WESTERN CONSTRUCTION

FEATURED THIS ISSUE

Short cuts for curing of winter-placed concrete

•

The new high-strength bolts, competition for the rivets

•

Driving Tecolote Tunnel thru Coast Range fault zone

•

Prestressing circular concrete structures by a new technique

SEPTEMBER 1951

KEEP AIR COMPRESSORS ON THE JOB—

regardless of operating conditions . . . with TEXACO air compressor oil

What's the best air compressor oil to keep your compressors working and your maintenance costs low? That depends on your operating conditions. But it *must* be an oil especially designed to meet those conditions. Texaco has it. For example—

★★ To assure clean operation and reduce wear under *normal conditions,* use a Texaco *straight mineral* air compressor oil.

★★ To *overcome rust* conditions in compressors, inter- and after-coolers, lines and receivers, use a Texaco *rust-inhibited* air compressor oil.

★★ To *avoid carbon and gum* formations, use a Texaco heavy-duty air compressor oil, with special detergent and oxidation-resistant properties.

★★ To *eliminate excessive wear* caused when moisture condensation in cylinders washes away lubricant, use a Texaco *compounded* air compressor oil.

A Texaco Lubrication Engineer will gladly help you select the one proper Texaco air compressor oil to assure you greater efficiency and lower costs under your particular operating conditions. And don't forget to ask him about the Texaco Simplified Lubrication Plan for *all* your equipment. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 E. 42 St., New York 17, N. Y.

DRILLS of all types run better with *Texaco Rock Drill Lubricant EP.* One user states: "We are amazed at the performance of this oil in comparison with what we had been using. We have cut oil consumption 50% and have shown a remarkable reduction in maintenance on all our drills."

TEXACO

TEXACO Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

You can't have all NORTHWEST ADVANTAGES unless you own a NORTHWEST

Northwest positive traction while turning as well as when going straight ahead permits Northwests to travel where others have difficulty. Travel gears are fully enclosed and run in oil.

Uniform Pressure Swing Clutches give smoother engagement, better control, less adjustment and longer life.

Northwest Dual Independent Crowd utilizes force other independent crowd shovels waste! Northwest Shovel Boom is powerful—all welded—proved in rock digging!

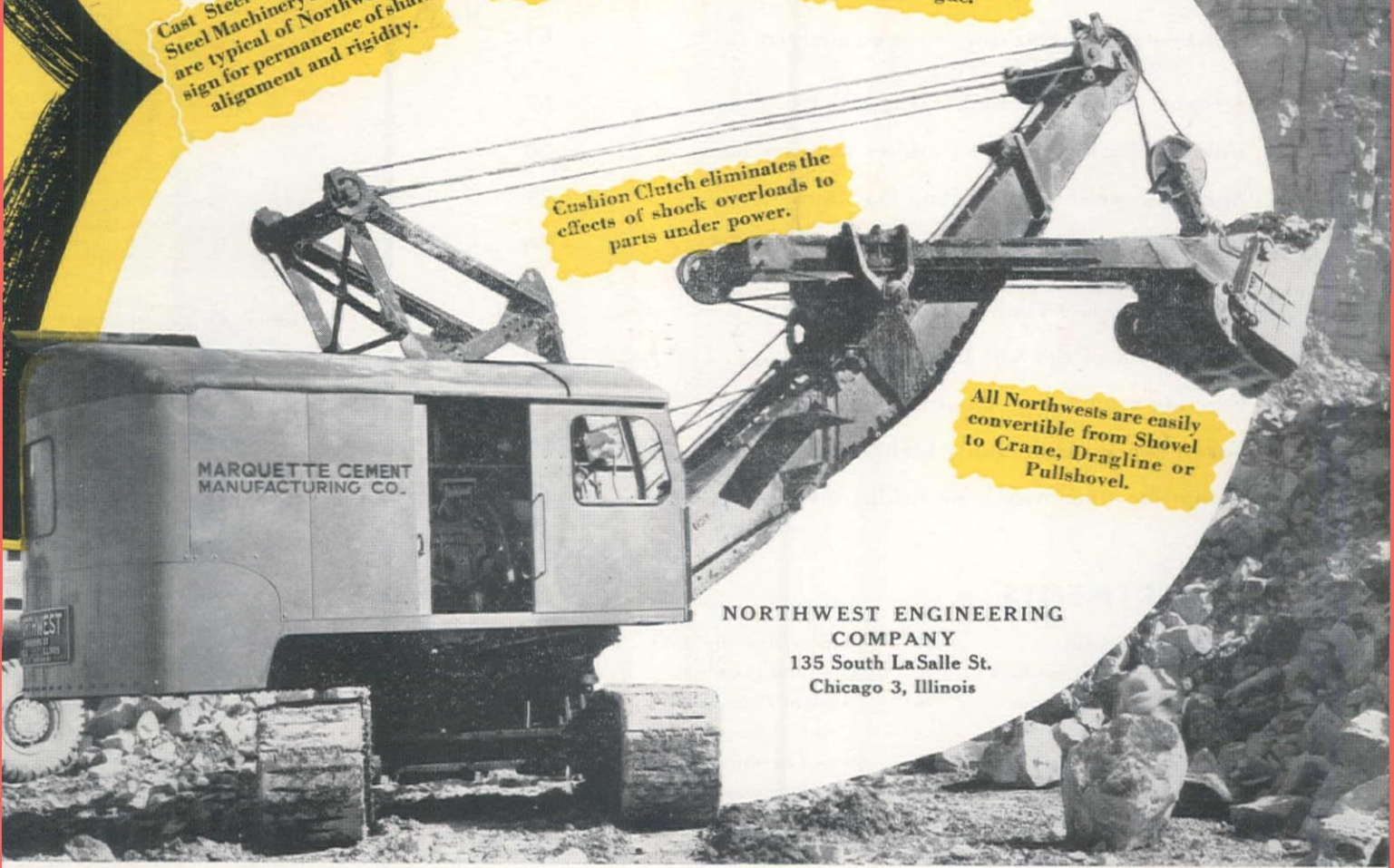
Cast Steel Bases with Cast Steel Machinery Side Frames are typical of Northwest design for permanence of shaft alignment and rigidity.

Ball and roller bearings on all high-speed shafts always have been standard equipment on Northwests.

"Feather-Touch" Clutch Control utilizes engine power to throw heavy clutches and reduces day-end fatigue.

Cushion Clutch eliminates the effects of shock overloads to parts under power.

All Northwests are easily convertible from Shovel to Crane, Dragline or Pullshovel.



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135 South LaSalle St.
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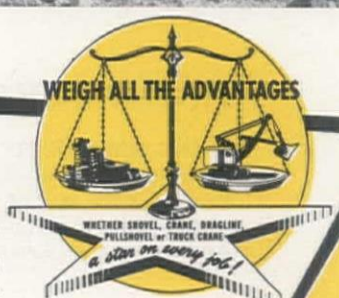

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WESTERN CONSTRUCTION

Volume 26 **SEPTEMBER 1951** Number 9

ARTICLES

DEPARTMENTS

FRONT COVER

USING SPRAY BARS as shown, crews of the Columbia Asphalt Paving Co. are applying hot asphaltic membrane lining to canals of the Columbia Basin Project at the rate of about 5,600 sq. yd. per day. Three passes effect complete coverage of sides and bottoms of the section with asphalt at 340 - 380 deg. F. For a pictorial review of the work, see pp. 62-63.

The Construction and Civil Engineering Publication of the West

★

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B.F.Goodrich

Pick your toughest hauling job— hand it to these tires

ROSCOE KREAGER, Supt., right above, watches a loading operation at the quarry of the Woodville Lime Products Company at Woodville, Ohio. Here, Mr. Kreager sees a giant crane dump a bucket of limestone into a trailer equipped with B. F. Goodrich Universals. This is a year-round operation at Woodville as the company processes limestone, fertilizers and other kindred products for nation-wide sales.

Some thirty vehicles are used by this company for intraplant stone hauling. According to Kreager, BFG Universals are used on all of these vehicles, and the company is well pleased with the performance of the B. F. Goodrich tires on these vehicles. Subjected to exceptionally hard wear, they travel over stone and razor-sharp rocks with equal traction in forward or reverse gears because they are nondirectional!

B. F. Goodrich Universal tires were selected on the basis of service and quality. These tires have greater bruise resistance and greater ability to absorb and withstand shocks because they're built with the patented *nylon shock shield*. Strong, protective layers of nylon are built in between the tread rubber and the cord body of all BFG tires of 8 or more plies . . . and at no additional cost to you.

There's a special B. F. Goodrich tire for every off-the-road service. See your local dealer. Let him help you get the benefits of longer tire life and lower operating overhead. *The B.F.Goodrich Company, Akron, Ohio.*

RESEARCH KEEPS
B.F.Goodrich
FIRST IN RUBBER

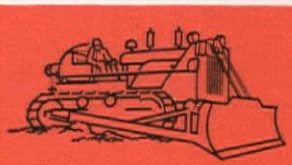
Big Red TD 24

ANOTHER BIG BITE is dumped by the shovel and Big Red goes into action, grading the dirt down the hillside to carve out a workbench for the shovel. Teamwork is essential when shovel and tractor work together. And you always want Big Red on your team.

INTERNATIONAL

INTERNATIONAL HARVESTER

POWER THAT PAYS



Takes a Big Bite!

How International's Big Red Champ... the TD-24... Tackles 40 Feet of Solid Earth and Rock

Bring on your big tough jobs! Mass up the earth and rock. Then pass the word for "Big Red"—International's Champion of crawlers.

In the heart of the West Virginia mountains, Joe Troitino is stripping more than forty feet of earth and rock overburden to bare a rich four-foot seam of coal.

With the Big Red Champ on the job, Troitino strips about 450 tons of coal a day, and it's only one of his three coal stripping jobs!

"My company now owns six International TD-24s," says Troitino. "We think it is the best tractor on the market—and we have used all sorts of them under all kinds of conditions!

"Of course, I like the International TD-24 because it is easy to run, but, above everything else, we like it because it is more economical to operate than any other tractor we have ever used and because there is no rock or earthmoving job too tough for it."

The word is out. On the more rugged jobs, contractors who know crawlers are telling each other about the power and smooth action of the Big Red TD-24. Get the real low-down from your International Industrial Distributor. Ask him to show you Big Red in action—you'll be a TD-24 man from then on in!

International Harvester Company, Chicago 1, Illinois

IT TAKES THE CHAMP to pile into a drift of heavy dirt with the speed and drive needed to move it out of the way. Big Red and its big bites make passes fast, keep the load moving. With the TD-24 synchro-mesh transmission, instant high-low range shift and Planet Power steering, watch how the pay-dirt flies!

Here's what WE mean by

The Newest, Finest

DESIGNED FOR YOUR JOB

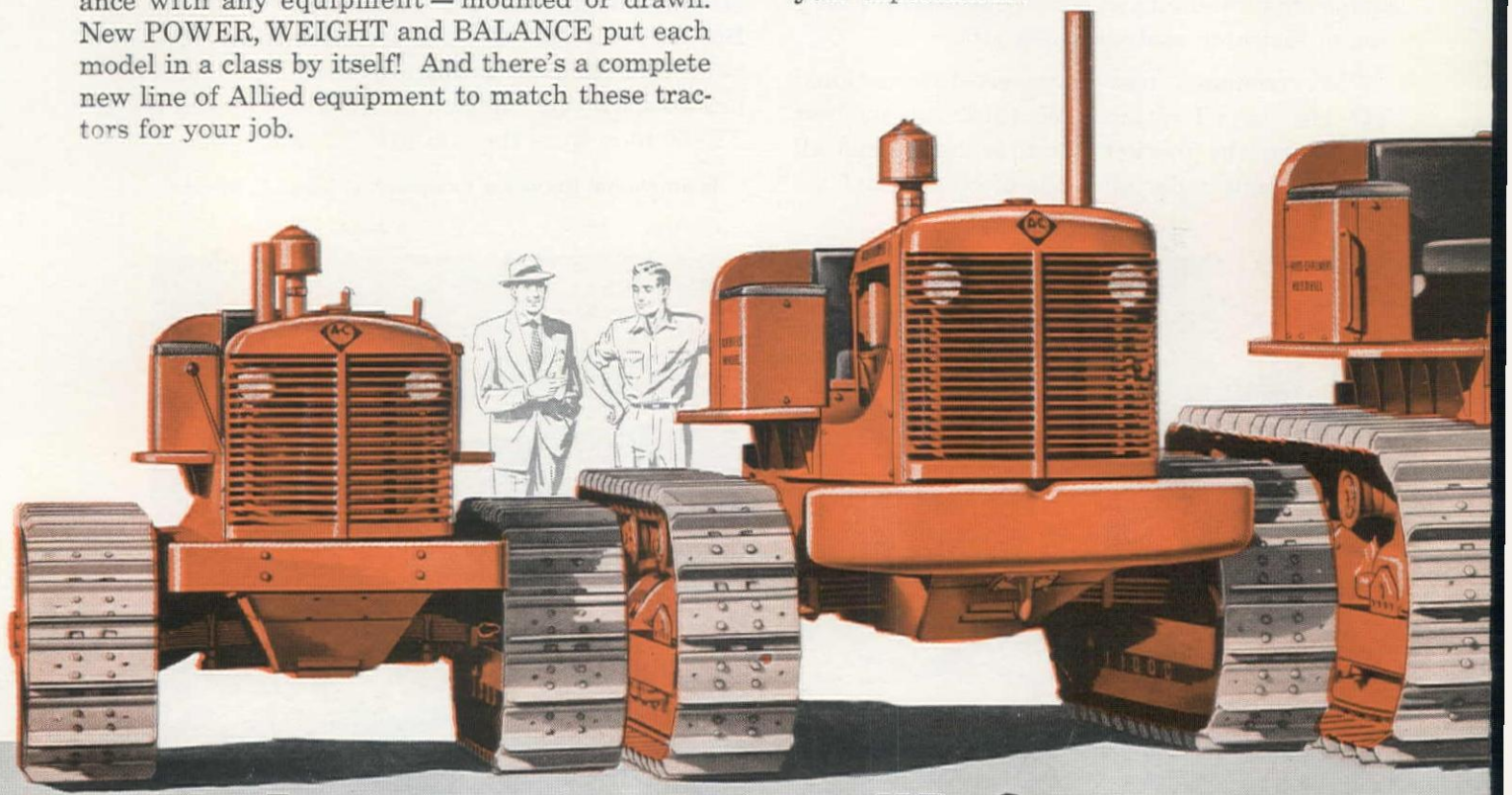
These Allis-Chalmers tractors are new models, not merely refinements of existing ideas . . . they are new from the ground up . . . without compromise anywhere in design or material.

They are the answer to your demands for tractors that will give you outstanding performance with any equipment — mounted or drawn. New POWER, WEIGHT and BALANCE put each model in a class by itself! And there's a complete new line of Allied equipment to match these tractors for your job.

BUILT TO "TAKE IT" . . .

These are the finest tractors ever built . . . with ample capacity and strength in every part! And that's no accident! To bring you tractors like these . . . with the qualities you want . . . Allis-Chalmers built them completely new.

You can depend on them to take the loads and jolts of today's jobs . . . because they are modern tractors built for the most grueling operating conditions. They will more than measure up to your expectations!



HD-5
40.26 drawbar hp., 11,250 lb.

HD-9
72 drawbar hp., 18,800 lb.

YEARS AHEAD

Each of these new Allis-Chalmers crawlers gives you a new yardstick for rating tractors. Each sets new standards in its class for performance, strength, servicing, operation. Get the full story from your Allis-Chalmers dealer NOW on this — The Newest, Finest Tractor Line on Earth.

see your

ALLIS-CHALMERS

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Tractor Line on Earth!

EASY TO OPERATE . . .

Operators have long awaited the greater handling ease and comfort now brought to them by this new line of Allis-Chalmers tractors.

