel	1935	Rockfill	285	800	1,200,000
Roosevelt	Arizona	Salt	1911	Arch-gravity	284	1,080	342,970
Cushman	Washington	N. Fork Skokomish	1926	Variable radius arch	280	1,110	90,000
Moreno	California	Cottonwood Creek	1930	Rockfill, concrete core	278	530	324,000
Lake Spalding	California	South Yuba	1919	Variable radius arch	275	800	191,772
Dix River	Kentucky	Dix	1925	Rockfill, concrete face	270	910	1,747,000
El Capitan	California	San Diego	1935	Semihydraulic fill and rockfill	270	1,230	[5] 2,400,000
Norris	Tennessee	Clinch	*	Gravity, straight	266	1,872	1,195,000
Big Tujunga No. 1	California	Big Tujunga Creek	1932	Variable radius arch	265	800	108,250
Cobble Mountain	Massachusetts	Little	1932	Earthfill, hydraulic	263	730	1,800,000
Shannon	Washington	Baker	1926	Semigravity arch, overflow	263	450	132,000
Seminoe	Wyoming	Platte	*	Gravity, straight	260	600	163,000
Lake Pleasant	Arizona	Agua Fria	1927	Multiple arch	256	[6] 2,146	98,400
Friant[1]	California	San Joaquin	*	Gravity, straight, stone mas. face	252	3,800	1,328,000
Olive Bridge	New York	Esopus Creek	1912	Gravity, straight	252	[7] 1,100	390,000
Coolidge	Arizona	Gila	1928	Multiple dome	249	932	204,000
Fort Peck	Montana	Missouri	*	Hydraulic earthfill	242	[8] 9,000	100,000,000
Copco No. 1	California	Klamath	1922	Variable radius arch	236	415	70,312
Tygart River	West Virginia	Tygart	*	Gravity, straight	235	1,850	1,100,000
Alcova	Wyoming	Platte	*	Earth and rockfill	232	900	1,500,000
Cheesman	Colorado	South Platte	1904	Arch-gravity	232	710	103,000
Big Santa Anita	California	Big Santa Anita Creek	1927	Variable radius arch	230	612	76,184
Calderwood	Tennessee	Little Tennessee	1930	Thin section arch, overflow	230	.....	400,000
Conchas	New Mexico	Canadian	*	Earthfill	230	[9] 26,000	7,300,000
Mormon Flat	Arizona	Salt	1925	Variable radius arch	229	623	42,980
Bouquet Canyon	California	Bouquet Creek	1934	Earthfill	228	1,950	3,421,300
Melones	California	Stanislaus	1926	Constant radius arch, overflow	222	590	92,913
Tieton	Washington	Tieton	1925	Earth and rockfill, semihydraulic	222	905	1,995,000
Calaveras	California	Calaveras Creek	1925	Earthfill, semihydraulic [10]	220	1,200	3,461,000
Salmon River	Idaho	Salmon	1912	Constant radius arch	220	490	.....
San Pablo	California	San Pablo Creek	1920	Earthfill, hydraulic	220	1,250	2,200,000
Pathfinder	Wyoming	Boise	1922	Constant radius arch [11]	218	432	60,210
Yadkin Narrows	North Carolina	Yadkin	1919	Arch-gravity, overflow	217	1,400	525,000
Upper San Leandro	California	Upper San Leandro Creek	1926	Earthfill, part hydraulic	215	660	1,248,000
Barrett	California	Cottonwood Creek	1922	Arch-gravity	213	773	139,569
Stewart Mountain	Arizona	Salt	1930	Variable radius arch	212	1,260	122,000
Saluda	South Carolina	Saluda	1930	Earthfill, semihydraulic	208	7,800	11,000,000
Wachusett	Massachusetts	Nashua	1906	Gravity, straight	207	971	266,663
Santeetlah	North Carolina	Tallassee	1927	Variable radius arch	202	340	.....
Davis Bridge	Vermont	Deerfield	1924	Earthfill, semihydraulic	200	1,250	1,950,000
Lake Arrowhead	California	Little Bear Creek	1922	Earthfill, hydraulic	200	720	1,000,000
Cheoah	North Carolina	Little Tennessee	1918	Arch-gravity, overflow	200	700	.....
Mulholland	California	Weid (Canyon)	1924	Arch-gravity	200	930	173,462
Glines Canyon	Washington	Elwah	1927	Semigravity arch	200	555	.....
Bull Run	Oregon	Bull Run	1929	Arch-gravity	200	1,000	230,000

* Under construction.
[1] Preliminary data.
[2] Authorized for height of 177 feet. Data given are for ultimate high dam.
[3] Height of 520 feet under consideration.
[4] Now being raised 85 feet.
[5] 1,500,000 earth, 850,000 rock, 50,000 concrete.
[6] Does not include 750-foot spillway.
[7] 4,650 feet with earth wings.
[8] 20,500 feet including dike on west bank.
[9] Includes wing dams.
[10] Lower half hydraulic fill. Upper half dry earth and rockfill.
[11] Granite random rubble masonry with coursed rubble faces.

Taylor Park Dam Progress During the 1935 Season

Camp established, 60,800 cu. yd. stripped from site and diversion-outlet tunnel driven and lined—Project to be completed in November

BEFORE WINTER ended the first construction season at the Taylor Park Dam project in Western Colorado, the contractor had made steady progress with a camp established, stripping operations well under way and the diversion tunnel driven and lined. Operations during the 1936 season will include completion of stripping and placing of the earth and rockfill, finishing of spillway excavation and concrete lining, and, finally, installation of outlet pipes and valves. Present schedule calls for completion of the project in November, 1936.

Located on the Taylor River, this structure is being built by the Bureau of Reclamation to store about 100,000 ac. ft. of supplemental irrigation supply for the 75,000 acres of irrigable land near Montrose, Colo., on the Uncompahgre project. This well established development of the bureau has been handicapped by several severe water shortages and the Taylor Park reservoir has been designed to relieve this condition.

Alternate bids were called for a concrete arch and an earth and rockfill structure; the arch design was reviewed in *Western Construction News*, September, 1934, and the features of the earthfill design were outlined in the issue of January, 1935. Opened in Gunnison, Colorado, Feb. 18, 1935, the low bids were:

	Concrete Arch	Earth-Rockfill
Utah-Bechtel-Morrison-Kaiser	$783,742	$798,078
Broderick-Hinman-Shofner-Gordon	974,682	.....
J. A. Terteling & Sons	.....	819,517

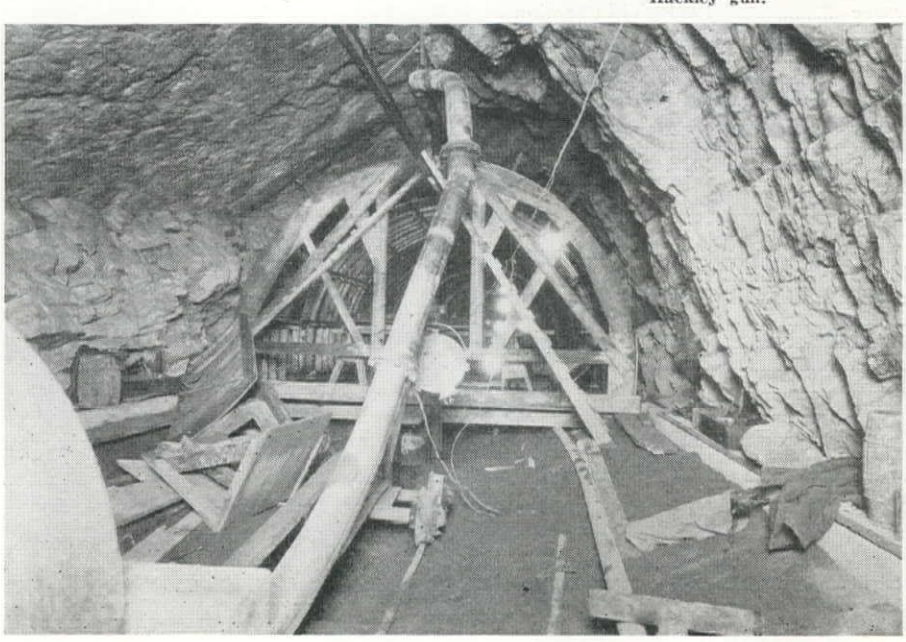
Contract was awarded to the Utah-Bechtel-Morrison-Kaiser organization for the earth and rockfill structure. Subsequently, Frederickson & Watson Construction Co. joined the group on this project, and are managing the construction operations.

Camp established

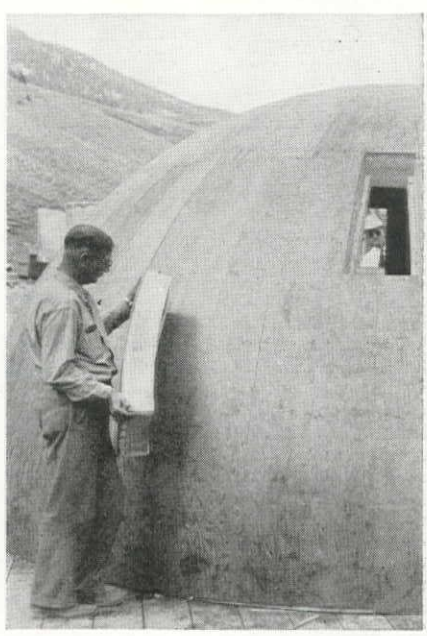
A 150-man construction camp was established in the reservoir site with the usual buildings including shops, dormitories, mess hall, offices, and accommodations for several supervisory officials. Near the camp a gravel washing and screening plant was set up with a batching plant established to handle the material for tunnel lining. The Bureau of Reclamation established accommodations for their engineering and supervisory staff, and built a field testing laboratory at the site.

Stripping the 110,000 cu. yd. from the site of the earth and rock embankment was carried forward during the summer and fall with a total of 60,800 cu. yd. removed. Hydraulic sluicing and hand labor were used to speed up stripping. This preliminary excavation work on the site was carried forward by turning the river to the south side of the channel with a temporary dike, and excavating behind this barrier in stream bed and along the edge of the north abutment. With the diversion and outlet tunnel completed this fall the river will be diverted through the tunnel shortly after resuming operations in the spring. Work during the 1935 season was carried out with a 2-yd. Northwest No. 70 dragline and a Northwest No. 80 shovel loading into 5-yd. Coleman and Fageol trucks. Two LeTourneau 25-yd. buggies hauled by Caterpillar diesel tractors were also used.

The fill will involve 833,000 cu. yd. of earth embankment placed and rolled in 6-in. layers in the main body of the dam with 130,000 cu. yd. of rockfill on the downstream slope and 26,000 cu. yd. of rock riprap on the upstream face. The upstream face of the dam is 3:1, the downstream slope of the main earthfill is 1½:1 and the outside slope of the rockfill blanket is 2:1 increasing to 4:1 near the base.



Timber forms and discharge pipe from concrete gun for lining diversion-outlet tunnel. Pipe is offset to clear overhead monorail used to carry concrete from portal to Hackley gun.

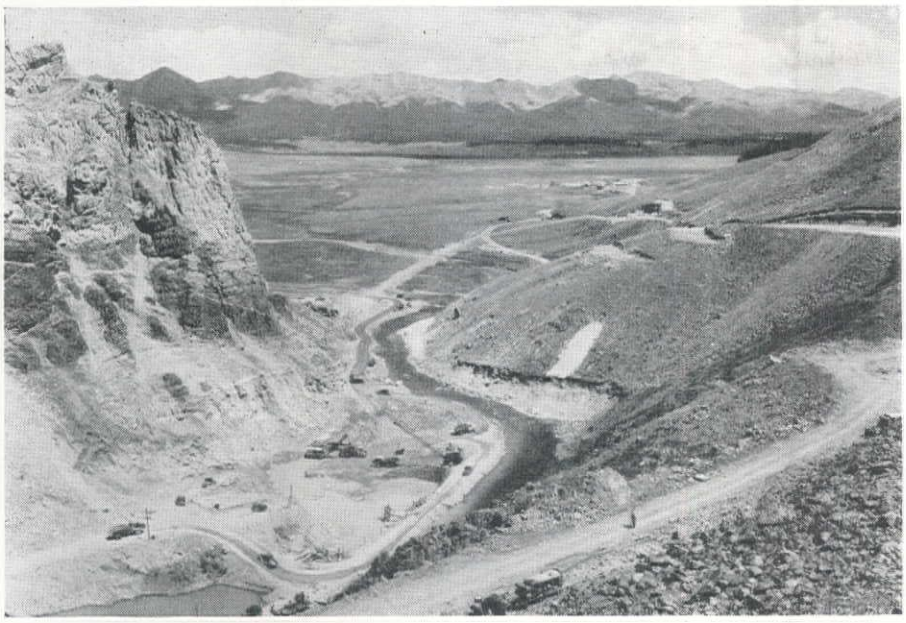


Construction Engineer A. A. Whitmore, Bureau of Reclamation, examines the plywood form used in concreting the gates chamber in the tunnel.

The height of the structure is 168 ft. above river bed with 14 ft. of freeboard above the lip of an unregulated side channel spillway. The dam has a crest width of 35 ft. and a length of 600 ft. Two concrete cut-off walls about 100 ft. apart extend into bed rock near the upstream face of the dam with provisions for grouting the foundation rock.

Diversion and outlet tunnel

The diversion and outlet tunnel, about 1,100 ft. long was driven through the north abutment. For about 600 ft. from the intake structure the tunnel is of standard horseshoe shape with a finished diameter of 10 ft. This lining has a normal thickness of 1 ft. with three concrete cut-off collars extending 4 ft. into the surrounding rock. At the axis of the dam, the tunnel enlarges



Taylor Park dam site, looking upstream into the reservoir site. Stripping is under way behind a temporary dike. Camp and gravel plant are shown in the distance, at right. The diversion-outlet tunnel was driven through the left abutment.

into an emergency gate chamber and then continues downstream in an 11½-ft. high by 16-ft. wide horseshoe section lined with 15 in. of concrete, in which one 72-in. and one 57-in. steel outlet pipe will be installed on concrete piers, following the diversion period. At the outlet end of the tunnel is the valve house containing two 48-in. needle valves attached directly to the ends of the two steel outlet pipes. In the emergency gate chamber will be installed the supply gates in the concrete tunnel plug, with operating mechanisms and control equipment. As already mentioned, this tunnel will be used for stream diversion during the 1936 construction season.

Tunnel driving was carried forward from both portals using Ingersol-Rand drifters mounted on columns and bars. The full face was advanced in 10-ft. rounds using 36 to 44 holes per round depending on rock conditions. Progress averaged about 22 ft. per day with a maximum of 29 ft. One compressor plant was used which was equipped with one Sullivan and one Ingersol-Rand unit, of 1,180 cu. ft. capacity each.

Mucking was done with two Sullivan slusher type loaders (one air driven and one electrically operated) dumping into 2-yd. Koppel cars. Hauling was by mule teams to a point where a line from a hoist at the portal was connected.

Aggregate for the lining concrete was hauled from the plant in Ford truck (four ½-yd. batches per load) to the mixing plant at the inlet portal. Batches were dumped into a hopper which discharged into a ½-yd. Ransome mixer. Concrete was taken into the tunnel in ½-yd. buckets which ran on an overhead monorail attached to plugs in the roof. These buckets were pushed along the overhead track by hand.

Placing started at the gate chamber and advanced to the inlet end at the mixing plant, then, again starting at the mid-point it was finished at the outlet portal. The invert was poured first, followed by the arch.

Arch forms were of wood built in panels 3 ft. wide and 8 ft. long, 50 panels were assembled to complete a 40-ft. section, which was the unit for arch placing. Concrete was shoveled by hand through doors in the forms up to the spring line. The final crown section was placed with a 2-yd. Hackley gun.

Organization

The Taylor Park dam is being built by the Bureau of Reclamation, Elwood Mead, commissioner and R. F. Walter chief engineer. A. A. Whitmore is construction engineer and I. D. Jerman, resident engineer.

For the contracting organization the field operations were directed by R. D. Watson, resident managing partner. Otto Bonnesen was general superintendent for the first part of the season and was succeeded by Ros Trewhitt. L. P. Sowles was engineer for the contractors. Frank Kane was in charge of tunnel driving, Roy Jellison was tunnel walker, Harry Fairman was in charge of concrete placing, Ross Parker supervised gravel production and grouting, and H. E. Christman was excavating foreman.

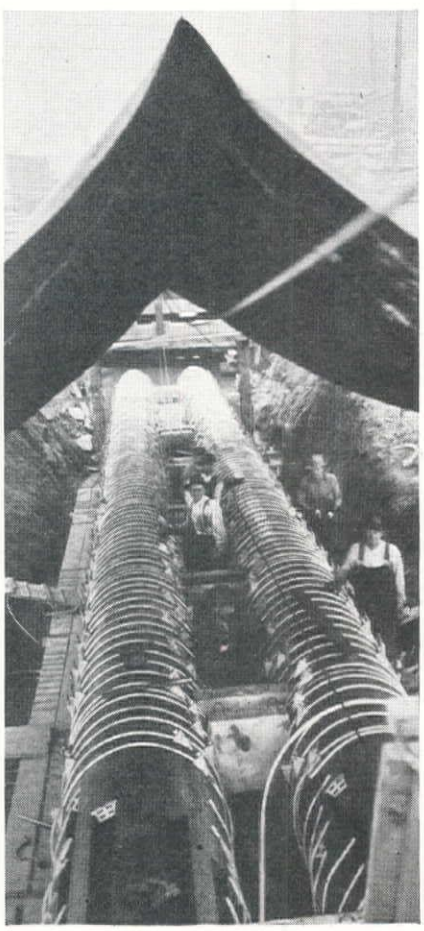
Wood Stave Pipe Siphon For Seattle Trunk Sewer

Two lines of 36-in. continuous type pipe assembled to proper profile, weighted, and pulled across ship canal into dredged trench

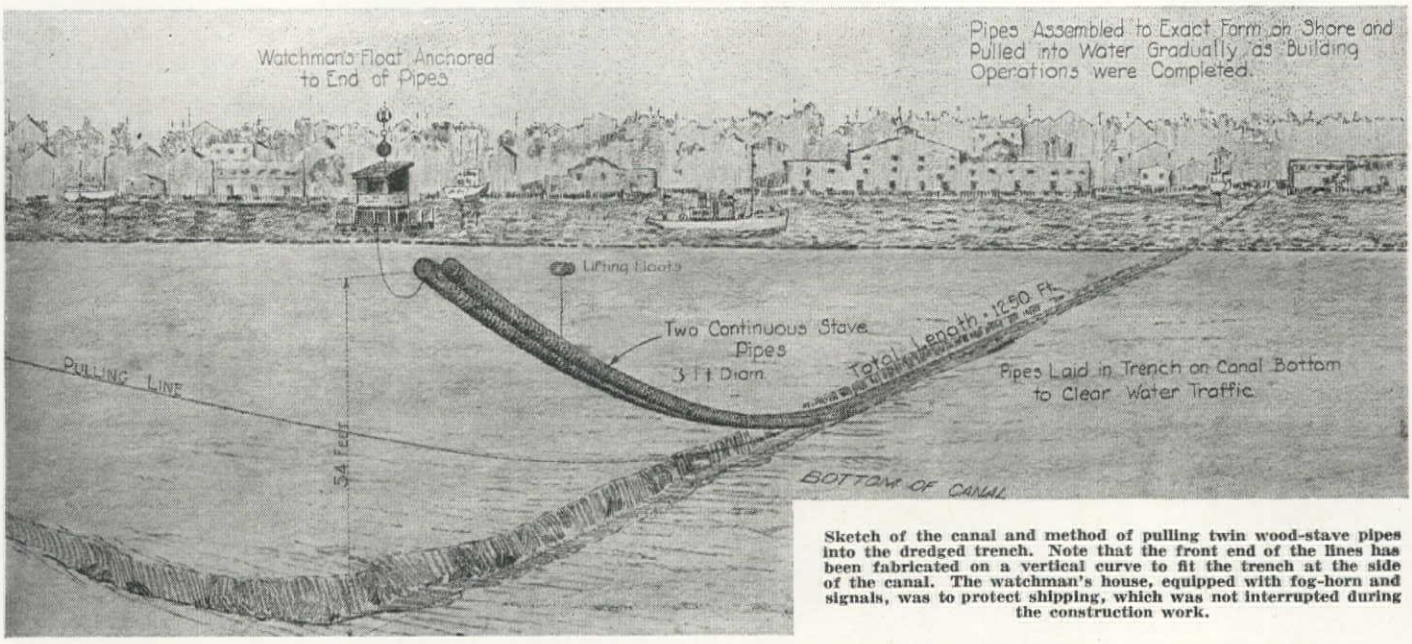
By L. H. SPAULDING
Engineer, Federal Pipe & Tank Co.
Seattle, Wash.

A DOUBLE LINE of 36-in. diameter wood stave pipe has been built as a subaqueous siphon under the Lake Washington ship canal connecting two important trunk sewer lines of Seattle. As they were fabricated on a building trestle, the continuous stave pipes were weighted and pulled down the launchway and across the canal into a dredged trench.

This project forms a part of a comprehensive program of sewerage system improvements which the City of Seattle has been constructing for several years. A major feature of this program is the elimination of raw sewage discharge into Lake Washington, an important recreational asset of



Looking down the launchways during fabrication of the continuous stave pipes, showing the pipes disappearing into the water of the canal at the lower end. The crew is working under a canvas protection.



Sketch of the canal and method of pulling twin wood-stave pipes into the dredged trench. Note that the front end of the lines has been fabricated on a vertical curve to fit the trench at the side of the canal. The watchman's house, equipped with fog-horn and signals, was to protect shipping, which was not interrupted during the construction work.

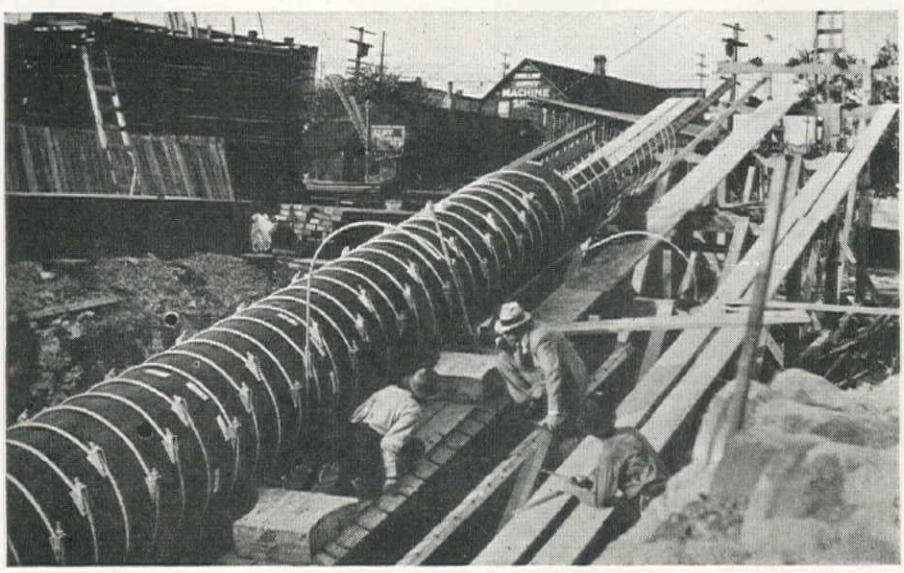
the city. As part of the general program, a trunk sewer was designed for the section of the city north of the ship canal and a connection had to be provided which would convey the sewage to the existing trunk line on the south side of the canal, with discharge into the Sound at West Point. Construction of this connection consisting of the twin wood stave pipes is outlined in the following article.

A building trestle and launchway was constructed on the north shore, consisting of nine timber bents at 10-ft. intervals. These bents were adjustable for height so that they could be set to build pipe either for vertical curves or tangent sections. Pairs of small flanged wheels were attached to these bents under the line of each pipe and 3x6-in. timber rails with steel-strip facing were used to move the completed pipes down the ways. These timber rails were slotted to accommodate the pipe bands, and as the pipe was moved ahead into the water the rails were recovered and re-used.

The canal is somewhat less than one-quarter mile wide and the maximum water depth is about 45 ft. A trench was excavated to a depth of 54 ft. below water level for a 350-ft. section in the channel. On the south end this trench rises on a 600-ft. radius curve for a distance of about 250 ft.; on the north end the pipe rises along a 5,000 ft. radius curve for a distance of about 650 ft. The twin pipes were designed and built to fit this curved profile of the trench because, although having certain flexibility, the continuous stave construction provides a comparatively strong and rigid pipe.

The section on the 600-ft. radius was built first, using the proper adjustments on the building trestle which was then changed to build straight pipe and, later, modified again to the 5,000-ft. radius. As the pipe was pulled across the canal, the leading section constructed on the 600-ft. radius did not conform to the bottom of the trench but was suspended in the canal for practically its entire length. The relation of this curved end to the canal, while construction was in progress, is shown in the accompanying artist's sketch.

On the building trestle, showing one pipe well advanced, the concrete weights lying on the platform and the slotted timber rails for the other pipe.



The forward end of this curved section was loaded with concrete spacer weights designed to partially overcome buoyancy, whereas the balance of the line was loaded so that it would remain in the bottom of the trench. Actually, the movements of the pipe due to buoyancy, along the curved section, were so balanced that there was practically no tendency for the suspended pipe to lift or sink around the axis at the end of the curve.

Since the weight of the pipe increases due to the absorption of water by the creosoted staves, it was necessary to maintain the proper amount of buoyancy at the forward end of the 600-ft. radius curve by attaching large metal barrels to the pipe at the proper time to take care of additional weight. The rate of increase in weight by absorption was determined by sinking a 15-ft. test section of pipe and taking weights over a period of fifty days. The barrels which were attached to pick up this increase in weight were kept below the surface to avoid jerking the pipe as a result of wave action.

To protect the forward end of the curve, as it moved across the canal, a float with a watchman's house and suitable lights and signals was attached to the pipe and moved across the canal as the work progressed. The watchman was provided with a bell and fog horn to keep vessels at a safe distance and reduce the speed of those passing close to the pipe, but there was no interruption of traffic in the canal at any time during the construction period.

About ⅔ of the dual line was pulled by means of hand winches. Actually, this amount of the line was pushed, since the pulling cables were then attached near the back end of the pipe which had just been completed. For the last third of the distance the pipe

was pulled by means of a steam winch located on a barge anchored at the far shore of the canal. To facilitate this pulling operation and avoid interruption caused by fog, telephones were installed on the barge and at the building trestle. This enabled the superintendent to direct the pulling operation and control the forward movement of the pipe.

The two pipe lines were constructed of Douglas Fir staves finished to a thickness of 2½ in. and creosoted by the pressure and vacuum process. Malleable iron castings were used to connect the butt joints of the staves; ¾-in. diameter galvanized steel bands encircle the pipes and similar bands in the shape of a figure "8" were used to fasten the two pipes together. The concrete spacer weights were fastened between the pipes. The pipes will be constantly saturated with the fresh water in the canal.

The project of the City of Seattle was designed and carried out under the general direction of Thomas R. Beeman, city engineer; O. A. Piper is principal assistant city engineer and I. W. Embury is assistant city engineer.

The general contract was awarded to L. Coluccio & Co. of Seattle and the Federal Pipe and Tank Co. handled the siphon installation under a subcontract. The method of installing the pipe line was, in general, optional with the contractor and the work was carried out by the Federal Pipe and Tank Co. under the supervision of the author.

Reports From A.G.C. Conventions

Western Chapters Show Vigorous Growth During 1935

Intermountain Branch Has Record Meet

THE fourteenth annual convention of the Intermountain Branch of the Associated General Contractors of America, held in Salt Lake City on January 4, included the usual business meeting of the branch, followed by a record-breaking dinner dance attended by 750. This banquet, attended by many prominent federal and state officials, as well as leaders of the construction industry in the Intermountain area, was declared the most successful ever held by this branch of the A.G.C.

Officers of the Intermountain Branch elected for 1936 are: T. G. Rowland, president; Paul Paulsen, vice-president; J. H. Tempest, secretary-treasurer; and J. W. Whiting and Clarence Waterfall, directors. The last two, together with A. O. Thorn and H. B. Way will serve as the governing board during the coming year.

HUDDLE FOR 1936: President T. G. Rowland (center); Past-President John H. Moser (right) and Secretary-Treasurer J. H. Tempest (left) discuss plans for this year's activity of the Intermountain Branch.

Annual meeting

John H. Moser presided over the annual meeting and rendered a detailed report of the accomplishments of the branch during his term of office. He called attention to the work of the legislative committee in opposing bills which were detrimental to the interests of general contractors and promoting measures which were beneficial to the industry. He urged members to use their influence against passage of a state amendment, to be voted upon at the next general election, which would allow the exemption of homes up to $2,000. If this amendment were to carry, Mr. Moser stated, it would make it impossible to finance construction work in the state or smaller political subdivisions because the assessed valuation would be so seriously reduced that both bond issues and financing from taxation would be almost impossible.

Mark Tuttle, Manager

The president also called attention to the valuable work which the local branch had done in coöperation with the national body. The meeting unanimously carried a motion to express the thanks of the members to the retiring president for his work during the year.

A motion was passed urging the Montana Highway Contractors to affiliate with the Associated General Contractors. Mr. Rowland stated that he had already urged several members of that organization to affiliate.

The budget for 1936 was adopted and a motion passed to thank the retiring secretary-treasurer, C. L. Wheeler, for his efficient work during 1935.

Ora Bundy, a former president, announced that the War Department was planning to begin construction on an arsenal in Ogden. A resolution was passed favoring the project and requesting the use of contract operations

and available agencies for construction work. This resolution was forwarded to Secretary of War Dern.

Addresses were made during the afternoon session by the following speakers: K. C. Wright, state highway engineer; Joel L. Priest, National Recovery Administrator for Utah; Franklin D. Richards, Federal Housing Administrator for Utah; and R. A. Hart, PWA engineer for Utah. Each speaker discussed the work of his particular organization and indicated how coöperation with members of the branch and governmental agencies would result in additional business for A.G.C. members.

The incoming president, Mr. Rowland, and Mark Tuttle, manager of the Intermountain Branch, were authorized to attend the national convention of the A.G.C. in Miami.

The banquet and dance, held at the Hotel Utah, were declared the most successful ever sponsored by the Intermountain Branch. The 750 in attendance included an extensive list of prominent public officials, engineers, architects, and representatives of firms supplying construction equipment and materials in the territory. The number attending the banquet had to be limited by the committee and many friends of members were not able to attend.

A. E. Christensen was chairman of the General Committee which arranged for the banquet; C. N. Stillman was in charge of the entertainment and program; J. B. Mullins was in charge of ticket sales; W. W. Clyde was chairman of the committee on prizes which provided each lady with a prize in addition to table favors; J. W. Whiting directed the allocation of the tickets.

Plans for Pacific Northwest Meeting

PLANS for the thirteenth annual convention of the Pacific Northwest Branch of the Associated General Contractors of America, to be held in Portland, Ore., Feb. 14 and 15, are receiving the active support from members of the four chapters. Judging from the requests for information concerning the detailed plans, it is certain, at the date of this preview, that the affair will be well attended by contractors from the entire Pacific Northwest. The convention will open Feb. 14, with registration at the convention headquarters, Hotel Multnomah, followed by the annual business meeting of the board of directors of the Pacific Northwest Branch, including the election of directors and officers for 1936.

The Pacific Northwest Branch is composed of the four Northwestern A.G.C. chapters: Spokane Chapter, Seattle Chapter, Mountain-Pacific Chapter and Portland Chapter. Officers for 1935, holding office until the 1936 convention, are: President, Geo. F. Christensen of Stevenson, Washington; treasurer, H. S. Woodworth of Tacoma; secretary, J. M. Clifton of Spokane; and recording secretary, Henry Nollan, manager of the Mountain-Pacific Chapter at Seattle. Past presidents of the branch, serving on the board of directors are James Crick, Spokane; J. C. Compton, McMinnville, Oregon; and James Murdock, Seattle. Directors are: R. L. Bair, Max Kuney, Iver Anderson, John Rumsey, Frank McHugh, Geo. D. Lyon, M. E. Norris, Henry Manson, Geo. Teufel, George Johnson, C. R. Shinn, Ross B. Hammond, and C. A. Schram.

The business session of the convention on Friday morning will open with a welcoming address by Mayor Joseph K. Carson of Portland, followed by a response from the president of the branch. This meeting will include a general discussion of present day problems and matters of interest to the industry. The morning session of the convention will be adjourned to a luncheon meeting to be addressed by representatives of the various state highway bodies and governmental agencies of the Northwest.

The afternoon session of the convention on Friday will be featured by a report on the national A.G.C. convention held at Miami and the Road Show held at Cleveland, from C. A. Schram, president of the Portland Chapter, and P. L. Crooks, past president of the Portland Chapter, who attended both of these conventions. Business and general discussion will be carried on during the afternoon session until adjournment. Friday evening a dinner dance will be held.

The convention reconvenes Saturday morning for unfinished business. On Saturday afternoon members and guests will visit the Bonneville power and navigation project, under construction 42 mi. from Portland. The annual banquet of the Pacific Northwest Branch will be held that evening at the Waverly Country Club.

J. A. Lyons, well-known Portland contractor, is general chairman of the convention and is being assisted by the following committee chairmen: Publicity committee, H. A. Dick; reception committee, Theodore Shoemaker; entertainment committee, Matt Glavin; finance committee, P. L. Crooks; registration and transportation committee, M. J. Lynch; hospitality committee, Glen E. Kibbe; program committee, L. E. Bufton.

Progress and Prospects In Southern California

By FRANK CONNOLLY

Manager, Southern California Chapter
Associated General Contractors

Frank Connolly, Manager

A SURVEY of the Southern California Chapter of the A.G.C. and its members shows, that without engaging in anything spectacular, 1935 was a very satisfactory year and 1936 will probably be even better.