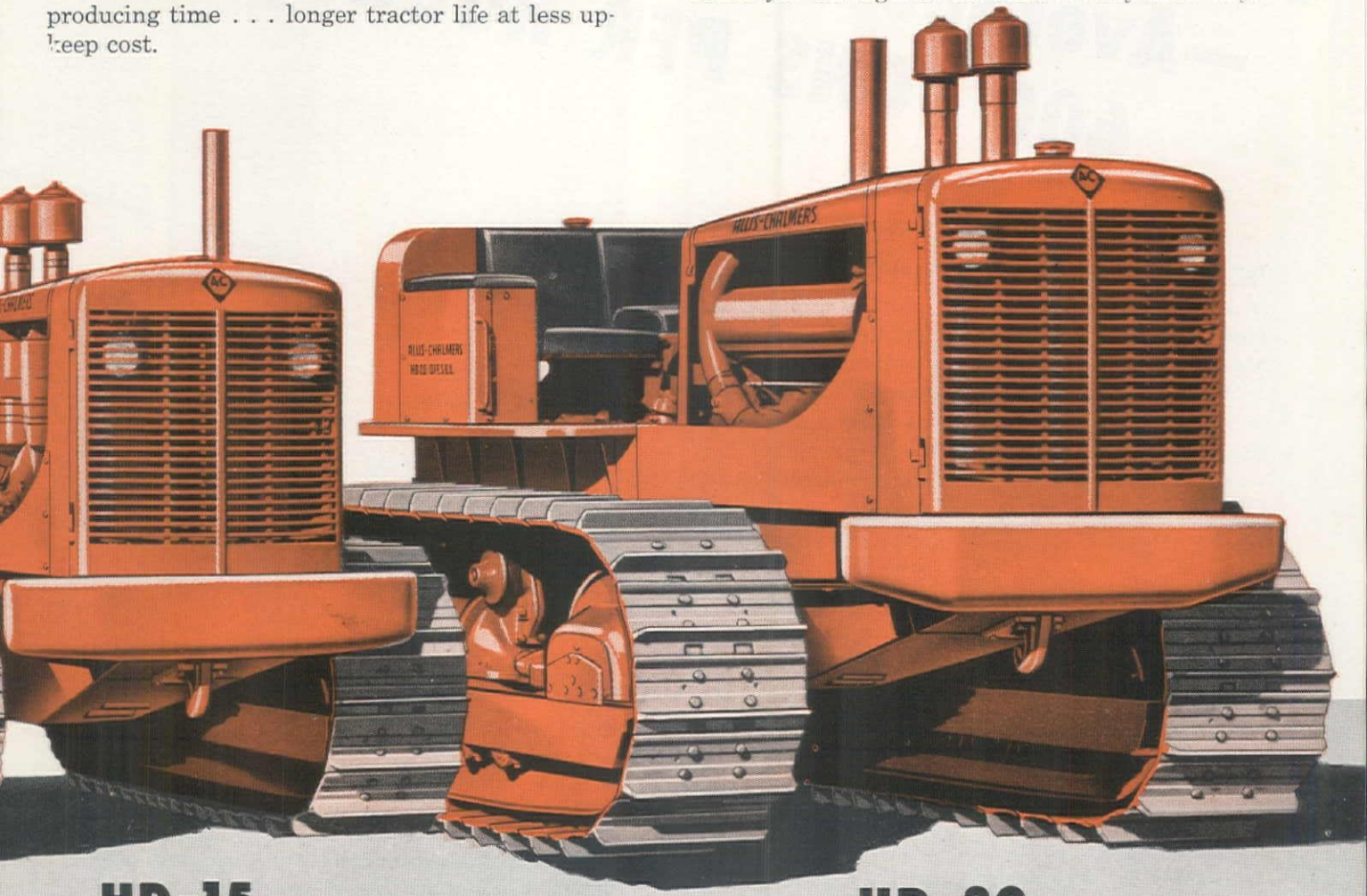
Conveniently located controls respond to the slightest effort . . . and are operated in the same familiar way—nothing tricky to "catch on to." There is new shifting ease, new seat and platform comfort, full visibility.

Because the operator's job is easier — takes less effort — he can maintain a steady pace, do a better job throughout his shift . . . day after day.

EASY TO SERVICE . . .

Adjustments are easier . . . lubrication simplified and lube periods greatly extended. Mechanics say these tractors are the easiest to service and repair.

This all adds up to less down time, more producing time . . . longer tractor life at less upkeep cost.



HD-15

109 drawbar hp., 27,850 lb.

HD-20

Hydraulic Torque Converter Drive, 175 net engine hp., 41,000 lb.

ARIZONA: Phoenix — Neil B. McGinnis Equipment Company. **NORTHERN CALIFORNIA: Oakland**—Buran Equipment Company; **Eureka and Willits**—Aikins and Williams Tractor Co.; **Modesto**—J. M. Equipment Co.; **Fresno**—Peerless Tractor and Equipment, Food Machinery and Chemical Corp.; **Salinas and King City**—Livingston Bros. Tractor Co.; **No. Sacramento, Stockton, Redding**—Moore Equipment Company, Inc.; **Mountain View**—Redwine Tractor Co.; **Visalia**—Tulare County Tractor Co. **SOUTHERN CALIFORNIA: Bakersfield**—San Joaquin Tractor Co.; **Los Angeles, San Diego and Riverside**—Shaw Sales & Service Company. **IDAHO: Idaho Falls and Boise**—Southern Idaho Equipment Company. **MONTANA: Missoula**—Mountain Tractor Company; **Sidney**—Northland Machinery Company; **Billings**—Seitz Machinery Company, Inc. **NEVADA: Elko**—C. W. Paul Hardware and Machinery; **Reno**—Moore Equipment Company, Inc. **OREGON: Eugene, Roseburg and North Bend**—Farm and Industrial Equipment Co.; **The Dalles**—Dielschneider Equip. Oreg. Ltd.; **Medford**—Tractor Sales and Service, Inc.; **Klamath Falls**—West Hitchcock Corp.; **Portland**—Wood Tractor Company. **UTAH: Salt Lake City**—Cate Equipment Co., Inc. **WASHINGTON: Seattle, Tacoma and Wenatchee**—A. H. Cox Company; **Spokane**—American Machine Company. **WYOMING: Casper**—Studer Tractor & Equipment Co.

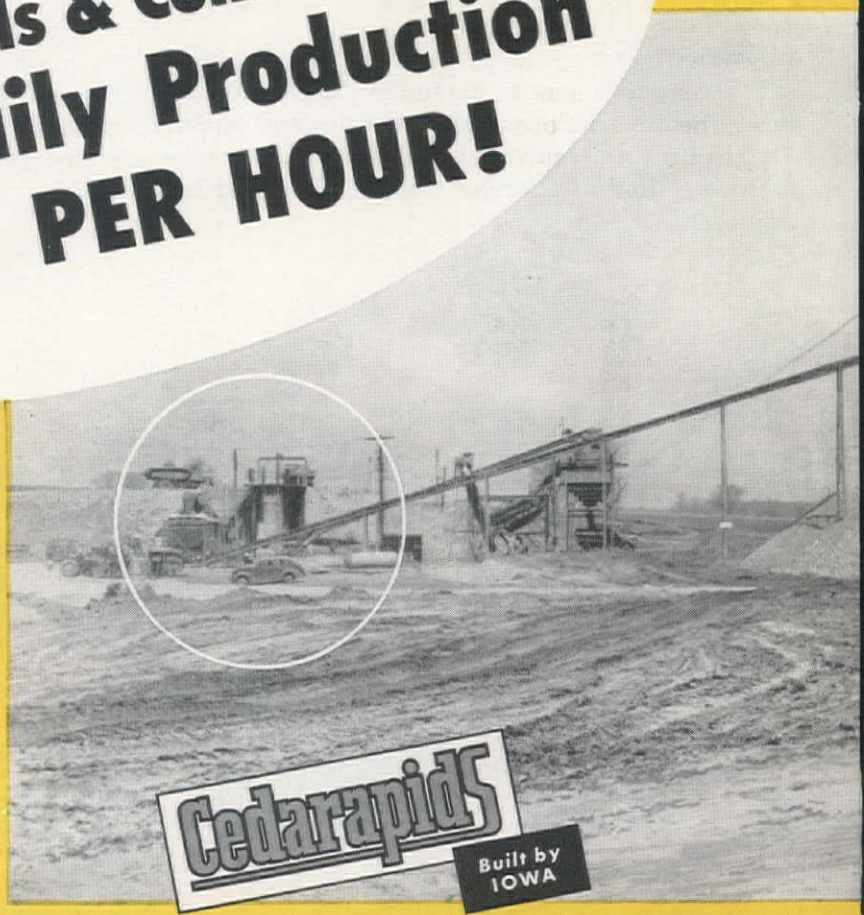
AGGREGATE

14,472 TONS! The Peak Day's Production at Concrete Materials & Construction Co. —Average Daily Production 600 TONS PER HOUR!

THIS CEDARAPIDS DOUBLE IMPELLER IMPACT BREAKER is really turning out the tonnage! On their New Jersey Turnpike contract, Concrete Materials & Construction Co. put through 14,472 tons of aggregate . . . 800 truck loads, at 16 to 20 tons per load . . . on their peak day, a 20-hour period when the surge pile was down and plenty of trucks were available for feed. *That's a 724 ton per hour peak production average!*

Originally scheduled to turn out around 400 tons per hour, the 5050 Double Impeller Impact Breaker in this Concrete Materials plant is consistently averaging more than 600 tons per hour. No wonder more and more contractors are depending on the bonus production of Cedarapids Double Impellers!

To meet today's demand for AGGREGATE UNLIMITED, and assure yourself of *opportunity unlimited* for profit, see your Cedarapids distributor today for the equipment you need to make *your* plant a real producer.



DOUBLE IMPELLER IMPACT BREAKERS

Get ready for the *big* jobs with a Cedarapids Double Impeller Impact Breaker in your plant. It's your assurance of maximum output of the cubical shaped aggregate required in so many specifications today. Because so much of the material is broken in suspension, you get an extremely high ratio of reduction at extremely low power costs. Exceptional tonnage with a minimum of connected horsepower! And you save on your plant set-up because you can eliminate much accessory equipment such as secondary crushers, conveyors, etc. You can get *immediate delivery* on Double Impeller Impact Breakers to give you OPPORTUNITY UNLIMITED right now! Four sizes available.

THE IOWA LINE *of Material Handling Equipment Is Distributed by:*

HALL-PERRY MACHINERY CO., Butte, Great Falls, Missoula and Billings, Montana; INTERMOUNTAIN EQUIPMENT CO., Boise and Pocatello, Idaho and Spokane, Washington; WORTHAM MACHINERY CO., 517 W. 17th Street, Cheyenne, Wyoming and Greybull, Rock Springs, Casper and Sheridan, Wyoming; KIMBALL EQUIPMENT CO., 222 W. 17th Street South, P. O. Box 1103, Salt Lake City 10, Utah; H. W. MOORE EQUIPMENT CO., 6th and Acoma Street, P. O. Box 2491, Denver 1, Colorado; CONTRACTORS EQUIPMENT CORP., 2727 S. E. Union Ave., P. O. Box 2191, Portland 14, Oregon; JACK SAHLBERG EQUIPMENT CO., 300 Aurora Avenue, Seattle 9, Washington; CASSON-HALE CORP., 22101 Meekland Avenue, P. O. Box 629, Hayward, Calif.; ARIZONA CEDAR RAPIDS CO., 1726 W. Jackson Street, P. O. Box 6186, Phoenix, Arizona; R. L. HARRISON COMPANY, INC., 1801 N. Fourth Street P. O. Box 1320 Albuquerque, New Mexico; SIERRA MACHINERY CO., 307 Merrill Avenue, P. O. Box 1330, Reno, Nevada; BROWN-BEVIS EQUIPMENT CO., 4900 Santa Fe Avenue, P. O. Box 174 Vernon Station, Los Angeles 58, Calif.

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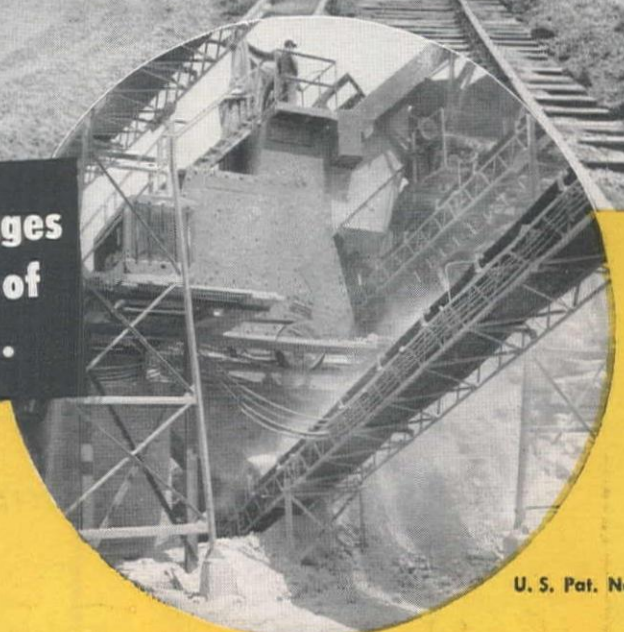
for the New Jersey Turnpike

BINKLEY BROS. PLANT averages 250 to 300 tons per hour of 3½" minus material....



In the Bradford Hills Quarry near Downington, Pa., one 5050 Double Impeller Impact Breaker, owned by Binkley Bros., is taking quarry rock ... material passing a 50" opening ... reducing it to meet specifications for small sized cubical aggregate, *and doing it in one pass* at a rate of 250 to 300 tons per hour.

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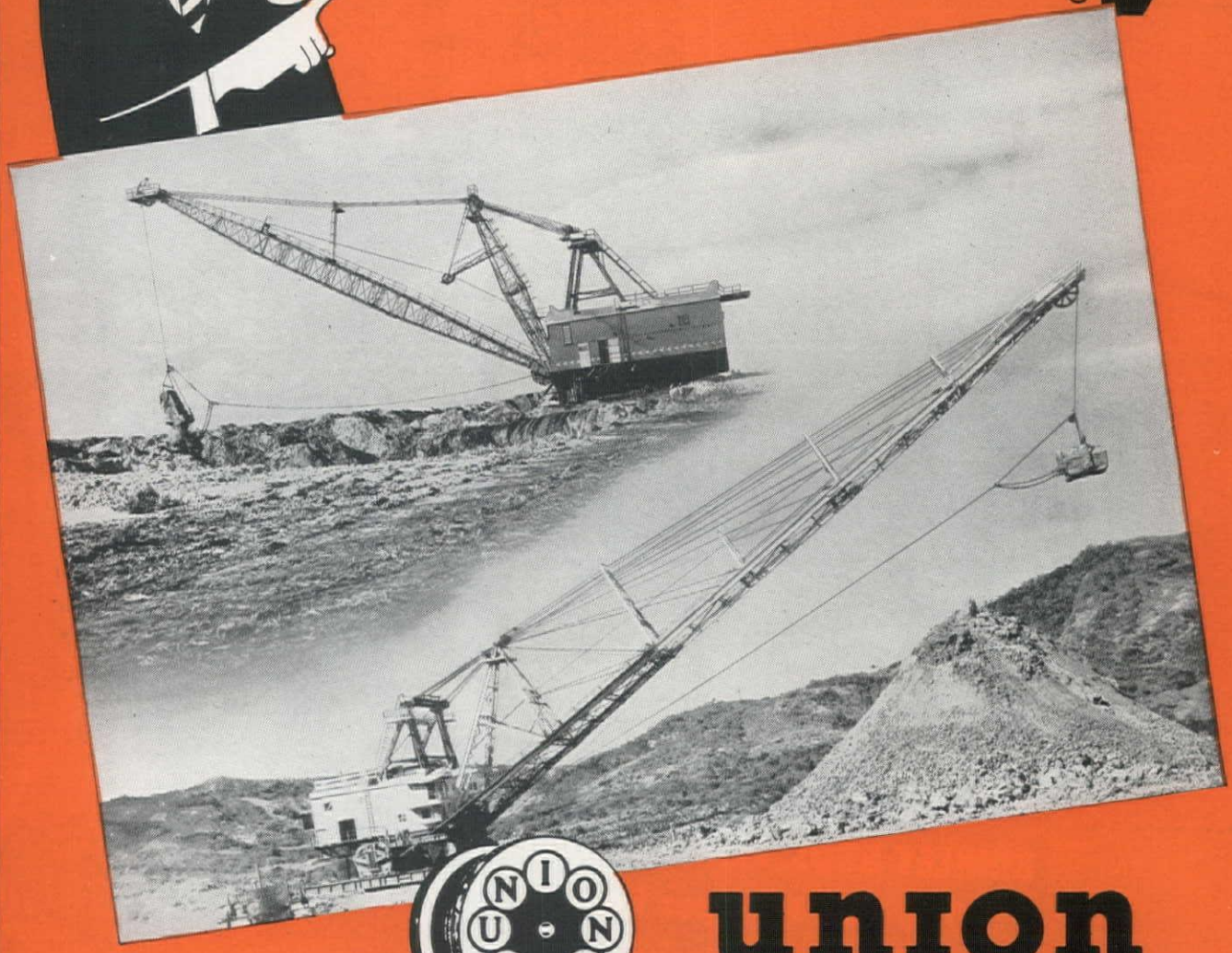
IOWA MANUFACTURING COMPANY

Cedar Rapids, Iowa, U.S.A.

Now! It's as Easy

Tuffy®



union Wire Rope

THESE Tuffy's ARE ALSO SPECIALLY DESIGNED FOR SPECIALIZED USES

Tuffy Scraper Rope

Withstands sharp bending, hugs sheave grooves and winds snugly and smoothly on drums. Large outer wires resist drum crushing. Has higher resistance to the shock of load impact on slack line.

Tuffy Mining Team

Mining Machine Ropes, Crab Motor Ropes, Winch Ropes — all Union-Formed (Preformed) and designed to give maximum safety and service—at ultimate low cost.

Tuffy Slings

Patented interlaced wire fabric construction gives extra flexibility and stamina. Proof-tested to twice safe working load. Non-kinking. Non-crushing. 10 types.

as 1-2-3 to Order

DRAGLINES

ONE, length . . . TWO, diameter . . . THREE, the name "Tuffy." That's all the information you need to order Tuffy Draglines—and get all the extra advantages of this tougher, stronger wire rope. No complicated specifications . . . no time-wasting, detailed forms to fill out.

Made for Extra Yardage . . . Extra Service

Ask the men who have used Tuffy Draglines about Tuffy's yardage and service. You'll find convincing proof that Tuffy actually handles *more* yardage—at a *lower* ultimate cost—and gives *longer* service on the job. Here's why Tuffy gives you these extra advantages:

EXTRA FLEXIBILITY. Wires of the finest steel in a construction designed for universal dragline service, gives Tuffy Draglines the extra flexibility needed without sacrificing other qualities.

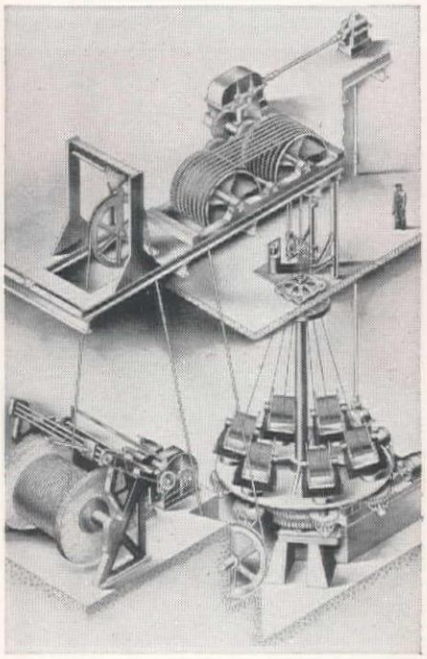
MAXIMUM ABRASIVE RESISTANCE. Obtained by finer technic in construction with materials toughened to withstand more abrasive wear.