Southern California has probably enjoyed the unique distinction of having a proportionately larger volume of business than any other section of the country. There are three main reasons for this. First, the devastation caused to our school buildings by the 1933 earthquake requiring the complete reconstruction of practically all of our schools and public buildings and many private buildings. Second, the construction of the Colorado River aqueduct by the Metropolitan Water District, one of the largest engineering projects ever undertaken. Third, the large state highway program in which the regular state expenditures and federal aid were augmented by large emergency relief appropriations.

The facilities of the building construction industry of Southern California have been used to full capacity on the school reconstruction program of which approximately $25,000,000 worth of construction is already completed. About $35,000,000 more is in prospect immediately; in fact, the program of the Los Angeles board of education alone will proceed at the rate of a job per day during the next few months. Supplementing this public works there has been a large increase in the amount of private construction. Several large industrial projects are under way now and quite a number of commercial structures are either nearing completion or getting under way. Many fine markets and other business structures are being built in active sections of the city and the volume in residential construction has shown a large increase. Los Angeles city building permit valuations for 1935 amounted to $31,500,000, exceeding 1934 by 117%. Reliable sources predict that 1936 valuations will reach $45,000,000, a 50% increase over 1935 and a 300% increase over 1934.

On the Metropolitan Water District Aqueduct many large contracts have

been awarded during the year. These operations represent an extension of the aqueduct construction from the original tunnel operations into canals, siphons, conduits and pipe lines. Several huge pumping plants have also been awarded. These operations are now in step with the tunnel work and the whole project is coördinated to insure completion at the date set. On these operations contractors from all over the United States have been attracted to Southern California. They have earned the reputation of doing fine work in a capable manner and their performance has been a great credit to the whole construction industry.

During the latter part of 1935 the number of highway projects offered for bids almost overtaxed the facilities of the industry but in most cases there was satisfactory competition and a large volume of this construction is now under contract. The work of our highway engineers and contractors has been so excellent that it has attracted the attention of everybody using our roads. Motorists marvel at the fine broad highways, easy grades and curves and the wonderful bridges which have been constructed by this group. Most of the emergency funds for highways have been obligated but the ordinary budget still provides for approximately $1,000,000 per month in highway construction for the next 18 months.

The biggest disappointment of the year has been the large amount of day labor work which has been undertaken by relief agencies, particularly, the WPA. Millions of dollars are being spent on construction projects by this agency under inefficient day labor methods where the organized construction industry could produce the same results at about one-half the cost while giving employment to an equal number of workmen. It is hoped that reason will prevail in this situation and that eventually the demonstrated efficiencies of our industry will be utilized.

H. M. Walker of the P. J. Walker Co. has presided over the destinies of the Southern California Chapter in a very capable way during 1935 and is retiring in favor of N. F. Jahn of Jahn and Bressi Construction Co., Inc., who was elected president for 1936. Several of our directors are also retiring from active participation in chapter affairs this year and it is with deep regret that the chapter accepts the retirement of S. M. Griffith of the Griffith Co., H. Stanley Bent of Bent Brothers, and C. G. FitzGerald of the FitzGerald Engineering and Construction Co. These men are replaced by O. C. Struthers of the Raymond Concrete Pile Co., Gilbert F. Shea of J. F. Shea Co., and J. C. Bonny of Morrison-Knudsen Co.

Officers for 1936 consist of N. F. Jahn, president—highways; J. Carson Agnew, vice-president—engineering; H. M. Baruch, vice-president—building; A. F. Brough, treasurer. Frank Connolly continues as manager of the chapter.

Northern California Sets Member Record

THE Northern California Chapter started 1936 with the largest membership in its history, according to an announcement made at the annual convention, December 14. At a subsequent meeting of the board of directors, the following officers were elected for 1936: President, W. A. Bechtel, Jr.; vice-president, B. F. Modglin; Floyd O. Booe was reëlected secretary-manager. Members of the board of directors are: W. A. Bechtel, Jr., R. G. Clifford, Harry Lord, B. F. Modglin, A. B. Ordway, W. J. Tobin and Carl Dodge.

A short report of the annual meeting and convention dinner was published in the last issue. The subjects discussed by the various speakers and the resolutions passed by the meeting follow:

Speakers at the meeting

The PWA program in California was reviewed by A. D. Wilder, state director, who quoted figures indicating the volume of PWA work completed, under way, and remaining to be done in California at the present time. Mr. Wilder indicated that the theoretical decentralization of authority in the PWA organization was not as complete in actual practice, with final decisions still being made in Washington headquarters.

Floyd O. Booe, Secretary-Manager

The WPA work in the state was reviewed by Frank McLaughlin, state director, who stated the WPA job in California was to find work for 160,000. He impressed upon the group the fact that the emergency situation did not permit contract operations for much of this program but expressed entire sympathy with the AGC and stated that as much of the work as was possible would be done by contract methods.

Federal and state highway activity were discussed in two separate talks. B. W. Matteson, senior highway engineer, Bureau of Public Roads, spoke in the absence of L. I. Hewes, deputy chief engineer, and outlined with statistics the amount of federal highway funds which were under contract and those remaining available for work in the eleven western states during the coming year. George T. McCoy, principal assistant highway engineer for California, outlined the state highway program for the biennium, reviewing the situations relative to the letting of contracts at the present time and spoke directly on the grade crossing separation work which is now getting under way, financed by the federal emergency funds.

W. A. Bechtel, Jr., President

Resolutions

A resolution of commendation was passed, expressing the chapter's appreciation of the manner in which the state highway departments of California and Nevada, and the regional and district offices of the Bureau of Public Roads have carried forward the emergency highway construction program.

Recommendations and principles of the Construction League of the United States were endorsed. These principles for the conduct of federal, state, and local public improvements are:

1. Continuation of a substantial program of useful federal public works and of federal aid to highways.
2. Continuation of PWA aid to states and municipalities for useful projects that add to the public wealth.
3. Grants for state and municipal projects and emergency appropriations for highways to be on a descending scale in proportion to

the increase in private employment.

4. Earmarking of all appropriations for particular purposes.
5. Mandatory provisions that construction projects financed in whole or in part by federal funds should be carried out in a normal manner through public lettings and contracts and the regular engagement of professional services without arbitrary and artificial restrictions.

Recommendations made by the National Executive Board of the AGC at its fall meeting in San Diego were endorsed in a resolution by the local chapter. This recommendation referred to the need for contract operations in the carrying out of the federal works program to conform to the will of Congress and insure protection to taxpayers.

The plan of the California Highway Users' Council was endorsed and approved.

•

Arrowrock Dam Contract

THE Department of Interior has announced the award of contract for raising Arrowrock Dam on the Boise reclamation project, Idaho, to T. E. Connolly, Inc., of San Francisco, on a bid of $395,040. The bid was the lowest of four submitted and opened by the Bureau of Reclamation at the Boise, Idaho, office Dec. 21.

Arrowrock Dam, which for several years after its completion in 1915 was the highest dam in the world, will be raised 5 ft. to a maximum height of 354 ft. The increase in the height of the dam and the channel of the spillway will increase the storage capacity of the Arrowrock reservoir from 280,000 ac. ft. to approximately 294,300 ac. ft.

In addition to raising the crest of the dam, the contractor will reface the lower part of the structure, where freezing has caused the original face to deteriorate. The dam had not been injured, according to the Bureau of Reclamation, but resurfacing the lower face will prevent its being damage in the future. A reinforced concrete slab will be placed on the face of the dam for the greater part of its height, and the remainder of the face will be covered with gunite. The dam will be raised by placing concrete on the present crest and roadway.

Colorado Contractors Elect Officers

G. W. HAMILTON of Denver was reëlected president of the Colorado Association of Highway Contractors at the annual convention of the group held in Denver, Jan. 27. James B. Kenney was reëlected secretary-treasurer. Creation of the office of second vice-president resulted in Vance Driscoll of Pueblo, who last year held the office of vice-president, being named first vice-president, and Ed. Honnen of Colorado Springs being named second vice-president. Directors are: Luke D. Smith of Denver, Arthur L. Allen of Pueblo, J. H. Monaghan of Denver, Ed Selander of Greeley, M. E. Carlson of Denver, Harry I. Gardine of Glenwood Springs and C. V. Hallenbeck of Denver.

The most important action taken by the association was the appointment of a standing committee on insurance and the decision to appoint a paid insurance expert as a member of the Denver office staff to work for the lowering of compensation premiums. The group will attempt to prove that highway construction premiums should be segregated from all other classes and that the accident rate in this work is out of line with the premiums now required.

Resolutions passed covered the recommendation of continued federal aid and censored the 80% clause in relief work appropriations. The association believes normal employment should be permitted.

Willard T. Chevalier, president of the American Road Builders Association, was the main speaker at the evening banquet, which was attended by more than 500 people.

Denver Projects Advance

Denver's major municipal projects are progressing rapidly. Clearing operations on the city's new sewage disposal plant is practically complete and grading is nearly 50% finished. Contracts have been let for equipment and others will be let shortly for construction of the plant. Meanwhile, WPA workers are installing connecting lines from different sections of the city to convey sewage to the new plant.

The city's Cherry Creek flood control project is about 98% complete. Only the parapet walls and a few minor details remain to be finished.

•

Engineers' Registration

CALIFORNIA leads all other states in the enforcement of its engineers' registration act, according to a study of registration laws in the United States by Dean P. H. Daggett, Rutgers University. This study indicated that there were 4,346 civil engineers registered in California on July 1, 1935 (only civil engineers are required to register) and the records of the board indicated twenty-four prosecutions and twenty-five revocations of licenses. This record far exceeds the enforcement record of any other state licensing board.

The information, for western states, taken from the study of Dean Daggett is given in the following table:

State	Engineers Registered July 1, 1935	Number of Prosecutions	Number of Revocations
Arizona	286	0	0
California[1]	4,346	24	25
Colorado[2]	500	0	0
Idaho[1]	174	0	0
Montana	.....	..	..
Nevada	[3]	..	..
New Mexico	.....	..	..
Oregon	784	1	1
Utah	.....	..	..
Washington	.....	..	..
Wyoming	219	1	1

[1] Civil Engineers only.
[2] Five branches of engineering.
[3] Record not available.

•

Personnel Expanded on Central Valley Project

With survey work under way on several phases of the Central Valley project in California, being built by the Bureau of Reclamation, the engineering personnel for the project is being expanded. The engineering personnel now at work under the direction of Walker R. Young, construction engineer in charge of the project includes:

E. C. Eaton, engineer, Sacramento
Roy M. Snell, resident engineer, Redding
Oliver B. Misz, engineer, relocation of Southern Pacific Railroad at Kennett reservoir
Paul M. Guyer, associate engineer on the same project
Franklin M. Murphy, assistant geologist
Oscar G. Boden, resident engineer, Contra Costa Canal, Antioch
H. S. Williams, associate engineer, Friant
Earl R. Mills, chief clerk, Sacramento

HIGHWAY FATALITIES IN THE WEST DURING 1935

State	Period Reported in Months	1935	1934	% Change in Deaths 1934-1935	% Change in Gas Consumption 1934-1935
Arizona	11	196	189	3.7	9.4
California	12	2,799	2,805	–0.2	9.5
Colorado	11	347	295	17.6	5.8
Idaho	11	146	132	10.6	8.1
Montana	10	135	154	–12.3	12.4
Nevada	10	65	59	10.2	8.2
New Mexico	10	116	100	16.0	13.0
Oregon	11	228	273	–16.5	7.2
Utah	11	161	182	–11.5	8.6
Washington	11	59	.....	.....	3.6
Wyoming	10	78	90	–13.3	14.0

Construction Design Chart

V. Spans for Concrete Form Supports

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

THERE are three factors, any one of which may govern, controlling the spacing of supports of sheathing for concrete forms. They are: flexure, shear, and deflection. The experienced designer will usually know from past experience which factor will control for any individual case.

The accompanying chart has been designed to give the allowable clear span between supports when the flexural stress is the controlling factor. The following assumptions have been made:

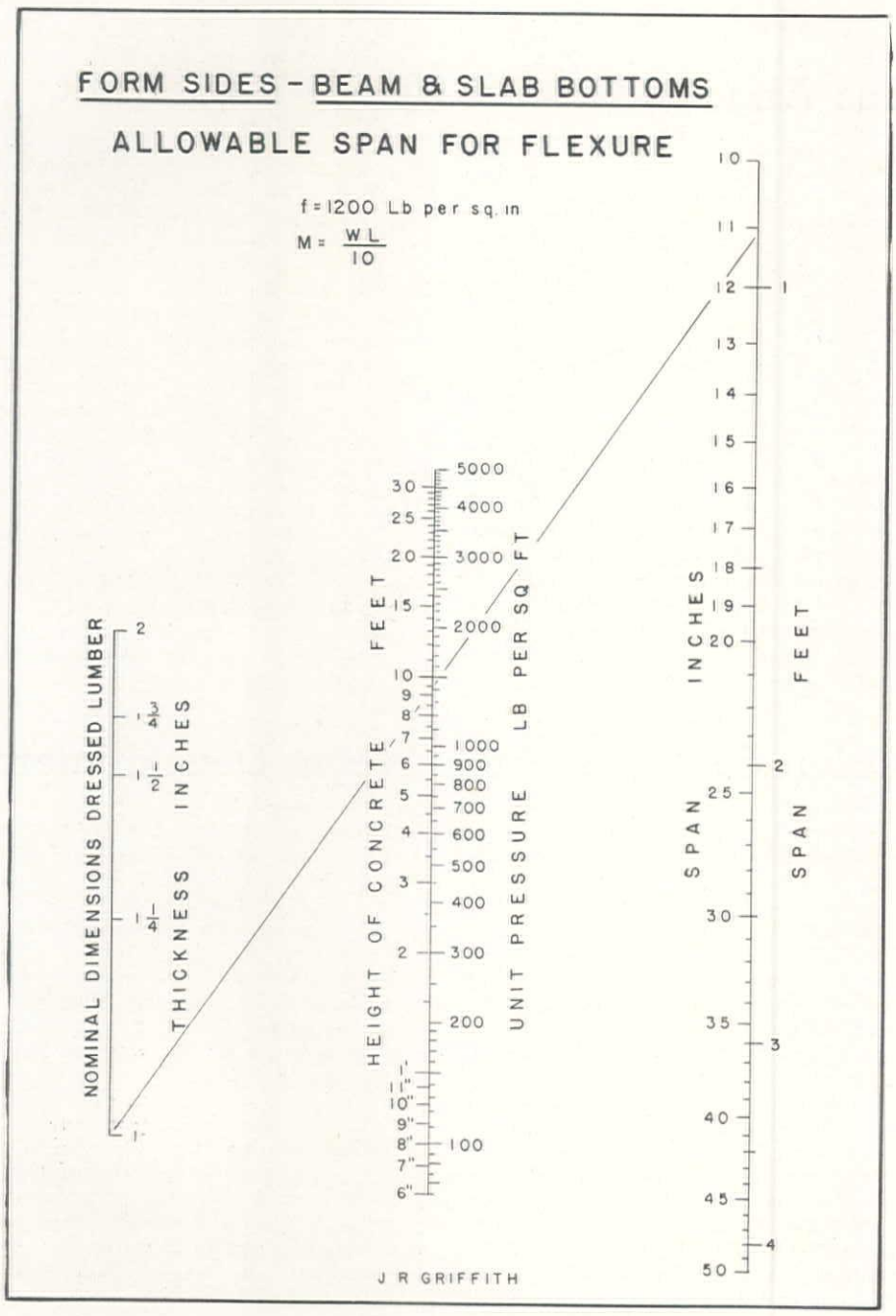
Allowable flexural stress,
$f = 1{,}200$ lb. per sq. in.

Maximum bending moment, $M = \frac{W L}{10}$

Weight of equivalent fluid,
$w = 150$ lb. per cu. ft.

Four different thicknesses of form lumber have been listed on the chart. Of these sizes, 1 in. and 2 in. stock dressed to 25/32 and 1⅝ in., respectively, are always obtainable. The intermediate sizes should be used only when they are obtainable.

A straight line intersecting all scales is necessary for a solution of this chart as will be seen from the following examples.



Example 1

Required to determine the spacing of yokes at the bottom of a square column form using 1-in. sheathing. The total height of concrete from the bottom of the form to the top of the upper floor slab is to be 10 ft. A trial line through 1-in. lumber and a 10-ft. height gives clear span of 10.8 in. Assuming that dressed 2x4-in. yokes are to be used with the narrow 1⅝-in. edge against the sheathing, the center to center spacing of the yokes would be 10.8 + 1.625 = 12.425 in. The average height of concrete on this spacing would then be about 9.5 ft. A line has been drawn through a height of 9.5 ft. for 1-in. lumber giving on the right hand scale a clear span between yokes of 11.1 in. Thus, in so far as flexural stresses are concerned, the two bottom yokes could be spaced at 11.1 + 1.625 = 12.725 in. This would probably be made an even 13 in. center to center.

Check solution:

Average height of 9.5 ft. gives a unit pressure of:
$9.5 \times 150 = 1{,}425$ lb. per sq. ft.

Bending moment, based on a 12-in. width and a clear span of 11.1 in.

Total span load,

$$W = 1425 \times \frac{11.1}{12} = 1{,}315 \text{ lb.}$$

$$M = \frac{W L}{10} = \frac{1315 \times 11.1}{10} = 1{,}460 \text{ in. lb.}$$

Section modulus 1-in. lumber,

$$S = \frac{b d^2}{6} = \frac{12 \times (25/32)^2}{6} = 1.22 \text{ in.}^3$$

Maximum flexural stress,

$$f = \frac{M}{S} = \frac{1460}{1.22} = 1{,}195 \text{ lb. per sq. in.}$$

Example 2

One-inch sheathing is to be used to support a concrete slab having an overall thickness of 9 in. A 75-lb. per sq. ft. live load is to be used for the weight of runways, buggies, and men. Required to determine the spacing of the joists.

On the central scale of the chart, it will be seen that a 9-in. depth of concrete gives a pressure of 112 lb. per sq. ft. The total load is then, 112 + 75 = 187 lb. per sq. ft. If a line, not shown, be drawn through 1-in. lumber and a pressure of 187 lb. per sq. ft., on the span scale will be found the allowable clear span of 30.8 in.

The values found in the above examples should not be taken as final till checked for shear and deflection. This will be done in following issues.

Work to Start on San Francisco Exposition

With the WPA turning over $3,043,120 to the War Department to be used for reclaiming the shoal area north of Yerba Buena Island, preliminary construction work on the 1938-39 World's Fair at San Francisco is scheduled for an immediate start. With the transfer of these funds, the War Department assumes jurisdiction over the work which will include the letting of contracts for dredging operations and the construction of a seawall around the 400-ac. fair site. These contracts, according to preliminary estimates, will involve the moving of about 18,000,000 cu. yd. of sand by hydraulic dredging and the construction of almost 4 mi. of seawall. The transfer of the funds from the WPA to the War Department, for administration by the Corps of Engineers, was expected to be completed during the first week of February.

•

Seattle Works Program

The City of Seattle is planning to carry out the following major items of a municipal construction program during 1936.

Sewer contracts totaling more than $350,000 have been awarded (December 24) and are awaiting approval by the PWA.

Henderson Street (Units 3, 4, 6 and 7)	$226,217
Henderson Street (Units 2 and 8)	123,522
East Mont Lake Trunk Sewer..	27,239

In addition, there is proposed for contract letting in the near future units 9 and 10 on the Henderson Street trunk sewer and a treatment plant with an estimated cost of $500,000.

The following bridge contracts have been let and are now awaiting PWA approval, with work expected to be under way in January: Schmitz Park bridge, reinforced concrete rigid frame estimating to cost $120,000; McGraw Street bridge, concrete arch estimated to cost $60,000; North Queen Anne Drive bridge, steel arch estimated to cost $70,000 and the reconstruction and redecking of the Fremont Bascule bridge at a cost of $55,000.

Thomas R. Beeman is city engineer of Seattle and O. A. Piper is principal assistant city engineer.

•

Roza Tunnels Awarded

Award of a contract for construction of three tunnels on the Yakima Ridge canal, which will serve the Roza division of the Yakima Bureau of Reclamation project in Washington, has been made to the Morrison-Knudsen Co. of Boise, Idaho, on its bid of $993,839.50.

The successful bid was the lowest of fifteen submitted and opened at the Bureau of Reclamation office, Yakima, Wash., December 3.

The tunnels will be horseshoe shaped with a diameter of 16 ft. 9 in. Tunnel number 1 will be 1,363 ft. long; tunnel number 2, 1,573 ft. long, and tunnel number 3, 9,813 ft. long. They are located from about 1½ mi. northeast to about 12 mi. north of Yakima. Work was scheduled to begin within 30 days and the job must be completed within 750 calendar days.

The Roza division of the Yakima project is designed in its ultimate form to provide water to 72,000 acres in the general vicinity of Yakima. The work now being started was provided for in an allocation of $4,000,000 from work relief funds.

•

Bull Lake Dam Awarded

Secretary Ickes announced award of the contract on December 21 for construction of Bull Lake dam on the Riverton, Bureau of Reclamation project in Wyoming to the J. S. Groves and Sons Co., of Minneapolis, Minn., on its bid of $653,397.50. This bid was the lowest of twelve received and opened at the Bureau of Reclamation office at Riverton, Wyo., December 7.

Bull Lake dam will be constructed across the channel of Bull Lake Creek about 20 mi. west of Pavillion, Wyo. It will be an earthfill structure 3,400 ft. long at the crest and 75 ft. high. The river will be diverted through twin conduits in the channel of the stream, through which water will later be diverted from the reservoir. The diversion and outlet conduit will have two horseshoe shaped reinforced concrete barrels 8 ft. in diameter, and will be 475 ft. long. The spillway channel will be concrete-lined, as will the stilling basin into which it discharges. The spillway will be controlled by three radial gates, each 29 ft. wide and 11 ft. high.

Storage for 155,000 acre-ft. of water is provided, which will furnish an additional regulated water supply for the Riverton project.

Work was to start within 30 days and must be completed in 700 calendar days.

Los Angeles Has $28,000,000 WPA Work

THE major part of the Los Angeles city construction program during 1936 will be done under the Works Progress Administration program. Tentative plans include twenty-five projects estimated to cost $28,000,000. Most of these projects are for storm drains and sewers which are seriously needed but could not be financed due to lack of necessary city funds.

Some of the larger individual projects are: A $4,250,000 flood control project on the Arroyo Seco from San Pascual to Pasadena; a storm drain to cost $9,000,000 on Slauson Ave. to provide an outlet for most of the storm drains already constructed in the southwest section; a $2,500,000 relief drain for the West Lake sewer, including the construction of about 20 mi. of relief drain in the most populous sections of the city; remodeling and enlarging of the present Hyperion sewage treatment plant to cost about $7,500,000. These projects are all under construction at the present time and are expected to be completed during 1936.

There are several large street improvement projects not yet started which are expected to be included in the WPA program. These are: a $1,250,000 improvement of Figueroa St. from Pasadena to Second St.; a $500,000 improvement of Highland Ave. between Cahuenga to Santa Monica Blvd. and an $800,000 improvement on Santa Monica Blvd. between Heath Ave. and Sepulveda.

The Figueroa St. tunnel, being carried forward under contract to L. E. Dixon Co., Bent Bros., Inc., and Johnson, Inc. ($366,607), is scheduled for completion in March.

Colorado Plans State Water Development

Colorado continues its plan for a state-wide water conservation program. The program to be presented to Washington authorities will cost $33,000,000 and will be divided among the four principal watersheds of the state. Storage reservoirs and transmountain diversion tunnels are included in the plan. State officials believe Colorado is entitled to the money because the state contains 19% of all the irrigated land in the eleven western states, but up to 1933 had received only 8% of the funds expended on reclamation.

Projects under discussion for the program include: (1) The Vegas Sylvestre and Conejos reservoirs, to cost about $5,000,000; (2) the $9,000,000 Caddoa Dam on the Arkansas River; (3) a new dam on the Apishipa River, replacing one which failed in 1923, costing about $300,000; (4) flood control dams at Trinidad and at other points on the Purgatoire River; (5) Grand Lake diversion project, to cost about $5,000,000; (6) Williams Fork transmountain diversion estimated to cost about $2,250,000; (7) Blue River diversion project, and (8) fifteen smaller storage projects on the western slope, to cost $6,250,000.

The needs of the western slope would be fully protected in all transmountain diversion through the construction of compensation reservoirs. All of these projects would not only increase the water supply for the eastern slope but would conserve more water for the western part of the state across the continental divide.

Elwood Mead Dies

ELWOOD MEAD, Commissioner of the Bureau of Reclamation since 1924, internationally recognized authority on irrigation engineering and formulator of the water law doctrine of the arid states, which forms the basis of water conservation and use in the West, died at his home in Washington, D. C., on January 26 after several weeks of illness. Culminating his long and distinguished career in the field of reclamation and irrigation, both as engineer and educator, Elwood Mead directed the work of the Bureau of Reclamation during the inception, design and construction of Boulder Dam. In his death the West loses one of its most loyal friends and one of its most outstanding engineers.

ELWOOD MEAD

When an honorary degree of Doctor of Laws was bestowed upon him by the University of Michigan, the citation stated:

"Dr. Elwood Mead, Commissioner of Reclamation, engineer, law-giver and administrator, whose labors will endure through ages yet to come. By framing and putting into operation the irrigation laws of the State of Wyoming, he established a precedent followed not only by the newer states of the West, but also by Canada, Australia, South Africa and New Zealand. He brought order out of confusion and opened a way where none had been."

Elwood Mead was born in Indiana, Jan. 16, 1858, and graduated from Purdue University in 1882, receiving a degree of Master of Science in 1884. He held a professional degree from Iowa State College of Agriculture and received the first honorary degree of Doctor of Engineering given by Purdue in 1904.

In 1886, after two years as professor of mathematics, he became professor of irrigation engineering at the Colorado Agricultural College, the first such chair held in an American school. In addition he served Colorado as assistant state engineer. He went to Wyoming as territorial engineer and served the state as its first state engineer from 1888 to 1898. When the new state was being organized, Dr. Mead as State Engineer proposed an entirely new water law for inclusion in the state constitution, which abandoned the common-law principle of riparian rights and provided for state title to all water supplies, with appropriations to be based on prior rights and beneficial use.

Dr. Mead served as chief of the irrigation and drainage section of the Department of Agriculture for eight years ending in 1907, and served the University of California concurrently as professor of institutions and practice of irrigation.

In 1907 Dr. Mead went to Australia as chairman of the State Rivers and Water Supply Commission of Victoria, and inaugurated a comprehensive water conservation and reclamation plan in Victoria during his eight years of service in that capacity.

Returning to the United States in 1915, Dr. Mead resumed his teaching at the University of California, becoming professor of rural institutions. He also served as chairman of the California state land settlement board. He left the University in 1924 when President Coolidge appointed him Reclamation Commissioner, which position he held until his death.

He knew the terrain of western United States intimately, beginning with exploration trips along some of the more difficult rivers of Wyoming in 1888, accompanied by "Buffalo Bill" Cody. Repeated trips in the years following gave him first hand knowledge of streams and irrigation possibilities in the arid region. In recent years, as Commissioner of Reclamation, he had made an annual tour of the West, inspecting federal irrigation projects, examining areas where new projects had been proposed and discussing reclamation with western leaders.

During Dr. Mead's administration of the Bureau of Reclamation, he introduced several reforms, one of the most important of which was the establishment of a policy of selecting settlers for new federal reclamation projects on the basis of their qualifications for irrigation farming.

Dr. Mead was a member and past director of the American Society of Civil Engineers, a member of the American Society of Agricultural Engineers, and the British Institute of Civil Engineers. He was a member of the water resources committee of the National Resources Committee and served on many other governmental committees and commissions.

Dr. Mead is survived by five grown children, two living in the West: Tom C. Mead, of Ogden, Utah, and Mrs. Edgar F. Kaiser, of Bonneville, Ore.

Edward J. Schneider Dies

E. J. SCHNEIDER, contracting manager of the bridge and structural department of the Columbia Steel Co. and widely known engineer and executive throughout the West died in Berkeley on January 25 after a brief illness. Mr. Schneider was sixty years old and had been in San Francisco since 1907, first with the American Bridge Co. and subsequently with the Columbia Steel Co. His extensive and successful work on outstanding western projects involving steel construction made him widely known to a large number of engineers, contractors, and others in the construction industry. The most recent and largest undertaking to come under his immediate charge was the contract of the Columbia Steel Co. for furnishing and erecting the entire superstructure of the San Francisco-Oakland Bay Bridge.

Mr. Schneider was born in Pontiac, Ill., graduating from the University of Illinois in 1900 in the college of sanitary engineering. His first position was that of draftsman with the Chicago and Western Indiana Railroad Co. The following year he went to work for the Koken Iron Works, which later became part of the American Bridge Co., and from then on he had been with the U. S. Steel Corp. continuously. Following design work on the power house for the St. Louis World's Fair and some building and bridge contract operations in the Middle West, he was made contracting manager for the company at Kansas City in charge of the office, and design and contracting.

E. J. SCHNEIDER

In May, 1907 he moved to San Francisco to become contracting manager for the American Bridge Co., later holding the same position for the U. S. Steel Products Co. and finally with the Columbia Steel Co. His position placed him in full charge of engineering, contracting, and steel erection in the Pacific Coast territory. Among the major bridges built under his direction were the Carquinez Straits bridge, the Southern Pacific Railway bridge at Suisun Bay, and most recently the entire superstructure of the $70,000,000 San Francisco-Oakland Bay Bridge project, now nearing completion.

He was a past president of the Engineer's Club of San Francisco, past president of the San Francisco Section, American Society of Civil Engineers, a member of the Bohemian Club, and other fraternal and engineering organizations.

Montana Earthquake Is Discussed by Engineers

The extended earthquake disturbances which occurred in Helena, Mont., during the fall months, formed the subject of a symposium presented before the Structural Engineers Association of Northern California at its meeting on January 14. Illustrated talks based on first-hand information concerning the earthquakes and the resulting damage were presented by F. P. Ulrich, engineer in charge of seismological investigations in California for the U. S. Coast & Geodetic Survey; H. M. Engle, engineer, Board of Fire Underwriters and H. J. Brunnier, consulting structural engineer of San Francisco. Each of these engineers had visited Helena either during the earthquake period or during the subsequent reconstruction.

Letters to the Editor . . . .

Reader comment is united in the opinion that the Fort Peck Reservoir belongs on the upstream side of the dam, and not on the downstream side as was shown on the front cover map for our last issue. We are glad the comments did not show undue concern over this error but accepted it as an incident which would not seriously affect this important western project.

The map was drawn by an artist during the year-end holiday period and this may account for some of the hydraulic difficulty. On the other hand, there is always the spirit of artistic self-assertion to be considered, and perhaps after drawing more than a dozen reservoirs on the upstream side of the dams, he decided to defy this mechanical conservatism and display originality in the case of the Fort Peck project.—Editor.

Sir—

Your January, 1936, number of *Western Construction News* has a very interesting map on the front cover but I am unable to understand the Fort Peck Dam development.

I am wondering if the Missouri River is so swift that when it contacts the lower side of the dam the impact is sufficient to force the water up through the penstocks and into the reservoir, or perhaps a hydraulic ram does the job or maybe someone has found at last a method of making water run up hill.

It is suggested that the dam and reservoir be oriented 180° before someone copies the idea.

A. J. TURNER,
Spokane, Wash.

●

Sir—

The error in the location of the Fort Peck Reservoir as indicated on the cover of your January issue was noticed by several members of my organization. It reminded me of the contractor who came here to bid on the spillway excavation and lining. After several hours of gazing at blue prints and plodding over the shale bluffs, this contractor turned to one of my engineers and asked, "Say! which way will the water run in this ditch?" Along with contractors, engineers and editors, artists are only human. This being so, all should be excused for an occasional error.

MAJOR T. B. LARKIN,
Corps of Engineers,
District Engineer,
Fort Peck, Mont.

●

Sir—

Please note the enclosed tracing which was made from a part of the map on the front cover of your January issue, covering the State of Montana. Was the Fort Peck Dam and Reservoir put on the map in this unique manner to make people like me ask questions, or what?

HAROLD L. PAGE,
Boulder City, Nev.

●

Sir—

I note on the cover of the current *Western Construction News* that the New Deal apparently has been successful in reversing the flow of the Missouri River at Fort Peck, thereby causing water to run up hill. We realize they have abrogated many of the laws of nature but this is the first time this particular instance had come to our attention. Do you know whether the Supreme Court has passed on this?

"ARIZONA ENGINEER."

●

Contractor Wins Suit Over Forfeited Check

A RECENT lower court decision in California ordered a $3,850 deposit check return to the low bidder, George Petersen, Oakland contractor, after it had been forfeited to the school trustees of Healdsburg. The low bid of $67,990 was submitted by George Petersen for construction of a high school building and the contract was awarded. Following the award of contract, Petersen notified the school board that he had made an error of $10,000 in the bid, which should have been $77,990. Further, he declared that he could not possibly complete the work under the NRA code regulations, in force at that time, if the board insisted on carrying out the contract. He requested that his deposit check for $3,850 be returned. Subsequently, on advice of the district attorney, the board claimed the deposit and the check was cashed by the county treasurer.

Later, Petersen brought suit for the deposit and the judge expressed the opinion that no breech of contract existed, since Petersen gave notice before work had been started and, the judge further stated, he could not see where the school board or the school itself had suffered any damage. The judge also pointed out that the contract could not have been carried out without the approval of the PWA which was financing the work. The necessary approval had been given for the project Jan. 14, 1935, but was suspended by the PWA the following day and finally entirely withdrawn on Feb. 6, 1935. Without this approval and financing of the PWA, the school board could not carry out the project and, according to the judge, was not authorized to execute the contract with Petersen or claim the deposit check.

●

Tunnel Contract Awarded

Contract for the construction of four tunnels on the Payette division of the Boise project has been awarded by the Bureau of Reclamation to J. A. Terteling & Sons, Boise, Idaho, on a low bid of $292,415. This bid was the lowest of three opened December 2 at Ontario, Ore. The work will involve the driving and lining of about 3,300 ft. of 14-ft. tunnel and 3,470 ft. of 8½-ft. tunnel.

Personally Speaking . . . . .

Norman Castellan is one of the new junior engineers recently appointed by the Bureau of Reclamation.

•

M. S. Bitner, who was formerly an engineer with the Denver Water Board, is now an assistant engineer with the Bureau of Reclamation.

•

C. L. Longson has been appointed city engineer of Burlingame, Calif., succeeding C. M. Thomas, who has retired.

•

Saxton & Looney, J. S. Risley, general highway contractors, have announced the opening of new offices in the Henry Building, Portland, Ore.

•

James H. Polhemus, general manager and chief engineer for the Port of Portland, Oregon, has been elected president of the Portland Section, Am. Soc. C. E. for 1936.

•

B. E. Torpen, senior civilian engineer at the Bonneville Dam and power project, has been elected to the executive committee of the power section of the Am. Soc. C. E.

•

W. F. Kemp, engineer with the Bureau of Reclamation, has been appointed construction engineer for the Heart Mountain division of the Shoshone project.

•

Frank Palermo has left the Sacramento office of the California Division of Highways to become associated with Biasotti, Willard & Biasotti, contractors of Stockton, Calif.

•

Walter L. Huber, consulting engineer, is president of the San Francisco Section of the Am. Soc. C. E. for 1936. H. J. Brunnier and Fred C. Scobey are vice-presidents, and T. J. Corwin, Jr., is secretary-treasurer.

•

Elmer A. Jacob has resumed his position as city engineer of Provo, Utah, following a year's absence as manager of the Deer Creek project. Earl Conder acted as city engineer during the absence of Mr. Jacob.

•

A. J. Orselli has recently moved from the Coos Bay bridge job of the Northwest Roads Co., now nearing completion at Marshfield, Ore., to a position of field engineer for the Six Companies Inc. on the Broadway Tunnel in Oakland.

•

M. B. Karelitz, formerly with the Bureau of Reclamation, is now in charge of designing the control mechanism for the 200-in. telescope which is being constructed by the California Institute of Technology for its Mount Palomar observatory.

•

Frank A. Weller, who has been construction superintendent at the Berdoo camp of the East Coachella tunnel on the Colorado River aqueduct for the past three years, has resigned to become associated with W. R. Fontain, consulting engineer of San Francisco.

•

Walter E. Stoddard, hydraulic engineer with the California Division of Water Resources, is president of the Sacramento Section af the Am. Soc. C. E. for 1936. Edward E. Welch and Herbert H. Hodgeson are vice-presidents, and Frank D. Talbot is secretary.

•

Irving C. Harris is the engineer for the Bureau of Reclamation in charge of installing electrical generating machinery in the power plant at Boulder Dam. Mr. Harris spent the last two years inspecting the manufacture of this equipment.

•

Major Clark Kittrell, Corps of Engineers, who has been construction engineer on the Fort Peck project since work started, has been named district engineer in charge of the project, replacing Major T. B. Larkin, Corps of Engineers, who has been ordered transferred to Fort Belvoir, Va.

•

Burdette Glenn, on leave of absence as associate professor of highway engineering at Oregon State College, has been made assistant traffic engineer for the Oregon State Highway department. Professor Glenn will direct the federal-state highway traffic survey in Oregon which will be carried out this spring.

•

O. L. Pringle has been appointed general manager of the operations of the Columbia Steel Co., succeeding W. R. Phibbs, resigned. **E. M. Barber** has been appointed general superintendent of the Torrance plant of the Columbia Steel Co., succeeding B. W. Lanz, resigned. Both appointments were effective Feb. 1.

•

C. J. Kavanagh, superintendent for Broderick & Gordon and Three Companies, will serve during the coming year as chairman of the Contractors' Executive Safety Committee on the Colorado River Aqueduct project. Harry Davis, superintendent of the Griffith Company, will serve as vice-chairman. Gilbert J. Shea was the retiring chairman of this group.

•

D. P. Barnes, assistant engineer for the Bureau of Reclamation in Denver who has been engaged in the study of soil mechanics for earth dams, has recently been transferred to the Bureau's laboratory of hydraulic research. In his new position, Mr. Barnes will replace J. B. Drisko, who has accepted a position with the Federal Soil Erosion Service in the National Hydraulic Laboratory at Washington, D. C.

•

Correction: **Henry J. Lawlor,** who was listed as director and member of the executive committee of Six Companies Inc. in our tabulation of the gold medallions awarded to officials of this company is also a vice-president of Six Companies Inc.

Obituaries . . . . .

W. H. Earl, civil engineer of Tulare, Calif., and former county surveyor of Lassen County, California, died in Tulare, Jan. 28, at the age of 70.

•

Elmer S. Foote, civil engineer of Denver and Greeley, Colo., died at Memphis, Texas, late in December, at the age of 57. He was well known around Denver for his surveys which located the Moffat railroad extension from Steamboat Springs to Craig.

•

Fred Davis, former manager of the Santa Cruz Portland Cement Co., member of the American Society of Civil Engineers since 1905 and conected with some of the early Hudson River tunnels in New York, died in Santa Cruz, Jan. 25. He came West about 30 years ago to assume the management of the Santa Cruz Portland Cement plant.

•

Wilfred Keefer Barnard, consulting civil engineer and member of the firm Quinton, Code & Hill-Leeds & Barnard, of Los Angeles, died January 22 at his home in Pasadena at the age of 57. An engineering graduate of Yale in 1901, Mr. Barnard spent several years in railroad work, including supervision of main line and terminal construction on the Los Angeles & Salt Lake R. R., and the Pacific Electric R. R. at Los Angeles. In 1913 he formed a partnership with Charles T. Leeds, under the firm name of Leeds & Barnard, for general civil engineering practice, specializing in river and

harbor work and coast protection. In 1930 this firm merged with Quinton, Code & Hill. He was a member of the Am. Soc. C. E. and other professional organizations.

•

Alexander W. Hess, engineer in charge of the pumping plants of the San Jose Water Works for more than 50 years, died in San Jose, Jan. 22, at the age of 80. Last year Mr. Hess received a silver plaque from the company to commemorate his half century of service which saw his work expand from operating one 40-gal. pump to supervising equipment of 5,000,000 capacity.

•

William H. Feigenson, prominent contractor of Portland, and president of the firm of Lindstrom & Feigenson died at his home in Portland, Jan. 25, at the age of 55. Born in New York, he was for more than 20 years a resident of Portland and had been active in affairs of the Associated General Contractors, while carrying out many important construction contracts. He served as president of both the Portland chapter and the Pacific Northwest branch of the A. G. C. as well as zone vice-president of the national organization. The firm of Lindstrom & Feigenson held many notable bridge contracts, including the Alsea Bay bridge on the Oregon coast route, now being completed, the Burnside and Ross Island spans in Portland and the Longview bridge across the Columbia River.

•

Charles A. Kyle, for 17 years bridge engineer for the Idaho Highway Department and previously highway bridge engineer for Montana, died in Boise, Jan. 21, at the age of 72. Beginning his bridge building career with his father, who was superintendent of bridges for the Baltimore Bridge Co., Mr. Kyle worked with the Kansas City Bridge & Iron Co. for eight years before it was consolidated with the Chicago Bridge & Iron Works in 1889. He worked as designer and manager of shops for this company in the East for many years until he was sent to Salt Lake City as chief designer for the smelting plants then being erected in Utah. In 1915 he became bridge engineer for the Montana Highway Department and moved to a similar position in Idaho in 1919. Since then he was in active charge of the design of the bridges on the Idaho state highway systems.

NEW Materials and EQUIPMENT

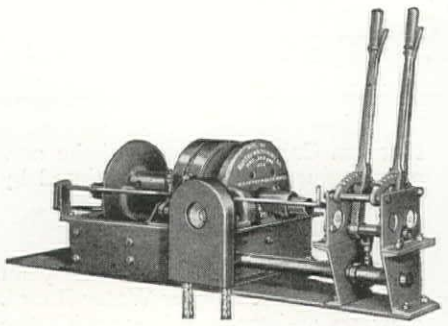
Bethlehem Introduces Kalman Road Joints

Two types of transverse expansion joints, air-cushion and elastic-cushion, and a contraction joint of similar design have been developed by the Kalman Steel Corporation, subsidiary of Bethlehem Steel Corporation, Bethlehem, Pa., as a means of preserving smooth and even concrete highway surfaces and permitting free movement of the pavement under expansion and contraction.

These Kalman Road Joints are shop-assembled, self-contained, concrete-interlock units that come to the job complete, requiring only to be set in place on the subgrade and staked to prevent movement while concreting. Their design embodies a distinctive system of interlocking lugs and recesses formed directly in the concrete, so proportioned and spaced that the strength of the concrete is utilized to its best advantage. Bottom, top, and ends are arranged to prevent entry of foreign materials into the body of the joint.

In the air-cushion type there is a ⅞-in. air space, transversely in the joint, while in the elastic-cushion type specified material such as cork, rubber, or other approved expansion joint material is mounted on steel surfaces. The detail of the contraction joint embodies all the distinctive features of the Kalman Interlock Joint, such as bottom and top sealing and so on, but with the expansion provision omitted.

Thickened edges, crown, curb extensions and all such features to meet the requirements of good pavement design are correctly provided for in the manufacture of these complete Kalman Road Joints. Copies of descriptive Folder No. 302 are available upon request.



Ramsey All-Steel Power Hoist

The Ramsey Machinery Company, 1626 N. W. Thurman Street, Portland, Oregon, manufacturers of all-steel three-speed hand winches and power hoists, have fully developed and are now in production on their new Ramsey all-steel power hoist, with friction clutch in the drum.

The outstanding feature of this new hoist is the drum clutch, which is a contracting band-gear type, fully enclosed in grease-tight housing. (Patents pending.) The clutch is operated with very little pressure on the lever, and has sufficient power to transmit its rated single line capacity of 4,000 pounds, with the drum completely full of cable.

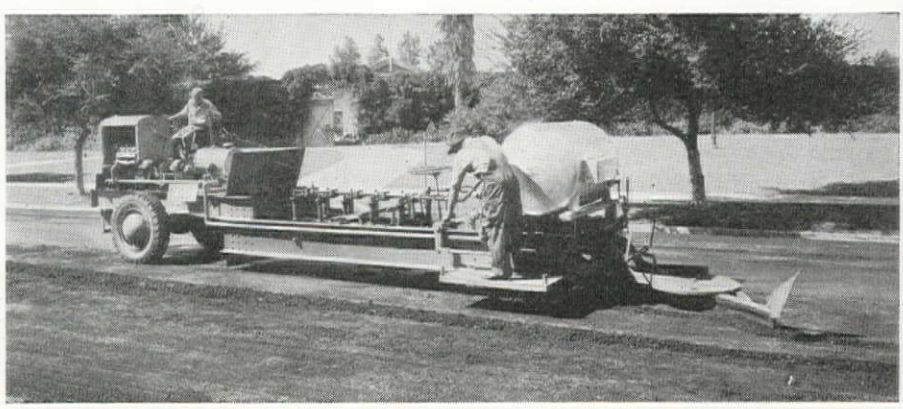
As there is no end thrust resulting from the operation of the clutch, friction and wear to moving parts are reduced. Also of importance is the fact that it is impossible for grease to get into the clutch and brake linings, and the cable cannot become fouled in the gearing. Compactness and light weight are also important features, and are made possible by its all-steel construction.

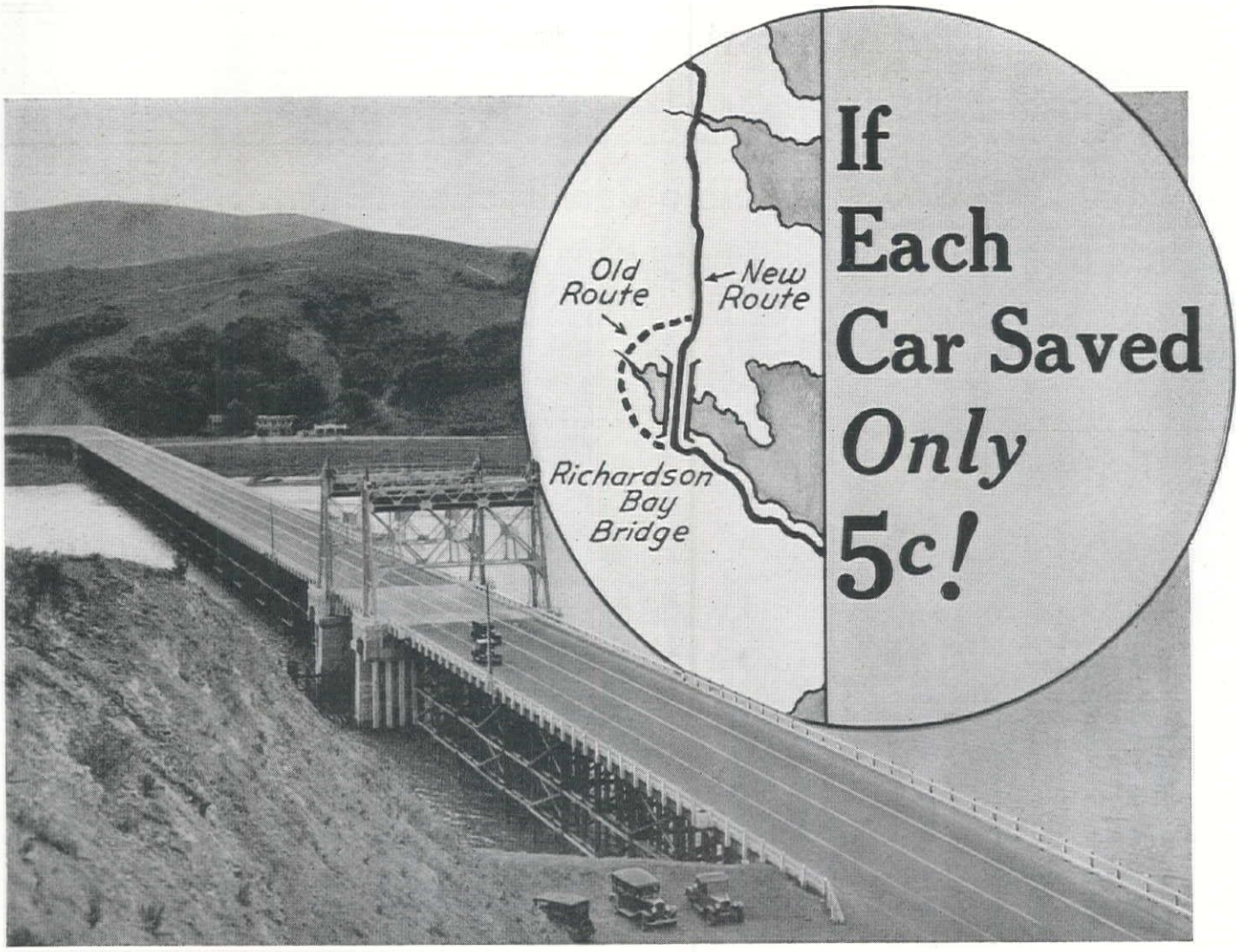
Due to its compactness and powerful friction clutch, the Ramsey power hoist makes an ideal hoist for truck mounting, driving from the truck engine through a power take-off. The hoist is mounted to the channel frame of the truck, directly back of the driver's cab. The operator stands alongside the cab or on the running board, where he has full vision of the hoisting operation and hair-trigger control of the load.

Advanced Design Heater-Planer

"Corrugated and skiddy pavements are things of the past, according to the Spear-Wells Machinery Company of Oakland, California, who have just announced their new Heater-Planer. This machine removed corrugations, skid-proofed, and sealed leaky pavements at an astonishingly low contract price, on a recent job in Sacramento. The area planed was almost 600,000 square feet, which is roughly equivalent to six miles of ordinary high-

(Continued on Page 44)





THE construction cost of this important bridge amounted to less than a nickel per vehicle for the four years it has been in service. Motorists have saved more than this through mileage reduction of the new route. The saving of time, the added safety and convenience are more important than the saving of miles and money.

Grade separations over highway and railroad, a lift span, a four-lane roadway over a long water crossing are paid for in reduced costs to motorists before ten per cent of the probable service life of the bridge has expired. Whatever the future requirements of the route may be, the judgment of the engineers who designed this bridge in Redwood has already proven sound from the standpoints of true economy, and serviceability.

"Let's Look at the Record"

RICHARDSON'S BAY REDWOOD BRIDGE

Total Length	2,477 Feet
Clear Roadway	44 Feet
Redwood Lumber	2,158,000 Ft. B. M.
Redwood Piling	35,000 Lin. Feet
Total Cost	$345,532
Completed	November, 1931

TRAFFIC DENSITY

Division of Highways rating:
5,000 to 7,500 vehicles per day

16-Hour Traffic Counts:

Average count	5,797 vehicles
Maximum count	11,554 vehicles
Maximum count	96 busses
Maximum count	517 trucks

California Redwood Association

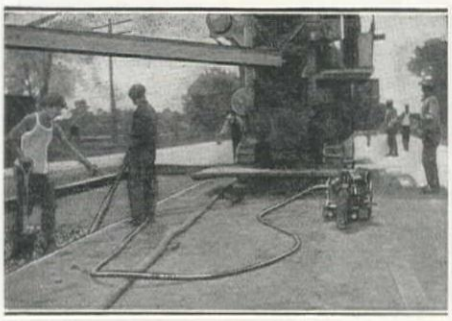
405 Montgomery Street, San Francisco

NATURALLY DURABLE CALIFORNIA REDWOOD

way, and was completed in twenty-five working days.

The Heater-Planer is a two-man, self-propelled, front-wheel drive machine, which heats the surface, planes off the high spots, and moves the excess material to one side, all in a continuous operation. Butane and propane gases may be used as fuel, or fuel oil burners can be used in regions where the liquid gases are not available. The operator has complete control (oil hydraulic) of all major mechanical operations from either side of the machine, this including a variable heat control. The driver is up in front, with complete visibility, and has the choice of 16 working speeds, varying from 6 to 150 feet per minute.

•



Pneumatic Tired Vibrator

A 3 h.p. gas engine vibrator mounted on a pneumatic wheel, wheelbarrow type mounting has been recently introduced by the Mall Tool Company. This vibrator was especially designed for use on pavement work for compacting concrete around ace joints and at the edges of the pavement. The wheelbarrow mounting provides unusual portability inasmuch as the entire assembly can be moved along the edges of the pavement as the work progresses.

The 3 h.p. gas engine power unit delivers vibration frequencies varying from 2,000 to 4,500 per minute which will comply with practically all specifications for concrete placement.

Like other Mall vibrator units, this outfit can be furnished with 14 ft., 21 ft., and 28 ft. of shafting. Additional information and prices will be furnished by writing to the Mall Tool Company, Chicago, Illinois.

•

New Oil-Resisting Pneumatic Hose

A new air hose, designed especially to overcome the deteriorating effects of hot oil from air compressors, is announced by the Republic Rubber Co., Youngstown, Ohio. The tube is made from a compound similar to that used in oil conducting hose and can be saturated with oil for long periods of time without affecting its serviceability.

The hose is said to have great resistance to heat, high pressures, abrasion, the cutting effect of sharp rock and exposure to sun and weather. It is recommended for quarries, rock industries, road work, contracting and general industrial use where service is exceptionally severe.

UNIT BID SUMMARY . . .

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

Pipeline Construction . . . . . .

Los Angeles, Calif.—Cajalco to Fontana Pipelines

Contracts awarded to American Concrete & Steel Pipe Co., 4635 Firestone Blvd., Southgate, $540,611 on Sched. 1P and $880,639 on Sched. 3P, and to Western Pipe & Steel Co., 5717 Santa Fe Ave., Los Angeles, $4,047,374 on Sched. 2S and $159,663 on Sched. 2B by Metropolitan Water District, Los Angeles, for precast concrete pipe and steel pipelines and 3-span through truss bridge and appurtenant works of the Colorado River Aqueduct disribution system, between Sta. 31 and 926 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.

SCHEDULE No. 1P—Precast concrete pipe for the Upper Feeder, Sta. 31-50 and 155. Pipe dia. 11′ 8″; length 12,277 feet. Bids from:

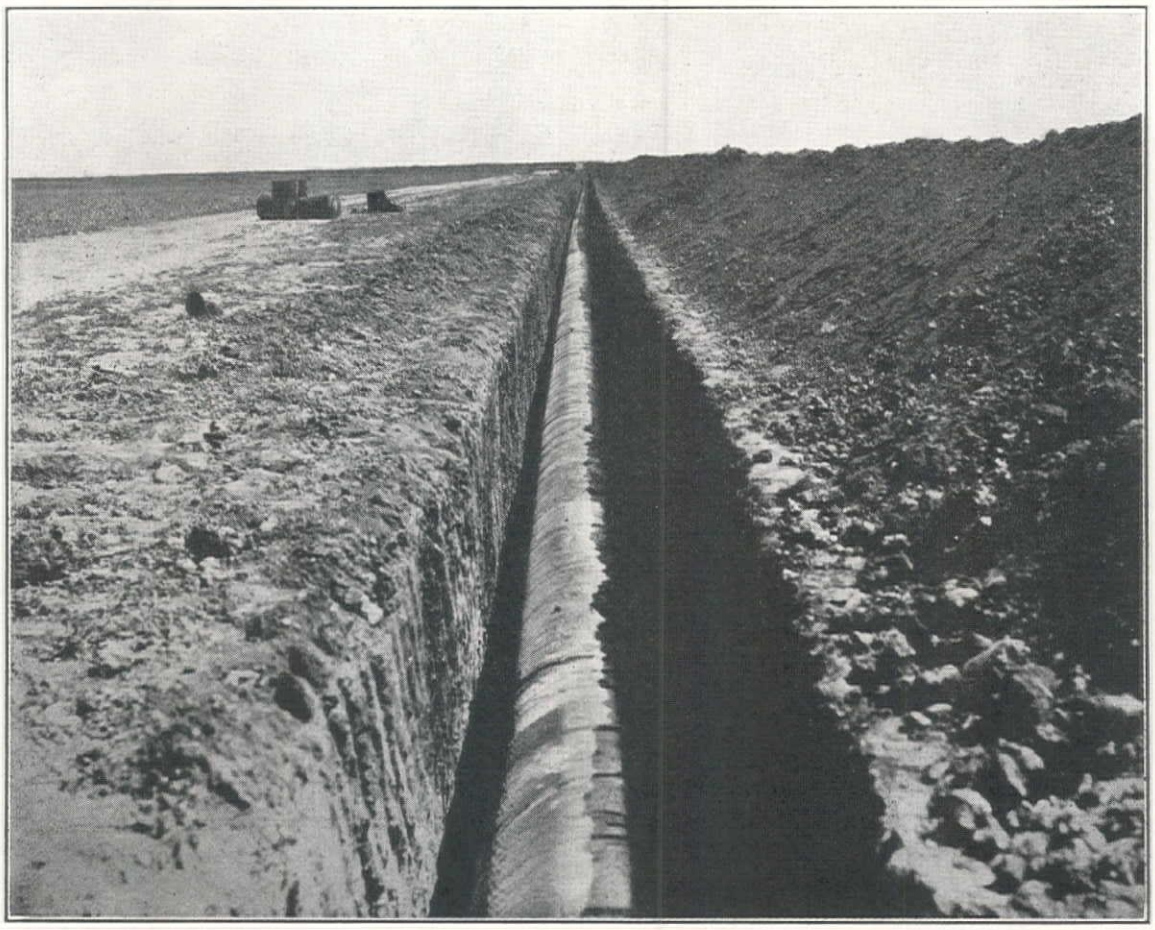
(1) American Concr. & Steel Pipe Co...$540,611
(2) United Concrete Pipe Corp..... 553,202
(3) Griffith Co., Los Angeles..... 569,235
(4) Wood & Bevanda, Stockton..... 581,150
(5) A. Teichert & Son and V. R. Dennis..$593,287
(6) Youdall Constr. Drainage Const. and E. Seabrook..... 654,994
(7) Walsh Construction Co..... 864,652

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
180,000 cu. yd. exc. for pipe, side slope	$.30	$.38	$.40	$.35	$.36	$.67	$1.00
300 cu. yd. excavation for struc.	3.00	1.00	1.50	1.50	2.00	1.00	2.00
120,000 cu. yd. backfill	.15	.12	.17	.20	.19	.20	.17
800 cu. yd. concr. in struc. reinf.	$17	18.00	19.00	17.50	18.00	20.00	28.00
50 cu. yd. concr. in struc. plain	$17½	18.00	18.00	15.00	18.00	15.00	15.00
120 cu. yd. concr. in anchors	$12	10.00	17.00	12.50	11.00	10.00	10.00
4,400 cu. yd. concr. in cradle	5.80	5.20	6.00	5.25	6.00	5.25	6.00
9,160 lin. ft. prec. conc. pipe	$20	19.60	20.00	22.50	21.30	22.60	30.40
3,180 lin. ft. same, cyl. reinf.	20.70	20.20	20.00	22.50	21.30	22.60	31.60
90,000 lb. pl. reinf. stl. in struc.	.01	.01	.015	.01	.01	.02	.01
4,300,000 lb. furn. & pl. reinf. stl. prec.	.04	.042	.042	.04	.045	.043	.0529
6,000 lb. furn. & inst. thimbles	.20	.30	.15	.25	.20	.20	.20
70,000 lb. install miscell. metal	.04	.05	.03	.03	.05	.03	.06
100 lin. ft. inst. conc. pipe, 12″ dia.	2.00	1.00	.50	1.00	.75	1.00	1.00
100 lin. ft. same, 8″ dia.	1.50	.50	.45	1.00	.50	.60	.80

SCHEDULE No. 2S—Construction of steel pipe for the Upper Feeder of the Colorado River Aqueduct, Sta. 155-00 and 707-00. Pipe dia. 9′ 8″ to 11′ 6″, length 54,530′. Bids from:

(1) Western Pipe & Steel Co.....$4,047,374
(2) Chicago Bridge & Iron Wks..... 4,143,810
(3) Bethlehem Steel Co.....$4,342,178
(4) Case Construction Co..... 4,347,373

	(1)	(2)	(3)	(4)
70,000 cu. yd. exc. for pipe, vertical trench	$.81	$.75	$.55	$.75
515,000 cu. yd. exc. for pipe, side slope tr.	.39	.38	.41	.32
1,500 cu. yd. excavation for structures	1.25	1.50	2.00	2.00
407,000 cu. yd. backfill	.195	.20	.275	.20
2,500 cu. yd. con. in struc. reinf.	20.00	20.00	23.00	22.50
300 cu. yd. conc. in struc. plain	20.00	18.00	20.00	20.00
600 cu. yd. concr. in anchors	14.00	15.00	18.00	10.00
500,000 lb. pl. reinf. steel in struc.	.015	.02	.016	.015
FURN. & INSTALL PLATE STEEL PIPE OF THE FOLLOWING SIZES:				
1,052 lin. ft. 9′ 8″ dia. 7/8″ thick	$65.27	$65.20	$68.30	$70.00
60 lin. ft. 10′ 4″ dia. 25/32″ thick	62.24	62.90	66.00	68.00
2,760 lin. ft. 10′ 4″ dia. 13/16″ thick	63.59	64.74	67.90	70.00
1,110 lin. ft. 10′ 4″ dia. 27/32″ thick	66.02	67.50	70.70	73.00
777 lin. ft. 10′ 4″ dia. 7/8″ thick	68.05	69.97	73.20	75.00
2,670 lin. ft. 10′ 4″ dia. 29/32″ thick	69.98	72.45	76.30	78.00
2,333 lin. ft. 10′ 4″ dia. 15/16″ thick	71.90	75.09	79.00	81.00
3,500 lin. ft. 10′ 4″ dia. 31/32″ thick	74.05	77.39	81.40	83.00
800 lin. ft. 10′ 4″ dia. 17/32″ thick	40.54	37.87	41.70	40.00
190 lin. ft. 10′ 6″ dia. 9/16″ thick	42.51	40.20	44.20	42.00
1,510 lin. ft. 10′ 6″ dia. 19/32″ thick	44.29	42.35	46.50	44.00
1,060 lin. ft. 10′ 6″ dia. 5/8″ thick	49.18	44.30	48.50	46.00
680 lin. ft. 10′ 6″ dia. 21/32″ thick	54.08	53.47	55.90	52.00
620 lin. ft. 10′ 6″ dia. 11/16″ thick	55.87	56.00	58.50	59.00
2,220 lin. ft. 10′ 6″ dia. 23/32″ thick	58.55	58.53	61.00	65.00
1,152 lin. ft. 10′ 6″ dia. 3/4″ thick	60.46	60.89	63.40	67.00
1,000 lin. ft. 10′ 6″ dia. 25/32″ thick	62.72	63.42	66.50	69.00
1,670 lin. ft. 10′ 6″ dia. 27/32″ thick	67.37	68.54	71.70	74.00
180 lin. ft. 10′ 6″ dia. 7/8″ thick	68.85	71.07	74.30	77.00
1,500 lin. ft. 10′ 6″ dia. 29/32″ thick	70.92	73.54	77.50	79.00
280 lin. ft. 10′ 8″ dia. 3/4″ thick	61.66	61.98	64.50	67.00
1,040 lin. ft. 10′ 8″ dia. 25/32″ thick	63.43	64.40	67.50	69.00
1,110 lin. ft. 10′ 8″ dia. 13/16″ thick	65.42	66.98	70.20	72.00
730 lin. ft. 10′ 8″ dia. 27/32″ thick	66.90	69.69	72.90	75.00
1,475 lin. ft. 10′ 8″ dia. 7/8″ thick	69.88	72.22	75.50	78.00
2,335 lin. ft. 10′ 8″ dia. 29/32″ thick	71.87	74.75	78.70	81.00
240 lin. ft. 10′ 8″ dia. 15/16″ thick	74.44	78.25	82.30	84.00
175 lin. ft. 10′ 8″ dia. 31/32″ thick	76.32	80.15	80.20	86.00
180 lin. ft. 10′ 10″ dia. 25/32″ thick	64.35	65.49	68.60	71.00
417 lin. ft. 10′ 10″ dia. 13/16″ thick	66.38	68.08	71.20	73.00
600 lin. ft. 10′ 10″ dia. 27/32″ thick	68.86	70.84	74.10	76.00
80 lin. ft. 10′ dia. 23/32″ thick	51.26	61.35	63.90	66.00
470 lin. ft. 11′ dia. 3/4″ thick	63.19	63.82	66.40	69.00
420 lin. ft. 11′ dia. 25/32″ thick	65.08	66.47	69.60	72.00
610 lin. ft. 11′ dia. 13/16″ thick	67.44	69.05	72.20	75.00
1,935 lin. ft. 11′ dia. 27/32″ thick	70.02	71.93	75.20	77.00
1,940 lin. ft. 11′ dia. 7/8″ thick	72.12	74.52	77.80	80.00
70 lin. ft. 11′ dia. 2″-21/32″ thick	57.19	56.98	59.50	61.00
1,010 lin. ft. 11′ 2″ dia. 11/16″ thick	59.29	59.57	62.10	64.00
1,940 lin. ft. 11′ 2″ dia. 23/32″ thick	61.97	62.33	64.90	67.00
460 lin. ft. 11′ 2″ dia. 3/4″ thick	64.15	64.92	67.50	70.00
880 lin. ft. 11′ 2″ dia. 25/32″ thick	65.99	67.56	70.70	73.00
590 lin. ft. 11′ 2″ dia. 13/16″ thick	68.44	70.15	73.40	76.00
40 lin. ft. 11′ 4″ dia. 19/32″ thick	46.00	45.95	50.20	48.00
230 lin. ft. 11′ 4″ dia. 5/8″ thick	50.06	47.90	52.30	50.00
370 lin. ft. 11′ 4″ dia. 21/32″ thick	58.06	57.78	60.30	62.00
1,150 lin. ft. 11′ 4″ dia. 11/16″ thick	60.18	60.49	63.00	65.00



(Completed line of Spiral Welded Pipe ready for back fill, at El Solyo Ranch, San Joaquin County, Calif.)

Calco Spiral Welded Pipe

"Stream Lined" — for Efficient Conveyance of Water*

Calco Spiral Welded Pipe (formerly known as Spi-Weld) is truly circular, having one smooth, butt-welded spiral seam—as strong as the metal itself.

There are no laps, no rivets, no interior projections of any kind, to reduce the capacity of the pipe. Water flows with extremely low friction loss. Spiral Welded Pipe is truly "stream lined" in the modern acceptance of the term.

Light in weight and easily handled, its installation is convenient and economical. Field joints can be welded or made with standard couplings.

There are years of trouble-free, dependable service in every easy installation of Calco Spiral Welded Pipe. Write for further details.

* And for oil, gas, and air, as well.

CALIFORNIA CORRUGATED CULVERT CO.
Berkeley Los Angeles

HARDESTY MANUFACTURING CO.
DENVER, COLO.
Salt Lake City, Utah Pueblo, Colo.
Missoula, Mont. Sidney, Mont. Boise, Idaho

WESTERN METAL MFG. CO.
Box 1585 Phoenix, Ariz.

PURE IRON CULVERT & MFG. CO.
2321 S. E. Gladstone Street, Portland

WASHINGTON CORRUGATED CULVERT CO.
Formerly the
Spokane Culvert & Tank Co.
Seattle Incorporated 1910 Spokane
H. H. HAZELWOOD, Representative
P. O. Box 777, Olympia, Wash.

WESTERN METAL MFG. CO.
HOUSTON
El Paso San Antonio Dallas

New Low Priced Engine-Driven Welder

A new 200 ampere special engine-driven "Shield Arc" welder is announced by the Lincoln Electric Company, Cleveland, Ohio, as the lowest priced welder of this type. This new model, known as the "200 ampere Shield Arc Special," supplies a uniform current for welding with bare or heavily coated shielded arc type electrodes in all sizes up to ¼ in. The welding current range of this new machine is from 60 to 250 amperes. Its generator is the single operator variable voltage type with completely laminated magnetic circuit and equipped with interpoles. Requires no external reactance or stabilizer. The patented Lincoln dual control of welding current is provided by adjustment of both series and shunt fields. Separate excitation of the generator shunt fields is supplied by an exciter connected on the generator end of the unit. A generator field rheostat and a current-regulating switch are mounted in vertical position on a "dead front" steel control panel. Electrode and ground cable connections of the wing nut type are also in an easily accessible position.