EASY TO HANDLE. It's pliable. Tuffy Draglines spool better and ride better on grooves.

HUGS DRUM WHEN CASTING. Jerking, pulling and bending stresses do not distort its pliable construction.

Put Tuffy Dragline to the test on one piece of your equipment. Compare it for length of service and yardage with other wire rope draglines. You'll see why so many operators standardize on Tuffy Draglines for their whole operation.

THIS GIANT MACHINE TURNS OUT 27 TONS OF UNION WIRE ROPE IN ONE CONTINUOUS LENGTH



It stands 4 stories high . . . has capacity for laying rope from ¾" to 4" in diameter. This massive closing machine in Union Wire Rope's modern plant is used in the production of Tuffy Draglines, boom ropes, boom support ropes, hoist ropes, crowd and retract ropes, counterweight ropes, holding and closing ropes, and other specialized wire rope for mining.

Send For These Folders Today

See how you can cut operating costs . . . reduce downtime . . . gain longer, better performance with Tuffy Wire Ropes. Mail coupon today.

UNION WIRE ROPE CORPORATION
Specialists in Wire Rope

2146 Manchester Ave. Kansas City 3, Mo.

Please send illustrated folder on: ☐ Tuffy Draglines ☐ Tuffy Mining Rope ☐ Tuffy Scraper Rope ☐ Tuffy Slings

*Firm Name*_____

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Output Leaders

Helping contractors get new speed, efficiency and economy in their operations is an old story to Bucyrus-Erie excavators. They've done it on a thousand-and-one different jobs — as shovels, cranes, draglines, clamshells and dragshovels.

It's easy to match job requirements exactly with one of the machines in Bucyrus-Erie's ⅜- to 4-yard line of gasoline, diesel, or single motor electric excavators. Each model has size and strength to handle its rated capacity regularly. This means less "time out" for expensive maintenance, more time on the job, building profits.

There's strength behind this top-notch line, too . . . your Bucyrus-Erie distributor. He's staffed and equipped to give you the service you need, when and where you want it. 283E51C

SOUTH MILWAUKEE BUCYRUS ERIE WISCONSIN

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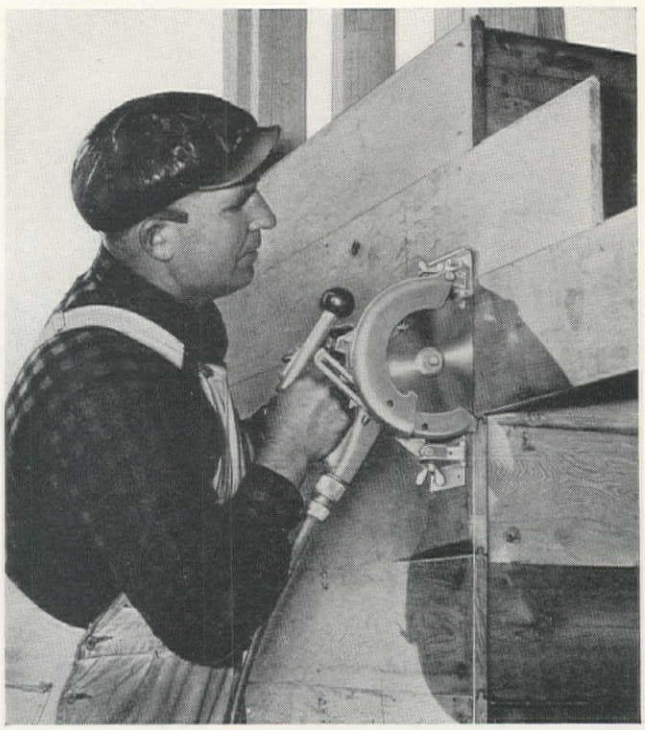
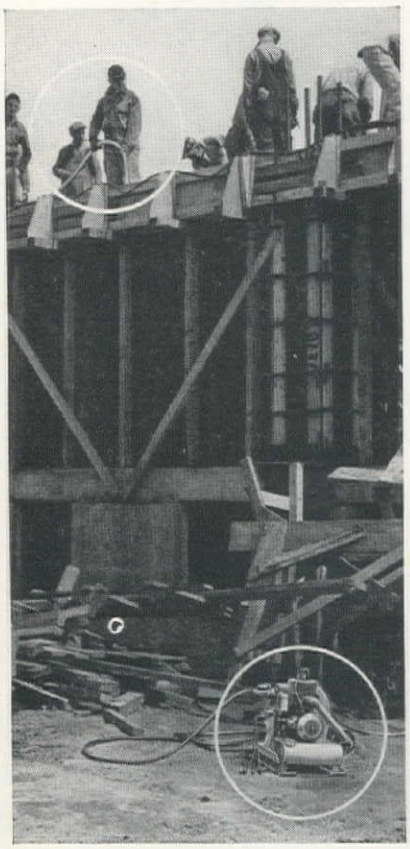
SHOVELS • DRAGSHOVELS • DRAGLINES • CLAMSHELLS • CRANES

CP Hicycle Saws have 55° bevel adjustment for angle cuts; blade speed won't sag . . . reserve power makes heavy cuts easy, blades require fewer sharpenings or replacements.





CP Hicycle Vibrator can be used anywhere within a 400-foot radius without moving generator. The motor is in the vibrator head—no flexible shafting is used. Vibrating frequency 10,000 V.P.M.

CP Hicycle Wire Brush Machine, also used for grinding and sanding.

HICYCLE ELECTRIC TOOLS for HEAVY-DUTY SERVICE with low maintenance

Developed to meet heavy industry's production line demands for continuous service on a three-shift basis, CP HICYCLE ELECTRIC TOOLS are equally efficient and economical on construction jobs.

They operate on 180-cycle, 3-phase, 220-volt current, and are powered by a light, inexpensive, gasoline-driven portable generator, which can be carried easily from one location to another by one man.

More powerful and more rugged than ordinary electric tools, HICYCLE TOOLS maintain speed under load. Maintenance is remarkably low because high speed, squirrel cage induction motor has no brushes to replace, no armature to burn out.

DRILLS	GRINDERS
WOODBORERS	SANDERS
NUT RUNNERS	CONCRETE VIBRATORS
CIRCULAR HAND SAWS	EXHAUST VENTILATORS

Write for detailed information.

CHICAGO PNEUMATIC TOOL COMPANY

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PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
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"EUC" PERFORMANCE *Pays Off*

MORE LOADS at LESS COST

Rear-Dump and Bottom-Dump "Eucs" are designed and built for moving earth and heavy excavation at the lowest cost per ton or yard on the toughest jobs. The simple but rugged construction of Euclids, combined with large capacity, ample power and speed, provide efficient off-the-highway hauling of any material.

Leading contractors and industrial users have standardized on Euclids. Owners know that Euclid staying power and continuous operation result in dependable and profitable performance . . . jobs done on or ahead of schedule.

Ask your Euclid Distributor for data on jobs similar to yours. There is a "Euc" to meet your requirements for off-the-highway work.

Bottom-Dump Euclids—Capacities of 13 to 50 cu. yds., 20 to 40 tons, diesel engines to 300 h.p.

Rear-Dump "Eucs"—Capacities 10 to 34 tons, diesel engines from 125 to 400 h.p., spring mounted or semi-rigid axles, top speed loaded up to 35.7 m.p.h.

MORE LOADS PER HOUR— MORE PROFIT PER LOAD

The EUCLID ROAD MACHINERY Co., Cleveland 17, Ohio

CABLE ADDRESS: YUKLID **CODE: BENTLEY**

EUCLIDS *Move the Earth*

18 YARD

Quick facts:

- 18 cu. yds. (heaped) ... 18 tons capacity
- 186 h.p. diesel engine
- 5 speeds to 35 m.p.h. ... electric power steer
- 15′ 8″ turn radius (90° turn) ... 19′ wheelbase
- 9′ x 11′ bowl top ... 8′ 6″ loading height
- Electric-control dump ... 25″ ground clearance
- 21.00 x 25 low-pressure tires ... 4-wheel air brakes
- Weighs approx. 35,820 lbs.

Also available with 275 or 450 h.p., in 27½-yd. (35-ton) and 44½-yd. (50-ton) capacities.

TOURNAHOPPER

. . . LeTourneau 18-yard, bottom-dump hauler, for use with 35 m.p.h., C Tournapull prime mover . . . has self-cleaning, clamshell-type doors that drop the stickiest loads instantly. Doors swing up along outside edge of bowl, wiping themselves clean as they go . . . open across full width of bottom. Anything that loads into the 9′x 11′ top has a vertical drop. It's all push-button electric controlled, so operator can get rid of entire load fast, or open gates at any partial width for controlled spread.

18-YD. TOURNAHOPPER INTERCHANGES wit

LETOURNEAU LET

Arizona — Phoenix
ARIZONA EQUIPMENT

California — Los Angeles, Bakersfield
CROOK COMPANY

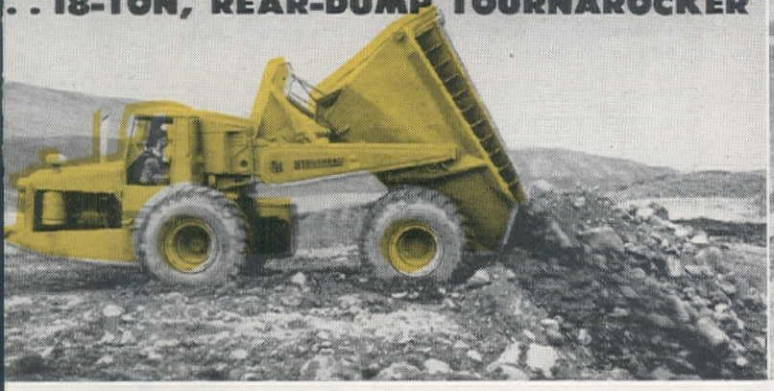
Idaho — Pocatello
J. K. WHEELER MACHINERY CO.

bottom dump HAULER

Tournahopper also has a lot of traction and steering advantages that lick mudholes, spongy fills and soft-footing common on bottom-dump hauling jobs. Loaded, you have 51% of your 18-ton load on the 2 big drive tires. There are no small front steering wheels to rob power and traction in tough going. Giant 21.00 x 25 low-pressure tires "float" loaded rig across soft, wet ground. Patented Tournamatic differential automatically delivers 4 times the tractive power to drive wheel on firmest footing . . . keeps Tournahopper moving through where other rubber-tired haulers bog down. What's more, with 90° turns Tournapull prime mover pivots and "walks" out of mudholes . . . has short 15′ 8″ turn radius for non-stop hauling cycles along narrow levee tops. Positive electric power steer is controlled by simple toggle switch on dashboard. Mutiple-disc, 4-wheel air brakes with 3,763 sq. in. total braking surface, provide more braking surface on one wheel than conventional haulers have on all four.

To you, all these exclusive Tournahopper advantages can mean less weather delays . . . more days worked each year . . . more profits per yard hauled. Your LeTourneau Distributor has complete facts on both 18-yard (18-ton) and big 27½-yard (35-ton) and 44½-yard (50-ton) bottom-dump Tournahoppers.

. . . 18-TON, REAR-DUMP TOURNAROCKER



. . . 15-CU. YD. CARRYALL SCRAPER

Tournahopper, Tournarocker, Tournamatic—Trademark
Tournapull, Carryall—Trademark Reg. U. S. Pat. Off. R197 W

Nevada — Reno
SIERRA MACHINERY COMPANY

New Mexico — Albuquerque
CONTRACTORS EQUIP. & SUPPLY CO.

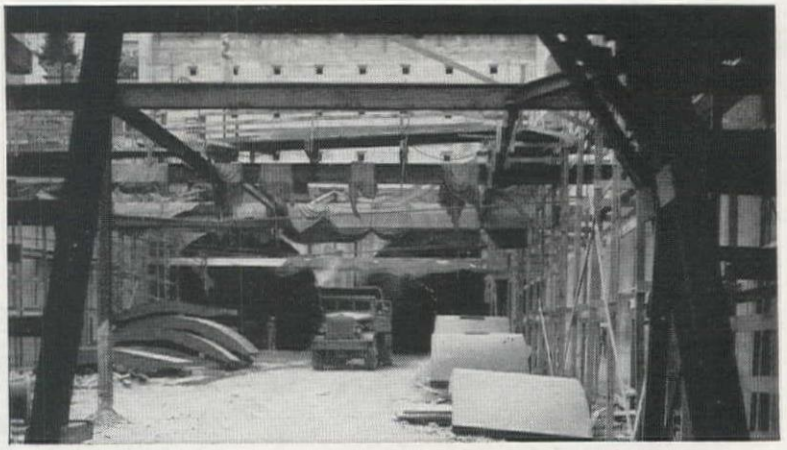
Oregon — Portland, Eugene
LOGGERS & CONTRACTORS MACHY. CO., INC.

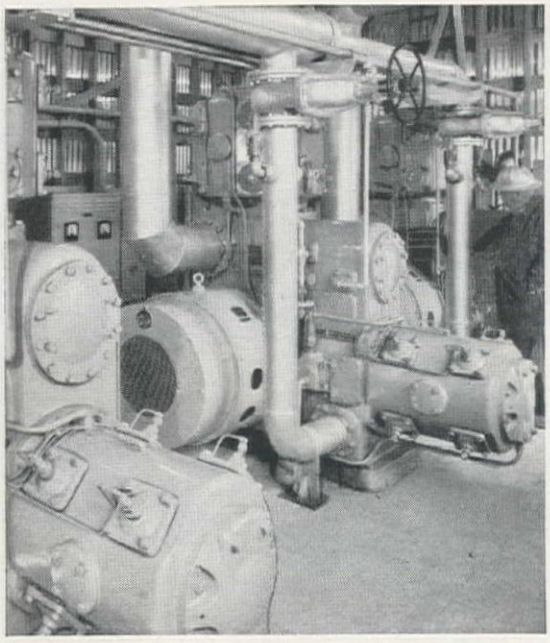
Utah — Salt Lake City
J. K. WHEELER MACHINERY CO.

Washington — Spokane
MODERN MACHINERY CO., INC.

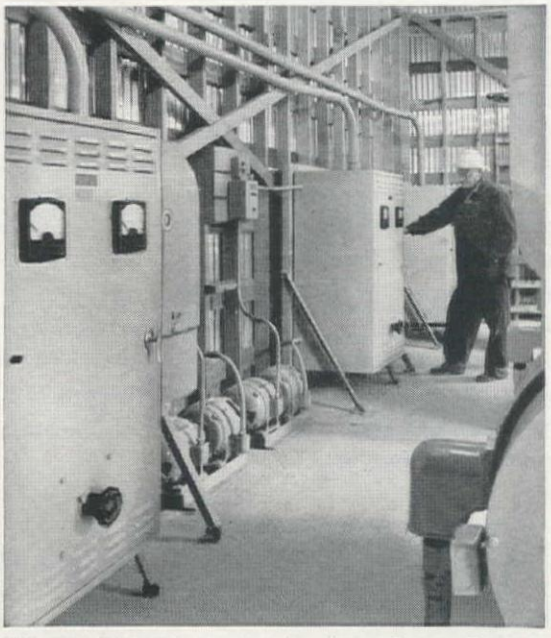
Wyoming — Casper
COLORADO BUILDERS' SUPPLY CO.

San Francisco's new twin-bore tunnel will be 3400 ft long portal-to-portal with a 1600-ft enclosed bore. Air for the construction tools and equipment is distributed from a central source under 100-lb pressure through 6-in. pipe.





A G-E 150-hp 440-volt, 600-rpm synchronous motor drives each of the three 930-cfm Ingersoll-Rand compressors. Motors and compressors run 24 hours a day, five days a week.



G-E control for each motor consists of a semi-magnetic starter providing reduced-voltage starting and complete motor protection. G-E motor-generator sets supplying field current are controlled by G-E magnetic starters mounted above them.

AIR for BOTH TUNNELER AND TRAVELER ... Electrically

G-E motors and control drive compressors for construction equipment and permanent ventilating blowers at San Francisco's Broadway Tunnel

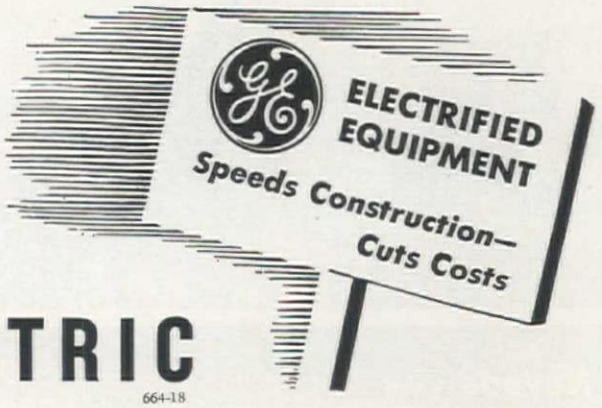
Compressed air to operate the more than 100 tools, hoists, and muckers being used by the Morrison-Knudsen Construction Co. in work on San Francisco's Broadway tunnel is supplied by centrally located compressors driven by G-E motors and control. Used in place of numerous individual units, the central air supply cuts maintenance costs and adds flexibility to the tunneling operation.