The welder is powered by a Waukesha four-cylinder engine which delivers 23 H. P. at 1,400 R. P. M., the speed at which the welder is operated. A gear-driven governor maintains proper engine speed at all load conditions. Total weight of the unit is 1,078 pounds.

•

Starting Unit for Gas and Diesel Engines

A new fast-working single-stage air compressor for starting gas and Diesel engines, capable of filling a tank of six cubic feet capacity up to 200 pounds pressure in five minutes or up to 250 pounds in nine and a half minutes, is now offered by the Cooper-Bessemer Corporation.

The new unit, to be known as the GX3A, runs equally well on either gas or gasoline. It is a simple, self-contained combination engine and compressor, and is of very moderate cost. Ford parts are largely used; pistons, piston rings, connecting rods, connecting-rod bearings, engine valves, and many smaller parts being thus obtained, with the assurance of high quality and uniformity at low cost.

A full description of the GX3A can be had by addressing the manufacturers, the Cooper-Bessemer Corporation at Mount Vernon, Ohio, Grove City, Pa., or any of its branch offices.

•

Master Vibrators

Master Vibrator Co., Dayton, Ohio, announces a new line of vibrators, a complete series of ten models, to suit any type of concrete work. A new catalog illustrates and describes these electric vibrators and the generator sets necessary for their operation.

Readers of this publication interested in these new electric vibrators may have a catalog on Master Vibrators upon application to the company.

550 lin. ft 11′ 4″ dia. 23/32″ thick	63.09	63.25	65.80	68.00
730 lin. ft. 11′ 4″ dia. 3/4″ thick	65.18	65.78	68.40	71.00
3,090 lin. ft. 11′ 6″ dia. 9/16″ thick	45.72	43.95	48.10	47.00
530 lin. ft. 11′ 6″ dia. 9/32″ thick	46.64	46.35	50.70	50.00
450 lin. ft. 11′ 6″ dia. 5/8″ thick	50.70	48.55	53.00	51.00
1,285 lin. ft. 11′ 6″ dia. 21/32″ thick	58.73	58.59	61.10	53.00
400 lin. ft. 11′ 6″ dia. 11/16″ thick	60.84	61.35	63.90	60.00
1,523,000 sq. ft. pipe coating, "A"	.065	.09	.075	.075
294,000 sq. ft. pipe coating, "B"	.12	.15	.14	.15
30,000 lb. furn. & inst. MH, covers, etc.	.16	.20	.16	.30
3,000 lb. furn. & inst. saddles, etc.	.22	.20	.16	.30
55,000 lb. furn. & inst. struc. stl.	.09	.12	.14	.15
25 pipe supports	298	300.00	360.00	350.00
1 expansion joint	$1,140	$1,000	$1,410	$1,200
200,000 lb. miscell. metal	.08	.07	.065	.05
950 lin. ft. 24″ dia. conc. pipe	1.25	.60	.70	3.00
100 lin. ft. 12″ dia. conc. pipe	.80	.30	.45	2.50
200 lin. ft. 8″ concrete pipe	.50	.30	.40	1.50

SCHEDULE No. 2B—Construction of the Santa Ana River bridge and piers for the Upper Feeder of the Colorado River Aqueduct Distribution System. Bids from:

(1) Western Pipe & Steel Co. $159,663
(2) Chicago Bridge & Iron Works 184,900
(3) Bethlehem Steel Corp. $200,950
(4) Case Construction Co. 217,253

	(1)	(2)	(3)	(4)
8,500 cu. yd. excav. for piers	$5.95	$6.50	$5.20	$5.40
3,500 cu. yd. backfill for piers	.30	.60	.40	.80
2,000 cu. yd. conc. in piers	9.50	12.00	17.50	17.90
3,600 cu. yd. conc. in pier fitgs.	8.50	12.00	17.50	18.35
35,000 lb. pl. reinf. stl. in piers	.02	.015	.02	.014
15,000 lb. furn. & pl. anchors bolts	.065	.075	.10	.15
17,000 lb. pl. stl. castings for bridge	.185	.20	.16	.24
600 lb. bronze pins	.50	.60	.55	1.50
Lump sum, struc. steel in bridge	53,318	54,940	52,100	58,973

SCHEDULE No. 3P—Construction of precast concrete pipe for the Upper Feeder, Stations 707-00 and 926-00. Pipe diameter 11′ 8″; length 20,124 ft. Bids from:

(1) American Concrete & Stl. Pipe $880,639
(2) United Conc. Pipe Corp. 927,744
(3) Wood & Bevanda 973,680
(4) Youdall Const. Co., etc. $1,057,480
(5) Teichert & V. R. Dennis 1,064,069
(6) Walsh Construction Co. 1,343,258

	(1)	(2)	(3)	(4)	(5)	(6)
12,000 cu. yd. exc. for pipe, vert. tr.	$.60	$.40	$.70	$.80	$.72	$1.10
275,000 cu. yd. exc. for pipe, side slope	.25	.31	.35	.35	.46	.51
200 cu. yd. exc. for structures	2.00	1.00	1.00	1.00	1.00	1.95
180,000 cu. yd. backfill	.15	.14	.20	.20	.20	.35
500 cu. yd. conc. in struc. reinf.	17.50	16.00	17.50	17.50	18.00	28.00
100 cu. yd. conc. in struc. plain	17.50	16.00	15.00	17.50	16.00	15.50
100 cu. yd. concr. in anchors	10.00	10.00	12.50	10.00	15.00	10.00
7,500 cu. yd. concr. in cradle	5.00	4.50	4.50	5.00	5.00	6.50
1,345 lin. ft. prec. conc. pipe	15.50	17.10	17.00	18.19	18.00	19.60
800 lin. ft. prec. conc., mortar jt.	15.40	17.10	20.00	21.00	18.00	20.90
17,995 lin. ft. same, cyl. reinf.	15.70	17.10	17.00	18.19	18.00	20.75
120,000 lb. pl. reinf. stl. in struc.	.01	.01	.01	.01	.02	.02
10,200,000 lb. reinf. stl. in prec. pipe	$.04	$.041	$.043	$.049	$.046	$.0627
6,000 lb. thimbles for connect. to pipe	.20	.30	.25	.20	.20	.20
40,000 lb. install. miscell. metal	.04	.05	.03	.05	.03	.06
100 lin. ft. inst. conc. pipe, 18″	2.00	2.00	1.00	1.00	.50	1.20
100 lin. ft. same, 12″	2.00	1.00	1.00	.75	.40	1.00
100 lin. ft. same, 8″	2.00	.50	1.00	.50	.30	.80

San Diego, Calif.—City—Electric Welded Steel Pipeline

Consolidated Steel Corp., 6500 E. Slauson Ave., Los Angeles, $412,259, low, to City Council, San Diego, for construction of the El Capitan-Lakeside Pipeline from Sta. 104 to Lakeside. Bids from:

(1) Consolidated Steel Corp. $412,259
(2) Western Pipe & Steel Corp. 424,847
(3) Southwest Welding & Mfg. 429,562
(4) Bethlehem Steel Corp. $435,192
(5) David H. Ryan, San Diego 441,776

PROPOSAL "A"—Electric welded steel pipe, trench excavation, backfill pipe and appurt. Station 104 to Lakeside.

	(1)	(2)	(3)	(4)	(5)
30,850 cu. yd. excav. Class 1	$.84	$.66	$.79	$.75	$.65
11,800 cu. yd. excav. Class 1	.572	.53	.61	.57	.65
12,500 cu. yd. excav. Class 2	.705	.68	.79	.71	.40
11,500 cu. yd. hauling excav. matl.	.143	.14	.14	.15	.15
1,000 cu. yd. hauling exc. matl.	.385	.37	.39	.39	.30
29,300 cu. yd. backfill	.50	.45	.53	.47	.50
2,236 lin. ft. 48″-¼″ plate elec. weld	8.95	10.40	9.97	10.40	11.00
10,000 lin. ft. 48″-9/32″ same	10.10	10.20	10.85	10.95	12.00
7,500 lin. ft. 48″-5/16″ same	10.95	12.05	11.36	11.35	12.50
1,200 lin. ft. 48″-3/8″ same	12.70	13.70	13.59	13.63	15.00
2 48″ x 36″-5/16″ elec. stl. red.	167.50	234.00	200.00	235.00	134.00
3 36″ x 30″ x 5/16″ same	177.00	178.00	200.00	215.00	120.00
1 36″ x 20″-5/16″ same	209.00	152.00	202.00	195.00	105.00
90 48″ addtl. cir. seams	50.00	10.00	44.00	39.00	30.00
8,300 lin. ft. 36″ ¼″ plate elec. stl. pipe	7.40	7.95	7.23	8.25	8.80
1,817 lin. ft. 36″-9/32″ same	8.20	8.60	8.79	9.15	9.30
1,350 lin. ft. 36″-5/16″ same	9.06	9.25	9.12	10.22	9.00
75 lin. ft. 28″-¼″ same	6.09	7.95	7.50	7.95	6.10
1 30″ x 28″-5/16″ reducer, 30″ flange	177.20	167.00	175.00	205.00	95.00
1 36″ x 28″-5/16″ same, 28″ gaskets	158.23	177.00	160.00	225.00	88.00
2 36″ x 16″-5/16″ same, 16″ flange	115.00	142.00	114.50	285.00	88.00
50 36″ addtl. circular seams	40.00	8.75	39.92	28.00	25.00
3,000 lb. elec. weld. stl. secs. incl. flanges	.209	.15	.2133	.32	.12
20,000 lb. elec. pipe, fab. angles	.189	.12	.1975	.24	.085
3 48″ Dresser couplings	91.50	104.00	94.00	122.00	55.00
3 36″ same	73.34	81.00	77.33	110.00	35.00
1 30″ bevel geared gate valve	$1,415	$1,322	$1,660	$1,462	$1,050
1 36″ same	$2,125	$2,010	$2,862	$2,118	$1,600
1 20″ same	$655	$594	$643	$721	$500
1 30″ vert. geared gate valve	$1,415	$1,320	$1,490	$1,460	$1,050
1 4″ air & vacuum valve assembly	$210	$138	$243	$167	95.00
15 4″ comb. press. air valve	$210	$211	246.70	$228	140.00
1 2″ pressure air valve assembly	90.00	91.00	96.00	112.00	55.00
6 4″ blowoff assemb. in place	42.50	43.00	50.33	55.00	20.00
4 6″ same	60.00	53.00	65.50	58.00	35.00
20 lin. ft. std. wr. iron pipe, 2″	1.00	.69	1.40	1.00	.32
575 lin. ft. 4″ std. wr. iron pipe	1.50	1.57	1.47	1.65	.95
250 lin. ft. 6″ same	2.50	2.63	2.45	2.40	1.70
80 lin. ft. 12″-12 ga. dip. stl. pipe	1.625	1.45	1.58	2.15	1.30
235 lin. ft. 20″- 8 ga. same	2.42	2.80	2.48	3.00	3.10
3,500 lb. C. I. frames & covers	.077	.08	.098	.08	.15

New Coast Manager

David Buttles, of Fresno, California, has been appointed Pacific Coast manager for the Cummins Engine Co. of Columbus, Ind. Buttles spent a number of years in close contact with Cummins Engines, both in their sales and service, and his addition to the factory staff of the Cummins Engine Co. makes it possible for much closer contact between the Cummins Engine users, the distributors, and the factory.

While in the Northwest recently he established C. M. Lovsted Co. as Industrial and Marine distributors for the Cummins line of engines, whose territory will also include Alaska.

●

Cletrac Changes Location

Cleveland Tractor Co. are now occupying their new building at 2660 Harrison St., San Francisco. This present sales and service headquarters was specially designed and built to allow better display of the new Cletrac models and provide complete storage space for parts.

●

Thew Appoints Distributors

The Thew Shovel Co. announces the appointment of A. H. Cox & Co., Seattle; Construction Equipment Co., Spokane; and Western Equipment Co., Boise, as exclusive distributors of Thew Shovels in Washington and Idaho. Each of these appointments is now in effect.

●

Toncan Stocks Enlarged

A complete stock of Toncan Sectional Plate Pipe and Arches is now being carried in the South San Francisco plant of Western Pipe & Steel Co. of California. A range of sizes and gauges to meet most any requirement is available for immediate delivery.

Sectional Plate Pipe is a comparatively new development and is notable for its solution to economical drainage problems in the form of large culverts or small bridges. The pipe is shipped knocked down, permitting low transportation costs and erection with common labor.

1	rem. exist. bulk. at Lakeside	150.00	$100	35.00	125.00	100.00
225	cu. yd. struc. exc. Class 3	2.20	2.11	2.20	2.25	1.50
220	cu. yd. exc. for appurtenances	2.20	2.11	2.18	2.25	1.50
115	cu. yd. concr. Class 1	20.00	19.50	22.60	20.35	15.00
40	cu. yd. concr. Class 2	20.00	19.50	22.05	20.35	14.00
260	bbls. cement in place	$2.75	$2.55	$2.60	$2.70	$2.70
1,000	lb. struc. stl. rim angles	.10	.12	.1725	.30	.09
17,000	lb. reinf. stl. in place	.06	.06	.06	.06	.06
175	lin. ft. 6" conc. dr. pipe	2.50	.43	.45	.446	1.00
200	lb. struc. steel covers	.30	.28	.55	.30	.25
3	manholes, direct into pipe	85.00	106.00	82.00	80.00	50.00
25	ft. drill. holes in concrete	2.00	1.60	1.84	1.65	1.00
220	cu. ft. conc. around small pipe	1.65	1.60	1.68	1.65	1.00
1	16" pressure reducer	$3,500	$3,326	$4,200	$3,600	$2,520
1	recording sta. for Venturi meter	200	169	178	180	100
1	28" inlet & outlet CI Vent. meter	3,000	2,625	3,400	2,194	1,800
1	1" corp. cock connection	25.00	5.00	29.00	42.00	10.00
3,500	lin. ft. creo. timb. piling	2.00	1.69	1.93	1.75	1.25
1	M ft. BM timb. pipe supports	175.00	158.00	168.00	175.00	100.00
1	M ft. BM timb. complete	175.00	158.00	168.00	175.00	100.00
200	cu. ft. conc. pavement	2.00	1.06	1.10	1.25	1.00
2	¾" press. taps with bronze valves	7.50	10.00	8.00	11.00	5.00

Water Supply Systems . . . . .

Los Angeles, Calif.—Iron Mountain Pumping Plant

Contract awarded to Wood & Bevanda, P. O. Box 49, Stockton, Calif., $498,789, Sched. No. 1, and $220,556, Sched. No. 2, by Metropolitan Water District, Los Angeles, for constructing the Iron Mountain pumping plant at 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. Bids form:

		SCHEDULE No. 1	SCHEDULE No. 2
(1)	Wood & Bevanda, Stockton	$498,789.25	$220,566.00
(2)	L. E. Dixon Co., Los Angeles	520,973.00	328,039.00
(3)	J. F. Shea Co., Parker Dam	591,449.30	277,429.50
(4)	Barrett & Hilp and Macco Const., Clearwater	604,850.80	337,149.00
(5)	Mittry Bros. Construction Co., Los Angeles	680,479.25	273,739.00
(6)	Winston Bros. and Wm. C. Crowell Co., L. A.	596,439.60	359,713.65
(7)	Hunkin-Conkey Const. Co., Cleveland, Ohio	677,791.22	370,821.35

SCHEDULE No. 1—Constructing the Iron Mountain pumping plant bldgs. and Appurt. works:

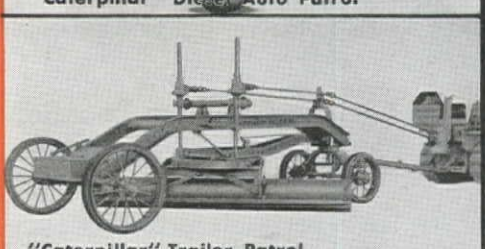
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
400	cu. yd. exc. strip. slopes	$1.50	$.50	$4.00	$1.20	$3.00	$2.37	$2.51
38,000	cu. yd. exc. earth for pump bldg.	.30	.53	.38	.60	.78	.58	.58
24,650	cu. yd.rock for pump bldg.	1.25	1.21	1.75	2.10	2.10	1.45	.80
6,000	cu. yd. exc. earth, switch house	.80	.50	.70	.75	.80	.85	.78
200	cu. yd. exc. rock, switch house	1.25	1.50	1.25	5.00	4.50	2.00	1.67
2,870	cu. yd. same, delivery pipes, etc.	.80	.52	.85	.90	.75	.80	1.63
2,400	cu. yd. same, delivery pipes, etc.	1.25	1.24	2.50	2.00	2.50	2.00	2.91
10	cu. yd. same, gate house, etc.	2.00	1.00	1.50	2.50	1.00	1.00	1.45
190	cu. yd. same, delv. pipe gate house	2.00	3.00	5.00	5.00	2.50	4.15	3.94
13,500	cu. yd. exc. earth 230-KV sw. rack	.30	.50	.30	.42	.65	.45	.47
200	cu. yd. exc. rock for same	1.25	1.25	3.75	5.00	2.50	2.00	1.12
900	cu. yd. exc. earth, drain ditches, etc.	.80	1.00	1.25	1.20	1.00	.75	2.61
100	cu. yd. exc. rock, same	1.25	3.00	3.75	5.00	3.50	2.00	4.46
28½	lin. ft. drill 24" plunger well	10.00	12.00	25.00	30.00	26.00	35.00	27.45
1,000	cu. yd. backf. not compacted	.20	.34	.37	.35	.20	.29	.33
27,200	cu. yd. backf. compact. all struc.	.30	.38	.50	.60	.50	.37	.52
424	cu. yd. rock fill, transf. found.	2.00	2.00	3.00	2.50	2.50	2.00	2.50
162,000	sta. yd. earthwork overhaul	.01	.01	.01	.01	.02	.02	.013
950	lin. ft. install anchor bars	1.00	.85	1.00	1.50	.90	.60	.96
400	lin. ft. drill grout holes	1.00	1.00	1.25	1.25	1.10	1.00	1.16
500	cu. ft. pressure grouting	1.00	1.50	2.25	2.00	2.50	2.00	2.68
7,010	cu. yd. conc. in substruct.	10.00	11.23	14.00	12.00	16.50	14.66	19.17
1,050	cu. yd. conc. 230-KV switch rack	15.00	16.00	17.00	18.50	20.00	21.00	22.80
2,340	cu. yd. conc. delivery pipe sup.	5.00	8.40	10.00	9.50	13.00	10.60	13.63
110	cu. yd. conc. deliv. pipe gate house	11.00	14.55	15.00	19.50	22.00	15.35	27.50
422	cu. yd. conc. elec. cond. env.	10.00	10.03	16.00	17.00	12.00	15.45	14.00
655,000	lb. fab. & pl. reinf. steel, pump house	.015	.0125	.014	.012	.02	.028	.02
90,000	lb. same, switch rack house, etc.	.015	.0125	.014	.014	.02	.028	.02
93,400	lb. same, delv. pipe supports	.015	.0125	.014	.014	.02	.028	.02
59,500	lb. same, pipe gate house	.015	.0125	.014	.014	.02	.028	.02
5,800	lb. same, elec. cond. envelopes	.015	.0125	.014	.014	.02	.028	.02
1,900	lb. galv. anchor bolts in conc. ste.	.20	.16	.20	.30	.18	.18	.20
5,200	lb. ungalvanized anchor bolts	.12	.12	.18	.25	.10	.12	.16
24,600	lb. track rails & accessories	.05	.07	.07	.095	.10	.08	.08
495	lin. ft. trac, incl. RR.	4.00	4.50	5.00	5.00	5.00	4.30	4.50
288,200	lb. glv. structural steel	.09	.10	.125	.105	.12	.11	.11
20,000	lb. miscell. iron and steel	.12	.10	.115	.11	.15	.12	.10
10,000	lb. misc. iron & steel, galv.	.10	.12	.12	.11	.18	.12	.11
880	lb. stair treads & plates	$.15	$.20	$.25	$.20	$.20	$.18	$.15
400	lb. black pipe railing	.30	.20	.23	.25	.25	.25	.20
3,000	lb. galv. pipe railing	.25	.20	.25	.22	.30	.28	.25
597,000	lb. steel delivery pipes	.115	.1225	.125	.11	.105	.12	.12
253,000	lb. inlet manifold, etc.	.125	.13	.125	.12	.11	.13	.13
15,700	lb. cast stl. & std. pipe sleeves	.18	.17	.14	.16	.20	.17	.20
114,000	lb. CIP fittings, etc.	.135	.105	.11	.10	.12	.13	.13
L. S.	hot & cold water piping	$800	$2,280	$900	$2,000	$1,500	$795	$2,500
L. S.	metal toilet partitions	100	208	300	100	200	82	300
71	sq. ft. metal clad swing doors	3.00	2.75	4.00	4.00	5.00	2.90	2.90
L. S.	ventilating duct work	200	300	500	400	550	113	134
L. S.	metal louvers, steel sash	600	51	300	100	150	206	200
34	sq. yd. const. thin partitions	3.00	3.50	4.00	3.00	3.00	2.50	2.46
L. S.	transite panels & barriers	1,700	938	1,500	1,600	800	1,207	1,400
42,700	lb. metal condut, 1¼"	.15	.125	.18	.15	.14	.13	.15
66,700	lb. same, 1½"	.15	.125	.17	.15	.14	.13	.15
450	lin. ft. 1" fibre conduit	.30	.24	.30	.40	.35	.28	.29
59,500	lin. ft. 2½" same	.18	.1525	.21	.19	.18	.16	.18
150	lin. ft. 3" same	.30	.21	.32	.30	.25	.23	.25
2,000	lin. ft. 4" same	.25	.215	.33	.40	.35	.23	.25
700	lb. copper sleeves, bars, etc.	.60	.50	.70	.60	.55	.54	.56
650	lbs. fab. metal boxes	.60	.50	.70	.50	.55	.54	.56
775	lb. same, boxes 10 to 25#	.45	.38	.40	.40	.45	.40	.45
1,250	lb. same, boxes 25 to 40#	.45	.36	.40	.40	.40	.39	.44
200	lb. same, boxes 40 to 60#	.40	.33	.35	.35	.36	.35	.39
3,000	lb. boxes over 60#	.32	.26	.35	.30	.25	.28	.31
300	lb. small cast metal boxes	.40	.33	.65	.85	.45	.35	.40

FIRST!

IN DEPENDABILITY AND PERFORMANCE

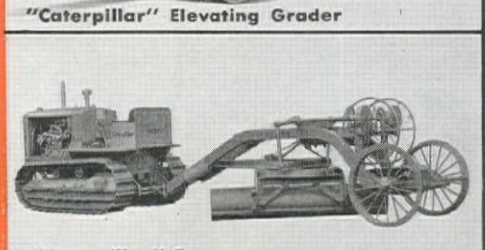
Caterpillar" Road Machinery is built to team with Caterpillar" Tractors. Built to stand the gaff of long ours and heavy work. In the factory, "Caterpillar" Road achinery is built with the same precision methods as e tractor. And when it goes to work on the roads, it FIRST in dependability—FIRST in performance—FIRST a profitable investment. Don't fail to get the road achinery SHOW-DOWN from a "Caterpillar" dealer. terpillar Tractor Co., Peoria, Illinois, U. S. A.

"Caterpillar" Diesel Auto Patrol

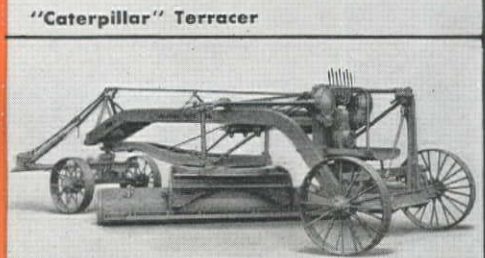


"Caterpillar" Trailer Patrol

"Caterpillar" Elevating Grader



"Caterpillar" Terracer

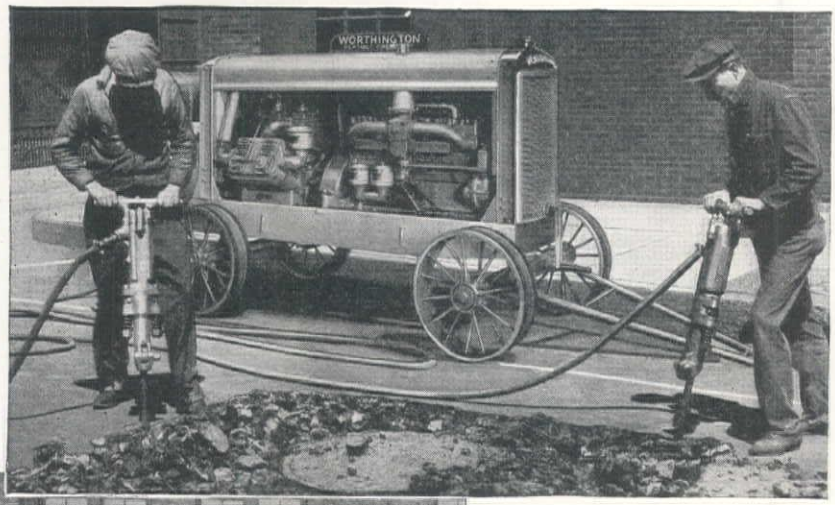


"Caterpillar" Blade Grader

CATERPILLAR

REG. U. S. PAT. OFF.

KEEP THE JOB MOVING with



WORTHINGTON PORTABLE COMPRESSORS and CONTRACTORS TOOLS

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

No. 36 Rock Hammer

No. 10 Pavement Breaker

No. 9 Clay Digger

No. 8 Backfill Tamper

- *Descriptive Literature on request*

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

THE WORTHINGTON COMPANY, Incorporated
SEATTLE SAN FRANCISCO LOS ANGELES

WORTHINGTON

When writing to WORTHINGTON PUMP & MACHINERY CO., *please mention Western Construction News*

New Machinery House

Machinery & Drill Steel Co., Inc., has recently organized to serve the construction industry. Their address is 1162 Bryant Street, San Francisco. C. Henry, manager, reports that their business is primarily renting air compressors and

●

Chain Belt Has New Building

Chain Belt Co., early this month, moved from their 909 Harrison St. address to their new building at 366 Brannan St., San Francisco. Improved storage and shipping facilities are provided for the Rex line of concrete handling and mixing equipment. William F. Nichols, Pacific Coast Manager, is in charge of this office.

●

Rubber House Expands

Hercules Equipment and Rubber Co. have moved to a new, modern building at 550 Third St., San Francisco. This is the third time in seven years that it has been necessary to enlarge their facilities to handle expanding business, under the direction of its founder, Monroe Paulsen. The Hercules institution is a distributor of B. F. Goodrich Company's line of mechanical rubber goods.

●

News of Rocky Mountain Distributors

Burt Johnson has been appointed salesman for the H. W. Moore Equipment Co. of Denver, to handle the Eastern Colorado teritory. L. Morrisson, Wyoming representative, had also been handling the eastern Colorado sector. Johnson was formerly with Moore up to about two years ago.

●

The Liberty Truck and Parts Co. of Denver has recently taken on Colorado distributorship of the American Hoist and Derrick Products Co. The firm is featuring the American Gopher shovel.

●

The McKelvey Machinery Co., 754 South Broadway, Denver, has recently taken over the Adams Grader Line.

●

Ray Corson, prominent Denver equipment dealer, has recently become distributor for the Hercules line. Also, the Viber and Bailey lines of concrete vibrators.

●

The Wilson Machinery Co. of Denver has moved from its long-time location at 1936 Market Street to 2811 Walnut.

●

Denver Firm Holds Equipment Show

More than 1,200 people attended the equipment show of Clinton and Held, Denver Caterpillar distributors, late in January. One of the unique features of the event was an operation display in a huge carnival tent behind the company building. It was illuminated by 125 one hundred watt lamps, the power for which was furnished by a displayed generator. Coke burning in steel drums furnished heat. Cutout models of all the latest Caterpillar diesels and other equipment were shown. Each day 28,000 feet of sound film showing equipment in action were shown.

90 lb. small metal boxes	.30	.25	.70	.80	.55	.28	.30
L. S. pump bldg. superstr., etc.	62,000	56,695	51,000	63,648	74,290	54,380	69,737
L. S. control house superstructure	22,000	17,232	18,000	25,000	21,905	18,013	23,488
L. S. switch house superstructure	10,000	11,707	14,000	25,000	24,200	12,114	21,852
L. S. generator & compressor house	2,000	1,786	3,000	2,100	3,970	1,912	2,844
L. S. concrete water tanks	7,500	8,473	1,500	8,500	18,700	14,118	15,787
L. S. wood deck & roof over pump bldg.	1,500	1,540	1,000	1,600	2,100	1,436	4,167
7,800 ton mi. hauling steel	.08	.11	.15	.10	.15	.16	.10
70,000 ton. mi. hauling cement	.08	.08	.10	.07	.06	.07	.07
Overhaul conc. aggr. fixed at, per cu. yd. mi.	.10	.10	.10	.10	.10	.10	.10

SCHEDULE No. 2—Constructing the Iron Mountain reservoir and appurtenant works:

5,500 cu. yd. exc. all classes, wasteway	.30	.33	.30	.45	.30	.39	.40
27,000 cu. yd. exc. for sand trap	.30	.36	.55	.75	.37	.58	.65
200,000 cu. yd. exc. for reservoir, etc.	.28	.335	.28	.45	.25	.41	.32
11,300 cu. yd. exc. for box siphon	.28	.28	.45	.45	.25	.35	.45
17,000 cu. yd. earth exc. intake siphons	.28	.53	.35	.75	.27	.54	.53
8,500 cu. yd. exc. rock, same	1.25	1.21	1.75	2.50	2.00	1.66	1.16
21,700 cu. yd. compact reserv. embankm.	.25	3.45	.10	.18	.12	.15	.15
250 cu. yd. compact canal embankm.	.50	.50	.50	.18	.20	.25	.23
23,000 cu. yd. backf. not compacted	.10	.16	.35	.30	.25	.18	.15
50 cu. yd. backf. compact. struc.	.50	.50	1.25	1.00	.50	.72	.80
500 sta. yd. earthwork overh.	.01	.05	.01	.03	.05	.03	.03
48,900 sq. yd. asph. lining for reserv.	.08	.20	.27	.30	.10	.19	.65
390 cu. yd. concr. in wasteway	10.00	15.78	25.00	22.00	18.00	26.11	26.33
2,800 cu. yd. concr. in sand trap	14.50	13.46	12.00	18.50	18.00	22.15	25.26
1,800 cu. yd. conc. in canal spillw.	6.50	9.96	9.50	10.00	14.00	16.30	15.42
350 cu. yd. conc. siphon spillway	13.00	12.20	19.00	17.00	20.00	19.75	20.27
1,545 cu. yd. conc. box siphon	9.00	11.87	16.00	9.00	10.00	16.95	17.25
740 cu. yd. conc. 16' intake siphon	13.50	13.88	14.00	22.00	15.00	18.95	19.51
350 cu. yd. conc. 5' 6" same	14.00	26.20	20.00	20.00	15.00	25.50	45.88
54,000 lb. fab. & pl. reinf. steel	.01	.01	.014	.014	.02	.028	.02
315,000 lb. reinf. steel, sand trap	$.01	$.01	$.014	$.01	$.02	$.028	$.02
180,000 lb. same, canal, spillway, etc.	.01	.01	.014	.01	.02	.028	.02
45,000 lb. reinf. steel in siphon	.01	.01	.014	.014	.02	.028	.02
366,000 lb. fab. & pl. reinf. stl. box sip.	.01	.01	.014	.01	.02	.028	.02
100,000 lb. reinf. stl. 16' intake siphon	.01	.01	.014	.012	.02	.028	.03
56,000 lb. reinf. stl. 5' 6" same	.01	.01	.014	.012	.02	.028	.03
60,000 lb. trash rack metal work	.08	.08	.10	.085	.12	.08	.094
125,000 lb. sand trap metal work	.12	.115	.15	.14	.15	.14	.143
1,000 lb. misc. iron & steel	.20	.10	.25	.17	.20	.21	.15
12,500 lb. miscell. metal work	.02	.04	.06	.02	.08	.05	.05
9,000 ton mi. hauling steel	.08	.11	.15	.10	.15	.16	.10
35,000 ton. mi. hauling cement	.08	.08	.10	.07	.06	.07	.07
Overhaul conc. aggr. fixed at, per cu. yd.	.10	.10	.10	.10	.10	.10	.10

Sewer Construction . . . . . .

El Centro, Calif.—City—Outfall Sewer

A & B Construction Co., 912 Atlantic Blvd., Hynes, $249,297 low to City Council, El Centro, for construction of an outfall sewer and pumping plant. Bids from:

(1) A & B Construction Co. $249,297
(2) Gogo & Rados and J. L. Cooley 265,939
(3) Marko Matich and VCK Const. 272,669
(4) Frank Doran, San Diego 285,022
(5) Daley Corp., San Diego $289,921
(6) Drainage Const. Co. 293,294
(7) J. C. Hickey, Alhambra 296,445

Bids on:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
14,000 ft. 27" VCP, extra strength	5.70	6.14	6.33	6.50	7.10	7.30	7.00
21,000 ft. 27" VCP, std. strength	5.40	5.75	5.92	6.00	5.80	6.20	6.00
3,970 ft. 15" VCP, std. strength	2.25	2.00	2.67	3.50	2.75	3.00	2.80
570 ft. 18" cast iron pipe	8.00	5.00	8.50	6.50	10.00	7.20	5.50
2,855 ft. 4" cast iron pipe	1.00	.90	1.00	1.50	1.25	1.10	1.38
59 ea. manholes, 6' dia.	115.00	140.00	140.00	200.00	195.00	215.00	225.00
13 ea. manholes, 5' dia.	105.00	130.00	80.00	130.00	115.00	115.00	120.00
11 ea. manholes, 4½' dia.	100.00	120.00	80.00	150.00	185.00	110.00	120.00
Lump sum pumping plant	$26,500	$30,000	$29,700	$28,000	$30,000	$23,000	$34,500
Lump sum fence pumping plant	500.00	$1,000	570.00	$1,000	500.00	850.00	600.00
Lump sum signal system	$3,500	$3,600	980.00	$2,000	$3,000	$2,600	$3,000

Street and Road Work . . . . . .

Los Angeles, Calif.—State—Grading and Surfacing—Los Angeles and Orange Counties

Contract awarded to R. E. Campbell, Central Bldg., Los Angeles, $332,995 to Calif. Div. of Highways, State Bldg., Los Angeles, for 2.6 mi. grading and select base material surfacing between Luitwieler Ave. and La Mirada Ave., LOS ANGELES and ORANGE COS. Bids from:

(1) R. E. Campbell, Los Angeles $332,995
(2) J. E. Haddock, Pasadena 33,199
(3) Oswald Bros., Los Angeles $335,561
(4) Basich Bros., Torrance 359,968

Bids received on:	(1)	(2)	(3)	(4)
135 stations clearing and grubbing	$20.00	$24.00	$12.50	$200.00
2,300 m gals. water	1.50	2.00	4.00	7.00
140,500 cu. yd. roadway excavation	2.02	2.00	2.10	1.79
1,800 cu. yd. structure excavation	2.00	2.40	1.25	4.00
550 cu. yd. ditch and chann. excav.	2.00	2.40	1.25	1.25
250,000 sta. yd. overhaul	.005	.02	.01	.003
135 sta. finish roadway	10.00	24.00	7.50	20.00
13,500 tons select material	1.60	1.35	1.00	3.00
240 cu. yd. "A" concrete struc.	20.00	19.00	20.00	25.00
50 cu. yd. "B" concrete struc.	18.00	18.00	18.00	19.00
44,000 lb. reinforcing steel	.05	.05	.055	.06
20 M ft. BM redwood timber dense	115.00	105.00	100.00	120.00
15 M ft. BM redwood timber select	105.00	100.00	100.00	120.00
30 tons rock	2.00	3.80	2.00	3.00
340 ft. 8" corr. metal pipe	1.00	.90	1.00	1.50
280 ft. 18" corr. metal pipe	2.00	1.60	1.75	2.50
680 ft. 24" corr. metal pipe	3.00	2.50	2.75	3.50
170 ft. 54" corr. metal pipe, 8 ga.	10.00	11.00	11.00	6.00
14 each spillway assemblies	15.00	14.00	16.00	14.00

Dam Construction . . . . . .

Boise, Idaho—Government—Raise Arrowrock Dam—Boise Project

Contract awarded to T. E. Connolly, Inc., 461 Market St., San Francisco, $395,040, by Bureau of Reclamation, c/o Boise Project Board of Control, Boise, Ida., for raising the Arrowrock Dam, Boise Project, Idaho, under Spec. 661. Bids from:

(1) T. E. Connolly, Inc., S. F. $395,040
(2) Utah Const. & Morison-Knudsen 519,352
(3) Case Const. Co., Inc., Alhambra $542,738
(4) Colonial Const. Co., Spokane 576,222

		(1)	(2)	(3)	(4)
18,000	cu. yd. common exc. (downstream toe)	.36	.50	1.30	1.00
100	cu. yd. rock excav. (downstream toe)	2.00	10.00	8.00	5.00
12,000	cu. yd. common exc. (river channel)	.40	.50	.55	.30
1,000	cu. yd. rock excav. (river channel)	2.00	1.80	3.60	5.00
3,000	cu. yd. excavation (diversion tunnel)	5.00	1.50	3.25	1.00
1,350	cu. yd. excavation (incline diversion tunnel)	18.00	20.00	10.00	15.00
500	cu. yd. excavation of old concrete	8.00	18.00	14.00	10.00
33,000	sq. yd. chip & roughen old concrete surfaces not more than 3" deep	1.20	2.50	1.95	2.00
4,000	sq. yd. chip and roughen old concrete surfaces 3" to 12" deep	2.00	3.00	4.50	5.00
4,500	cu. yd. backfill	.30	.40	.30	.50
10	MFBM remove old timber in diversion tunnel	20.00	40.00	50.00	50.00
10	MFBM install perm. timber in tunnel	70.00	100.00	85.00	100.00
42	lin. ft. drill holes for anchor bars and grouting bars	.50	.50	.75	1.50
13,000	cu. yd. concrete in slab on downstream face of dam	10.70	13.50	16.85	15.00
3,600	cu. yd. concrete on crest of dam	8.00	10.00	9.60	15.00
500	cu. yd. concrete (curbs and parapets)	17.00	22.50	32.00	15.00
240	cu. yd. concrete (tunnel lining)	25.00	20.00	10.35	15.00
50	cu. yd. concrete (pipe anchors)	18.00	15.00	10.35	15.00
800	cu. yd. concrete (spillway crest)	15.00	20.00	20.00	15.00
150	cu. yd. concrete (spillway piers)	25.00	30.00	40.00	15.00
1,100	cu. yd. concrete (floor of spillway channel)	8.00	15.00	10.40	15.00
250	cu. yd. concrete (sidewalks of spillw. chan.)	12.00	25.00	22.70	15.00
16,000	cu. ft. gunite	1.10	1.80	1.10	1.50
675,000	lb. place reinforcing steel	.02	.02	.012	.03
52,000	lb. place and anchor gunite reinf. fabric	.03	.04	.03	.05
1,200	lin. ft. install metal sealing strips	.50	.60	.50	.50
800	sq. yd. special finish of concr. surfaces	.70	1.50	.75	1.50
16,000	lin. ft. manufacture and place porous concrete drain tile	.40	.50	.22	.45
275	lin. ft. drill drainage holes	2.00	.50	2.50	1.50
L. S.	dismantle, recondition, install and paint drum gates, hinges and sills	$5,000	$4,500	$5,800	$5,000
L. S.	dismantle counterweights, sheaves and supports	$1,000	450.00	$2,100	500.00
44,000	lb. install 24" needle valve, etc.	.03	.05	.03	.05
L. S.	dismantle valves, etc.	600.00	200.00	625.00	100.00
L. S.	dismantle hatchway covers	500.00	$1,000	775.00	500.00
36	ea. dismantle metal lamp posts	20.00	20.00	15.40	10.00
L. S.	dismantle and install handrail	300.00	475.00	650.00	400.00
28,000	lb. install penstock outlet pipe	.03	.03	.03	.05
2,000	lb. install, steel outlet pipe anchors	.05	.04	.03	.05
22,000	lb. install steel stairways	.03	.10	.06	.10
60,000	lb. install miscellaneous metalwork	.05	.05	.04	.03
3,500	lin. ft. install elec. conduits	.50	.20	.20	.50

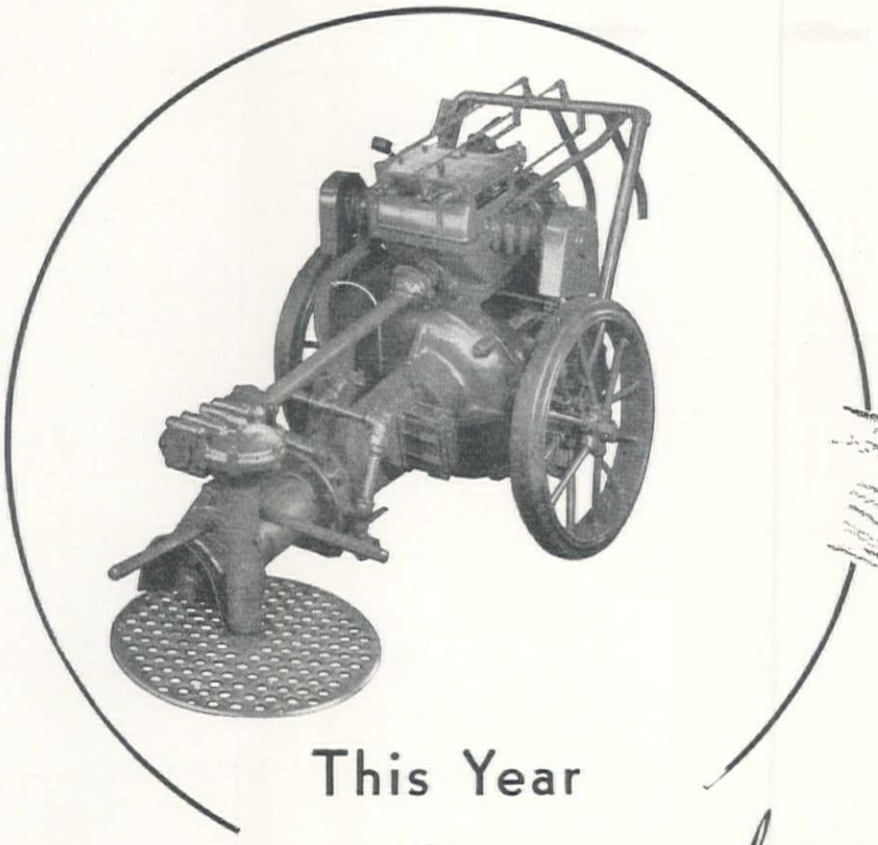
Street and Road Work . . . . .

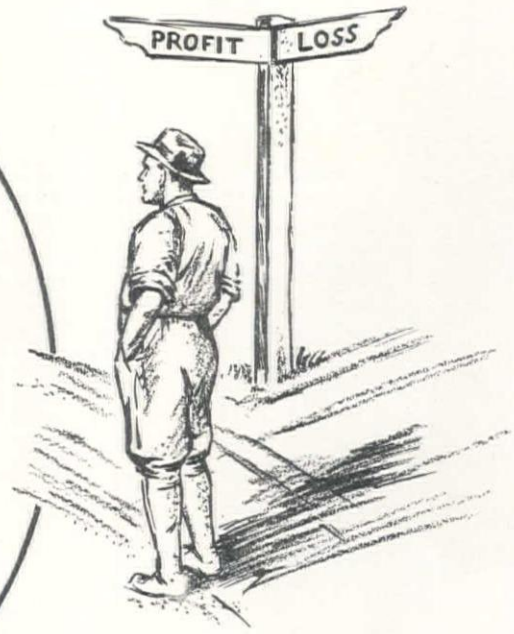
Sacramento, Calif.—State—Grading and Surfacing—San Luis Obispo County

Contract awarded to A. Teichert & Son, Inc., P. O. Box 1113, Sacramento, $117,031, by Calif. Div. of Highways, Sacramento, for 6.6 mi. grad. and cr. run base and rd. mix surf. betw. 1 mi. E. of Cholame and Kern County line in SAN LUIS OBISPO COUNTY, Calif. Bids from:

(1) A. Teichert & Sons, Inc. $177,031
(2) Granfield, Farrar & Carlin, S. F. 202,749
(3) Peninsula Paving Co., S. F. 206,132
(4) Union Paving Co., S. F. $206,910
(5) George Pollock Co., Sacramento 237,364
(6) Basich Bros., Torrance 239,184

		(1)	(2)	(3)	(4)	(5)	(6)
580	M gallons water	2.50	2.00	2.00	1.00	3.50	3.00
4,375	cu. yd. struc. excavation	1.00	1.50	1.00	1.50	1.00	1.00
995,000	sta. yd. overhaul	.003	.005	.005	.06	.01	.008
4,375	cu. yd. struc. excavation	1.00	1.00	.60	.60	1.00	.60
4,375	cu. yd. ditch and chann. excavation	.40	1.00	.60	.60	1.00	.60
351	sta. finish roadway	5.00	10.00	5.00	8.00	10.00	8.00
9,560	cu. yd. crusher run base	1.40	1.85	2.00	1.40	2.05	2.50
9,965	cu. yd. min. aggreg. (road mix)	1.60	1.75	2.25	1.80	2.35	2.75
80	tons liq. asph. SC-2 (prime coat)	10.50	11.00	17.00	15.00	10.00	12.00
843	tons liq. asph. SC-2 (road mix)	10.50	11.00	17.00	15.00	10.00	10.00
80	tons liq. asph. 90-95 (seal coat)	16.00	16.00	25.00	20.00	15.00	18.00
985	tons screenings (seal coat)	5.00	5.00	4.00	4.00	2.35	2.50
25	cu. yd. "A" concr. (culv. paving)	16.00	30.00	25.00	20.00	13.10	25.00
215	cu. yd. rubble masonry	16.00	15.00	17.00	16.00	11.00	15.00
925	sq. yd. pav. gutters and inlet apron	.50	2.00	1.00	2.00	.50	1.00
580	ft. 8" corr. metal pipe	1.00	1.00	1.00	1.40	.95	1.20
2,462	ft. 18" corr. metal pipe	1.75	1.75	1.75	2.50	1.50	1.90
572	ft. 24" corr. metal pipe	3.00	2.60	2.75	3.50	2.20	2.75
352	ft. 30" corr. metal pipe	3.50	3.20	3.25	4.00	2.75	3.10
618	ft. 36" corr. metal pipe	5.00	4.85	5.00	6.00	4.10	5.00
494	ft. 36" corr. metal pipe, 10 gauge	6.00	5.75	6.00	9.00	4.75	6.00
230	ft. 48" corr. metal pipe	7.50	6.55	7.50	9.00	5.70	7.00
340	ft. 48" corr. metal pipe, 8 gauge	11.00	9.35	10.00	12.50	8.00	10.50
200	ft. 90" multi plate corr. metal pipe	20.00	15.50	16.00	24.00	14.10	19.00
60	ft. 135" multi plate corr. metal pipe	50.00	40.45	40.00	60.00	36.50	51.00
32	spillway assemblies	15.00	20.00	15.00	15.00	12.00	13.00
5,215	ft. laminated guardrailing	1.00	1.00	1.00	1.00	1.00	1.40
370	guideposts	2.00	2.00	2.00	3.00	2.00	2.00
152	culvert markers	2.50	2.00	2.25	2.00	2.00	2.00
13.3	mi. new fence	$425	$600	$500	$400	$500	$650
26	drive gates	20.00	15.00	20.00	15.00	22.00	15.00
123	monuments	3.00	3.00	3.00	3.00	4.00	4.00





This Year adopt *proved* and *efficient* equipment...

DON'T hesitate at the crossroad to better and more efficient equipment . . . . begin the year right by purchasing a Fuller-Kinyon Portable Pump for unloading and transporting your bulk cement shipments . . . a machine that has been proved efficient, capable of duty, on hundreds of jobs during the past six years. It has meant, to many contractors, the difference between profit and loss.

Equipped with such a machine you are enabled to bid and compete on many projects where only a conveying system such as the Fuller-Kinyon Pump is capable of performing the duties required. Also, this machine need not be discarded upon completion of a job, but can very readily be transported and put to work on another project.

The utility and performance of the Fuller-Kinyon Portable Pump warrants your investigation at once.

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

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

P-3

FULLER-KINYON, FLUXO, AND AIRVEYOR CONVEYING SYSTEMS · · · · ROTARY FEEDERS AND DISCHARGE GATES
ROTARY AIR COMPRESSORS AND VACUUM PUMPS · · · AUTOMATIC BATCH WEIGHERS · · · BIN SIGNALS

Sacramento, Calif.—State—Grading, Surfacing, and Bridge—Stanislaus County

Contract awarded to Pacific Bridge Co., 1114 Balfour Bldg., S. F., $162,973, by Calif. Div. of Highways, Sacramento, for 3.1 mi. grad. and rd. mix. surf. tr. applied and const. bridge betw. River Road and 2 mi. W. of Gates Road, SAN JOAQUIN COUNTY, CALIF. Bids from:

(A) Pacific Bridge Co., S. F. $162,973
(B) N. M. Ball Sons, Berkeley 168,519
(C) Paul J. Tyler and Lord & Bishop $183,556
(D) C. W. Caletti, San Rafael 187,867

		(A)	(B)	(C)	(D)
1,150	M gallons water	1.50	1.00	1.50	1.00
9,000	cu. yd. roadway excavation	.65	.30	.30	.50
499	cu. yd. ditch & channel excavation	1.00	1.00	1.20	1.00
56,000	cu. yd. imported borrow	.50	.43	.60	.55
1,920	cu. yd. struc. excavation	4.00	6.00	6.00	4.00
90	sta. prepare existing roadway	10.00	8.00	15.00	10.00
146	sta. finish roadway	10.00	5.00	10.00	6.00
34	tons liq. asph. SC-2 (prime coat)	20.00	13.00	20.00	17.50
404	tons liq. asph. SC-4	20.00	14.00	20.00	17.50
32,700	sq. yd. prep. mix & shape roadbed	.06	.045	.08	.12
560	cu. yd. "A" concrete (pavement)	10.00	11.00	12.50	14.50
660	cu. yd. "A" concrete (structures)	18.00	21.00	20.00	20.00
270	cu. yd. "A" concrete (footing blocks)	9.00	21.00	15.00	14.00
172,000	lb. bar reinforcing steel	.04	.045	.044	.05
342,000	lb. structural steel	.06	.07	.068	.075
4,160	lb. cast steel	.15	.15	.15	.20
360	MFBM tr. Douglas Fir timber	85.00	85.00	90.00	95.00
26	MFBM redwood timber (dense)	90.00	100.00	100.00	140.00
3,044	ft. furn. untr. D. F. piles & test piles	.25	.30	.30	.30
23,000	ft. furn. tr. D. F. piles & test piles	.60	.60	.65	.70
445	ea. drive D. F. piles & test piles	12.50	18.00	12.00	20.00
40	ft. 18" corr. metal pipe	2.00	2.00	1.50	3.00
82	ft. 24" corr. metal pipe	3.00	2.75	2.50	3.50
370	ft. 36" corr. metal pipe (siphon)	6.00	6.00	7.00	7.50
24	ea. concrete joints (pipe siphons)	5.00	25.00	25.00	20.00
104	ea. guideposts	2.00	2.50	2.50	2.00
2.1	mi. new property fence	600.00	500.00	450.00	400.00
4	ea. drive gates	20.00	18.00	15.00	15.00
42	ea. monuments	3.00	3.00	2.50	4.00
1	lot miscell. work	800.00	$1,000	$2,500	$1,000

Phoenix, Ariz.—State—Grading, etc.—Navajo County

H. J. Hagen, Globe, Arizona, $174,486, and ALT. $173,345, low, to Arizona State Highway Comm., Phoenix, for 3.2 mi. grading and draining on the Globe-Springerville Highway beginning 3.8 mi. N. E. of the Gila Navajo County line in NAVAJO COUNTY, FA 105-D. Bids from:

			ALT.
(1)	H. J. Hagen, Globe	$174,486	$173,345
(2)	Packard Contr. Co., Phoenix	184,961	183,861
(3)	Lee Moor Contr. Co., El Paso	187,671	188,664
(4)	Geo. W. Orr, El Paso	$197,336	$197,084
(5)	O. F. Fisher, Phoenix	218,309	214,852

		(1)	(2)	(3)	(4)	(5)
137,479	cu. yd. roadway excav. uncl.	$.80	$.80	$.85	$1.00	$1.05
2,337	cu. yd. drain. excav. uncl.	.40	.75	.75	.50	1.50
13,708	cu. yd. slides and overbreakage	.60	.60	.6375	.75	.7875
1,454	cu. yd. struc. exc. uncl.	1.50	2.50	1.50	1.05	1.50
150,409	sta. yd. earthwork overhaul	.03	.05	.04	.03	.02
22,326	cu. yd. imported borrow	.35	.20	.18	.18	.35
5,817	cu. yd. mi. import. borrow haul	.50	.40	.50	.30	.50
502	cu. yd. "A" conc. incl. cement	30.00	30.00	25.00	27.00	35.00
55,439	lbs. reinf. steel	.065	.06	.06	.055	.075
6	each grating for drip inlet headw.	14.00	15.00	16.00	15.00	25.00
98	cu. yd. cement rubble masonry	17.00	20.00	18.00	17.00	20.00
636	lin. ft. 24" corr. metal pipe	2.50	3.00	3.00	2.75	3.50
396	lin. ft. 30" corr. metal pipe	3.50	4.00	3.50	3.50	4.25
180	lin. ft. 48" corr. metal pipe	9.00	8.00	8.25	8.00	11.00
6,330	lin. ft. road guard	1.00	1.25	1.10	.85	.90
3,473	lin. ft. crown ditches	.10	.25	.10	.10	.15
31,670	lin. ft. standard line fence	.07	.10	.10	.07	.15
6	each std. line fence gates	10.00	25.00	3.50	10.00	10.00
44	each guide posts	2.50	3.00	2.00	1.50	2.00
40	each right-of-way markers	3.00	3.00	3.00	3.00	2.50
1,867	cu. yd. hand laid rock embankm.	2.00	5.00	6.50	2.50	1.50
	ALTERNATE, using double 165" multiplate pipe in lieu of concrete arch:					
1,224	cu. yd. struc. excav. uncl.	1.50	2.50	1.50	1.50	1.50
52	cu. yd. "A" concrete	30.00	35.00	25.00	30.00	25.00
180	lin. ft. 165" multiple pipe	60.00	60.00	56.00	56.00	60.60
5,439	lbs. reinforcing steel	.075	.08	08	.065	.075
398	cu. yd. cement rubble masonry	17.00	17.00	18.00	16.00	20.00

Los Angeles, Calif.—State—Grading and Surfacing—San Diego County

Basich Bros., 20550 N. Normandie Ave., Torrance, $297,396, low, to Calif. Division of Highways, Los Angeles, for 3.3 mi. grading on Palomar Mt. Road between Iron Springs Creek and the Observatory site, SAN DIEGO COUNTY. Bids from:

(1) Basich Bros., Torrance $297,396
(2) C. W. Caletti & Co., San Rafael 298,233
(3) Daley Corp., San Diego 313,133
(4) Shofner & Gordon 316,116
(5) J. E. Haddock, Ltd., Pasadena $323,601
(6) Granfield, Farar & Carlin 324,898
(7) Oswald Bros. 325,745
(8) V. R. Dennis, San Diego 363,555

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
173	sta. clearing & grubbing	$250	$250	$290	$500	$340	$800	$300	$250
500	M gals. water	3.00	4.00	3.00	3.00	3.00	2.50	2.90	4.00
138,500	cu. yd. roadw. excav.	1.46	1.50	1.50	1.40	1.55	1.00	1.65	1.85
132,500	sta. yd. overhaul	.01	.02	.02	.01	.02	.01	.08	.02
1,650	cu. yd. struc. excav.	2.20	2.50	4.00	2.50	3.00	2.50	3.00	4.00
10,000	cu. yd. imp. sel. matl.	2.20	2.00	2.25	.50	2.10	2.00	2.00	2.00
173	sta. finish roadway	$15	$20	$5	$20	$20	$15	5.00	$40
1,486	lin. ft. 18" corr. met. pipe	2.60	3.00	3.00	3.00	3.00	2.50	2.80	3.00
512	lin. ft. 24" corr. met. pipe	4.50	3.00	5.00	4.00	3.00	4.00	4.00	5.00
116	lin. ft. 30" corr. met. pipe	5.50	6.00	7.00	5.00	4.00	5.00	5.00	8.00
370	lin. ft. 36" corr. met. pipe	7.90	6.00	9.00	6.00	5.00	8.00	7.00	$12
128	lin. ft. 48" corr. met. pipe	11.60	9.00	$13	8.00	8.00	$12	$10	$15
68	ft. 8" perf. met. pipe underdr.	1.85	2.00	3.00	2.00	2.50	1.75	2.75	3.00
120	ft. 75" multi-plate C. M. P.	$28	$20	$30	$30	$20	$30	$26	$50
60	cu. yd. rubble masonry	$15	$20	$30	$50	$24	$15	$21	$35
0.3	mi. remove fences	$125	$500	$150	$300	$400	$150	$300	$500
1,050	ea. border stones	5.00	1.00	2.50	3.00	4.00	3.00	1.60	3.00

Griffith Company, long-time LeTOURNEAU fleet user, working a Bulldozer on the Metropolitan Aqueduct in Southern California.

PROOF...

OF PROFITABLE OPERATION ... LE TOURNEAU FLEET USERS

The best testimonial, we believe, to the profitable earthmoving of LeTOURNEAU equipment is the fact that so many successful contractors are LeTOURNEAU fleet users. More than 100 now operate three or more LeTOURNEAU units—and they all started with one on trial. Here are a few of our 11 western states users:

Theodore Arenz	Portland, Ore.
Guy F. Atkinson	San Francisco, Calif.
Basich Bros. Construction Co.	Torrance, Calif.
Bechtel-Kaiser Co., Ltd.	San Francisco, Calif.
Blanchard Bros.	Rawlins, Wyo.
W. E. Callahan Construction Co.	Yuma, Ariz.
Clifton-Applegate	Priest River, Idaho
L. Coluccio & Co.	Seattle, Wash.
Crow Bros.	Los Angeles, Calif.
Dunn & Baker	Klamath Falls, Ore.
Frederickson & Watson	Oakland, Calif.
Granfield, Farrar & Carlin	San Francisco, Calif.
Isbell Construction Co.	Reno, Nev.
Kern & Kibbe	Portland, Ore.
Lewis County	Washington
Macco Construction Co.	Los Angeles, Calif.
Peninsula Paving Co.	San Francisco, Calif.
Red River Lumber Co.	Westwood, Calif.
Santa Cruz County	California
Six Companies, Inc.	Boulder City, Nev.
A. Teichert & Sons	Sacramento, Calif.
Utah Construction Co.	San Francisco, Calif.

The experience of these users proves that LeTOURNEAU equipment moves more yardage quicker and at less cost. Talk to them; they are our best salesmen. Visit their jobs; see for yourself what LeTOURNEAU equipment is doing.

R. G. LeTOURNEAU, Inc.

STOCKTON, CALIFORNIA PEORIA, ILLINOIS

Cable Address: "BOBLETORNO"

ANGLEDOZERS . . BULLDOZERS . . BUGGIES . . CARRY-ALL SCRAPERS . . CRANES . . ROOTERS . . SHEEP'S FOOT ROLLERS . . POWER CONTROL UNITS . . TRAILERS

D. McDonald, another long-time user of LeTOURNEAU equipment, moves the earth with CARRYALLS on Calero Dam in the Santa Clara Valley.

One of the U. S. Government's many LeTOURNEAU units. This one, an Angledozer, is working in Sierra National Park.

J. F. Collins, another of the LeTOURNEAU fleet users, working on the Almaden Dam in the Santa Clara Valley.

Bridges and Culverts . . . . . .

Los Angeles, Calif.—State—Overhead Crossing—Los Angeles County

Contract awarded to Clinton Const. Co., 923 Folsom St., San Francisco, $578,420, by Calif. Div. of Highways, Los Angeles, for overhead crossing over SPRR tracks and LA RR, Figueroa St., in Los Angeles, inv. one 127', one 200' and one 103' steel plate girder span on conc. piers and 0.23 mi. roadway to be graded and asph. conc. pav., LOS ANGELES COUNTY. Bids from:

(1) Clinton Const. Co., S. F.....$578,420
(2) Bent Bros., Los Angeles..... 620,547
(3) Mittry Bros., Los Angeles..... 627,253
(4) C. W. Caletti, San Rafael.....$632,860
(5) Griffith Co., Los Angeles..... 646,061

		(1)	(2)	(3)	(4)	(5)
9	sta. clearing & grubbing	$36.00	$15.00	$18.00	$50.00	$10.00
1,200	M gals. water	.60	.75	.60	1.50	1.00
14,000	cu. yd. roadway excavation	.36	.30	.40	.50	.50
23,000	cu. yd. struc. excavation	2.80	2.60	2.80	4.00	4.50
45,000	cu. yd. imported borrow	.48	.35	.90	.41	.40
3,100	cu. yd. select material	.84	1.25	1.00	.70	1.00
6,300	sq. yd. subgr. for paving	.18	.12	.12	.10	.10
9	sta. finish roadway	12.00	10.00	15.00	10.00	2.00
2,200	tons asph. conc. base & level	2.90	2.60	2.50	3.00	3.50
1,600	tons asph. conc. type "A" surf.	3.40	3.00	2.75	3.50	4.00
5,000	sq. yd. asph. paint binder	.03	.02	.04	.02	.03
2,810	cu. yd. "A" conc. footing blocks	7.60	6.50	8.50	9.60	10.00
11,600	cu. yd. "A"conc. struc.	16.00	21.60	18.60	16.10	17.76
130	cu. yd. "F" conc. railing	68.00	70.00	70.00	40.00	40.00
1,430,000	lb. reinf. steel	.04	.0375	.04	.042	.04
880,000	lb. struc. silicon steel	.094	.09	.09	.11	.09
710,000	lb. struc. carbon steel	.079	.08	.08	.09	.08
34,000	lb. spec. cast steel	.156	.15	.15	.16	.15
12,700	lb. cast steel	.147	.14	.24	.15	.15
900	lb. misc. iron & steel	.11	.15	.10	.25	.10
4,400	ft. furn. conc. piles, incl. test	1.36	1.75	1.50	2.00	3.00
216	each drive same	32.00	20.00	20.00	25.00	15.00
6,100	ft. furn. steel sheet piles	1.28	1.25	.75	1.25	1.02
270	each drive same	6.00	4.00	9.00	10.50	8.00
800	cu. yd. "A"conc. slope pavem.	9.00	10.00	12.00	12.50	14.00
184	ft. 18" std. reinf. conc. pipe	3.00	2.50	4.00	2.00	3.00
46	ft. 18" extra str. reinf. C. P.	4.35	3.00	4.50	3.00	3.00
155	ft. 18" corr. metal pipe	2.20	2.00	2.00	3.00	3.00
270	cu. yd. "A" conc. curbs, gutters	14.00	15.00	12.10	12.50	14.00
1,900	ft. traffic stripe	.33	.35	.18	.20	.35
300	cu. yd. conc. remove	6.00	4.00	2.00	1.50	5.00
500	ft. 2" conduit	.50	.60	.60	.50	.50
355	ft. 18" cast iron pipe	6.00	10.00	12.00	4.00	5.00
14	ft. 24" cast iron pipe	10.00	15.00	20.00	7.00	10.00
3	standard manholes	300.00	100.00	90.00	100.00	125.00
1	lot misc. lighting equipment	$9,900	$9,200	$9,500	$8,000	$10,000
1	lot miscell. items of work	$1,300	$750	$4,000	$800	$3,000

Los Angeles, Calif.—State—Undergrade Crossing—Los Angeles County

Contract awarded to L. E. Dixon Co., 609 S. Grand Ave., Los Angeles, $241,661, by Calif. Division of Highways, Los Angeles, for constructing undergrade crossing under tracks of Pacific Elec. RR. at Mission Road in Los Angeles, LOS ANGELES COUNTY. Bids from:

(1) L. E. Dixon Co., L. A.....$241,661
(2) J. E. Haddock, Pasadena..... 245,917
(3) R. E. Compbell, Los Angeles..... 264,976
(4) Bodenhamer Const. Co., Oakland....$273,900
(5) Mittry Bros., L. A..... 324,073

		(1)	(2)	(3)	(4)	(5)
430	cu. yd. exist. conc. removed	4.00	2.00	3.00	4.00	3.00
1	lot grading	$1,500	$1,000	$1,918	$1,000	$2,800
4,600	cu. yd. struc. excavation	1.50	2.00	2.18	3.00	2.50
2,700	sq. yd. subgr. for pavement	.12	.15	.12	.15	.12
1,300	tons asph. conc. pavement	3.00	3.25	4.00	4.00	2.75
130	cu. yd. "A" conc. curbs, gutters, etc.	15.00	13.00	18.10	14.00	12.50
5,360	cu. yd. "A" conc. structure	19,00	17.50	21.00	20.00	19.10
669,000	lb. reinf. steel	.04	.04	.044	.045	.0425
1,000,000	lb. fabricating struc. steel	.0534	.06	.055	.06	.07
3,150	sq. yd. membrane water proof	.80	.80	.75	.70	.20
1,000	ft. 4" spec. perf. met. drain	.60	.75	.60	1.00	1.10
170	ft. 12" reinf. conc. pipe	1.60	1.60	1.70	1.50	2.10
280	lin. ft. 68" reinf. conc. pipe	20.00	14.00	16.20	15.00	30.00
17,500	ft. reinf. conc. piles, tr. piles	1.50	2.00	2.00	2.00	3.50
240	ft. curb armor	1.00	1.00	1.00	1.00	1.10
1,200	ft. curb bars	.30	.25	.25	.75	1.00
550	ft. pipe handhail	3.50	4.50	4.00	7.00	3.00
1	lot misc. work	$1,500	$2,500	$1,340	$5,000	$2,100

Los Angeles, Calif.—State—Grading and Bridge—Los Angeles County

Contract awarded to Guy F. Atkinson Co., 658 Russ Bldg., San Francisco, $355,762, by Calif. Division of Highways, Los Angeles, for 2.2 mi. grad. & const. steel stringer bridge in San Gabriel Canyon between Camp Bonita and Follows Camp, L. A. CO. Bids from:

(1) Guy F. Atkinson, S. F.....$355,762
(2) Granfield-Farrar & Carlin..... 368,394
(3) Basich Bros., Torrance.....$399,224
(4) Oswald Bros., Los Angeles..... 442,219

		(1)	(2)	(3)	(4)
117	sta. clearing & grubbing	70.00	250.00	86.00	550.00
171,500	cu. yd. roadway excavation	1.71	1.25	1.75	2.15
3,500	cu. yd. struc. excavation	2.00	2.50	4.00	2.30
475,000	sta. yd. overhaul	.005	.02	.015	.005
117	sta. finish roadway	40.00	20.00	17.60	5.00
71,000	lb. reinf. steel	.042	.05	.06	.055
390	cu. yd. "A" conc. box culv.	20.00	22.00	15.00	22.00
75	cu. yd. rubble masonry	14.00	15.00	25.00	15.50
200	ft. 8" C. M. P.	1.00	1.10	1.50	1.25
240	ft. 24" C. M. P.	2.50	3.00	2.65	2.85
240	ft. 30" C. M. P.	3.50	3.30	5.00	3.55
220	ft. 36" C. M. P.	4.50	4.75	6.50	5.35
100	ft. 42" C. M. P.	6.00	6.00	7.00	6.50
9	ea. spillway assemblies	20.00	15.00	25.00	18.00
240	cu. yd. "A" conc. bridge	20.00	30.00	20.00	22.00
1,040	cu. yd. "B" conc. bridge	12.00	28.50	15.00	20.00
107,000	lb. struc. steel	.07	.14	.085	.08
240	ft. timb. handrail	1.00	2.50	2.00	1.50

Elevated Tanks for Improved Water Pressure

Wherever you want to improve water pressure or reduce operating costs in municipal water systems, elevated storage is essential.