Expressing complete satisfaction with the system, Assistant Project Manager Harry Kirmond reports outstanding performance from G-E drives: *no unscheduled downtime has been charged to the drives up to the halfway mark in the two-year project.* And when the tunnel is complete, G-E equipment will still be on the job in the form of ventilating-equipment drives, and complete distribution facilities for lighting.

This is another excellent example of the flexibility, speed, and economy that G-E electrification can give you on construction jobs. *General Electric Company, Schenectady 5, N. Y.*

Ask him Today!

Whether you buy or build construction equipment, your G-E representative can show you how to do a better job—at lower cost—by complete electrification. Write him now, and he'll call on you at your convenience.



WESTERN PLANTS OR SERVICE SHOPS: Anaheim, Denver, Los Angeles, Oakland, Ontario, Portland, Richland, Salt Lake City, San Diego, San Francisco, San Jose, Seattle.
WESTERN SALES OFFICES: Albuquerque, Bakersfield, Butte, Denver, Eugene, Fresno, Los Angeles, Medford, Oakland, Pasco, Phoenix, Portland, Riverside, Sacramento, Salt Lake City, San Diego, San Francisco, San Jose, Seattle, Spokane, Stockton, Tacoma

GENERAL ELECTRIC

664-18

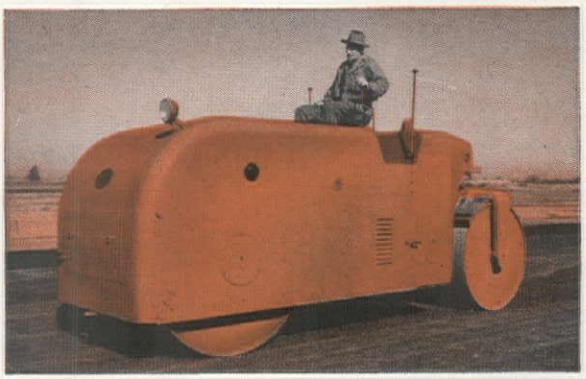
HUBER

A DEPENDABLE NAME IN . . .

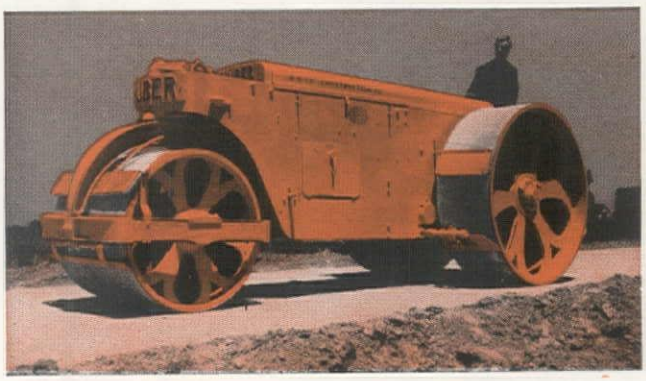
ROAD MACHINERY

Dependability in road machinery is the result of many factors—such as sound design, use of the right materials and careful workmanship. The experience and general policy of the manufacturer are also important influences.

Since 1863, HUBER has had one policy —to build machinery that will do a sound job in the field. Not to meet a price nor outsell a competitor, but to do a job for the man who buys it.



The HUBER Maintainer has won wide acceptance as a 6,000 lb., 42½ H. P. Grader with attachments that permit year-round use in a variety of maintenance jobs. HUBER's complete line of rollers is known and used throughout the world. HUBER Motor Graders are doing important jobs—and doing them well.



For dependable road machinery, see your nearest HUBER Distributor.

Lee & Thatro Equipment Co.	Los Angeles 21, Calif.
Jenkins & Albright	Reno, Nevada
Contractors' Equipment & Supply Co.	Albuquerque, New Mexico
Feenaughty Machinery Co.	Portland 14, Oregon
Feenaughty Machinery Co.	Boise, Idaho
Feenaughty Machinery Co.	Spokane 2, Washington
The O. S. Stapley Co.	Phoenix, Arizona
Feenaughty Machinery Co.	Seattle 4, Washington
Casson Hale Corporation	Hayward, Calif.
Foulger Equipment Co., Inc.	Salt Lake City 8, Utah
The Colorado Builders' Supply Co.	Denver 9, Colorado
The Colorado Builders' Supply Co.	Casper, Wyoming
Montana Powder & Equipment Co.	Helena, Billings, Montana

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oils

UNIT 50 diesel engines

JOB "Super Inch" gas pipeline

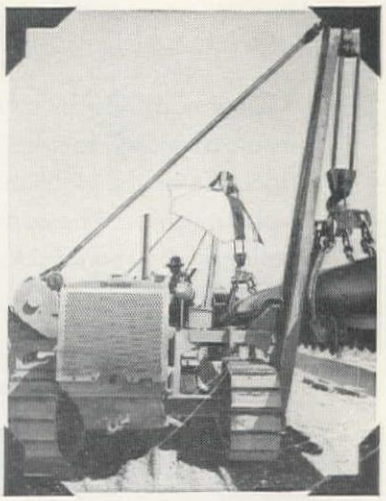
LOCATION From Arizona to California Pacific Coast

FIRM Bechtel Corp., San Francisco

Only 3 ring jobs on 50 engines in 1½ year's operation!

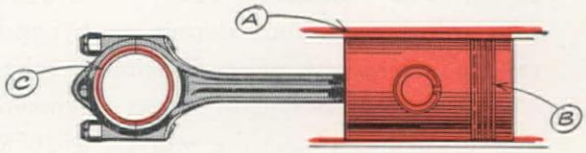
LUBRICATED WITH RPM DELO OILS, only three of the 50 heavy-duty diesel engines, used by Bechtel Corporation in building the great "Super Inch" pipeline, required ring replacements in 1½ year's work. No bearings were replaced.

WHEN BUILDING "SUPER INCH", biggest and longest gas pipeline in the world, equipment worked under every condition—in knee-deep dust, water, mud, sand and rock; in extreme heat and freezing cold. The trench, 5½ feet deep and 44 inches wide, was dug across deserts, farm areas and mountains from Topock, Ariz., to Oakland, Calif. The 34-inch pipe, welded, asphalt-coated and paper-wrapped on the job, was handled by special off-center tractors at right.



DIESELS OF ALL SIZES up to D-13000 models were on the job. Here four Caterpillar D-8's "walk" a pipe section into place along side the trench. There's an RPM DELO Lubricating Oil for every diesel.

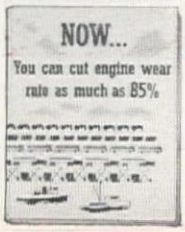
How RPM DELO Oils reduce wear, corrosion, oxidation in Tractor, Truck and other Heavy-Duty Engines



A. Contain special additives that provide metal-adhesion qualities...protect parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent piston scuffing.

C. Special compounds stop corrosion of any bearing metal and foaming in crankcase.



FREE BOOKLET on the RPM DELO Oils gives you complete information. Write or ask for it today.

TRADEMARK "RPM DELO" REG. U. S. PAT. OFF.

RPM DELO LUBRICATING OILS

STANDARD TECHNICAL SERVICE checked this product performance. For expert help on lubrication or fuel problems, call your Standard Fuel and Lubricant Engineer or Representative; or write Standard Oil Company of California, 225 Bush St., San Francisco.

STANDARD OIL COMPANY OF CALIFORNIA

REPEAT ORDERS

represent a lot of confidence in

LaPLANT-CHOATE MOTOR SCRAPERS

THERE'S one big reason why so many successful contractors repeat on buying Motor Scrapers... the job performance that makes earthmoving profitable.

LaPlant-Choate Motor Scrapers have *earned* their reputation as dependable profit-makers. They've *proved* their work-capacity under all kinds of operating conditions from one end of the country to the other.

The experience of successful outfits which have made money is worth considering. When you plan for the big construction years ahead, find out why so many profit-wise contractors are 100% sold on Motor Scrapers. Call on your LaPlant-Choate distributor today for a complete description of the many Motor Scraper advantages that will put money in your pocket. LAPLANT-CHOATE MANUFACTURING CO., INC., Cedar Rapids, Iowa.

LaPLANT CHOATE

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COLUMBIA EQUIPMENT CO.
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5030 1st Ave. South SEATTLE, WASHINGTON

WESTERN CONSTRUCTION EQUIP. CO.
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Stephens & Mount Ave. MISSOULA, MONTANA

ENGINEERING SALES SERVICE, INC.
410 Capitol Boulevard BOISE, IDAHO

STUDER TRACTOR & EQUIP. CO.
East Yellowstone Hwy., P. O. Box 779, CASPER WYOMING

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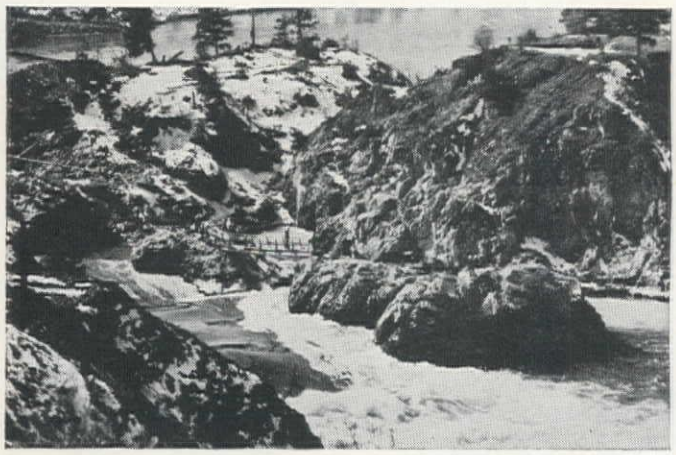
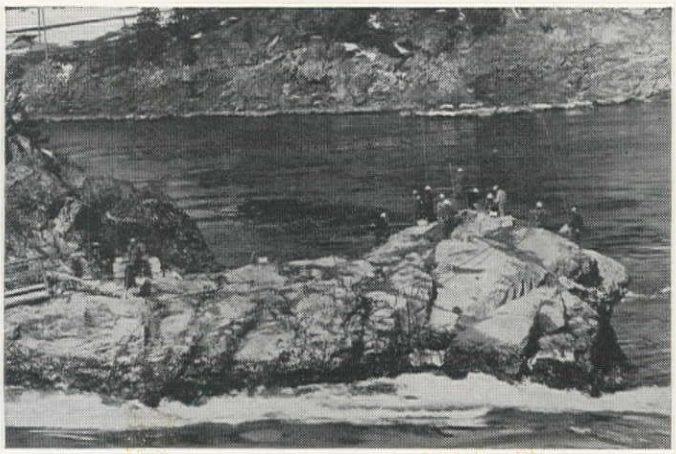
N. C. RIBBLE CO.
1304 N. Fourth St. ALBUQUERQUE, NEW MEXICO

ISLAND BLAST MAKES WAY FOR NEW DAM

. . . another job for Du Pont Dynamites

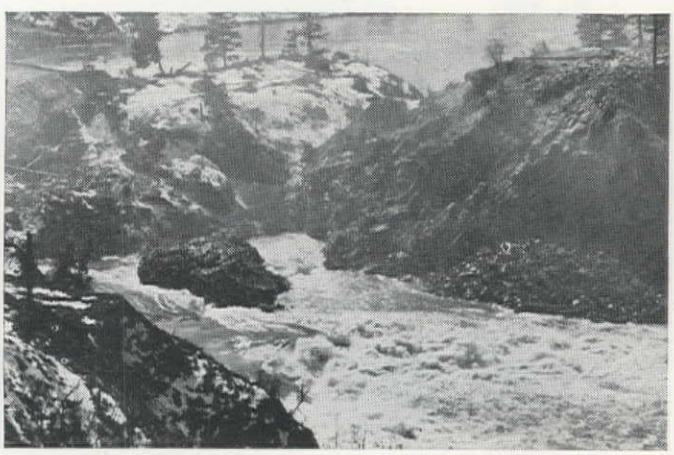


ISLAND OF SOLID ROCK in channel of Pend Oreille River, in Idaho, presents a difficult problem for the Macco Corporation, initial contractors in the construction of the new Albeni Falls Dam. The island had to be removed with a single shot. The contractor chose Du Pont Dynamites to do the job.



DRILLING OPERATIONS proceeded on schedule. Here, powder men complete loading of 6,000 pounds of Du Pont Dynamite in some 150 drill holes. The powder foreman checks every wire to be sure that it is "alive." Wiring is such that every drill hole goes, or else none at all.

BLAST UPHEAVES ISLAND. Holes were drilled 20 feet below water level to shatter island all the way to the river bed. Du Pont Dynamites are widely used for work of this kind. And, Du Pont technical representatives are always on hand whenever there's need for their special services.



RIVER IS READY for construction of the new dam. Note that the blast completely obliterated the granite-island obstruction. Whether you're faced with a tough problem or "run-of-the-mill" operation, you can count on dependable Du Pont Explosives and technical help at all times.

CALL ON the Du Pont Explosives representative in your area. He'll be glad to help you in the planning of your next job. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

DU PONT EXPLOSIVES

DU PONT
REG. U. S. PAT. OFF.

Blasting Supplies and Accessories

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

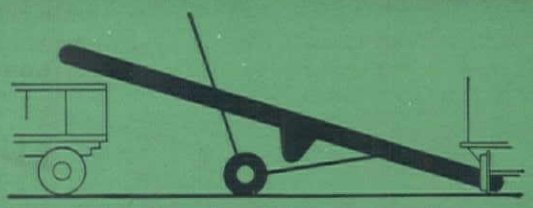
Barber-Greene

847461

Faster..Lowest Cost per Ton..
One-Man Operation

The versatility and one-man usefulness of B-G Portable Belt Conveyors offer almost unlimited possibilities for cutting the cost per ton handled — speeding up loading, unloading, stockpiling and conveying operations wherever they're put to work. These modern high-capacity conveyors handle all materials—stone, sand, gravel, coal, coke, ashes, bulk chemicals, bagged or boxed material — even wet concrete. Available in many sizes (lengths from 25′ to 60′; belt widths from 18″ to 30″) with advanced features that include highly portable, pneumatic-tired wheel trucks, lighter, stronger frames, V-belt drives and speed reducers—no chains or sprockets—and 100% anti-friction bearings. Use the coupon or see your B-G distributor for full information. Barber-Greene Company, Aurora, Illinois.

101



Unloading-loading cars, trucks

Multiple setups for unloading-loading, conveying bulk or packaged material.

Fast, easy towing

New Literature Describes New Advantages of the B-G Portable Conveyors

USE THIS COUPON

BG *Constant Flow Equipment*

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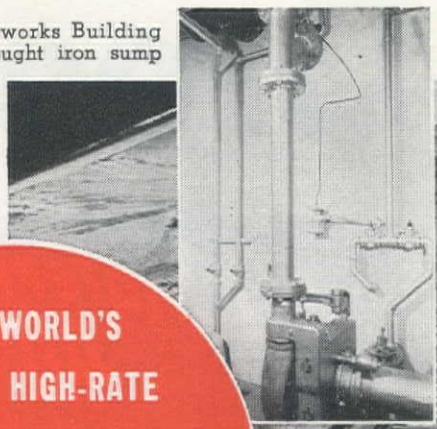
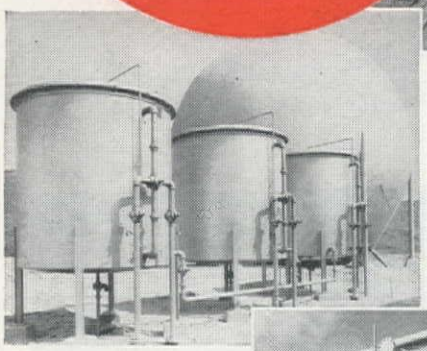
FOR SALE BY: Brown-Bevis Equipment Co., Los Angeles 58, Calif.; Columbia Equipment Co., Spokane, Wash., Seattle, Wash., Boise, Ida., Portland 14, Ore.; Wilson Equipment & Supply Co., Cheyenne, Wyo., Casper, Wyo.; Contractors' Equip. & Supply Co., Albuquerque, N. Mex.; Ray Corson Machinery Co., Denver 9, Colo.; Jenison Machy. Co., San Francisco 7, Calif.; Western Construction Equipment Co., Billings, Mont., Missoula, Mont.; Kimball Equipment Company, Salt Lake City 10, Utah; State Tractor & Equipment Co., Phoenix, Ariz.

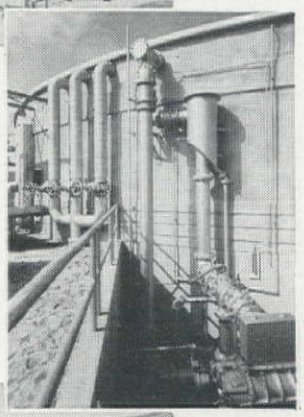
Pump room in Headworks Building showing genuine wrought iron sump pump and grit pump discharge pipe, and effluent wash water lines.



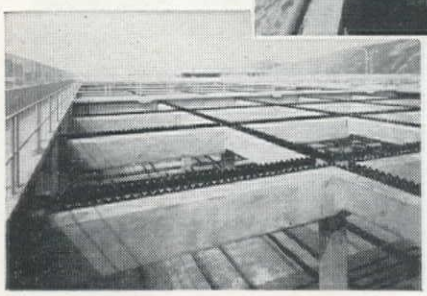
In the WORLD'S LARGEST HIGH-RATE ACTIVATED SLUDGE PLANT 51 INDIVIDUAL SERVICES ARE BYERS WROUGHT IRON



Showing genuine wrought iron water, gas and air lines leading into gas purifier.



Showing genuine wrought iron vents, water, effluent, and gas manometer lines on one of the 18 digester tanks.



Showing genuine wrought iron weir plates in final settling tanks at sludge plant.