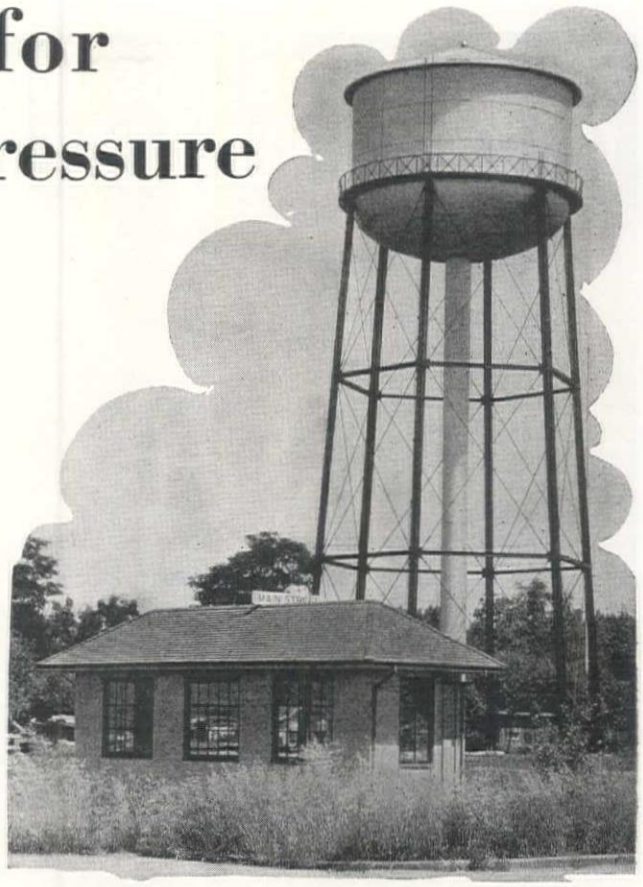
Horton elevated water tanks are built in standard designs in a complete range of capacities, or in special designs to meet your specific requirements. Capacities range from 5,000 to 2,000,000 gallons.

In addition to the manufacture and erection of tanks for municipal use, we build steel tanks of all kinds for industrial or institutional service. We will gladly furnish you with estimating data on any tanks that fill your need.

CHICAGO BRIDGE & IRON WORKS

SAN FRANCISCO.....1013 Rialto Building
LOS ANGELES.....1414 William Fox Building
BIRMINGHAM.....1500 North Fiftieth Street
CHICAGO.....Old Colony Building

Plants at **BIRMINGHAM, CHICAGO** *and* **GREENVILLE, PA.**



150,000 gallon elevated tank in the Oregon-Washington Water Service Co. distribution system at Hillsboro, Ore. It is 75 feet to bottom.

Travel Speeds 1 or 20 M.P.H.

BEVIS MACHINERY CO.
3649 Santa Fe Ave., Los Angeles
H. G. PURCELL
Colman Bldg., Seattle
GARFIELD & COMPANY
Hearst Bldg., San Francisco

The time spent by a crane in traveling and switching is too often overlooked. For example: a crawler crane travels ½ to 1 mile per hour while some railroad cranes travel up to 20 miles per hour. And the switching ability of the two types is in about the same proportion. This does not mean that a railroad crane is better for every job — that depends on operating conditions. As builders of a complete line of both crawler and railroad cranes, we will give you an unbiased judgment as to which type will be most economical for your work.

GENERAL OFFICES
BAY CITY, MICHIGAN

INDUSTRIAL BROWNHOIST

NEW YORK, PHILADELPHIA
CLEVELAND, CHICAGO

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

Extend quay wall at Navy Yard, Pearl Harbor, T.H., for Bur. of Yards & Docks, Washington, D. C. Est. cost $200,000. Bids soon.

Steam power generating plant for Utah Power & Light Co., Salt Lake City, Utah. Est. cost $1,600,000. Work to start immediately.

Sewage disposal plant for Spokane, Wn., bond election March 10th to vote $2,000,000.

18,000,000 cu. yd. dredge fill and rock retaining wall at Yerba Buena Shoals for U. S. Engr. Office, S. F. Est. cost $3,000,000. Bids soon.

High pressure turbo-generator plant for Union Pacific Coal Co., Rock Springs, Wyo. Est. cost $500,000. To start immediately.

Street improvements for San Francisco, Calif. Est. cost $2,373,777.

CALLS FOR BIDS

Two overhead storage tanks for Sacramento, Calif. Est. cost $360,000, bids to Feb. 20.

3.9 mi. grading and surfacing betw. Scotts Valley and Santa Cruz for Calif. Div. of Highways. Bids to Feb. 19.

6.8 mi. grading, concrete paving and a bridge betw. Bradley and San Ardo for Calif. Div. of Hgwys. Bids to Feb. 19.

Eagle Mt. Pumping plant for Metropolitan Water Dist., L. A. Bids to March 13.

BIDS RECEIVED

Outfall sewer and pumping plant for El Centro, Calif., A. & B. Const. Co., Hynes, $249,297 low.

El Capitan-Lakeside steel pipeline for San Diego, Calif., Consolidated Steel Corp., Ltd., L. A., $412,259 low.

3.3 mi. grading on Palomar Mt. Road for Calif. Div. of Highways, Basich Bros. Const. Co.

Postoffice at Spokane, Wn. for Treasury Dept., Procurement Div., Public Works Branch, Wash., D. C., A. D. Belanger & Co., Seattle, $644,888 low.

CONTRACTS AWARDED

11.1 mi. grading and 2 concrete and steel bridges betw. Espanola and Abiquiu for New Mexico Highway Dept. to New Mexico Const. Co., Albuquerque, N. M., $294,088.

Gasoline for 12 months for Los Angeles, Calif. to Shell Oil Co., L. A., $300,000.

Centrifugal pumps for Metropolitan Water Dist., L. A., to (1) Byron Jackson Co., Berkeley, $225,474 for 6 pumps. (2) Allis Chalmers Mfg. Co., L. A., $98,300 for 3 pumps. (3) Worthington Pump Co., L. A., $268,000 for 6 pumps.

Almagordo dam for Bur. of Reclamation, Carlsbad, N. M., to Hallett Const. Co., Crosby, Minn., $1,132,547.

8.8 mi. grading, etc., on Phoenix-Yuma Highway for Ariz. Hgwy. Comm. to Heuser & Garnett, Glendale, Calif., $202,300.

Iron Mountain Pumping Plant for Metropolitan Water Dist., L. A., to Wood & Bevanda, Stockton, $498,789 on Sched. 1 and $220,566 on Sched. 2.

Railroad overpass on S. 5th St., Grand Junction, for Colorado Hgwy. Dept. to C. A. Switzer, Arvada, $203,755.

3.2 mi. grading, etc., on Globe-Springerville Hgwy. for Ariz. Highway Comm. to H. J. Hagen, Globe, Ariz., $174,486.

Tunnels 1, 2, 3 and 4, Black Canyon Canal, for Bur. of Reclamation, Ontario, Ore., to J. A. Terteling & Sons, Boise, $292,415.

Earthwork, canal lining, etc., Ogden-Brigham Canal for Bur. of Reclamation, Ogden, Utah to J. A. Terteling & Sons, Boise, $424,978.

Buildings, roads and services at Naval Ammunition Depot, Coco Solo, C. Z. for Bur. of Yards & Docks, Wash., D. C., to W. P. Thurston Co., Richmond, Va., $276,000.

Precast concrete and steel Cajalco to Fontana pipeline for Metropolitan Water Dist., L. A., to (1) American Concrete & Steel Pipe Co., Southgate, $540,611. Sched. 1P and $880,639 for Sched. 3P. (2) Western Pipe & Steel Co., L. A., $4,047,374 for Sched. 2S and $159,663 for Sched. 2B.

Raising the Arrowrock Dam for Bur. of Reclamation Boise, Idaho to T. E. Connolly, S. F., $395,040.

Undercrossing and 0.27 mi. paving on the Pacific Hgwy. at Salem for Oregon State Highway Comm. to Kern & Kibbe, Portland, $256,502.

Undergrade crossing at Mission Road for Calif. Div. of Highways, L. A., to L. E. Dixon Co., L. A., $241,661.

Overhead crossing and 0.23 mi. grade and pave at Figueroa St. for Calif. Div. of Hgwys., L. A., to Clinton Const. Co., S. F., $578,420.

Street and Road Work. . . . . .

WORK CONTEMPLATED

SAN FRANCISCO, CALIF.—A program of street improvements, to cost $2,373,777 has been started by the Dept. of Public Works, S. F. 1-30

SAN FRANCISCO, CALIF.—Plans and specifications completed by City Engineer and protests will be heard to 10:30 a. m., Feb. 21 by Dept. of Public Works, City Hall, San Francisco, for improvement of Union St., betw. Montgomery and Calhoun Streets and Calhoun St. 172 ft. southerly from Union Street. Est. cost $12,630. 1-30

PORTLAND, ORE.—The Bureau of Public Roads, Portland, contemplates calling for bids for 3.724 miles clearing involving 40 acres on the South Fork Stillaguamish Highway about 13 mi. east of Granite Falls, in SNOHOMISH COUNTY, Wn. Actual call for bids may be delayed until too late for interested contractors to examine the project, therefor contractors interested in the project are advised to go over the work at this time. Estimated cost of work is $20,000. 1-6

CALLS FOR BIDS

PHOENIX, ARIZ.—Bids to 10 a. m., Feb. 25 by the Bureau of Public Roads, Phoenix, Ariz., for 9.141 mi. (exclusive of Service roads and Parking areas, which have an area of approx. 67,205 sq. yd.) placing cr. rock base course on all of Route 8, Hermit Rest and the Head-

NEWS SUMMARY

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

quarters Service Roads and Parking Areas, Grand Canyon Natl. Park, COCONINO COUNTY, Ariz. Work involves in the main: 38,200 tons cr. rock base course. 1-29

PHOENIX, ARIZ.—Bids to 10 a. m., Feb. 27 by Bureau of Public Roads, Phoenix, Ariz., for 12.696 miles placing a base course surfacing on Sections G and H of Route 7, the Oak Creek National Forest Highway, Coconino National Forest, COCONINO COUNTY, Ariz. Work involves: 12,500 cu. yd. sand for stabilizing. 26,600 tons cr. rock base course. 1-31

SACRAMENTO, CALIF.—Bids to 2 p. m., Feb. 19th by the Calif. Div. of Highways, Sacramento, for 0.6 mi. const. riprap slope protection between Isleton and Walnut Grove in SACRAMENTO COUNTY, Calif. Work involves: 6,500 cu. yd. local borrow. 9,000 tons riprap (150 pounds dry solid cu. ft.) 1-28

SACRAMENTO, CALIF.—Bids to 2 p. m., Feb. 19 by the Calif. Div. of Highways, Sacramento, for 6.8 mi. grade and concr. paving and const. a reinforced concr. bridge betw. Bradley and 6 mi. south of San Ardo in MONTEREY COUNTY, Calif. Work involves: 241,000 cu. yd. roadway excavation; 2,940,000 sta. yd. overhaul; 4,850 cu. yd. ditch and channel excav.; 11,000 cu. yd. imported borrow; 75,000 sq. yd. prep. mix and shape shoulders, detours and rd. approaches; 15,770 cu. yd. A concr paving. 1-28

SACRAMENTO, CALIF.—Bids to 2 p. m., Feb. 19 by Calif. Div. of Hgwy., Sacramento, for 3.9 mi. grad. and cr. run base and pl. mix surf. betw. Scotts Valley and 1 mi. N. of Santa Cruz, in SANTA CRUZ COUNTY, Calif. Work involves: 255,000 cu. yd. roadway excavation. ALTERNATE "A": 34,250 tons crusher run base; 6,600 tons Natural rock asphalt. ALTERNATE "B": 32,350 tons crusher run base; 74 tons liq. asph. MC2 (prime coat); 9,250 tons mineral aggreg. (plant mix). 1-28

OLYMPIA, WN.—Bids to 10 a. m., Feb. 18 by Director of Highways, Olympia, Wn., for: (1) YAKIMA COUNTY—.6 mi. paving on State Road No. 3, 1st st. in City of Yakima. (2) YAKIMA COUNTY—.5 mi. clearing and grading of State Road 5, Tieton Dam vicinity. (3) YAKIMA COUNTY—4.2 mi. grading, surf. and const. bitum. macadam of county road, Cowiche to Tieton. (4) CLALLAM COUNTY—.6 mi. paving of State Road No. 9, First St. betw. Race and Lincoln in Port Angeles. (5) FRANKLIN COUNTY—.4 mi. clearing, grading, const. bitum. surf. and overcrossing on Northern Pacific tracks on State Road 11, Pasco north, Airport vicinity. (6) ADAMS COUNTY—Producing and stockpiling 36.1 mi. State Road 11, Ritzville to the Adams-Franklin County line. (7) SNOHOMISH COUNTY—Paving of Broadway from 37th Street to south city limits, Everett. (8) WALLA WALLA COUNTY—Const. bitum. surface on 3.5 mi. of county road, Walla Walla, north. (9) PIERCE COUNTY—3.2 mi. paving of county road, Gig Harbor to Point Fosdick. (10) SPOKANE COUNTY—.5 mi. grading, surf. and const. overcrossing to S. P. & S. railroad on County Road, Cheney-Plaza road, overcrossing south of Cheney. (11) WAHKIAKUM COUNTY—Constructing trestle on County Road, Crooked Creek Bridge. 1-31

BIDS RECEIVED

PHOENIX, ARIZ.—Lee Moor Contracting Co., Bassett Tower, El Paso, Tex., $107,856 low to State Highway Comm., Phoenix, for 9.6 mi. grad. and surf. 6 mi. S.E. of Holbrook and extending east on the Holbrook-St. Johns Highway, WPH 42, NAVAJO COUNTY, Ariz. 1-3

PHOENIX, ARIZ.—Phoenix Tempe Stone Company, Phoenix, Arizona, $64,644 low to Arizona State Highway Comm., Phoeniz, Ariz., for grading and draining 0.8 mi. roadway furnishing and placing road mix and seal coat, on the Phoenix-Prescott Highway located at both ends of the new bridge at Wickenburg, MARICOPA COUNTY. 1-31

LOS ANGELES, CALIF.—Bids received as follows by Calif. Div. of Highways, L. A., for: (1) SAN DIEGO COUNTY—Basich Bros., 20550 Normandie Ave., Torrance, $297,396 low for 3.3 mi. grade on Palomar Mt. Road betw. Iron Springs Cr. and the Observatory site. (See Unit Bid Summary). (2) LOS ANGELES COUNTY—Southwest Paving Co., Inc., 11,402 Radford Ave., Roscoe, $35,811 low for 0.6 mi. grad. and asph. concr. pav. betw. Fenwick St. and Scovill Ave. through Sunland. (3) LOS ANGELES COUNTY—Sully Miller Contr. Co., 1500 W. 7th St., Long Beach, $38,567 low for 3.7 mi. widen and asph. conc. surf. betw. Traffic Circle and L. A. St. 1-30

SACRAMENTO, CALIF.—Bodenhamer Const. Co., 1101 75th Ave., Oakland, $171,869 low to Calif. Div. of Highways, Sacramento, for 0.25 mi. grading and roadmix surf. and const. bridge over Potato Slough at Terminus, SAN JOAQUIN COUNTY. 1-8

SACRAMENTO, CALIF.—Basich Brothers, 20,550 Normandie Ave., Torrance, $109,721 low to Calif. Div. of Highways, Sacramento, for 7.3 mi. grad. and roadmix surf. betw. Big Pine and Keough Hot Springs in INYO COUNTY, Calif. 1-29

SEATTLE, WN.—Northwest Const. Co., 3950 6th, N. W. Seattle, Wn., $117,657 low to Co. Comm., Seattle, Wn., for 15 mi. clearing, grubbing grad., drain and const. bitum. surf. on The Fall City-Snohomish County Line Rr. Project. No. 125. 1-23

SHELTON, WN.—Roy Kimbel, Shelton, Wn., $10,432 low to Mason County Comm., Shelton, Wn., for constructing Secondary Road project No. 11 (McClain's Cove). 1-16

CONTRACTS AWARDED

PHOENIX, ARIZ.—Awards as follow by State Highway Comm., Phoenix, Ariz., for: (1) GRAHAM COUNTY (WPSS 115-B)—To Tiffany Const. Co., Phoenix, Ariz., who bid $45,535 for 6.2 mi. grad., drain. roadway and furn. and plac. aggreg. base course south of Safford on the Safford-Bowie Junction Highway. (2) MOHAVE COUNTY (WPGH 118-A AFE 6638)—To Geo. W. Orr, El Paso, Texas, who bid $154,805 for 2.1 mi. grading, drain. and furn. and plac. of aggreg. base course over a new highway located about 35 mi. N.E. of Kingman on the Ashfork Kingman Highway. (3) MARICOPA COUNTY (WPGH 46-B&WPGH 46-C)—To Heuser & Garnett, 816 Allen Ave., Glendale, $202,300 for 8.8 mi. grad. cutback oil cake on the west end of the Coldwater Bridge, about 15 mi. west of Phoenix, S.W. over a new highway, on the Phoenix-Yuma Highw. 1-29

PHOENIX, ARIZ.—To Pearson & Dickerson Constr., Inc., P. O. Box 471, Prescott, $141,959 by Arizona State Highway, by Arizona State Highway Comm., Phoenix, for 5 mi. grading, draining at the Prescott Nat'l Forest Boundary about 22 mi. N.E. of Prescott on the Prescott Jerome Highway, FA 96-C, YAVAPAI COUNTY. 1-9

PHOENIX, ARIZ.—To H. J. Hagen, Globe, Ariz., $174,486, by Arizona State Highway Comm., Phoenix, for 3.2 mi. grading and draining on the Globe-Springerville Highway beginning 3.8 mi. Northeast of the Gila Navajo County line, NAVAJO COUNTY, FA 105-D. 1-9

EUREKA, CALIF.—To Helwig Const. Co., 115 South Main St., Sebastopol, Calif., $5,688, by District Engineer, Calif. Div. of Highways, Eureka, for 0.2 mi. widening existing highway and surf. with river run gravel, placing corr. metal culverts and drop inlets near Lane's Redwood Flat in MENDOCINO COUNTY, Calif. 1-23

LOS ANGELES, CALIF.—Awards as follows by Calif. Div. of Highways, State Bldg., Los Angeles, for: (1) ORANGE COUNTY—To C. F. Robbins, P. O. Box 902, Ventura, $42,487 for 1.3 mi. grading and conc. paving on So. Main St. in Santa Ana. (2) RIVERSIDE COUNTY—To Sharp & Fellows Contracting Co., 533 Central Bldg., Los Angeles, $129,848 for 10.9 mi. grading and treating with liq. asph. and const. timb. pile trestle betw. 10 mi. West of Indio and Indio. (3) LOS ANGELES COUNTY—To Guy F. Atkinson, 658 Russ Bldg., S. F., $355,762 for 2.2 mi. grading and const. steel stringer bridge in San Gabriel Canyon between Camp Bonita and Follows Camp. 1-14

SACRAMENTO, CALIF.—Awards as follows by Calif. Div. of Highways. Sacramento, for: (1) NAPA COUNTY—To Union Paving Co., Call Bldg., S. F., $67,523 for 6.3 mi. grading and const. bridge betw. St. Helena and Larkmead Station, Calif. (2) KINGS COUNTY—To Leo F. Piazza, 296 N. 6th St., San Jose, $18,127 for 6.3 mi. grading shoulders betw. 2 mi. S. of Lemoore and 1½ mi. E. of Stratford. (3) TEHAMA COUNTY—To N. M. Ball Sons, 1889 Yosemite Road, Berkeley, $91,790 for undergr. crossing under SP RR tracks and 0.45 mi. grad. and conc. pav. roadway ½ mi. S. of Red Bluffs. (4) SANTA CLARA COUNTY—To Barrett & Hilp, 918 Harrison St., S. F., $152,897 for undergrade crossing under SP tracks at Lafayette St. in Santa Clara, Calif. 1-6

SACRAMENTO, CALIF.—To Union Paving Co., Call Bldg., S. F., $85,187 by Calif. Div. of Highways, Sacramento, for 3.1 mi. grad. and road mix surf. on select matl. base and const. timber bridge betw. Bear Valley and 1 mi. North of Willow Creek in SAN BENITO COUNTY, Calif. 1-9

SAN FRANCISCO, CALIF.—To Fay Improvment Co., Phelan Bldg., San Francisco, $43,568, by Dept. of Public Works, San Francisco, for widening and reconstructing the roadway on 5th Street between Mission St. and Harrison Street and between Bryant Street and Townsend Street in San Francisco, under Spec. D.P.W. No. 18917. 1-15

SAN JOSE, CALIF.—To Union Paving Co., Call Bldg., San Francisco, $27,908, by City Clerk, San Jose, for resurf. So. Market St. and South 1st St. 1-20

COCO SOLO, C. Z.—To W. P. Thurston Co., Richmond, Va., $276,000. Item 1 by Bur. of Yards & Docks, Navy Dept., Wash., D. C., for 1 quarters, 1 office and inert storehouse, 4 smokeless powder magazines, 3 arch type magazines, 2 detonator magazines, 6 hose shelters, bridge, and macadam paving at Naval Ammunition Depot and Naval Submarine Base, Coco Solo, C. Z., under Spec. No. 8124. 1-10

DENVER, COLO.—Awards as follow by the Colorado State Highway Dept., Denver, Colo., for: (1) GARFIELD COUNTY (WPSS 366C)—To J. B. Claybaugh & A. V. Hallenbeck, 910 Main St., Grand Junction, Colo., who bid $67,711 for 6 mi. gravel surf. betw. Glenwood Springs and Basalt. (2) ARAPAHOE & ADAMS COUNTIES (FAP 351A, FAP 149 and DR2&FAP 149, GR2, comb.)—To Monarch Eng. Co. & Ulrich S. Stegrist, P.O. Box 1126, Denver, $9,992 for 2 mi. gravel surf. east of Strasburg and between Bennett and Strasburg and between Byers and Deertail. 1-27

DENVER, COLO.—To Blanchard Bros., 1641 S. Logan St., Denver, Colo., $313,425, by State Highway Dept., Denver, Colo., for 18.402 mi. gravel surfacing betw. Fort Morgan and Roggen in WELD and MORGAN COUNTIES, Colo., FAP 285 H. 12-30

DENVER, COLO.—To L. L. DeRemer, A. P. & L. M. Atchison, 3551 Blake St., Denver, Colo., $34,893, by Colo. State Highway Dept., Denver, for 1½ mi. grav. surf. betw. Manassa and San Luis in CONEJOS COUNTY, Colo. 1-6

DENVER, COLO.—To Owen-Babb & Thorkildsen, 1375 Menaco Blvd., Denver, Colo., $167,441, by Colorado State Highway Dept., Denver, Colo., for 8 mi. gravel surf. betw. Matheson and Ramah in EL PASO COUNTY, Colo., Proj. FAP 192B. 1-6

DENVER, COLO.—To C. A. Switzer, Rt. 1, Box 247, Arvada, Colo., $124,888, by Colorado State Highway Dept., Denver, Colo., for 5 miles gravel surfacing betw. Sapinero and Cimarron, GUNNISON COUNTY, Colo., Project FAP 260-D. 1-17

BOISE, IDAHO—To F. H. DeAtley & Co., Lewiston, Idaho, $58,883 by Commissioner of Public Works, Boise, Ida., for 25.416 mi. const. loose riprap and grading at intermittent points on the Lewis and Clark Highway betw. Myrtle and Orofino in NEZ PERCE and CLEARWATER COUNTIES, Ida., FAP 136-ABCD, 92-A Reop. 1-27

BOISE, IDAHO—To Carl Nyberg, Spokane, Wn., $61,756, by Comm. of Public Works, Boise, for const. roadbed, drain. struc. and cr. grav. surf. on 3.752 mi. from Algoma to S. end of Standpoint bridge in BONNER COUNTY, Proj. WPSO 194, Ida. 1-20

GREAT FALLS, MONTANA—Awards as follow by State Highway Dept., Rainbow Hotel, Great Falls, Montana, for: (1) RICHLAND COUNTY (FAP 245G&265B)—To Albert La Lande, Sidney, Montana, $77,416 for 3.975 mi. grad., surf. and const. small bridge on Sec. "G" of the Glendive Sidney Road; also 0.976 mi. grad., surf., etc., on Sec. "B" of Sidney Bridge-North Dakota Line Road. (2) GARFIELD COUNTY (FAP 247-B)—To Inland Const. Co., 3867 Leavenworth St., Omaha, Nebr., $131,386 for 7.632 mi. grad., surf. and const. small drain. struc. on Sec. "B" of the Jordan-Circle Road. (3) POWDER RIVER & CARTER COUNTIES (FAP 262-B)—To S. J. Groves & Sons, Wesley Temple Bldg., Minneapolis, $200,445 for 16.049 mi. grad., surf., etc. on Sec. B of Broadus-Wyoming Line Road. (4) CARBON & STILLWATER COUNTIES (WPSO 346)—To Corey & Bell, Red Lodge, Mont., $36,455 for 2.821 mi. grad., surf., etc., on Red Lodge-Absarokee Road. (5) CHOTEAU COUNTY (WPSO 349)—To Tomlinson-Arkwright Const. Co., Great Falls, Mont., $34,348 for 2.840 mi. grad., surf., etc., on Geraldine-Ft. Benton Road. (6) CUSTER COUNTY (WPSO 350)—To Callison & Dolven, Inc., Billings, Montana, $43,797 for 2.889 mi. grad., surf., etc., on the Moon Creek Road. (7) DEER LODGE COUNTY (WPSO 352)—To Barnard Curtiss Co., Phoenix Bldg., Minn., $41,686 for 1.149 mi. grade and const. small drainage structures on Anaconda-Ralston Road. 1-28

GREAT FALLS, MONT.—Awards as follow by State Highway Dept., Rainbow Hotel, Great Falls, Montana, for: (1) TOOLE COUNTY (WPSO 366)—To N. Smith, Great Falls, Mont., $45,914 for 3.695 mi. grad., surf., etc., on Sweet Grass West Road. (2) GALLATIN COUNTY (WPSO 370)—To Standard Const. Co., Bozeman, Mont., who bid $31,303 for 1.780 mi. grad., const. small dr. struc., surf., etc., over East Gallatin River on the Bridger Canyon Road. (3) LEWIS and CLARK COUNTIES (WPMH 77-B)—To Nolan Bros., 18 N. 2nd St., Minneapolis, Minn., $17,890 for 0.693 mi. surf. with pl. mix bitum. tr. cr. grav. top course on Main St. in City of East Helena. (4) HILL COUNTY (FAP 95-C)—To Barnard Curtiss Co., Phoenix Bldg., Minneapolis, $21,152 for 18.171 mi. grad., surf. with gravel subbase matl., etc., on Sec. "C" of the Glacier Park Trail

Road. (5) GALLATIN COUNTY (WPMH 222-B&222-E)—To Standard Const. Co., Bozeman, Mont., $142,133 for 0.695 mi. regrad. and const. plmix bitum. tr. cr. gr. surf. course on Sec. B of proj. betw. E. City limits and Buttonwood Ave. and 0.747 mi. conc. or Warren bitu. wr. crse. and 0.135 mi. same all on U. S. Highw. No. 10 in City of Bozeman. (6) YELLOWSTONE COUNTY (WPMS 52)—To Chas. Shannon, Butte, $37,578 for 1.990 mi. widen. exist. conc. pav. with pl. mix. bitum. tr. cr. grav. on Polytechnic Rd. (7) FLATHEAD COUNTY (FAP 58-G)—To James Crick, 3104 N. Monroe St., Spokane, Wn., $193,904 for 9.977 mi. grad. surf., etc., on Sec. "G" of the Kalispell-Libby Road. 1-28

CARSON CITY, NEV.—To Dodge Const., Inc., Fallon, Nev., $52,083 by Nevada State Highway Comm., Carson City, Nev., for 12.60 mi. grading and gravel surfacing between 3 miles east of Tonopah and west Forest boundary, Rt. 4, Sec. A1, FLP 11A, in NYE COUNTY, Nevada. 1-31

SANTA FE, NEW MEXICO—To New Mexico Const. Co., Albuquerque, N. M., $294,088 by State Highway Engr., Santa Fe, N. M., for 11.100 mi. grad. const. 2 conc. and steel bridges, etc., on U. S. Highw. Rt. 285, betw. Espanola and Abiquiu, RIO ARRIBA COUNTY, WPH 100-D. 1-31

SANTA FE, NEW MEXICO—Awards as follow by State Highway Engineer, Santa Fe, N. M., for: (1) OTERO COUNTY (FAP 40)—To George W. Orr, El Paso, $159,553 for 6.690 mi. grading, minor drain. struc., 3 multiple span conc. box culverts, steel and concr. bridge, 2 course surf., etc., on U. S. Highway 70 betw. Tularosa and Roswell. (2) GUADALUPE COUNTY (WPMH 97-G)—To W. E. Bondurant, Roswell, $51,880 for 4.127 mi. grad., dr., struc., culverts, etc., on U. S. Highw. Rt. 60, betw. Vaughn and Encino. (3) OTERO COUNTY (Proj. 106-A)—To New Mexico Const. Co., Albuquerque, who bid $177,246 for 9.868 mi. grading, draining, struc., etc., on U. S. Highw. Rt. 54, betw. Alamogordo and Newman. (4) EDDY COUNTY (131A)—To Capital Const. Co., Santa Fe and Dudley Stone Prod. Co., El Paso, who bid $146,519 for 15.127 mi .preparing base, top crse. surf., etc., on U. S. Highway Rt. 285, betw. Carlsbad and Malaga. (5) LEA COUNTY (WPMS 237B)—To Armstrong & Armstrong, Roswell, $104,668 for 8.729 mi. grad., dr. struc. 2 course surf. & misc. const. on State Highw. Rt. 18, betw. Eunice & Jal. 1-25

PORTLAND, ORE.—Contracts awarded as follow by the Oregon State Highway Comm., Portland, Oregon: (1) JOSEPHINE COUNTY (WPSS 244B)—To E. C. Hall, 1st Natl. Bank Bldg., Eugene, $38,362 for 2.09 mi. grad., surf. and oil mat surf. tr. on Grays-Greek-Powers Ranch, Section. (2) LANE COUNTY—To Itschner & Rigdon, Barlow, Ore., $89,142 for 6.0 mi. grading on Awbrey-Eugene Sec. of Junction City-Eugene Sec. Highway. 1-2

PORTLAND, ORE.—To Tom Lillebo, Reedsport, Ore., $62,818 by Oregon State Highway Comm., Portland, Ore., for 0.48 miles grading and surfacing and const. bridge over North Fork of John Day River on Long Creek-Monument County Road at Monument, GRANT COUNTY, Oregon. Proj. WPSO 260. 1-7

PORTLAND, ORE.—To Saxton & Looney and J. S. Risley, Broadway Bldg., Portland, $25,795, by Oregon State Highw. Comm., Portland, for 16,500 cu. yd. cr. rock in stockpile on W. Lake-Mohler Rock Production project, Oregon Coast Highway in CLATSOP & TILLAMOOK COUNTY, Oregon. 1-11

PORTLAND, ORE.—To E. F. & W. F. Philpot, Portland, Ore., $38,829, by Oregon State Highway Comm., for const. concrete bridge over Oregon, Calif. and Eastern Ry. and 0.51 mi. grad. and bitum. macad. wr. surf. on the Klamath Falls-Lakeview Highway near Dairy in KLAMATH COUNTY, Oregon. 1-11

PORTLAND, ORE.—Awards as follow by Oregon State Highway Comm., for: (1) DESCHUTES COUNTY—To M. L. O'Neil & Son, Eugene, Ore., $15,842 for 3.5 mi. grading Upper Tumalo Sec. of Tumalo Falls-Bend Co. Road. Next low bid: Consolidated Highway Co., $15,873. (2) UNION AND WALLOWA COUNTY—To A. A. Hardesty, 236 N.E. 79th Ave., Portland, Ore., $22,731 for 13,000 cu. yd. cr. rock stockpiled on Elgin-Rock Creek Rock Prod. Project. 1-13

PORTLAND, ORE.—Awards as follow by Oregon State Highw. Comm., Portland, Oregon, for: (1) CLACKAMAS COUNTY—To E. C. Gerber, Oregon City, Ore., $48,143 for 27.87 mi. oil mat surf. tr. on 8 sections of County Road. (2) MULTNOMAH COUNTY—To Jacobsen-Jensen Co., 517 N.E. Stanton St., Portland, Ore., $66,589 for 0.82 mi. grading and 5.72 mi. asph. concr. paving, 122nd Ave.-Troutdale Sec. of N.E. Halsey Street. (3) BENTON COUNTY—To Saxton & Looney and J. S. Risley, Broadway Bldg., Portland, $12,022 for 3.1 mi. grad., Polk Co. Line-Soap Creek Section of Tampico. County Road. 1-15

HOOD RIVER, ORE.—To Warren Northwest, Inc., $31,660 by Town Council, Hood River, Ore., for improvements to City streets in Hood River. 1-17

SALT LAKE CITY, UTAH—To J. W. Whiting, Springville, Utah, $76,154 by Utah State Road Commission, for 2.641 mi. gravel surfaced road betw. Cedar-Kanarraville, Anderson's Ranch-Toquerville and Dry Sandy Wash Revision in IRON and WASHINGTON COUNTIES, FAP 54-A and FLHP 21-A&22A. 1-4

SALT LAKE CITY, UTAH—To Northwestern Engineering Co., Rapid City, South Dakota, $62,985 by Utah State Road Commission, for construction of a Natural Rock Asphalt road between Myton and Roosevelt, a distance of 8.336 miles in DUCHESNE COUNTY, Utah, Project FAP 94-C. 1-13

SALT LAKE CITY, UTAH—Awards as follow by Utah State Road Comm., for: (1) UTAH COUNTY—To W. W. Clyde & Co., Springville, Utah, $38,042 for 3.804 mi. gravel surfacing road betw. Santaquin-Elberta. (2) UTAH COUNTY—To Strong & Grant, Springville, Utah, $157,731 for 2.938 mi. concr. and bitum. concr. OR alternate rock asph. road betw. Provo and Springville. (3) CARBON COUNTY—To J. M. Sumison, Springville, Utah, $59,000 for 1.15 mi. grav. surf. road from Price southerly on State Road No. 10. 1-13

SALT LAKE CITY, UTAH—To Gibbons & Reed, 165 E. 4th, South, Salt Lake City, Utah, $52,942, by State Road Commission, for constructing a concrete paved road, 23rd East—Parley's canyon, in SALT LAKE COUNTY, Utah, Project FAP 97-A and D, a distance of 1.43 mi. 1-21

NEWPORT, WN.—To P. Carbon & Sons, 716 Mansfield St., Spokane, Wn., $49,361 by County Commissioners, Newport, Wn., for clearing, grading, draining and surfacing with screened gravel on 4 miles of the Sacheen highway, from the State Road near Rodgers pass to Sacheen Lake. 1-10

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) SAN JUAN COUNTY (WPSO 255-A)—To C. V. Wilder, Blaine, Wn., $3,266 for 0.2 mi. clearing and grading of Co. road, Cascade Creek Fill on Orcas Island. (2) SKAGIT COUNTY (WPSO 256-A)—To Robt. Nordlund, Mt. Vernon, Wn., $25,499 for 2.4 mi. clearing, grading and surf. of county road, Big Lake Northwest. (3) SKAMANIA COUNTY (WPSO 257-A)—To Sam Angelo, Cape Horn, Wn., $20,246 for 1.0 mi. clear, grad. and surf. of County Road, Junction State Road No. 8 to Carson. (4) SPOKANE COUNTY (WPSO 224-B)—To Redmon-Turner, Inc., 304 So. 4th Ave., Yakima, $79,771 for 5.7 mi. grad., surf. clr. and const. 2 tr. timber (framed) trestles on County Road, Cheney-Plaza Road. (5) THURSTON COUNTY (WPSO 261-A)—To Graham Bros. & Medley, 974 N. St. Chehalis,

Wn., $21,177 for 1.3 mi. clr. grad., surf. and const. a reinf. conc. T-beam bridge on Co. Road, Tenino Vicinity. (6) BENTON COUNTY (WPSO 230-A)—To Joslin & McAllister, 3038 E. Trent Ave., Spokane, Wn., $9,326 for 7.5 mi. surf. of County Road, Horn to Benton City. 1-16

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., $23,211 for .5 mi. paving of city streets, 29th Ave., betw. Grand Blvd. and Perry St. in City of Spokane. (2) SPOKANE COUNTY—To Chas. A. Power, E. 27 8th Ave., Spokane, Wn., $35,296 for .7 mi. paving of city street, Napa St. betw. Trent Ave. and Mission Ave. in City of Spokane. 1-30

OLYMPIA, WN.—$49,845 by Director of Highways, Olympia, Wn., for 1.0 mi. grad. and concr. and asph. concr. paving of city streets and 1.5 mi. of county road, Holly St. and Meridian St., in Bellingham and Guide Meridian Road. 1-30

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) CLARK COUNTY (WPMS 272-A)—To Warren Northwest, Inc., P. O. Box 5072, Portland, Ore., $15,701 for 0.7 mi. const. bitum. macad. surf. of city streets in City of Vancouver. (2) FERRY COUNTY (WPSO 237-A)—To Leo J. Lavin, Coulee City, Wn., $13,722 for 1.0 mi. clearing, grading and surf. County Road, Republic to Curlew Rd. (3) ISLAND COUNTY (WPSO 242-A)—To James H. Coyne, Hastings Bldg., Port Angeles, $15,741 for 2.1 mi. clearing and grading of County Road, Freeland-North. (4) LINCOLN COUNTY (WPSO 249-A)—To J. W. Poe, Lewiston, Ida., $14,450 for 1.3 mi. grading of County Road, Reardon-Long Lake. 1-16

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) DOUGLAS COUNTY—To Goodfellow Bros., Inc., Box 1332, Wenatchee, Wn., $8,188 for 1 mi. grading and surf. of County Road, Farmer-Withrow road, Farmer north. (2) KITSAP COUNTY—To J. S. Pederson & Co., Enumclaw, Wn., $17,468 for 1.7 mi. clearing, grading and surf. on County road, Suquamish-Millers Bay Rd., Suquamish north. (3) CHELAN COUNTY—To Washington Asphalt Co., 220 W. Hudson St., Seattle, Wn., $37,102 for 4.2 mi. const. bituminous surface on city streets in City of Wenatchee. (4) SPOKANE COUNTY—To D. Nygren & G Schehle, Lloyd Bldg., Seattle, Wn., $125,511 for .5 mi. grading, surf. const. bitum. surf. and overcrossing on County Road, Hardesty road, Northern Pacific Railway overcrossing at Parkwater. 1-23

OLYMPIA, WN.—Awards as follow by Director of Highways. Olympia, Wn., for: (1) CLARK COUNTY (WPSO 233-A)—To United Contract. Co., Stock Exch. Bldg., Portland, $24,000 for 1.7 mi. grad. and pave with asph. concr. (Battleground Highway), Vancouver-East. (2) PACIFIC COUNTY (WPSO 252-A)—To Graham Bro. & Medley, 974 N. St., Chehalis, Wn., $10,788 for 0.7 mi. clear., grad., etc. on County Road, Raymond, West. 1-16

CHEYENNE, WYOMING—To W. W. Clyde & Co., Springville. Utah, $229,095 by State Highway Comm., Cheyenne, Wyo., for 18.808 mi. grad., drain., const. 4 tr. timb. bridges, 10 reinf. conc. culv. and misc. work on the Rock Springs-Rawlins Road in SWEETWATER COUNTY (WPH 49). 12-30

Bridges and Culverts . . . . . .

BIDS RECEIVED

PORTLAND, ORE.—Bids received as follows by Oregon State Highway Comm., Portland, Oregon, for: (1) KLAMATH COUNTY—G. I. Stebbins Const. Co., Klamath Falls, Ore., $26,848 low for concrete, steel and timber undercrossing under the Oregon-Calif. and Eastern Ry. tracks and 0.48 mi grad., surf. and bitum. macad. wr. surf. on the Klamath Falls-Lakeview Highway at Olene. (2) UMATILLA COUNTY—Colonial Const. Co., W. 326 1st Ave., Spokane, Wn., $184,885 low for const. overcrossing over O. W. R. & N. Co.'s tracks and 1.5 mi. grad. and paving city streets on Old Oregon Trail in Pendleton. 1-11

PORTLAND, ORE.—Bids received as follows by Oregon State Highway Comm., for: (1) MALHEUR COUNTY—C. J. Montag & Son, Worcester Bldg., Portland, $42,735 low for steel and timb. bridge over Owyhee River on the Jordan Creek Sec. of the I.O.N. Secondary Highway 2 miles South of Rome. (2) WASHINGTON COUNTY—Saxton & Looney & J. S. Risley, Broadway Bldg., Portland, $16,242 low for undercrossing under Oregon Elec. Ry. tracks and 0.19 mi. grade and oil mat surf. tr. on Beaverton-Aurora Secondary Highway at Metzger. 1-13

MOUNT VERNON, WN.—Manson Const. & Engr. Co., 129 Canadian Natl. Pier, Seattle, $117,783 low to Skagit County Comm., Mt. Vernon, Wn., for const. a struc. steel, concrete and timber bridge known as Swinomish Slough Bridge No. 231, on portion of Cascade Highway, Secondary Road No. 32 and PWC Docket No. 5898. 1-22

CONTRACTS AWARDED

PHOENIX, ARIZ.—To Daley Corp., 4430 Boundary St., San Diego, $102,766 by State Highway Comm., Phoenix, Ariz., for const. of a concrete and steel underpass structure, under the railroad, and other work located between Glendale and Peoria, about 10 miles N.W. of Phoenix, MARICOPA COUNTY, Proj. WPGH 48. 1-29

LOS ANGELES, CALIF.—Awards as follow by Calif. Div. of Highways, Los Angeles, for: (1) LOS ANGELES COUNTY—To L. E. Dixon Co., 609 S. Grand Ave., L. A., $241,661 for undergrade crossing under tracks of Pacific Elc. RR at Mission Road in Los Angeles. (2) LOS ANGELES COUNTY—To Griffith Co., L. A. Railway Bldg., L. A., $116,864 for overhead crossing over Valley Blvd. and S. P. RR tracks in L. A. at Soto St. consisting of conc. piers and abutments with steel superstruc. and approx. .62 mi. roadway to be graded and asph. conc. pav. (3) LOS ANGELES COUNTY—To Clinton Const. Co., 923 Folsom St., S. F., $578,420 for overhead crossing over S.P. RR tracks and L. A. RR., Figueroa St. in L. A. inv. 1 127 ft., 1 200 ft. and 1 103 ft. steel plate girder span on concr. piers and 0.23 mi. roadw. to be grad. and asph. concr. pav. (4) LOS ANGELES COUNTY—To Oscar Oberg, 150 N. Vista St., L. A., $154,942 for undergr. crossing under U.P. RR tracks at Soto St. in L. A. consist. of reinf. concr. abutm. on timb. pile founda. with steel superstruc. and approx. 0.22 mi. roadway to be graded and concrete paved. 1-14

MODESTO, CALIF.—To Harry E. Brown, Rt. 4, Box 1551, Modesto, $4,389 by City Clerk, Modesto, for a reinf. concrete bridge within the City of Modesto on Sycamore Avenue across the Modesto Irrigation District Lateral No. 4. 1-30

SACRAMENTO, CALIF.—To Daniel G. Longtin, deYoung Bldg., S. F., $3,301 by State Division of Highways, Public Works Bldg., Sacramento, for test borings at site of proposed highway and railroad bridge, over the Pit River, to be constructed in connection with the Kennett Dam of the Central Valley Water Project. 1-31

DENVER, COLO.—To Gordon Const. Co., 1900 31st St., Denver, Colo., $169,166 by State Highway Dept., Denver, Colo., for const. railroad underpass North of Denver in ADAMS COUNTY, Colo., Proj., WPGH 129. 1-6

DENVER, COLO.—To C. A. Switzer, Rt. 1, Box 247, Arvada, Colo., $203,755, by State Highway Dept., Denver, for const. a railroad overpass on South 5th St. in City of Grand Junction, MESA COUNTY, Colo. WPGM 299-C. 1-17

DENVER, COLO.—Awards as follow by the State Highway Dept., Denver, Colo.: (1) CHEYENNE COUNTY (WPGH 278-J)—To E. H. Honnen Const. Co., P. O. Box 391, Colorado Springs, Colo., $79,278 for const. a railroad crossing and 0.5 mi. approaches betw. Kit Carson and Cheyenne Wells. (2) ARAPAHOE and ADAMS COUNTIES (FAP 351 & ERP 11)—To E. H. Honnen Const. Co., P. O. Box 391, Colorado Springs, Colo., $109,891 for const. bridge and 0.5 mi. approaches betw. Strasburg and Anton. 12-30

BOISE, IDAHO—Awards as follow by Comm. of Public Works, Boise, Idaho, for: (1) JEFFERSON & MADISON COUNTY—To Warren Northwest, Inc., Portland, Ore., $191,714 for const. a 696 ft. steel and concr. bridge across the South Fork of Snake River, a 24 ft. concr. bridge across Long Island Canal, etc. (2) BONNER COUNTY (WPGH 100-C)—To G. L. Arnett & Son, Standpoint, Ida., $45,122 (Resiliflex) for const. a 262.7 ft. concr. and steel overhead struc. over the Northern Pacific RR and grading and surf. approaches with screened gravel on 0.572 mi. of the North and South Highway about 0.75 mi. S. of Dufort. 1-20

GREAT FALLS, MONT.—Contracts awarded as follows by State Highway Comm., Great Falls, Montana, for: (1) YELLOWSTONE COUNTY (WPGM 134-B)—To Massman Const. Co., Box 577, Glasgow, Mont., $73,997 for const. steel and concr. underpass crossing of the Northern Pacific Ry. Co. tracks in City of Laurel on So. 1st Ave., includ. 0.093 mi. grad., surf. and conc. paving on approach road. (2) MISSOULA COUNTY (WPGH 271-B)—To Chas. Shannon, Butte, Mont., $27,837 for const. reinf. concrete viaduct over tracks of Chicago, Milwaukee, St. Paul and Pacific Railroad Co., 2½ miles west of Soudan, together with 0.422 mi. approach road. (3) LEWIS and CLARK COUNTIES (WPGM 376)—To Massman Const. Co., Box 577, Glasgow, Mont., $88,336 for const. reinf. concr. viaduct over tracks of the Great Northern Railway Co., on Lyndale Ave., in City of Helena, Montana, together with 0.438 mi. grad., surf., etc. on approach road. 1-28

CARSON CITY, NEV.—To Gibbons & Reed, 165 E. 4th, South, Salt Lake City, Utah, $58,797 by Nevada State Highway Comm., Carson City, Nev., for a reinf. concrete bridge and 0.98 mi. grading and gravel surfacing approaches in City of Elko, ELKO COUNTY, Nevada. 1-31

PORTLAND, ORE.—To Edlesfsen-Weygandt Co., Peninsular Ave. and Columbia Blvd., Portland, Ore., $77,891 by Oregon State Highway Comm. for overcrossing over the O.W.R.&N. Co's tracks and 0.26 mi. grad. and pav. on 102nd Ave. (Craig Road) near Portland, MULTNOMAH COUNTY. 1-13

PORTLAND, ORE.—To Kern & Kibbe, 42 E. Salmon St., Portland, $256,502, by Oregon State Highway Comm., for undercrossing under S.P. Co.'s tracks and 0.27 mi. grading and paving on the Pacific Highway at North city limits of Salem, in MARION COUNTY, Ore. 1-25

SALT LAKE CITY, UTAH—To Christensen-Gardner, Inc., Terminal Bldg., Salt Lake City, Utah, $117,449 by Utah State Road Comm., for two underpasses and approaches in UTAH COUNTY, U. S. Works Program Grade Crossing and Highway Proj. No. WPMH and WPGM 124-C at Pleasant Grove, Utah, a distance of 1.186 mi. approaches. 1-27

SALT LAKE CITY, UTAH—To T. G. Rowland, 1558 Yale Ave., Salt Lake City, Utah, $180,113 by Utah State Road Comm., for const. 2 underpasses and approaches betw. Brigham City and Corinne, a distance of 2.7 miles. 1-13

OLYMPIA, WN.—Awards as follow by Director of Highways, Olympia, Wn., for: (1) WALLA WALLA COUNTY (WPH 169-D&WPGH 169-D)—To James Coyle, 901 West Lake Ave., Seattle, $46,679 for timb. and steel overcrossing and grad. 1.2 mi. of St. Rd. 3, over Northern Pacific Ry. Co. tracks, Wallula Vicinity. (2) KING COUNTY (WPGH 184-H)—To Newton Const. Co., Inc., 2653 W. Newton St., Seattle, $27,972 for tr. timb. and steel overcr. of White River Lbr. Co. tracks on State Road No. 5, Enumclaw East Overcrossing—White River Lbr. Co. RR. 1-16

Water Supply Systems. . . . . .

WORK CONTEMPLATED

MAXWELL, CALIF.—Bond election will be held Feb. 27th by Maxwell Utility Dist., Maxwell, Calif., to vote on $45,000 in bonds to finance const. of a proposed sewage and water system. Total est. cost, $63,000. 1-6

CALLS FOR BIDS

LOS ANGELES, CALIF.—Bids to 10 a. m., March 13 by Metropolitan Water District, Los Angeles, for construction of the Eagle Mt. pumping plant of the Colorado River Aqueduct, under Spec. No. 143. Work is located in RIVERSIDE COUNTY, on the line of the Colorado River Aqueduct about 10 miles north of the town of Desert Center, and comprises the construction of the Eagle Mountain pumping plant buildings together with inlet works, outlet structures, electrical switching station, and other appurtenant works. 1-31

LOS ANGELES, CALIF.—Bids to 2 p. m., Feb. 17 by County Board of Supervisors, L. A., for reinforcing the elevated steel water tank tower at Rancho Los Amigos, near Downey, Spec. 349. 1-31

SACRAMENTO, CALIF.—Bids to 8:15 p. m., Feb. 20 by the City Clerk, Sacramento, for L. S. 2 overhead storage tanks. Per cu. yd. addtl. excavation. Per cu. yd. addtl. foundation concrete. Est. cost, $360,000. 1-25

BIDS RECEIVED

ARCADIA, CALIF.—Southwest Welding & Mfg. Co., 3201 W. Mission Road, Alhambra, $82,283.49 low to City Clerk, Arcadia, for construction of a water supply system. 1-24

FRESNO, CALIF.—Underground Construction Co., 391 South Raymond Ave., Pasadena, $21,463 low to County Clerk, Fresno, for constructing a waterworks system for Fresno County Waterworks District No. 2. 1-8

PASADENA, CALIF.—Marko Matick, Los Angeles, $46,626 low to City Manager, Pasadena, for construction of cast iron, steel and reinf. concrete water mains and service laterals in and near Pasadena. 1-30

SAN FRANCISCO, CALIF.—Eaton & Smith, 715 Ocean Ave., San Francisco, $29,073 low to Dept. of Public Works, San Francisco, for constructing 5 reinforced concrete cisterns (Group No. 3) for fire protection on Dolores, 22nd, 24th, 26th, 28th, and 30th Streets, in San Francisco. 1-29

McCAMMON, IDAHO—Olson Manufacturing Co., Boise, Idaho, who bid $8,946 (labor only) and identical bids of $24,604 (materials) by Waterworks Equipment Co., Salt Lake City, Utah; and Pacific States Cast Iron Pipe Co., Provo, Utah, low to Town Clerk, McCammon, Idaho, for laying and furnishing 21,480 lin. ft. 6 in. and 3,900 lin. ft. 8 in. cast iron pipe for water supply line. 1-8

MITCHELL, ORE.—Eugene Ruedy Co., Sherlock Bldg., Portland, Ore., $18,191 low to A. D. Reed, Mayor, Mitchell, Ore., for const. a water supply pipeline, consisting of 11,500 ft. 5 in. O. D. and 6,700 ft. 4½ in. O. D. steel dipped and wrapped pipe placed. Diversion dam and intake structure, 1,500 ft. of 4 in. dipped and wrapped overflow pipe placed. Also, necessary connections, bends, valves, and structure for crossing canyons. 1-30

MONMOUTH, ORE.—West Coast Const. Co., Lloyd Bldg., Seattle, Wn., $17,410, low to City Recorder, Monmouth, Oregon, for renewal of 22,500 ft. 4 to 10 in. water pipe, fittings and accessor. 1-18

MULTNOMAH, ORE.—West Coast Const. Co., Lloyd Bldg., Seattle, Wn., $12,059 low to the Home Water District, Multnomah, Oregon, for furnishing and laying 5,140 ft. 12 in. and 8 in. cast iron pipe, gate valves, and fittings. 1-16

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To Wood & Bevanda, P. O. Box 49, Stockton, $498,789 SCH. 1 and $220,566 SCH. 2 by Metrop. Water Dist., Los Angeles, for const. the Iron Mountain pumping plant at the Colorado River Aqueduct, under Spec. 136. Work is located in SAN BERNARDINO COUNTY, on the line of the Colorado River Aqueduct, about 15 mi. N.W. of town of Rice and comprises the const. of the Iron Mt. pumping plant bldgs., together with inlet works, outlet struc., elec. switching station and other appur. works. (See Unit Bid Summary). 1-24

LOS ANGELES, CALIF.—Awards as follow by Metropolitan Water Dist., 306 W. 3rd St., L. A., for furnishing centrifugal pumps for the main pumping plants of the Colorado River Aqueduct, under Spec. No. 116.: (1) To Byron Jackson Pump Co., 2150 E. Slauson Ave., Huntington Park, $112,737 for 3 single stage centrifugal pumps with spare parts for intake pumping plant and $112,737 for 3 same, for Gene Pumping Plant. (2) To Allis Chalmers Mfg. Co., 458 S. Spring St., Los Angeles, $98,300 for 3 single stage centrifugal pumps with spare parts for Iron Mountain Pumping Plant. (3) To Worthington Pump Co., 5075 Santa Fe Ave., Los Angeles, $134,000 for 3 single stage centrifugal pumps with spare parts for Eagle Mountain Pumping Plant, and 3 same for Hayfield Pumping Plant. 1-25

SAN FRANCISCO, CALIF.—To Pacific States Const. Co., Call Bldg., S. F., $26,420 by Pub. Util. Comm., S. F., for laying 6 and 8 in. cast iron mains in area of Esmeralda to Silvia St. and Waterville to Mission St., under S.F.W.D. Contract No. 104. 1-28

SAN FRANCISCO, CALIF.—To MacDonald & Kahn Co., Ltd., Financial Center Bldg., S. F., $157,308 by Pub. Util. Comm., S. F., for const. the Central pumps Reservoir, to be covered reservoir with concr. roof. and lining, valve house and inlet and outlet struc. to be located at Sloat Blvd., 23rd Ave., Ocean Ave. and 22nd Ave., S.F.W.D. 100. 1-28

SAN FRANCISCO, CALIF.—To The Lowrie Paving Co., Inc., 1540 16th St., S. F., $16,986 by Pub. Util. Comm., S. F., for laying 6 in. and 8 in. cast iron water mains from 20th Ave. to 30th Ave., and betw. Lincoln Way to Rivera Street, under SFWD Contr. 103. 1-14

SAN FRANCISCO, CALIF.—To Lowrie Paving Co., Inc., 1540 16th St., S. F., $58,375 by Pub. Utilities Comm., S. F., for laying 12 in. and 16 in. feeder mains in Central part of City under SFWD Contract No. 58. 1-14

SAN FRANCISCO, CALIF.—To Sibley Grading & Teaming Co., Ltd., 165 Landers St., S. F., $17,976 by Dept. Pub. Wks., S. F. for const. three 75,000 gal. reinf. concr. fire cisterns, one each at Pine, Post, Ellis & Van Ness Ave. (Group No. 1). 1-17

SAN FRANCISCO, CALIF.—To Pacific States Const. Co., Call Bldg., San Francisco, $17,965, by Public Utilities Comm., San Francisco, for laying 6 in. and 8 in. cast iron water mains in Balboa Park District, under S. F. Water Dept. Contract No. 102. 1-14

SAN FRANCISCO, CALIF.—To MacDonald & Kahn Co., Ltd., Financial Center Bldg., S. F., $137,964 by Pub. Utilities Comm., S. F. for laying 20 in. and 24 in. steel feeder mains in San Francisco, under S.F.W.D. Contract No. 101. 1-21

SEAL BEACH, CALIF.—Award subject to PWA approval, to H. A. Teget, 133 Princeton St., Ontario, $52,956, by City Clerk, Seal Beach, for construction of water supply system. 1-21

SUISUN, CALIF.—Award recommended (subject to PWA approval) to Robert B. McNair and H. Gould, 3745 Rhoda Avenue, Oakland, at approximately $34,000 by City Clerk, Suisun, Calif., for constructing waterworks improvements under WPA Project No. 1045. 1-31

HEPPNER, ORE.—To O. N. Pierce & F. L. Connor, 212 N. Russell St., Portland, Oregon, $10,712 by City Recorder, Heppner, Ore., for the rehabilitation of the present municipal water system. 1-22

SEATTLE, WN.—To Seattle Boiler Works, 1132 W. 45th St., Seattle, Wn., $5,950, by Board of Public Works, Seattle, Wn., for fabricating and erecting two steel plate closing-in pieces for the penstocks at the Diablo Power House at Reflector Bar, Skagit, for City Light Dept., under Ordinance No. 64869. 12-30

SHELTON, WN.—To Worthington Co., Inc., 922 1st So., Seattle, Wn., $1,118, by City Clerk, Shelton, Wn., for furnishing and installing pumping equipment. All bids for 50,000 gal. aerating tank, have been rejected. 1-13

Sewer Construction . . . . . .

WORK CONTEMPLATED

STOCKTON, CALIF.—A special Municipal election will be held February 18th by Stockton, Calif., to vote on the following bond issues: $110,000 for additions to sewage system and to sewage treatment tank. $50,000 for acquisition of fire apparatus. C. C. Kennedy, Consulting Engineer, Call Bldg., San Francisco, has been retained by the City Council, Stockton, to prepare a report and make recommendations on the reconstruction of two sewage treatment plants in City of Stockton. Est. cost is $150,000. 1-9

SPOKANE, WN.—Bond election will be held March 10th by Spokane, Wn., to vote on $2,000,000 bond issue to finance construction of a new sewage disposal plant. 1-16

CALLS FOR BIDS

MONTEREY PARK, CALIF.—Bids to 7 p. m., Feb. 17 by City Clerk, Monterey Park, for const. a sewer system, involving: 40,792 ft. 6 in. vitr. pipe, std. str.; 115,845 ft. 8 in. same; 8,711 ft. 8 in. same, extra strength; 4,396 ft. 10 in. same, std. strength; 895 ft. 10 in. same, extra strength; 994 ft. 12 in. same, std. strength; 2,111 ft. 12 in. same, extra strength; 6,023 ft. 15 in. same, standard strength; 12,729 ft. 15 in. same, extra strength. 1-31

BIDS RECEIVED

GLENDALE, ARIZ.—Hoagland Engineering & Construction Co., First National Bank Bldg., Long Beach, $41,443 low to City of Glendale, Ariz., for construction of a sewage disposal plant. 1-6

EL CENTRO, CALIF.—A & B Construction Co., 912 Atlantic Blvd., Hynes, $249,297 low to City Council, El Centro, for construction of an outfall sewer and pumping plant. (See Unit Bid Summary). 1-2

SAN FRANCISCO, CALIF.—Healy Tibbitts Const. Co., 64 Pine St., San Francisco, $96,200 PROP. "A" and Frederick W. Snook Co., 596 Clay St., S. F., $37,884. PROP. "B" low bids to Dept. of Public Works, S.F., for const. Marina Sewage Pumping Plant. 1-22

SAN FRANCISCO, CALIF.—To Lowrie Paving Co., Inc., 1540 16th St., San Francisco, $19,489 by Public Utilities Comm., S. F., for laying 6 in. and 8 in. cast iron mains in area of Orizaba St. to Rolph St. and Seneca to County Line, under Spec. S.F.W.D., No. 105. 1-28

CONTRACTS AWARDED

BARSTOW, CALIF.—Award (subject to PWA approval) to John Grancich, 1117 North Gage St., Los Angeles, $83,241, by City Council, Barstow, for construction of the Barstow Sewage Treatment plant. 1-18

EL MONTE, CALIF.—Award recommended, subject to PWA approval, to George E. Miller, 9401 Brighton Way, Beverly Hills, Calif., $51,000, by City Council, City Hall, El Monte, for construction of the El Monte Sewage Treatment plant. 1-15

HUNTINGTON BEACH, CALIF.—Contract awarded, subject to PWA approval, to Hoagland Engineering & Const. Co., 1st National Bank Bldg., Long Beach, $79,753 to City Clerk, Huntington Beach, for construction of a sewage disposal plant. 1-30

LAGUNA BEACH, CALIF.—To O. U. Miracle Co., 4751 Monroe St., San Diego (subject to PWA approval) $75,440, by City Clerk, Laguna Beach, for construction of sewers in Lateral Sewer District No. 3. 1-11

LAGUNA BEACH, CALIF.—To O. U. Miracle Co., 4751 Monroe St., San Diego, (subject to PWA approval), $32,037, by City Clerk, Laguna Beach, for construction of sewers in Lateral Sewer District No. 2. 1-11

PITTSBURG, CALIF.—To Bundeson & Lauritzen, P. O. Box 395, Pittsburg, $4,378, by City Manager, Pittsburg, for constructing a storm drainage system on West 10th and Montezuma Streets and on West 9th and West 8th Streets. 1-15

SANTA ANA, CALIF.—Award recommended (subject to PWA approval) to Macco Construction Co., 815 Paramount Blvd., Clearwater, $26,000, by Board of Supervisors, Santa Ana, for construction of the Lovita Ave. Storm Drain. 1-15

GRESHAM, ORE.—To Parker-Schram Co., Couch Bldg., Portland, Ore., $94,115 (USING CONCRETE PIPE) by C. G. Schneider, Mead Bldg., Portland, Ore., for constructing a sanitary sewer system, storm water system and sewage disposal plant. 1-14

NYSSA, ORE.—To Olson Mfg. Co., Boise, Ida., $20,509 by Town Recorder, Nyssa, Oregon, for constructing a sewage disposal plant. Work involves primary clarifier or septic tank, trunk line, pumping station, etc. 1-29

OSWEGO, ORE.—To Gilpin Const. Co., Henry Bldg., Portland, Ore., $116,484 by City Recorder, Oswego, for const. of a sewage system for the City of Oswego, consist. of 3 pipe trunk sewers and branches converging at outfall. 1-30

PENDLETON, ORE.—To Herber & Sheldon, Rust Bldg., Tacoma, Wn., $21,755 by City Recorder, Pendleton, Ore., for const. a sewage disposal plant consisting of remodeling existing septic tank, const. pump and boiler house and a sludge digester tank, furnishing and placing pipes, pipe fittings, valves, sludge pump, hot water boiler and sludge digestion equipment, etc. 1-18

River and Harbor Work. . . . .

CALLS FOR BIDS

BENICIA, CALIF.—Bids to 10 a. m., Feb. 21 by Commanding Officer, Benicia Arsenal, Benicia, Calif., for repairs to wharf involving replacement of 10 fender piles and 1 mooring pile with new creosoted piles. 1-30

LOS ANGELES, CALIF.—Bids to 10 a. m. Feb. 19th by Board of Harbor Comm., Los Angeles for relocation and reconstruction of the transit shed facility Berth 155, San Pedro, including relocation of shed sprinkler tank and bldgs.; construction of reinf. conc. retaining walls and ramp walls; make and settle earthfill to new floor level; construct concr. floor and integral column footings; const. conc. pavemt. curbs and loading platform; relocate all elec. water and gas lines and relocate two existing railroad tracks, under Spec. No. 948, PWA Docket No. 1210. Est. $44,889. 1-23

LOS ANGELES, CALIF.—Bids to 10 a. m., Feb. 19th by Board of Harbor Comm., Los Angeles, for construction of rock riprap bank protection and rubble bulkhead wall at Berth 155, Wilmington Dist. Rock riprap to be placed 441 ft. x 60 ft. x 3 ft. after existing rubble and earth is removed. Spec. No. 955 PWA Docket No. 1209, Unit 3. 1-23

LOS ANGELES, CALIF.—Bids to 10 a. m., Feb. 19th by Board of Harbor Comm., Los Angeles, for construction of a timb. apron wharf at Berth 155, Wilmington District. Work includes construction of a cresoted timber apron wharf 462 ft. long and 22.5 ft. wide; fender system; framing timber wharf structure, etc., and furnishing and placing crane rails and crane rail fastenings under Spec. No. 949, PWA Docket No. 1209 Unit No. 1. 1-23

LOS ANGELES, CALIF.—Bids to 10 a. m., Feb. 19th by Board of Harbor Comm., Los Angeles, for construction of a concrete wharf and steel frame transit shed at Berth 155, Wilmington Dist. Work involves construction of a conc. wharf and steel frame transit shed 441 ft. long x 120 wide, including steel rolling doors and sash, elec. and sprinkler systems, pavement trackage, etc., under Spec. No. 950, PWA Proj. No. 1209, Unit No. 2. 1-23

LOS ANGELES, CALIF.—Bids to 10 a. m., Feb. 19th by Board of Harbor Comm., Los Angeles, for construction of a creosoted timber wharf and fender system, 599 ft. long and 39 ft. wide, including connections to existing wharf at Berth 146, L. A. Harbor, removal of a 12 pile dolphin and cat walk construction of timber approaches and asph. concrete roadway, electrical installation and water services, fencing and gates and 8 standard guage railroad service tracks. Spec. 954. PWA Proj. No. 1206. 1-23

CONTRACTS AWARDED

SAN FRANCISCO, CALIF.—Awards as follow by the U. S. Treasury Dept., Procur. Office, 49 4th St., San Francisco, for: INVIT. No. 423—To S. F. Bridge Co., 503 Market St., S. F., 64 days at $1,400 per day—total $89,600 for one or more dredgers to dredge 1,787,000 cu. yd. material in San Diego Bay. INVIT. No. 434—To Standard Dredging Co., Central Bldg., L. A., 50 days at $1,575 per day—total $78,750 for one or more dredgers for dredging 1,700,000 cu. yd. material in San Diego Bay. INVIT. No. 448—To Sparkes & McClellan, 23rd and Central Ave., Newport Beach, 94 days at $435 per day—total $40,890 for one dredger to dredge 436,000 cu. yd. material in San Diego Bay. 1-14

SEAL BEACH, CALIF.—Award (subject to PWA approval) to Rohl Connolly Co., 4351 Alhambra Ave., Los Angeles, $71,162 by City Clerk, Seal Beach, for construction of a rock jetty on the Westerly side of the inlet at Anaheim Landing Bay, involving 30,000 tons rock A, B and C. 1-4

STOCKTON, CALIF.—Award recommended (subject to PWA approval) to O. H. Chain, 41 S. Sutter Street, Stockton, $185,297, by Stockton Port Commission, for const. warehouses C, D, E, F, L & M, with extensions to water system, drainage, dry pipe fire protection system, and road system located at the Deep Draft Terminal, Stockton, Calif. 12-31

SEATTLE, WN.—To General Const. Co., 3840 Iowa St., Seattle, Wn., $52,338, by U. S. Engineer Office, Seattle, for 366,000 cu. yd. dredging material from Duwamish waterway, extending from the bridge at 8th Avenue So., to a point 4,700 ft. below the bridge in Seattle, Wn. 1-21

Irrigation and Reclamation . .