Covering 76 acres, this $41,000,000.00 Hyperion sewage treatment plant of the City of Los Angeles is the world's largest treatment works using high-rate activated sludge process combined with sludge digestion, power generation, and fertilizer production.

In the design and work planning, engineers under Lloyd Aldrich, City Engineer, took decisive steps to forestall excessive maintenance and premature failure by specifying genuine wrought iron for 51 individual services where corrosion is a threat to durability. In the Primary Settling System, Digestion System, Power and Boiler Plant, Aeration System, General Piping System, Final Settling System, Elutriation System, and Ocean Outfall Sewer, genuine wrought iron safeguards a wide range of services against corrosion hazards. More than 141 tons of Byers Wrought Iron was used in fresh water lines, sump pump discharge lines, weir plates, condensate piping, instrument air piping, down spouts, flushing lines, air lines, underground piping, bearing plates, and many other services too numerous to list. Metcalf & Eddy of Boston were Consulting Sanitary Engineers; Merrill Butler, Deputy Engineer in charge of design; E. G. Studley, Engineer of Sewer Design; C. L. Bell, Projects Coordinating Engineer; G. A. Parkes, Senior Treatment Plant Design Engineer; and F. M. Darnell, Senior Administrative Engineer. The plant is being operated by the Bureau of Engineering.

The unique structure and composition of Byers Wrought Iron provides the needed service qualities for these punishing applications. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity iron, halt and "detour" corrosive attack. They also help anchor the initial protective scale, which shields the underlying metal.

Our bulletin, WROUGHT IRON FOR SEWAGE TREATMENT AND DISPOSAL INSTALLATIONS, gives some helpful information on how to reduce repairs and maintenance. Write for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, N. Y.

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CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

P&H PAYS OFF 3 WAYS

1 Greater Stability

gives you a higher ratio of lifting capacity in relation to gross weight . . . lets you work faster!

2 More Modern Features

true tractor-type crawlers . . .
low pressure hydraulic control . . .
live roller circle . . .
all-welded construction . . .

3 Unexcelled Service

Genuine P&H parts stocked by dealers . . . backed by nation-wide network of warehouses to keep your jobs on the move.

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NOW P&H services the West From the West!

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LOS ANGELES 21, California	Lee & Thatro Equipment Co., Inc., 820 Santa Fe Ave.
PHOENIX, Arizona	Arizona Equipment Sales, Inc., 2750 Grand Ave.
RIO VISTA, California	Berglund Tractor & Equipment Co.
SACRAMENTO, California	Sacramento Valley Tractor Co., 1901 Broadway
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ESCONDIDO, California	Southern Equipment & Supply Co., 301 W. Grand
EUREKA, California	*Riley Logging Supply Co., 1034 Broadway
CRESCENT CITY, California	Riley Logging Supply Co., Highway "Y"
RENO, Nevada	Jenkins & Albright Mack Truck Sales, 1131 W. 4th Street
PORTLAND 14, Oregon	*Loggers & Contractors Machinery Co., 240 S. E. Clay Street
EUGENE, Oregon	Loggers & Contractors Machinery Co., 540 Filmore Street
SALT LAKE CITY, Utah	Western Machinery Company, 748 West 8th, South
SEATTLE 8, Washington	Bow Lake Equipment Co., Inc., 300 Michigan Street
SEATTLE 4, Washington	Glenn Carrington & Co., 91 Columbia Street
SPOKANE 15, Washington	F. M. Viles & Co., Inc., N. 1107 Freya

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Cement is Building for DEFENSE!

RUNWAYS
TAXIWAYS
PARKING STRIPS
AIRCRAFT HANGARS
ARSENALS
WAREHOUSES
RADAR NETWORKS
POWER PLANTS
ATOMIC ENERGY PLANTS
MILITARY ROADS
BARRACKS
HOSPITALS

Cement from Western Mills is building miles of concrete runways to serve the nation's newest type warplanes.

HUNDREDS OF THOUSANDS OF BARRELS OF PERMANENTE CEMENT have poured into the Nation's re-armament program during the past year—and the tremendous construction projects planned by the Armed Services have only begun to swing into all-out production.

PERMANENTE CEMENT COMPANY has been called upon to furnish a very large proportion of its 7,000,000 barrel production capacity for the Defense Department's West Coast requirements. At the same time, they have made every effort to keep abreast of the needs of civilian construction. Defense shipments have been greatly expedited by the Company's coast-wide distribution system—with facilities in every major population center on the Pacific Coast, from Long Beach, California, to Anchorage, Alaska, and in the Hawaiian Islands—it is possible to make delivery of these vital cement shipments where and when they are needed.

PERMANENTE'S slogan, "On the Job, On Time!," which has been so well proved through years of service to the Western Construction Industry, has never been so important as now—when "On the Job, On Time!," can mean the survival of our way of life.

PERMANENTE CEMENT COMPANY

On the job - On time

PERMANENTE CEMENT COMPANY

PERMANENTE, SANTA CLARA, YOSEMITE AND KAISER BRANDS OF PORTLAND CEMENT AND PERMANENTE LIME PRODUCTS

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WORLD'S LEADING TRUCK SHOVEL

THE ONE AND ONLY "QUICK-WAY"

Reg. U. S. Pat. Off.

QUICK-WAY truck shovels can be found "on the job" in every one of the 48 states and in 65 foreign countries as well.

Yes . . . *QUICK-WAY* . . . the original and always the standard among truck shovels, demonstrates its versatility and adaptability, as well as its superb engineering and long-lasting construction, in Alaska and the Amazon, Great Britain and British Columbia.

Abroad, as well as at home, *QUICK-WAYS* get to and from the job faster. They're on the job more, because they're "between location" less. And *QUICK-WAYS* are quickly converted in minutes from shovel to scoop, dragline, trench-hoe, crane, clamshell, pile driver or backfiller. And most important of all, *QUICK-WAYS* are built for long, hard service with quality materials and superior workmanship. They're truly an investment in profits.

Mail Coupon Today!

"QUICK-WAY"

TRUCK SHOVEL CO.

DENVER, COLORADO

U. S. A.

"QUICK-WAY" TRUCK SHOVEL CO.
Dept. 12—2400 East 40th Ave.
Denver, Colorado

Please send me complete details on "QUICK-WAY" truck shovels — four different models for large jobs and small.

NAME _____

ADDRESS _____

CITY _____ STATE _____

On this highway job between Bardstown and Fredericktown, Ky., a 1¾-yd. Thew Lorain shovel, powered by a "Cat" D13000 Engine, loads heavy rock into Athey wagons, pulled by "Caterpillar" D7 Tractors. The contractor is W. C. Snyder, Danville, Ky.

There's a big job ahead

How your equipment stands up in the months ahead has a real bearing on America's fight to be strong and stay free. A vital part of that effort is the $12,000,000,000 worth of earthmoving and road building needed this year. And we're entering a period that will separate "the men from the boys" in the field of construction machinery.

Military needs and Defense Rated Orders are taking their share of "Caterpillar" production. Shortages of steel and other materials add to the difficulty of supplying the demand for new machines. This means that *present equipment must be kept in use.*

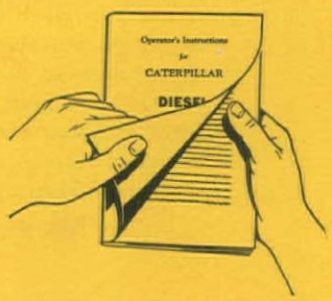
"Cat" Diesel Engines, Tractors, Motor Graders and Earthmoving Equipment are built with the stamina to serve you long and faithfully. But *how* long is up to you and the operation and maintenance you give them. Good care pays off.

You can add many hours to equipment life if you follow sound maintenance practices. Anticipate your parts needs *before* wear goes beyond repair. Talk it over with your "Caterpillar" dealer. He is qualified to give competent opinion. If a part is not readily available, he has the tools and knowledge to rebuild many worn parts — and keep your machinery on the job.

CATERPILLAR TRACTOR CO. • San Leandro, Calif.; Peoria, Ill.

You're the Doctor

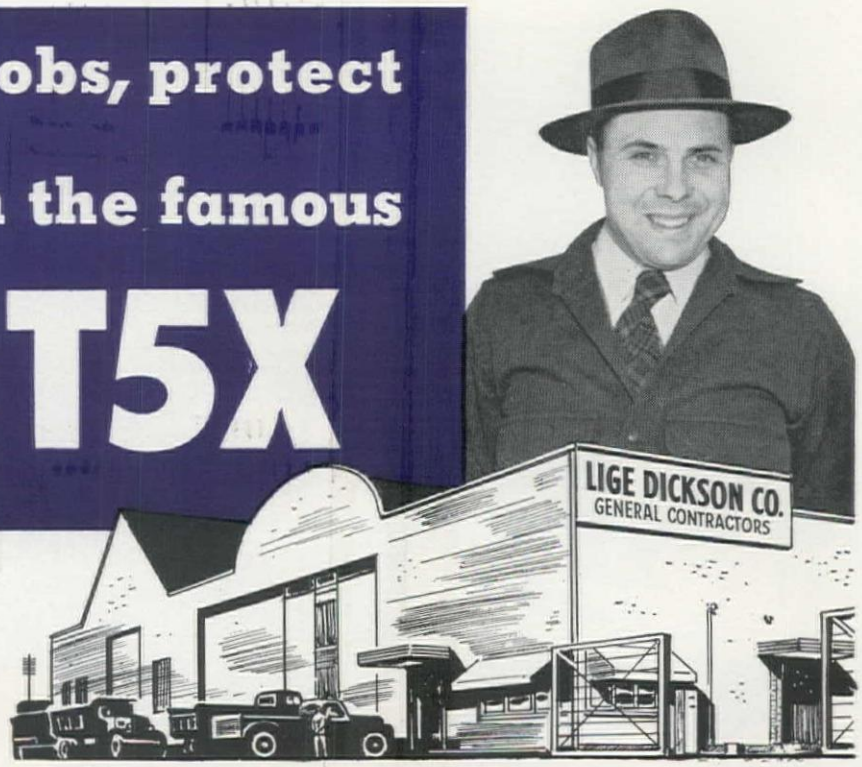
Don't let your engine overheat. Maintain the cooling system, keeping it free of scale, rust and sediment. Use soft or treated water and, when freezing temperatures exist, protect your engine with anti-freeze. Clean the radiator periodically, removing foreign matter from the core by brushing or washing. Use chemical flushing solutions. Prevent engine troubles which come with overheating. Consult your Operator's Instruction Book.



CATERPILLAR
REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

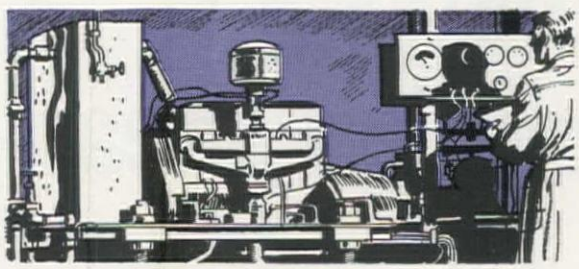
On rugged jobs, protect engines with the famous purple oil... T5X



Tacoma contractor reports Union Oil products are "of first quality consistently"

William B. Dickson of the Lige Dickson Company, Tacoma, Wash., writes: "We are general contractors engaged in heavy construction work of all types. Our fleet consists of many varied types of equipment and is powered by both gasoline and Diesel motors. For the past few years we have been purchasing Union Oil products and have found them to be of first quality consistently."

T5X — the amazing *purple* motor oil — is the lubricant found throughout the Lige Dickson Company's fleet. Mr. Dickson explains: "In our line of business, breakdowns must be avoided; consequently we continually try to improve our maintenance and adhere to equipment manufacturers' recommendations." T5X is the choice of many construction men because they know it passes rigid Army specifications for a heavy-duty oil.



In T5X, a combination of special compounds have been added to the finest of base stocks. These additives enable T5X to resist oxidation, corrosion and acid action. Sludge formation is kept at an absolute minimum. Because of its stability, T5X *does not* break down under long hours of continual heavy load.

T5X is specifically designed to do an outstanding job under *any* operating condition, no matter how severe. If you want fewer breakdowns and lower maintenance costs, give T5X a trial in your engines operating under critical conditions.

For full information on T5X and other Union Oil Company products call your local representative, or write Sales Department, Union Oil Company, Los Angeles 17, California.

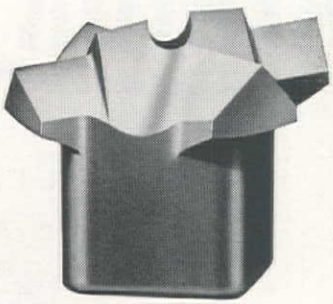
UNION OIL COMPANY OF CALIFORNIA

76

Only the Timken Company offers

ALL 3

ROCK BIT



TYPES

and a complete Rock Bit Engineering Service!

NO matter which type of removable rock bit is best for your particular job, you can get it from the Timken Company. For *only* the Timken Company *makes all three rock bit types*—multi-use, carbide insert, and one-use "Spiralock". And because our rock bit engineers have all three rock bit types to choose from, they can help you make an unbiased selection of the *one* best bit for your job.

From top to bottom above—

1. **MULTI-USE.** Gives lowest cost per foot of hole when full increments of drill steel can be drilled and when control and reconditioning of bits are correct.

2. **CARBIDE INSERT.** For drilling extremely hard and abrasive ground, small holes, extra deep holes. Holes go down faster, bit reconditioning is simplified.

3. **ONE-USE "SPIRALOCK".** For use where reconditioning is not feasible. Gives lowest unit cost. "Spiralock" union holds bit on dependably, permits easy removal.

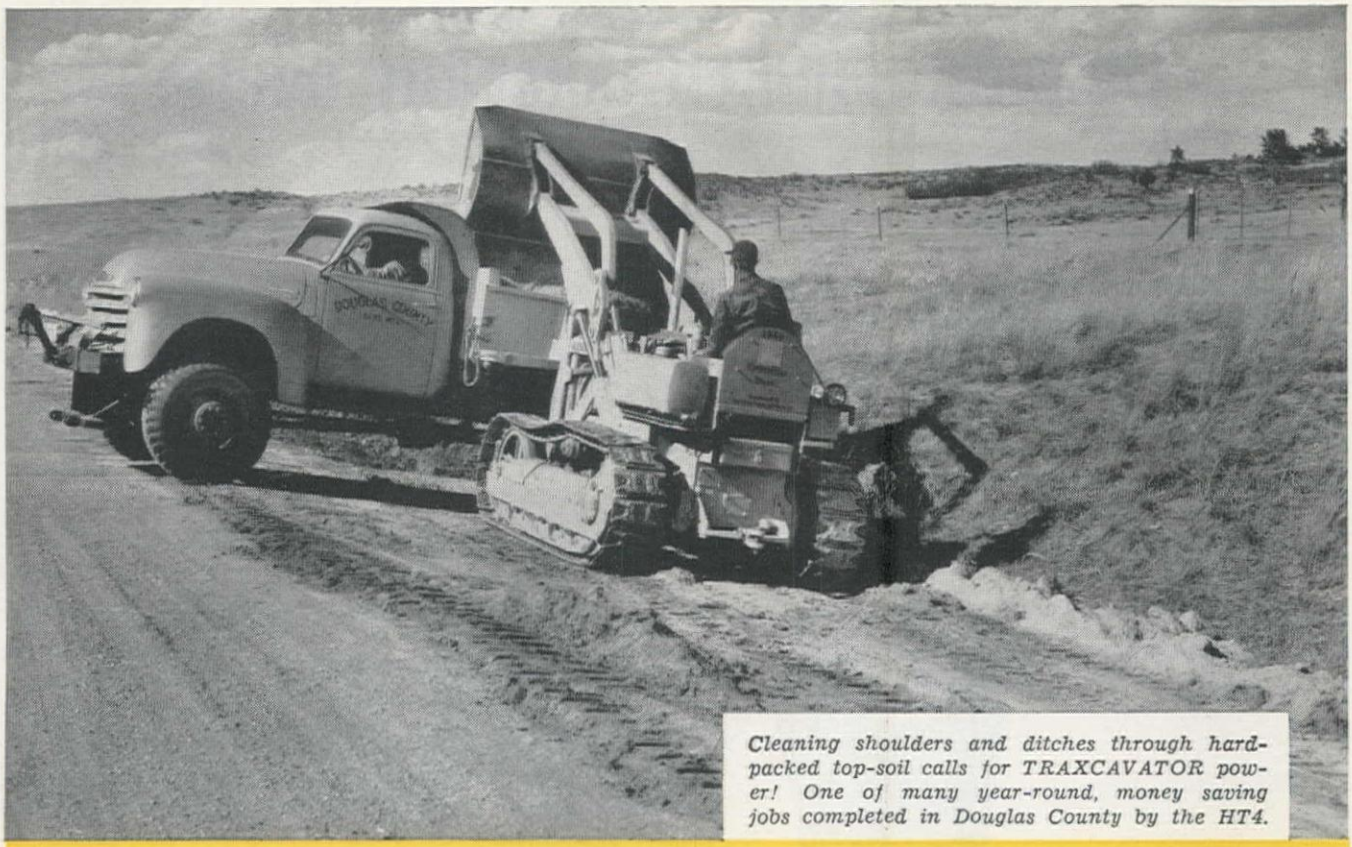
Our rock bit engineers have all three rock bits to choose from and more than 18 years of field and laboratory experience behind them. So whether you're looking for lowest bit cost, lowest cost per foot drilled, high drilling speed, or any other advantage, call on them to get the bit performance you're after.

FREE BOOKLET! *Packed with helpful information. Shows full line of bits. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".*

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit
... for every job



Cleaning shoulders and ditches through hard-packed top-soil calls for TRAXCAVATOR power! One of many year-round, money saving jobs completed in Douglas County by the HT4.

YOU NAME IT A TRAXCAVATOR WILL DO IT!

Whatever your job, digging, loading, grading, 'dozing, excavating, stripping, backfilling, land-clearing, ditching, snow-removal—whatever the material—a TRAXCAVATOR will do it . . . faster and cheaper.

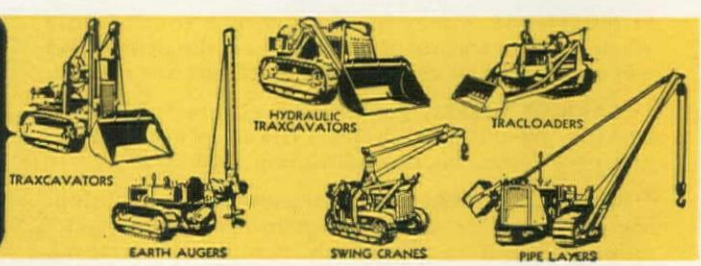
Douglas County, Colorado, uses their versatile HT4 TRAXCAVATOR to clean shoulders and ditches, feed sand and gravel to a screening plant as well as many other jobs throughout the county.

Converting dependable "Cat" Diesel Tractor power to work-power, these economical and rugged tractor-shovel teammates are designed to meet any task. Powerful digging action gets heaped loads every pass . . . balanced design . . . wide tracks allow high gear hauls . . . positive dumping gets all the material out of the bucket . . . high lift gets the load into any hauling unit. And the rear of the tractor is free for drawbar work or installation of other equipment.

There are five TRAXCAVATOR models with capacities from ½ to 4 cubic yards . . . with a full line of attachments to increase job range! See your TRACKSON-"Caterpillar" Dealer or write TRACKSON COMPANY, Dept. WN-81, Milwaukee 1, Wisconsin.

Digging and feeding pit-run gravel to the screen hopper, this hydraulically controlled HT4 TRAXCAVATOR handles over 500 cubic yards a day for Douglas County, Colorado.

TRACKSON
TRACTOR EQUIPMENT



Performance Records Prove...

. . . that trucks equipped with Eaton 2-Speed Axles make faster trips, travel more miles, at lower cost per mile. They reduce strain and wear on engine and power transmitting parts, permit the engine to run at peak efficiency under all operating conditions. Records also prove that Eaton's exclusive features, including forced flow lubrication, and planetary gearing, add thousands of miles to axle life, and assure top performance for the life of the vehicle. Ask your dealer to explain how Eaton 2-Speed Axles pay for themselves many times over.

EATON
2-Speed Truck
AXLES

Axle Division

EATON MANUFACTURING COMPANY

CLEVELAND, OHIO

PRODUCTS: SODIUM COOLED, POPPET, AND FREE VALVES • TAPPETS • HYDRAULIC VALVE LIFTERS • VALVE SEAT INSERTS • JET ENGINE PARTS • ROTOR PUMPS • MOTOR TRUCK AXLES • PERMANENT MOLD GRAY IRON CASTINGS • HEATER-DEFROSTER UNITS • SNAP RINGS SPRINGTITES • SPRING WASHERS • COLD DRAWN STEEL • STAMPINGS • LEAF AND COIL SPRINGS • DYNAMATIC DRIVES, BRAKES, DYNAMOMETERS

deep water or
swamp—

NO PROBLEM FOR MONOTUBE

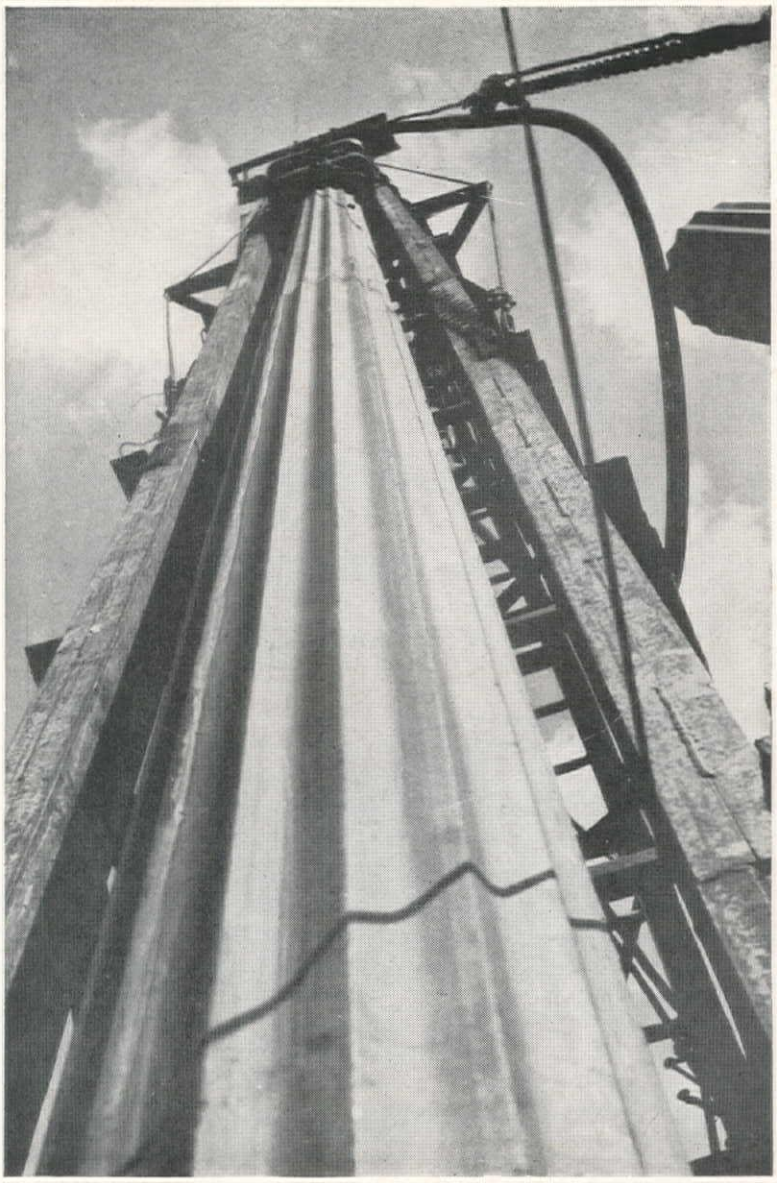
tapered steel piles

BRIDGE foundations often pose tough problems. No exception was the construction of the 900-foot trestle-type bridge across the Tuckahoe River on Maryland State Route 328.

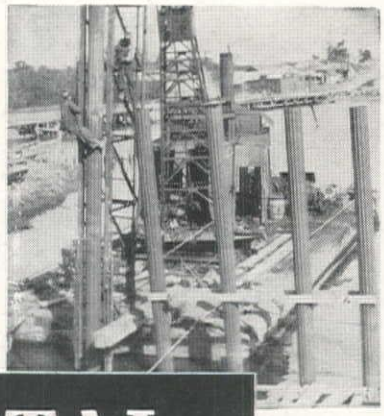
Here, engineers faced a 3-way foundation problem: deep water . . . swamp areas with soft layers of alluvial mud . . . and the need for a full 18-foot clearance above mean tide in the channel area. Careful studies proved Monotube tapered steel piles to be both the ideal *and* the lowest-cost solution to an unusual problem.

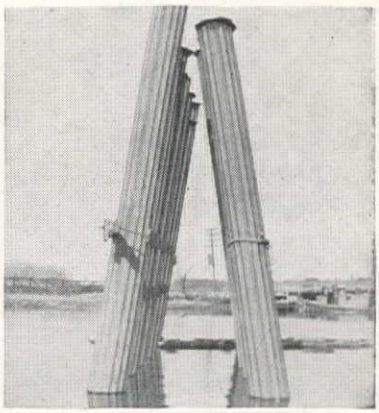
Rugged Monotubes, cold rolled and fluted, offered the extra columnar strength and stability that meant sound construction with a minimum number of piles. Light in weight, easy to handle, and extendible right on the job, Monotubes could be placed and driven *fast* with average driving equipment. Moreover, the wide variety of Monotube diameters made it easy and economical to obtain the required column strength at *any* location . . . deep water or soft mud.

Monotubes come in lengths, gauges, sizes and tapers for varying soil conditions . . . save time and money in all kinds of foundation work. For complete, helpful data, write The Union Metal Manufacturing Company, Canton 5, Ohio.



Looking at 65 feet of Monotube pile straight up from the water. Approximately 10,000 feet of 7 gauge and 3 gauge piles were used for the Tuckahoe River bridge, built for Maryland State Roads Commission by Tidewater Construction Company, under direction of Walter C. Hopkins, Deputy Chief Engineer.





Left: Welding extensions to tapered portion . . . a big time-saving.

Right: Twelve Monotube piles driven for a double bent . . . strong, rigid, good for years.

UNION METAL

Monotube Foundation Piles

MACK TRUCKS...

Today's Wise Buy

Now, more than ever, it pays to look upon your truck purchase as an investment...one that should yield you long-term dividends in dependability and economy. Measured that way, you'll find there's no other truck to match a Mack.

Long-lasting, profit-making Mack performance is well demonstrated by Mack Model A-40 Series (23,000 lbs. g.v.w. to 53,000 lbs. g.c.w.) which cover a wide utility range as trucks, tractors, four or six-wheelers.

Like all Macks, these popular trucks are built with extra strength and sturdiness in every part...give you assurance of sustained, uninterrupted operation should trucks become difficult to replace during the uncertain period ahead.

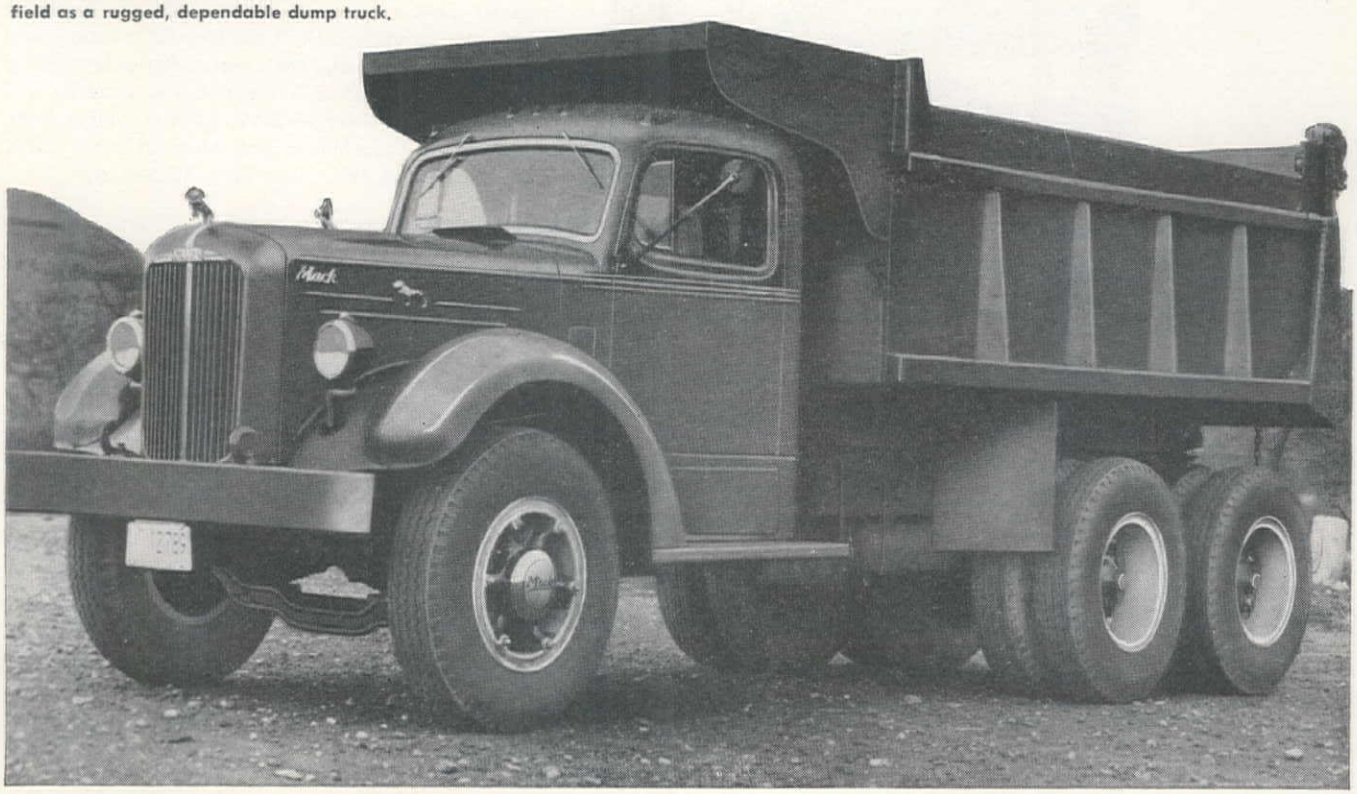
Your nearest Mack branch or distributor will explain to you what "Built Like A Mack" means in extra long life and low-cost operation...why Mack is *today's wise buy* in trucks.

Mack TRUCKS

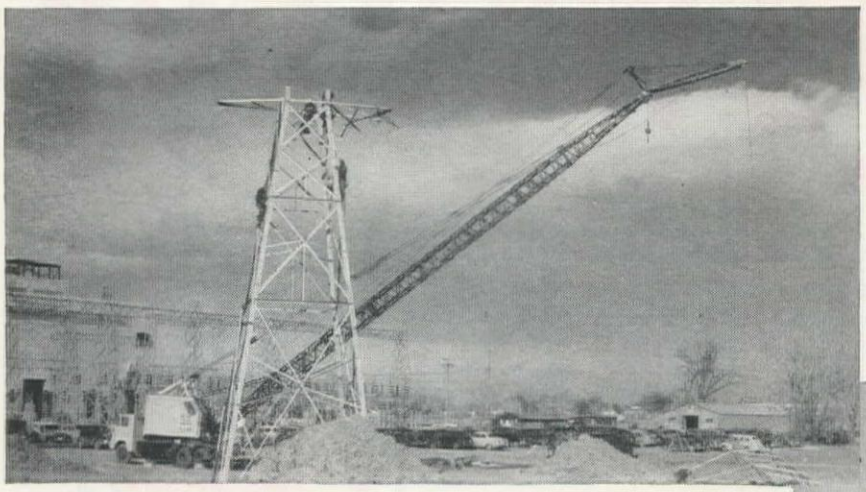
...outlast them all

Mack Trucks, Inc.—Los Angeles • Denver • San Francisco Seattle • Portland • Salt Lake City • Factory branches and distributors in all principal cities for service and parts.

Mack Model A-405 six-wheeler has won outstanding recognition in the construction field as a rugged, dependable dump truck.



You can take on any kind of lifting job with a BAY CITY CRANEMOBILE



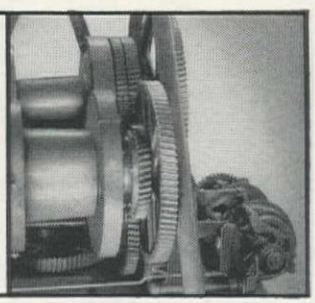
for high lifts . . . There is plenty of balance and stability in this 20 ton capacity CraneMobile to handle long booms and jibs. Here a "180" is reaching out to pick up a prefabricated top section of a 90 foot transmission tower. The worm and worm wheel boom hoist will raise and lower boom and load *only under power* either independently of or simultaneously with other operations.

for heavy lifts . . . POWER and WEIGHT are always necessary to pick heavy loads. The BAY CITY CraneMobile has them both as shown here where the 25 ton capacity "190" lifts a massive rotary dryer. When lowering, the operator will engage the power load lowering device which permits precision controlled lowering against machinery and engine.

for twin lifts . . . Frequently an exceptionally heavy load requires cranes to operate as a team, as in this illustration where two 20 ton capacity CraneMobiles, working on a new railroad underpass, handle two girders each weighing 37½ tons. This job calls for *precision booming* and *precision load lowering* — BAY CITY furnishes both. For complete CraneMobile facts write us today. BAY CITY SHOVELS, INC. BAY CITY, MICHIGAN.

CHECK LIST
- 20-25 Ton Capacity
- Pin-Connected Boom
- Hi-Collapsible Gantry
- Independent Power Boom Hoist
- Precision Power Load Lowering
- Removable Counterweight
- Specially Designed Carrier
- High Road Speeds

power load lowering . . . A specially arranged Power Load Lowering mechanism for accurate control in lowering heavy loads is standard equipment on CraneMobiles. This device, independent of the boom hoist, automatically lowers the load at about one inch per second on six parts of line without use of brakes. The mechanism can be quickly engaged or disengaged.



189

BAY CITY

SALES AND SERVICE

DENVER
Ray Corson Machinery Company
350 Kalamath Street

LOS ANGELES
Brown-Bevis Equipment Company
4900 Santa Fe Avenue

SAN FRANCISCO
Garfield & Company
1232 Hearst Building

PORTLAND
Feenaughty Machinery Company
112 S.E. Belmont Street

SEATTLE
Feenaughty Machinery Company
1028 Sixth Avenue, S.

SPOKANE
Feenaughty Machinery Company
N. 715 Division Street

BOISE
Feenaughty Machinery Company
600 Front Street

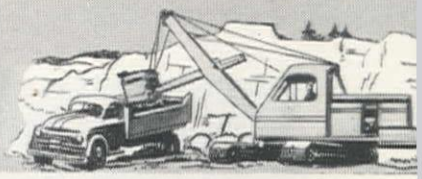
HELENA
Neil E. Grimes, Inc.
821 N. Main Street

SALT LAKE CITY
C. H. Jones Equipment Company
1595 So. Second, W.