CALLS FOR BIDS

YAKIMA, WASH.—Bids to 10 a. m., Feb. 24 by the Bureau of Reclamation, Yakima, Wn., for construction of a spillway at the Kachess Dam, Yakima Project, Washington, under Spec. No. 669. Work is located about 2½ miles northwest of Easton, Wash., and involves in the main: 61,200 cu. yd. earthwork exc. (struc. and other purposes); 660 cu. yd. exc. (concr. and rubble pav.); 2,800 cu. yd. backfill; 11,000 cu. yd. earth fill in embankm.; 1,300 cu. yd. riprap on upstream slope and rock fill at toe of embkm.; 900 cu. yd. dumped riprap (spillway channel); 250 cu. yd. screened gravel under floor of spillway; 75 cu. yd porous concrete; 2,260 cu. yd. concrete; 150 sq. yd. grouted paving; 25,000 lb. reinforcement bars; 1,095 lin. ft. 6 in. to 18 in. dia. sewer pipe drains (construct); 70 lin. ft. holes for anchor bars and grouting bars (drill); 275 lin. ft. metal sealing strips (inst.); 60,800 lb. gates and other metalwork (inst.) 1-27

BIDS RECEIVED

MODESTO, CALIF.—All bids submitted to the Modesto Irrigation District, 823 11th St., Modesto, Calif., for constructing 2 in. concrete lining and reinf. concrete outlet headwalls in the Canals and laterals of the Modesto Irrigation District, have been rejected and work is to be done by the District forces. 1-3

TURLOCK, CALIF.—Lloyd W. Terrell, 221 9th Ave., Turlock, $36,409 (Sched. 10, Items 1, 2, 3 and 5) and Ed. Erickson, Rt. 4, Box 744, Modesto, $3,520 (Sched. 10, Item 4) low bids to Turlock Irrigation Dist., 117 W. Main St., Turlock, for concrete canal lining. No bids were received for Scheds. 1 to 9 inclusive and they will probably be readvertised at a later date. 1-14

MISSOULA, MONT.—Hale & Bates, Missoula, Montana, $48,329, low to Bureau of Reclamation, Missoula, Mont., for const. diversion works and structures, Main Canal, Frenchtown Project, Montana, under Spec. 662. 1-3

ONTARIO, ORE.—George B. Henly, Nyssa, Oregon, $7,395, low to Bureau of Reclamation, Ontario, Oregon, for earthwork, Ontario, Oregon, for earthwork, North Canal Owyhee Project, under Spec. No. 527-O. 1-9

CONTRACTS AWARDED

CARLSBAD, NEW MEXICO—To Hallett Const. Co., Crosby, Minn., $1,132,547 by Bureau of Reclamation, Carlsbad, New Mexico, for construction of the Almagordo Dam. 1-27

OGDEN, UTAH—To J. A. Terteling & Sons, 2223 Fairview Ave., Boise, Ida., $424,978 (Sched. 1 and 2) by Bureau of Reclamation, Ogden, Utah, for constructing earthwork, canal lining, and struc. Ogden-Brigham Canal, Sta. 587 to Sta. 1260, Sched. 1, and South Ogden Highline Canal, Sta. 10 to Sta. 335, Sch. 2, Ogden River Project, Utah, under Spec. 659. (See Unit Bid Summary). 1-9

Dam Construction . . . . . .

BIDS RECEIVED

PHOENIX, ARIZ.—Bids received as follows by Showlow Silver Creek Water Conservation and Power District, NAVAJO COUNTY, Arizona, for construction of nine separate units, all part of the Showlow-Silver Creek Water Conservation and Power District Project: UNITS 2, 4, 5 and 6—no bids received. UNIT No. 1—Award recommended (subject to PWA approval) to J. H. Frost, Snowflake, who bid $11,340 for the Silver Creek diversion dam and hydro-elec. power canal. UNIT No. 3—Walter H. Denham & Co., submitted low bid $14,148.70 for the Showlow Creek Irrigation diversion dam. UNIT No. 7—Award recommended (subject to PWA approval) to J. H. Frost, Snowflake, who bid $4,054 for installation of the hydro-electric power plant equipment. UNIT No. 8—Taylor Construction Co., low, $6,316 for construction of the power transmission line from the new power house to Taylor. Other bid: J. W. Electric Co. UNIT No. 9, Schedule No. 1—Contract awarded to Laffel & Co., Springfield, Ohio, $4,211 for water turbine. Schedule No. 2—Bids rejected, and will be readvertised at a later date, for furnishing equipment. Schedule No. 3—Western Metals Mfg. Co., low, $19,022 for single items and $18,138.42 for carload lots, of miscellaneous materials. 1-15

PRESCOTT, ARIZ.—Pearson & Dickerson, 202 N. Central Ave., Phoenix, $69,759 low to City Clerk, Prescott, for construction of a dam on Hassayampa Creek, repairs to Goldwater Dam and 800 ft. 12 in. pipeline. 1-6

CONTRACTS AWARDED

BOISE, IDAHO—To T. E. Connolly, Inc., 461 Market St., San Francisco, $395,040, by Bureau of Reclamation, care of Boise Project Board of Control, Boise, Idaho, for raising the Arrowrock Dam, Boise Project, Idaho, under Spec. 661. 1-13

ELKO, NEVADA—Award recommended to J. A. Terteling & Sons, 2223 Fairview Ave., Boise, Ida., $94,770 by U. S. Indian Irrig. Service, L. A., for const. an arch dam, located about 70 mi. N. of Elko, Nev., at Wild Horse site on Owyhee River. 1-17

Railroad Construction . . . . . .

CALLS FOR BIDS

LOS ANGELES, CALIF.—Bids to 10 a. m., Feb. 19th by General Manager, Harbor Comm., City Hall, Los Angeles, for constructing a standard gauge railroad track, including grading, track laying, trestle construction, paving, automatic grade crossing protection, etc., for Los Angeles Municipal Terminal Railroad, Belt Line Track extension

Wilmington District, under Harbor Spec. 946, PWA Docket 1208, Unit 1. Est. cost $119,247. 1-23

LOS ANGELES, CALIF.—Bids to 10 a. m., Feb. 19th by General Manager Harbor Comm., 112 City Hall, L. A., for construction of a railroad electric interlocking plant at E. Thenard & West Thenard Sts., LOS ANGELES COUNTY, to control movements of trains over six crossings on the L. A. Municipal Terminal RR Belt Line track extension Wilmington District under Spec. No. 947 PWA Docket No. 1208 Unit 2. Est. cost $44,889. 1-23

SAN FRANCISCO, CALIF.—Bids to 3 p. m., Feb. 19th by Public Utilities Commission, San Francisco, for reconstructing Geary Street tracks between Powell and Kearny Streets, S. F., under Munic. RR Contract No. 172. 1-22

Tunnel Construction . . . . . .

CONTRACTS AWARDED

ONTARIO, ORE.—To J. A. Terteling & Sons, 2223 Fairview Ave., Boise, Ida., $292,415, by Bureau of Reclamation, Ontario, Oregon, for constructing Tunnels, 1, 2 3 and 4, Black Canyon Canal, under Spec. No. 654. 1-9

Pipeline Construction . . . . . .

WORK CONTEMPLATED

SUNSET BEACH, CALIF.—Application has been made by Sunset Beach Sanitary District, Sunset Beach, ORANGE COUNTY, Calif., to U.S. Engineer Office, Los Angeles, for war department permit to construct a 6 in. welded steel pipeline, extending approx. 1,700 ft. seaward from mean high tide at the foot of Los Patos Ave. for the disposal of effluent from a sewage treatment plant. 1-30

CALLS FOR BIDS

INGLEWOOD, CALIF.—Bids to 7:30 p. m., Feb. 18th by City Clerk, Inglewood, for furn. welding and laying in trench steel pipe and fittings, involving: 3,340 lin. ft. 24 in. welded steel pipe. 1-31

BIDS RECEIVED

SAN DIEGO, CALIF.—Consolidated Steel Corp., Ltd., 6,500 E. Slauson Ave., Los Angeles, $412,259. PROP. "A" low to City Clerk, San Diego, for const. the El Capitan-Lakeside Pipeline from Sta. 104 to Lakeside. (See Unit Bid Summary). 1-28

LA MESA, CALIF.—Consolidated Steel Corp., Ltd., 6500 E. Slauson Ave., Los Angeles, $141,306. PROP. "A" (10 per cent discount if awarded both jobs) low to La Mesa, Lemon Grove & Spring Valley Irrig. Dist., La Mesa, Calif., for const. 10,400 ft. of the El Capitan Pipeline. 1-28

CONTRACTS AWARDED

LOS ANGELES, CALIF.—Awards as follow by Metropolitan Water District, 306 W. 3rd St., Los Angeles, for precast concrete pipe and steel pipelines and 3-span through truss bridge and appurtenant works of the Colorado River Aqueduct distribution system, betw. Sta. 31-50 and 926, of the Upper Feeder, under Spec. 137. SCH. No. 1P—To American Concrete and Steel Pipe Co., 4635 Firestone Blvd., Southgate, $540,611 for precast concrete for the Upper Feedr, Sta. 31-50 to 155. SCH. No. 2S—To Western Pipe & Steel Co., 5717 Santa Fe Ave., Los Angeles, $4,047,374 for const. steel pipe for the Upper Feeder, Sta. 155 and 707. SCH. No. 2B—To Western Pipe & Steel Corp., 5717 Santa Fe Ave., Los Angeles, $159,663 for const of the Santa Ana River bridge and piers for the Upper Feeder. SCH. No. 3P—To American Concrete & Steel Pipe Co., 4635 Firestone Blvd., Southgate, $880,639 for const. of precast concrete pipe for the Upper Feeder, Sta. 707 and 926. (See Unit Bid Summary). 1-11

Power Development . . . . . .

WORK CONTEMPLATED

SALT LAKE CITY, UTAH—Plans and specifications are being completed by the Utah Power & Light Co., Geo. M. Gadsby, President and General Manager, Kearns Bldg., Salt Lake City, Utah, and work will start as soon as a site has been selected for construction of a steam power generating plant of 25,000 h.p. capacity. Est. cost, $1,600,000. 1-15

ROCK SPRINGS, WYOMING—Plans and specifications have been completed and work will commence immediately by Union Pacific Coal Co., Rock Springs, Wyoming, on construction of a 5,000 K.W. high pressure turbo-generator power plant to be located on company property at east city limits of Rock Springs. Est. cost, $500,000. 1-20

Lighting Systems . . . . . .

CALLS FOR BIDS

LOS ANGELES, CALIF.—Bids to 10 a. m., Feb. 19 by Bd. of Pub Wks., L. A., for lighting system complete in Crescent Heights Blvd. from Olympic Blvd. to Pico Blvd. 1-30

LOS ANGELES, CALIF.—Bids to 10 a. m., Feb. 19 by Bd. of Pub. Wks., L. A., for a lighting system complete in Figueroa St. from Bishops Road to Solano Ave. 1-30

Miscellaneous . . . . . .

WORK CONTEMPLATED

SOUTHGATE, CALIF.—Plans and specifications are being drawn up by Guy F. Nevill, City Engineer, Southgate, for construction of a swimming pool. Work is to be done by WPA Labor. 1-27

CALLS FOR BIDS

SAN DIEGO, CALIF.—Bids to 11 a. m., February 18 by 11th Naval District, Foot of Broadway, San Diego, for replacement of refrigerating machinery at the Naval Operating Base (Destroyer Base) San Diego, under Spec. 8160. Work includes removing of existing compressor with elec. motor, a condenser, piping and misc. appurten.; furn. and install. new water-cooled ammonia compressor unit, one cooling water circulating pump, one water-cooling circulating pump, one water-cooling tower, expansion valves, thermostats, piping and elec. and miscellaneous work. 1-31

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.

Asphalt
Asphalt Institute, The
General Petroleum Corp.

Asphalt Plants
Barber-Greene Co.
Madsen Iron Works

Backfillers
Austin-Western Road Mchy. Co.
Harnischfeger Corp.
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co.

Batchers, Concrete Aggregates
Western Pipe & Steel Co.

Bins, Storage and Hopper
Chain Belt Company
Western Pipe & Steel Co.

Bits, Rock Drilling
Chicago Pneumatic Tool 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.
Hercules Powder Co.
Trojan Powder Co.

Bridges
United States Steel Corp.

Buckets
Bucyrus-Erie Co.
Electric Steel Foundry Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Northwest Engineering Co.
Page Engineering Co.
Wellman Engineering Co.

Bulldozers
Austin-Western Road Mchy. Co.
LeTourneau, R. G., Inc.

Cable, Highway Guard Rail
American Cable Company
Leschen, A., & Sons Rope Co.
Roebling, John A., Sons Co.
United States Steel Corp.

Cableways
Leschen, A., & Sons Rope Co.
Roebling, John A., Sons Co.

Castings, Steel and Alloy Steel
Electric Steel Foundry Co.
Madsen Iron Works
United States Steel Corp.

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.
Dorr Company

Compressors, Air
Chicago Pneumatic Tool Co.
Worthington Pump & Mchy. Co.

Conveyors, Belt
Link-Belt Co.

Cranes, Diesel, Electric, Gas and Steam
American Hoist and Derrick Company
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Industrial Brownhoist Corp.
Harnischfeger Corp.
Koehring Co.
Lima Locomotive Works, Inc.
Link-Belt Co.
McKiernan-Terry Corp.
Northwest Engineering Co.
Osgood Company
Thew Shovel Co.
Universal Crane Co.

Crushers
Austin-Western Road Mchy. Co.
Iowa Manufacturing Co.

Culverts
Austin-Western Road Mchy. Co.
California Corrugated Culvert Co.
Hardesty Manufacturing Co.
Pure Iron Culvert & Mfg. Co.
Washington Corrugated Culvert Co.
Western Pipe & Steel Co.

Derricks, and Derrick Fittings
American Hoist and Derrick Company
Harnischfeger Corp.
McKiernan-Terry Corp.

Drill Bits, Detachable
Timken Roller Bearing Company

Ditchers
Barber-Greene Company

Drills, Diamond
Chicago Pneumatic Tool Co.
Sullivan Machinery Company

Drills, Rock
Chicago Pneumatic Tool Co.
Worthington Pump & Mchy. Corp.

Dynamite
Apache Powder Co.
Atlas Powder Co.
Halafax Explosives Co.
Hercules Powder Co.
Trojan Powder Co.

Elevating and Conveying Equipment
Adams, J. D., Company
Austin-Western Road Machinery Company
Link-Belt Company

Elevators, Bucket
Link-Belt Co.

Engines, Diesel, Gasoline and Steam
Caterpillar Tractor Co.
Chicago Pneumatic Tool Co.
Fairbanks-Morse Company
Worthington Pump & Mchy. Corp.

Equipment, Rebuilt
(See Opportunity Section)

Equipment for Rent
(See Opportunity Section)

Equipment, Used
(See Opportunity Section)

Excavators, Ditching and Trench
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Lima Locomotive Works, Inc.
Link-Belt Co.
Northwest Engineering Co.
Osgood Company
Thew Shovel Co.

Excavators, Dragline
Austin-Western Road Mchy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Lima Locomotive Works, Inc.
Link-Belt Co.
Northwest Engineering Co.
Osgood Company
Thew Shovel Co.

Explosives
Apache Powder Co.
Atlas Powder Co.
Halafax Explosives Co.
Hercules Powder Co.
Trojan Powder Co.

Ferric Chloride
Great Western Electro-Chemical Co.

Flumes, Metal
California Corrugated Culvert Co.
Hardesty Mfg. Co.
Pure Iron Culvert & Mfg. Co.
Washington Corrugated Culvert Co.
Western Metal Mfg. Co.
Western Pipe & Steel Co.

Forms, Concrete
Western Pipe & Steel Co.

Generators, Electric
General Electric Co.
Harnischfeger Sales Corp.
Master Vibrator Company

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.
Iowa Manufacturing Co.

Hoists, Diesel, Gas, Electric and Hand Power
Chicago Pneumatic Tool Co.
Harnischfeger Corp.
Link-Belt Co.
McKiernan-Terry Corp.
Wellman Engineering Co.

Hoppers, Steel
Link-Belt Co.
Standard Steel Works
Western Pipe & Steel Co.

Hose, Air, Steam and Water
Chicago Pneumatic Tool Co.

Hydrants
Pac. States Cast Iron Pipe Co.

Lighting Plants
General Electric Co.
Harnischfeger Sales Corp.

Liner Plates
Western Pipe & Steel Co.

Loaders, Power, Truck and Wagon
Austin-Western Road Mchy. Co.
Barber-Greene Co.
Link-Belt Co.

Lumber
Baxter, J. H., & Co.

Lumber, Redwood
California Redwood Assn.

Lumber, Treated
Baxter, J. H., & Co.

Meters
Neptune Meter Co.

Mixers, Concrete
Chain Belt Company
Koehring Co.
Link-Belt Company
Western Pipe and Steel Company

Motors, Electric
General Electric Co.
Harnischfeger Sales Corp.

Oxygen
Air Reduction Sales Company

Paints, Protective
General Paint Corp.

Paving Breakers
Chicago Pneumatic Tool Co.
Worthington Pump & Mchy. Corp.

Penstocks
Western Pipe & Steel Co.

Pile Drivers
American Hoist and Derrick Company
Harnischfeger Corp.
Industrial Brownhoist Corp.
McKiernan-Terry Corp.

Piling, Creosoted
Baxter, J. H., & Co.

Piling, Steel
United States Steel Corp.

Piling, Wood
Baxter, J. H., & Co.

Pipe, Cast Iron
Pacific States Cast Iron Pipe Co.
U. S. Pipe and Foundry Company

Pipe, Riveted Steel
Western Pipe & Steel Co.

Pipe, Steel
Crane Company
United States Steel Corp.
Western Pipe & Steel Co.

Pipe, Welded Steel
California Corrugated Culvert Co.
Hardesty Mfg. Co.
Washington Corrugated Culvert Co.
Western Pipe & Steel Co.

Pipe, Wood
California Redwood Association

Powder
(See Explosives)

Pumps
Chain Belt Company
Chicago Pneumatic Tool Co.
Crane Company
Fairbanks-Morse Company
Layne & Bowler Co.
Pelton Water Wheel Co.
Pomona Pump Co.
Worthington Pump & Mchy. Corp.

Rails, and Rail Specialties
United States Steel Corp.

Reinforcing, Steel Bar and Fabric, for Concrete
United States Steel Corp.

Road Oils
Asphalt Institute, The

Rollers, Compacting
LeTourneau, R. G., Inc.

Rollers, Road
Austin-Western Road Mchy. Co.

Rope, Wire
United States Steel Corp.
Leschen, A., & Sons Rope Co.

Scarifiers
Adams, J. D., Co.
Austin-Western Road Mchy. Co.
Caterpillar Tractor Co.
LeTourneau, R. G., Inc.

Scrapers
Adams, J. D., & Co.
Austin-Western Road Mchy. Co.
LeTourneau, R. G., Inc.

Screens, Sand and Gravel
Austin-Western Road Mchy. Co.
Iowa Manufacturing Co.
Link-Belt Company
Smith Engineering Works

Second Hand Equipment
(See Opportunity Section)

Sewage Disposal Equipment
Dorr Company
Link-Belt Company
Wallace & Tiernan Company

Sharpeners, Drill
Sullivan Machinery Company
Worthington Pump & Mchy. Corp.

Shovels, Power
American Hoist and Derrick Company
Austin-Western Road Mchy. Co.
Bucyrus-Erie Company
Harnischfeger Sales Corp.
Koehring Company
Lima Locomotive Works, Inc.
Link-Belt Company
Northwest Engineering Co.
Osgood Company
Thew Shovel Company

Stackers
Barber-Greene Co.

Steel, Abrasion Resisting
Electric Steel Foundry Co.

Steel, Reinforcing
United States Steel Corp.

Steel, Sheet-Galvanized Corrugated
California Corrugated Culvert Co.
United States Steel Corp.

Steel, Structural
Western Pipe & Steel Co.

Tanks, Metal
California Corrugated Culvert Co.
Western Pipe & Steel Co.

Timber, Creosoted
Baxter & Company, J. H.

Tires, Rubber
Firestone Tire & Rubber Co.

Tools, Pneumatic
Chicago Pneumatic Tool Co.
Sullivan Machinery Company
Worthington Pump & Mchy. Corp.

Torches, Carbide
Air Reduction Sales Co.

Tractors
Allis-Chalmers Mfg. Co.
Case, J. I., Company
Caterpillar Tractor Company

Tramways, Aerial
Leschen, A., & Sons, Rope Co.

Trucks, Motor
General Motors Truck Co.

Turbines
General Electric Co.
Pelton Water Wheel Co.

Valves
Crane Company

Valves, Gate
California Corrugated Culvert Co.
Pacific Pipe Co.
Pelton Water Wheel Co.

Vibrators, Concrete
Chicago Pneumatic Tool Co.
Electric Tamper & Equipment Co.
Mall Tool Co.
Master Vibrator 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.
Air Reduction Sales Company
Harnischfeger Corp.

Welding Gas
Air Reduction Sales Company

Weighing Equipment
Fairbanks-Morse Company
Standard Steel Works

Welding Rods and Wire
Adams, J. D., Co.
Air Reduction Sales Company

PROFESSIONAL DIRECTORY

NEW YORK MONTREAL VANCOUVER

AMBURSEN DAM CO., Inc.

Engineers + Contractors

ALEXANDER BLDG., SAN FRANCISCO

CLEVELAND DAVENPORT SAN ANTONIO

LOW COST INSTALLATIONS

CABLEWAYS

ANY CAPACITY

NEW AND REBUILT

FOR DAMS BRIDGES FILTRATION AND SEWERAGE PLANTS

HANDLES MEN EXCAVATION FORMS STEEL CONCRETE

ROBERT S SMILIE & CO.

85-2ND ST - SAN FRANCISCO

Robert W. Hunt Company

251 Kearny Street, San Francisco

Testing and Inspecting Engineers

Bureau of Inspection, Tests and Consultation

LOS ANGELES SEATTLE PORTLAND

And all large manufacturing centers

JOHN SCHUYLER BATES

Consulting Engineer

MUNICIPAL AND SANITARY ENGINEERING

STRUCTURAL DESIGN

PRECISE BASIC SURVEYS AND MAPS

3134 ETON AVENUE BERKELEY, CALIF.

Engineering Societies Employment Service

For Employers of Chemists and Engineers

57 POST STREET, SAN FRANCISCO

PHONE SUTTER 1684

ENGINEERING OFFICES OF

Clyde C. Kennedy

CLYDE C. KENNEDY EDWARD N. PROUTY

Consulting Engineers

WATER SUPPLY
WATER PURIFICATION
SEWERAGE, SEWAGE TREATMENT, INDUSTRIAL WASTE DISPOSAL AND GENERAL MUNICIPAL IMPROVEMENTS

Inspection and Laboratory Services

SAN FRANCISCO

CALL BUILDING

Burns-McDonnell-Smith

Engineering Company

CONSULTING ENGINEERS

Water Supply, Waterworks, Sewerage and Sewage Disposal, Power Plants, Valuations and Rate Investigations of Municipal Utilities.

KANSAS CITY, MO.

107 WEST LINWOOD BLVD.

Harold Farnsworth Gray

Sewage Disposal
Water Purification
Mosquito Abatement

2540 BENVENUE AVENUE

BERKELEY, CALIF.

Abbot A. Hanks, Inc.

Engineers and Chemists

CONSULTING—TESTING—INSPECTING

CONCRETE—STEEL—MATERIALS

624 SACRAMENTO STREET

SAN FRANCISCO

ENGINEERING OFFICES

J. B. Lippincott

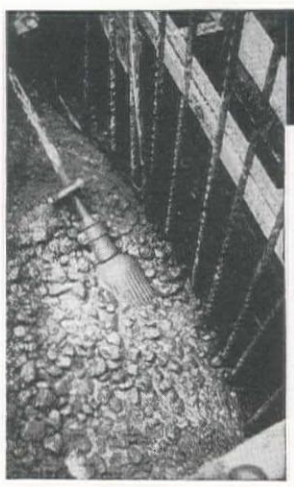
Consulting Engineers

WATER SUPPLY . . IRRIGATION . . SEWAGE AND SEWAGE DISPOSAL

VALUATION AND RATE INVESTIGATIONS

543 Petroleum Securities Bldg.

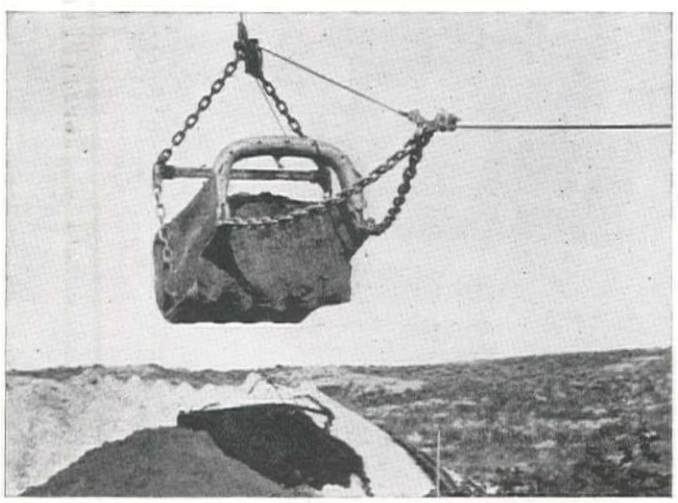
Los Angeles



JACKSON

CONCRETE VIBRATORS

DESIGNED and built by the originators of vibratory concrete placing equipment, JACKSON CONCRETE VIBRATORS place stronger, denser concrete with better bond between layers and between concrete and reinforcing, with greater uniformity, greater watertightness and with definite savings in cement and labor. Various sizes . . . external and internal for jobs of all types and sizes. Furnished with portable power plants if desired. Write for complete details. ELECTRIC TAMPER & EQUIPMENT CO., LUDINGTON, MICHIGAN.



ESCO DIPPERS AND DRAGLINE BUCKETS

"If *every* contractor knew what every ESCO owner knows." (Write for Bucket Book 77)

ELECTRIC STEEL FOUNDRY CO.

24th and York Streets PORTLAND, OREGON Phone BEacon 6344

SOUTHWESTERN DISTRICT BRANCH

NORMAN W. MILLS, District Manager

2205 Santa Fe Avenue LOS ANGELES, CAL. Phone JEfferson 4191

AGENTS—Harron, Rickard & McCone Co., San Francisco and Los Angeles; Neil B. McGinnis Co., Phoenix, Arizona; R. L. Harrison Co., Albuquerque, N. M.; National Equip. Co., Salt Lake City, Utah; Wm. A. Jenkins, Denver, Colo.; Intermountain Eqpt. Co., Boise, Ida.; Tri-State Eqpt. Co., El Paso, Tex.

SEATTLE BRANCH — A. L. BIBBINS, Manager

2724 First Avenue South SEATTLE, WASHINGTON Phone Eliot 4161

Western-Made Cast Iron Pipe . . . Sizes 1¼ thru 12 inches

McWANE CAST IRON PIPE CO. BIRMINGHAM ALABAMA

PACIFIC STATES CAST IRON PIPE CO. PROVO, UTAH

SAN FRANCISCO
116 New Montgomery Street

LOS ANGELES

PORTLAND, ORE.
606 Spalding Building

DENVER
1921 Blake Street

SALT LAKE CITY
149 W. 2nd South Street

OPPORTUNITY SECTION

OFFICIAL BIDS

PUMPING PLANT BUILDING

Los Angeles, California.

Bids March 13, 1936.

Subject to the conditions 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 Eagle 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., March 13, 1936.

The work is located in Riverside County, California, on the line of the Colorado River Aqueduct, about 10 miles north of Desert Center, and comprises the construction of a pumping plant building together with its inlet works, outlet structures, steel delivery pipes, electrical switching station, 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 consideerd for less than the whole of the work.

Each proposal must be accompanied by a certified or cashier's check for $90,000. 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.

January 31, 1936.

OFFICIAL BIDS

OPPORTUNITY SECTION

McCAFFREY BARGAINS

BULLETIN NO. 122

Model No. 70, 1¾ Yd. Northwest Shovel or Crane
Model No. 6, 1½ Yd. Northwest Shovel or Crane
Model No. 104, 1¼ Yd. Northwest Shovel or Crane
Model No. 105, 1 Yd. Northwest Shovel or Crane
¾ Yd. P & H Shovel or Crane
½ Yd. Speeder Shovel
1¼ Yd. Gas and Air Shovel
⅜ Yd. Fordson Shovel
"75" Caterpillar (Diesel with Bulldozer)
"60" Caterpillar Tractor
"80" Cletrac Tractor
"30" Caterpillar Tractor
"40" Cletrac Tractor (2)
"30" Cletrac Tractors with Bulldozers (4)
"20" K Cletrac Tractors
LeTourneau Power Control Unit (Single and Double)
Woolridge Trail Builders for "30" Cletrac
360 Ft. Schramm Compressor (Portable)
120 Ft. Rex Compressor on Truck
110 Ft. Sullivan Compressor on Truck
110 Ft. Sullivan Compressor (Portable)
85 Ft. Rix Compressor on Skids
2 Drum Murray Hoist (Electric)
1 Drum Fulton Hoist (Electric)
LeTourneau Carryall Scraper
McCaffrey 5-Tooth Rooter (Cable)
LeTourneau 3-Tooth Rooter
Ateco 5-Tooth Scarifier
Killifer Scarifier for "30" and "60" Tractor
McCaffrey Sheep Foot Tamper
Ball Sheep Foot Tamper
LeTourneau 3-Section Tamper
5 and 6 Ft. Scrapers
9 Ft. Russell Super Special Grader
12 Ft. Russell Super Mogul Grader (Pneumatic)
12 Ft. Caterpillar Grader
6 Ft. Adams Leaning Wheel Grader
12 Ton 3-Wheel Austin Roller (Single)
12 Ton 3-Wheel "Galion" Roller (Double)
Screen Cylinder, Type 10 Ft. x 30 In.
2000 Ft. 2-In. Pipe
1000 Ft. 1-In. Water Hose

THESE AND MANY OTHER BARGAINS . . . WIRE, WRITE OR CALL FOR QUOTATIONS

SHEEP FOOT TAMPERS—McCAFFREY SCARIFIERS AND BULLDOZERS—30 AND 60 CATERPILLARS
DRAGLINE—ORANGE PEEL—CLAMSHELL BUCKETS—DIPPERS—BOOMS AND MANY OTHER BARGAINS

M. P. McCAFFREY

1420 North Spring Street, Los Angeles, Calif.
Telephone CApitol 11161

BUCKEYE DITCHERS

FOR SALE—BY OWNER

1—Large machine specially powered with Waukesha Engine—34-5½—new caterpillar crawlers. Rapid transit . . . 10 m.p.h. on the road.
1—Small machine—15-18-5½—also miscellaneous Buckeye equipment.

M. E. Frith, 1250 Yosemite Ave., San Jose, Calif.

Operators' Opportunity

One 2-Yd. Marion All-Electric Crawler Shovel, with MG set, 34 ft. Boom, easily converted to dragline, excellent operating condition. Bargain.
One 25-Ton Link-Belt Locomotive Crane, 50 ft. Boom with 1½ Yd. Bucket. Modern.
One 50-Ton Std. Gauge American Steam Locomotive. Address Box 480, Western Construction News, 114 Sansome St., San Francisco.

Lowest Rate in the West

Less than 24", within one year..$4.00 per in.
24" to 59", within one year..... 3.75 per in.
60" to 119", within one year..... 3.50 per in.
120" to 179", within one year..... 3.25 per in.
180" or more, within one year.... 3.00 per in.
(Fractional inches count as one inch)

DIESEL DRAGLINES

4—50-B Bucyrus Erie Diesel Draglines, 50 ft. boom, 10 ft. extension, Atlas Engine, caterpillar mounting.
2—775 P & H Diesel Draglines, 50 ft. boom, Atlas Engine, caterpillar mounting.

The above are part of the surplus construction equipment of the Middle Rio Grande Conservancy District. Wire or write for list of all equipment, which includes pumps, compressors, lighting plants, tractors, shovels, pile driving outfits, concrete mixers, scales, Insley concrete placing outfit, concrete heaters and vibrators, gravel screening plant, compressed air drill sharpeners, shop equipment, gasoline powered hoists with and without skips, bar benders and cutters, carbic floodlights, and other items at bargain prices.

R. L. HARRISON CO., Inc.
ALBUQUERQUE, NEW MEXICO

POSITION WANTED

CONSTRUCTION SUPERINTENDENT—Twenty-three years' practical experience in all kinds of reinforced concrete construction. Cold storage plants . . . Hospital buildings . . . Telephone buildings . . . Industrial projects. First-class references, location immaterial. Box 475, *Western Construction News*, 114 Sansome Street, San Francisco, Calif.

FOR RENT OR SALE
Portable Air Compressors
Concrete-Breakers

W. H. COWEN
1114 Sutter Street Phone ORdway 0173
SAN FRANCISCO

FOR SALE
N-1 Cement Gun

W. H. COWEN
1114 Sutter Street San Francisco
Phone ORdway 0173

USED EQUIPMENT
SALE or RENT

Portable Crushing plant . . Hoists
Tractors . . Shovels . . Locomotives
Air Compressors (Portable or Stationary)
Pile Hammers

P. B. HACKLEY EQUIPMENT CO.
625 Market St., Rm. 1417, San Francisco
Phone: SUtter 0978

WE RENT
WE REPAIR
WE EXCHANGE
WE SELL

GOOD EQUIPMENT
PRICED RIGHT
PROMPTLY

OAKLAND **CONTRACTORS MACHINERY EXCHANGE INC.** OAKLAND

1135 57th Ave. FR 0715

When writing to above advertisers, please mention Western Construction News

INDEX TO ADVERTISERS

OPPORTUNITY SECTION