PHOENIX
Western Machinery Company
124 E. Buchanan Street

WHEREVER ENGINES WORK

In Construction, Chrysler Powers
Ditching Machines • Cranes • Truck Mixers • Shovels • Loaders • Yarders • Concrete Mixers • Road Pavers • Crane Carriers • Scoop Tractors

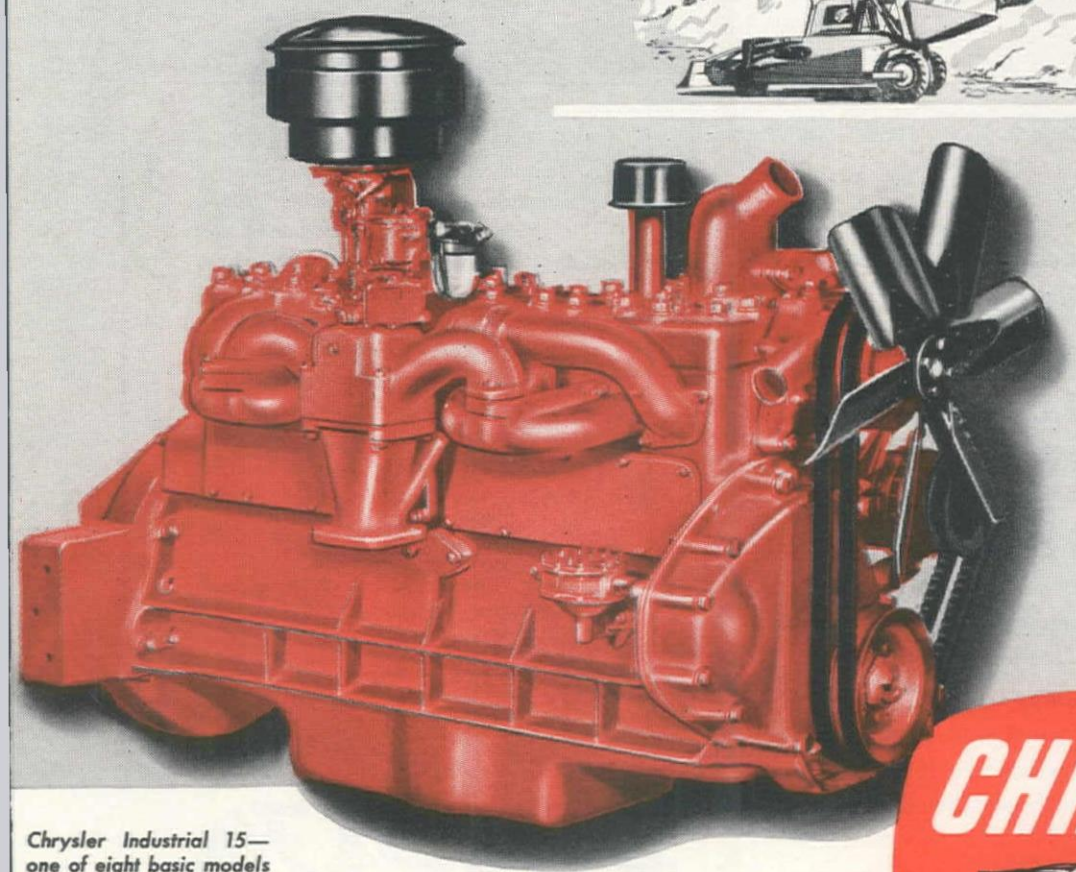


In Industry, Chrysler Powers
Air Compressors • Hoists • Derricks • Pumps • Generators • Tractors • Arc Welders • Baling Machines • Conveyors • Tackle Blocks • Winches

Chrysler Industrial Engines Do a Better Job at Lower Cost!

In Farming, Chrysler Powers
Tractors • Combines • Gang Mowers • Spreaders • Irrigation Equipment • Orchard Sprayers • Hay Choppers • Pumps • Feed Mills • Sprinklers

In Other Fields, Chrysler Powers
Locomotives • Motor Coaches • Air Conditioning Equipment • Pulp Machines • Drilling Equipment • Fire Pumps • Snow Plows • Street Flushers • Saw Mill Equipment • Oil Well Pumps and Drillers



Chrysler Industrial 15—one of eight basic models

More manufacturers, more operators of industrial equipment are discovering the brilliant efficiency of Chrysler Industrial Engines on scores of different applications.

For Chrysler Industrial Engines are built *solely for industrial jobs.* Furthermore, Chrysler Industrial Engines are designed and engineered to meet the *specific working requirements* of each type of equipment they power. They can also be adapted to special regional operating conditions.

A letter of inquiry will bring an engineer well qualified to discuss your particular application. Address: *Industrial Engine Division, Chrysler Corporation, Detroit 31, Michigan.*

CHRYSLER

HORSEPOWER WITH A PEDIGREE

Nerve center of Charleston, West Virginia's busy Kanawha Airport, the architectural concrete Terminal Building is acclaimed as one of the handsomest and most efficient structures of its kind. View above shows building from airport apron side. Carved from rugged sandstone hills, runway and service building grading required movement of 9,100,000 cubic yards of rock and dirt. An idea of the size of the operation is given by the fact that on site now occupied by Terminal Building, there once rose a hill 50-feet higher than control tower. Architects for the building: Tucker & Silling, Charleston, West Virginia; Contractor: Kuhn Construction Co., Charleston, West Virginia.

Contractors of Kanawha Airport Terminal Building Report:

"Plywood Cuts Formwork Time and Labor Costs By Over 20 Per Cent"

ECONOMY, SPEED AND APPEARANCE of finished concrete. These constitute the three-way yardstick by which plywood's performance was measured in building the new Kanawha Airport Terminal Building.

Consider speed and economy. According to Charles J. Kuhn, president Kuhn Construction Co., contractors on the airport building, "Plywood speeded formwork operations all along the line . . . cut application time and labor costs by at least 20 per cent."

Consider appearance. Architects Tucker and Silling who specified plywood on the job because "the panels permit a smooth monolithic surface to be cast simultaneously with structure," report that concrete surfaces on the Terminal Building are "uniformly smooth and even-textured."

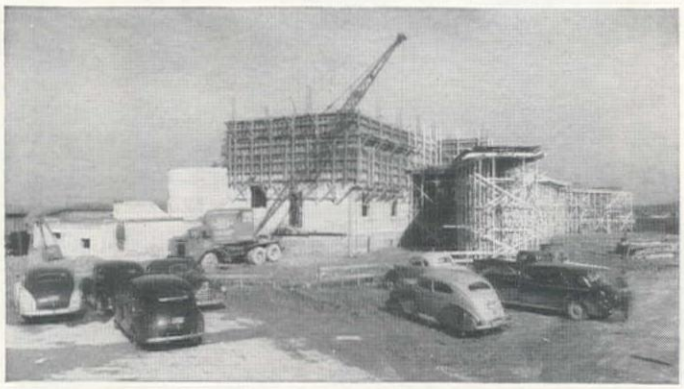
Conclusion? Simply this: Public building or industrial structure . . . apartment or heavy construction project—plywood forms do a *better* job, *faster*, *more economically*.

Douglas Fir Plywood

AMERICA'S

Re-Use of Plywood Form Panels Helps Reduce Construction Costs

Passenger approach side view of Terminal Building shows pleasing functional design obtained by balancing vertical and horizontal masses. In addition to time and labor savings, re-use factor of plywood forms helped reduce construction costs on the job. Re-used to job completion, contractors report, plywood forms were still in good condition after last pour.



Construction view shows plywood forms in place. Form sections were built by placing ¾″-thick Exterior Concrete Form panels across studding. Forms were held in line with double 2″x4″ wales, backed by double 2″x6″ liners, placed vertically. After each use, plywood forms were cleaned, re-oiled and crane-erected into position for next pour. Note scaffolding at right which supports plywood canopy forms.

Large, Light, Strong Real Wood Panels

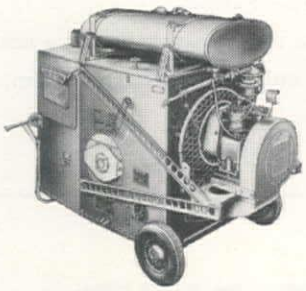
For additional data on Douglas fir plywood for concrete form work, write (USA only): Douglas Fir Plywood Association, Tacoma 2, Washington. Of particular interest are two booklets: "Concrete Forms of Douglas Fir Plywood" and "Handling PlyForm".

BUSIEST BUILDING MATERIAL

I find I can't afford cheap portable heaters

HERMAN NELSON DE LUXE I
Capacity 280,000-450,000 BTU/hr.
Completely automatic, including temperature control.
Fresh air delivery 2,000-2,350 cfm.
Electric motor powered.

HERMAN NELSON ECONOMY MODEL
Priced lower for smaller jobs.
Capacity 125,000-190,000 BTU/hr.
For 115/230 volt A.C.
Costs but 19¢ per hour to operate.



HERMAN NELSON STANDARD MODEL
Capacity 250,000-385,000 BTU/hr.
Gasoline engine powered.
Completely self-contained.
For areas lacking electricity.

THEY'RE *unsafe*... AND TOO COSTLY!

THIS isn't double talk. Top construction men tell us the *safety* factor of Herman Nelson portable heaters pays real dividends. Their exclusive "sealed flame" feature eliminates fire and fume hazards and supplies heat that's "fresh air" clean.

Play safe on this winter's construction jobs. Quick, clean, *safe* heat from Herman Nelson portable heaters will cure those job lags and make man hours more productive.

Make a deal now with your nearest Herman Nelson dealer—while he can supply you without a long wait. For his name just write to Dept. WC-9 at the address below.

AAF

herman moline illinois nelson

HERMAN NELSON

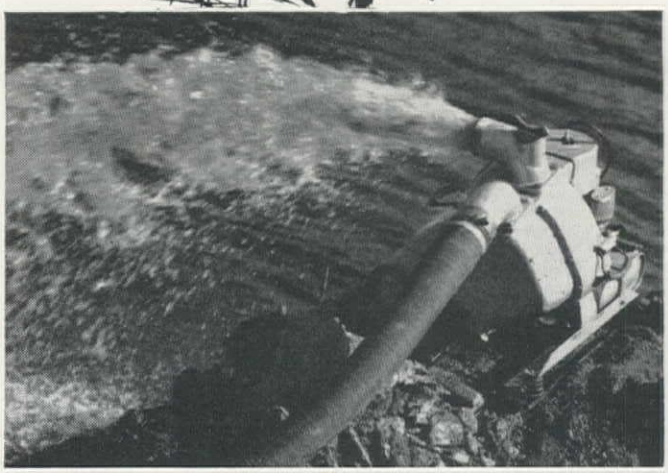
Division of **AMERICAN AIR FILTER COMPANY, INC.**

MOLINE, ILLINOIS

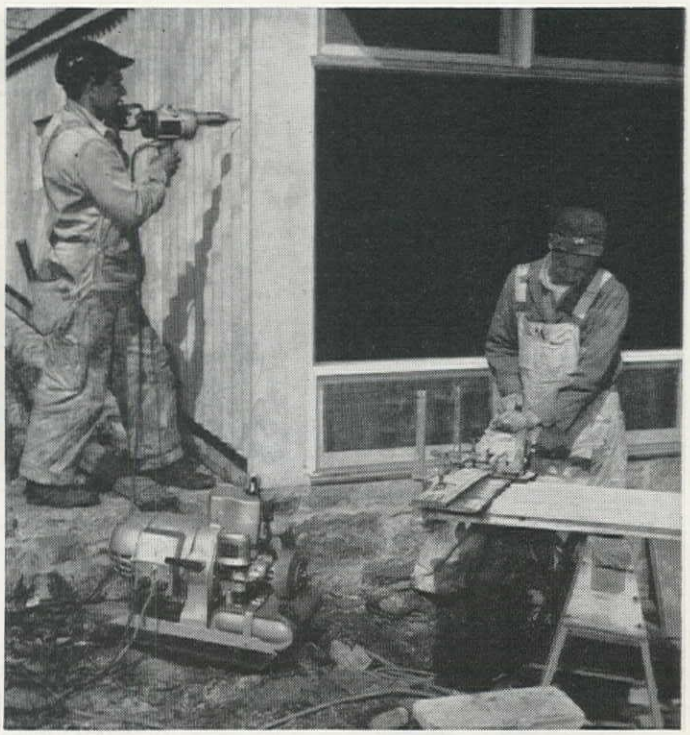
To every Contractor who wants to Save Money with

HOMELITE

Carryable EQUIPMENT



Use Homelite Gasoline Engine Driven Pumps for faster dewatering. One man sets it up . . . gets it going instantly . . . any place. Fastest automatic self-priming. Non-clogging. 28 foot suction lift. And handles up to 15,000 gallons per hour.



Use Homelite Gasoline Engine Driven Generators to operate power tools or floodlights. No delays . . . no waiting for power installation . . . no long hazardous and power hungry cables. Several models including new dual purpose generator that operates *both* high cycle and standard universal tools.

Act now! Homelite Carryable Pumps and Generators are not too easy to get. There are delays in deliveries. But with a wise eye to the future it's better to order a Homelite for as early as possible delivery, than pick up some inferior piece of equipment that might be hanging around. After all, the present building boom isn't going to burst overnight. Predictions point to months, yes *years* of intensive building activity. And to keep pace with the program, you'll need all the time-saving, cost-cutting equipment you can get. You'll need equipment that will really stand up under rugged, *steady* use . . . dependable equipment like Homelite Carryable Pumps, Generators and Chain Saws.

Write today for complete information on the availabilities of Homelite carryable equipment . . . Pumps, Generators and Chain Saws.

Manufacturers of Homelite Carryable Pumps • Generators Blowers • Chain Saws

PERFORMANCE · DEPENDABILITY · SERVICE

HOMELITE CORPORATION

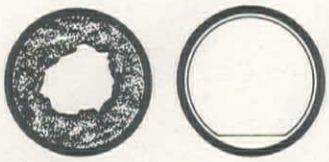
1309 RIVERDALE AVENUE • PORT CHESTER, N. Y.

Old pipe reconditioned by cement mortar lining.

MAKE YOUR OLD PIPE LINE PERFORM LIKE NEW...

at much less than new pipe line costs!

FOR WATER, GAS AND OIL PIPE LINES OF 4" DIA. AND UP



Before reconditioning. After reconditioning.

- Restore flow coefficients.
- Reduce pumping costs.
- Prevent leakage.
- Protect against corrosion.
- Protect against discoloration and contamination.

Patented Cement Mortar Lining Processes Recondition Lines in Place

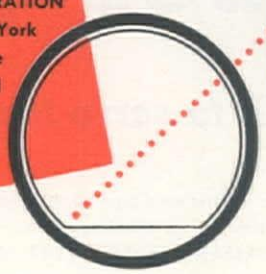
Are you encountering leaks, reduced flow capacity or other pipe line troubles due to failure in service of an old pipe line?

If so, reconditioning by the famous TATE and CENTRILINE processes can solve your problems quickly, efficiently and economically.

These processes use patented equipment that thoroughly removes all tuberculation and incrustation and applies a smooth, continuous cement mortar lining of proper thickness. All the work is done with the pipe line in place and with only momentary interruption of service to install by-pass lines.

The thoroughly reconditioned pipe gives practically new and permanent pipe line performance at much less than new pipe line costs. Write for complete details today.

In eastern and central states the CENTRILINE CORPORATION of 140 Cedar Street, New York 6, N.Y. offers Centriline service and has been licensed by Pipe Linings, Inc. to line small pipe lines by the Tate process.



PIPE LININGS, Inc.

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NOW! WIDE FLANGE BEAMS ARE PRODUCED IN THE WEST!

To help meet critical defense needs, Kaiser Steel is now producing Wide Flange Beams—the first produced in the West!

Kaiser Steel Wide Flange Beams offer fabricators and engineers a bonus in strength because they are heavier and the inside faces of the flanges are given a slight taper.

Two sizes are being produced in each group from 8 to 16 inches. These stronger beams have substantially the same depth and width as Wide Flange Beams produced on other mills and are readily interchangeable.

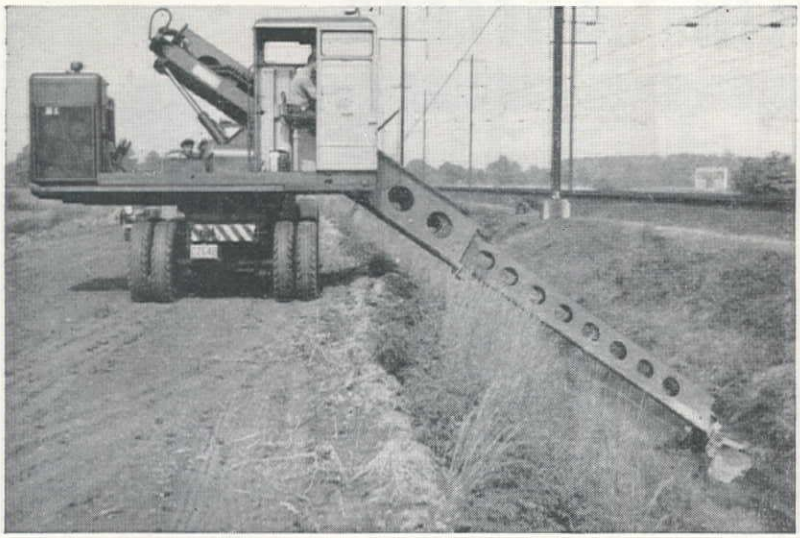
As a supplement to Kaiser Steel's standard structural shapes, the production of Wide Flange Beams marks another step forward in a continuous expansion program, offering more evidence that . . .

It's good business to do business with

Kaiser Steel

built to serve the West

PROMPT, DEPENDABLE DELIVERY AT COMPETITIVE PRICES • plates • continuous weld pipe • electric weld pipe • hot rolled strip • hot rolled sheet • alloy bars carbon bars • structural shapes • cold rolled strip • cold rolled sheet • special bar sections • semi-finished steels • pig iron • coke oven by-products
For details and specifications, write: **KAISER STEEL CORPORATION, LOS ANGELES, OAKLAND, SEATTLE, PORTLAND, HOUSTON, TULSA, NEW YORK**



The Gradall stretches far to do a fast, neat clean-out job on ditches.

"Arm action" tilts the bucket laterally to dress side slopes of drainage ditch.

A Gradall grooms the busiest stretch of track in the world

EACH DAY about 400 passenger trains and 45 freight trains travel the high speed four-track electrified line between New York and Philadelphia. An elaborate system of right-of-way ditches with lead off canals has the effect of turning the entire 91 mile stretch into a fill, for better roadbed stability and improved riding.

Gradalls, with their mobility and versatility, are used for earth moving and many other construction and maintenance jobs.

Wherever Gradalls are used... by contractors, utilities, municipalities... actual cost figures prove that a Gradall pays and pays big!

In this restricted location working under low-hanging power lines the Gradall widens bottom and does a precision job following contours of this ditch.

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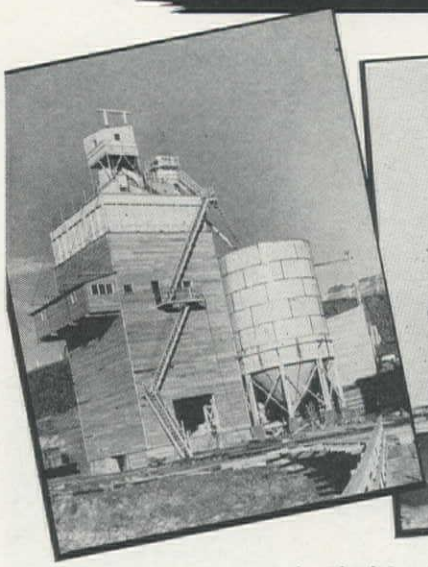
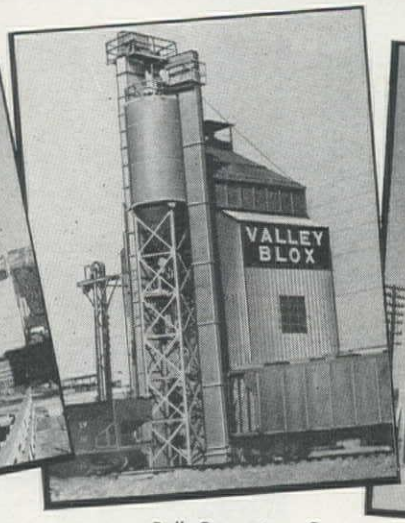
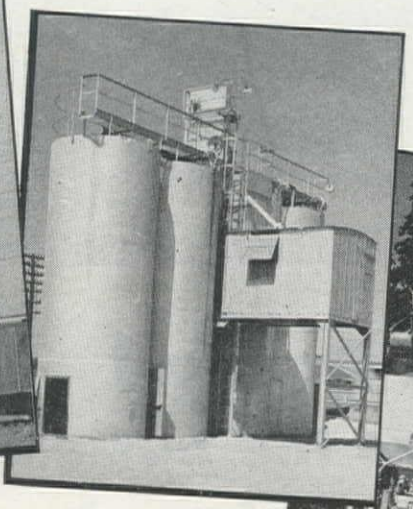
SEE NOBLE FIRST!



McNary Dam Mixing Plant — 900-ton, 6-compartment bin, automatic batcher, with two 7500-bbl. cement silos.



Cinder Block Batching—NOBLE 350-ton, 4-compartment plant with 500-bbl. cement silo, in Virginia.



Bulk Cement — One of 4 NOBLE plants batching and transferring cement for Haliburton Oilwell Cementing Co.

Snoqualmie Pass — Semi-automatic 100-ton plant with 2000-cu. ft. cement silo, batching highway concrete.

No matter what your problem . . .

- batching plants for
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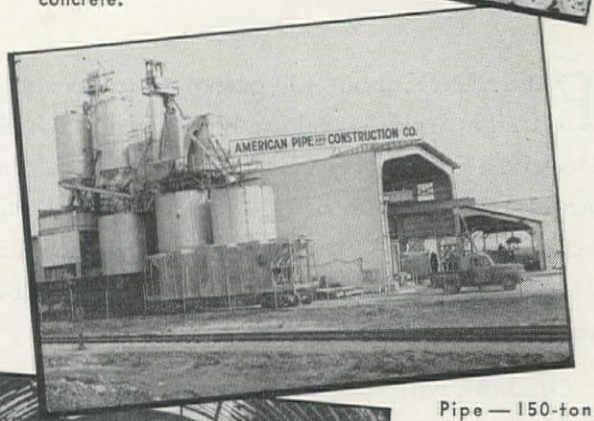
. . . we can help you. Take advantage of our concreting experience NOW on estimating, designing and fabricating. Wire, write or phone for NOBLE help TODAY. No obligation.



Pipe — 150-ton, 4-compartment plant with two 2000-cu. ft. silos, first of 5 for Amer. Pipe & Construction.

Oakland Outfall Sewer—NOBLE jumbo and 105" telescoping tunnel form, horsehoe type, Stolte, Inc.

DESIGNERS AND BUILDERS OF

CEMENT AND AGGREGATE BATCHING PLANTS . . . BULK CEMENT PLANTS . . . AGGREGATE BINS AND CEMENT SILOS . . . STEEL FORMS FOR CONCRETE CONSTRUCTION JOBS . . . TUNNEL AND DRILL JUMBOS CONVEYORS AND ELEVATORS . . . WEIGH METERING DEVICES

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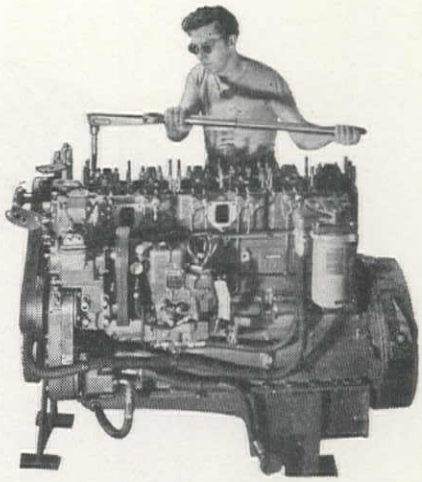
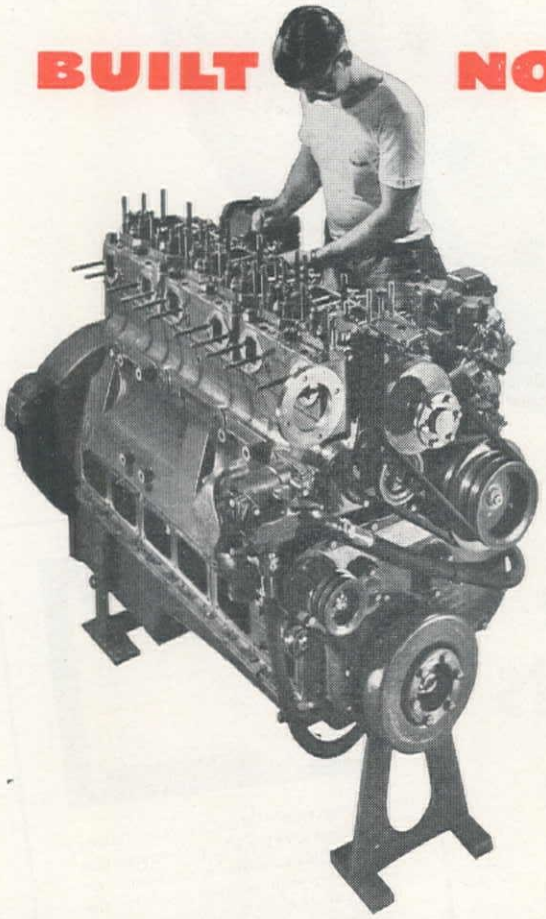


BUILT NOT ONCE BUT TWICE



Each rugged, lightweight *and* high-speed Cummins Diesel is actually built *twice*. It's assembled, run-in tested, disassembled . . . inspected . . . then reassembled and tested again. And each engine is custom-built *to fit the job*. *Extra* care in building, Cummins exclusive fuel system, efficient service and parts organization, enable users to get *less* "down-time", *more* power and profits from Cummins Diesels. *See your Cummins Dealer.*

Diesel power by CUMMINS

CUMMINS Dependable DIESEL

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Lightweight High-speed Diesel Engines (50-550 hp) for:

on-highway trucks • off-highway trucks
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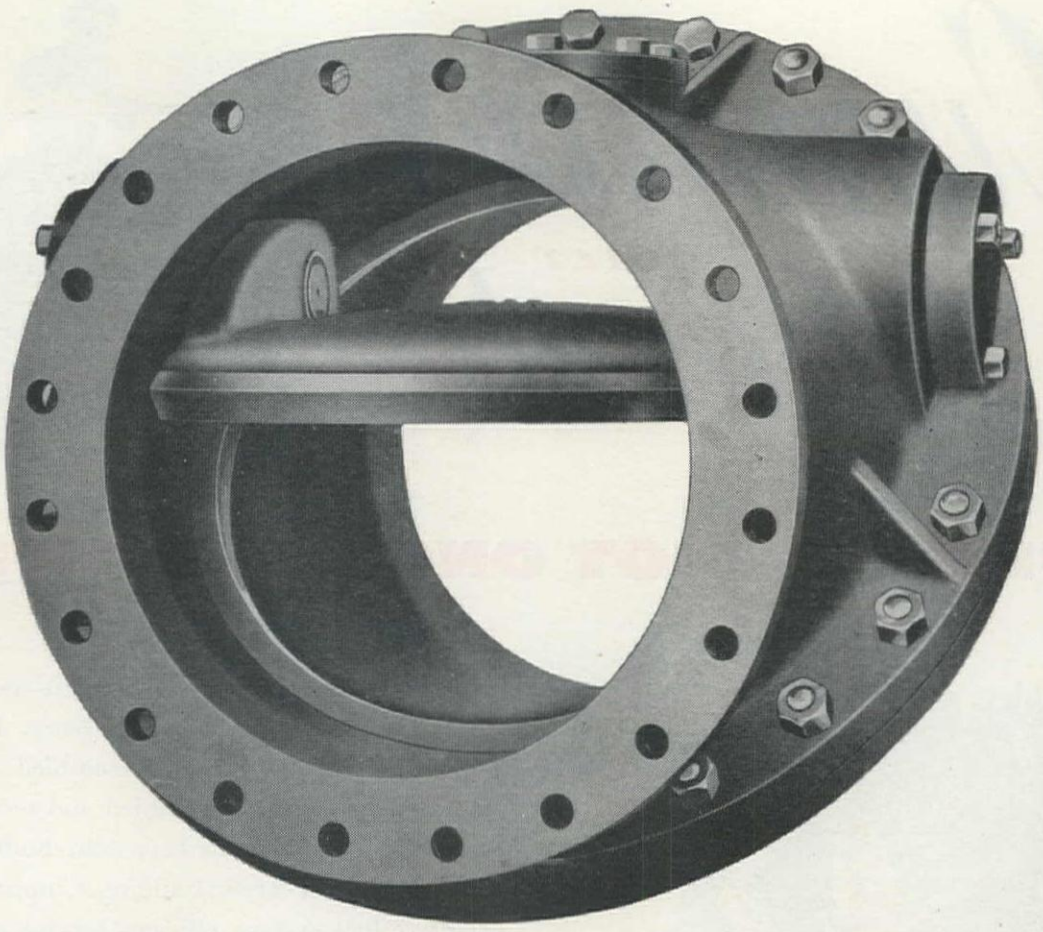
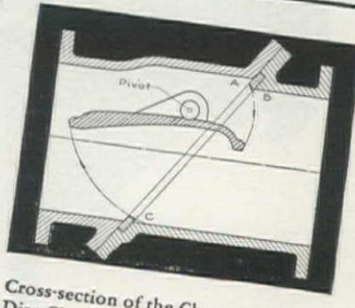


CHAPMAN

TILTING DISC CHECK VALVES

Cut Maintenance Costs

with Cushioned-Closing



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

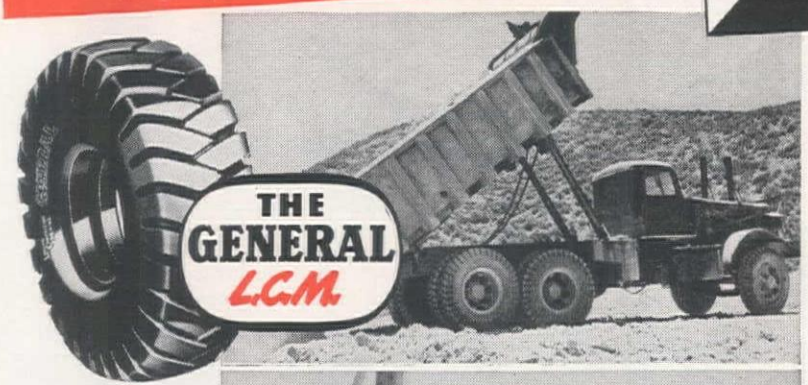
There's less wear on seating surfaces, hinge pins and bearings with the cushioned closing action in a Chapman Tilting Disc Check Valve. No destructive slamming. No fatiguing flutter. No vibration of pipe lines or adjacent structure — nor danger of opening pipe joints or rupturing pipe lines. Just a quick and quiet closure that cuts maintenance costs.

And what's more, the balanced streamlined discs in Chapman Tilting Disc Check Valves ride smoothly on the stream—reduce head losses 65 to 80% over conventional swing type checks. You'll want to know more about this maintenance-saving, more efficient check valve. Write today for engineering data, Bulletin #30.

THE CHAPMAN VALVE MANUFACTURING COMPANY
INDIAN ORCHARD, MASSACHUSETTS

GENERALS

do any job, anywhere — FASTER! EASIER! AT LOWER COST!

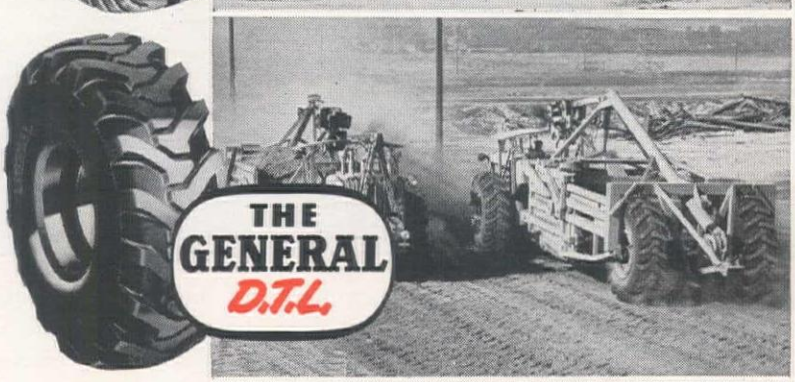


GENERAL L. C. M.

For most work off the road, some on. Broad, deep lugs and thick, rugged shoulders prevent cuts, snags, bruises. More rayon cords, more rubber for extra carcass strength.

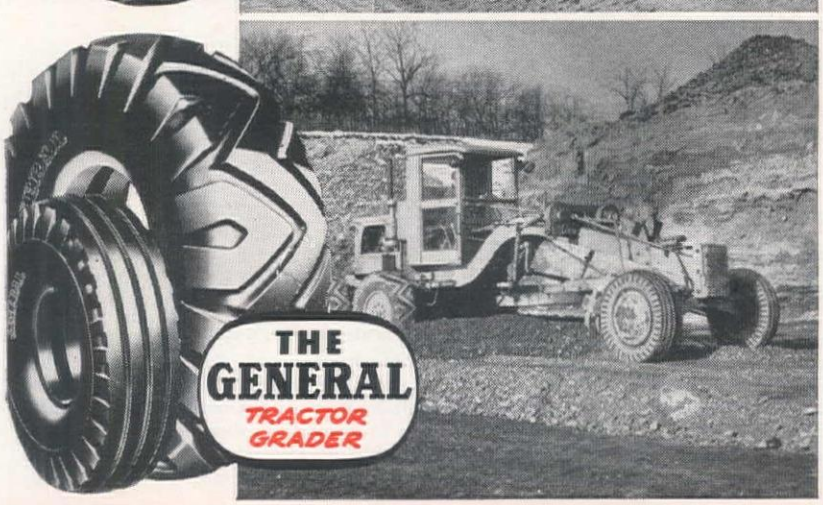
GENERAL H. C. T.

Designed for most work on the road, some off. Long-wearing safety tread and reinforced shoulder cleats give more traction, more original and recap miles.



GENERAL DUAL TRACTION LUG

To move more yards of dirt, the General Dual Traction Lug digs deep for more traction in soft going, forward or backward. Makes heavy jobs easy.



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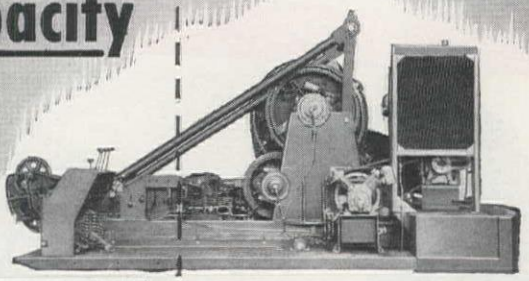
For power wheels—sharp, diagonal, self-cleaning tread bars for maximum traction, forward or backward. For front wheels—easy steering, smooth riding ribs.

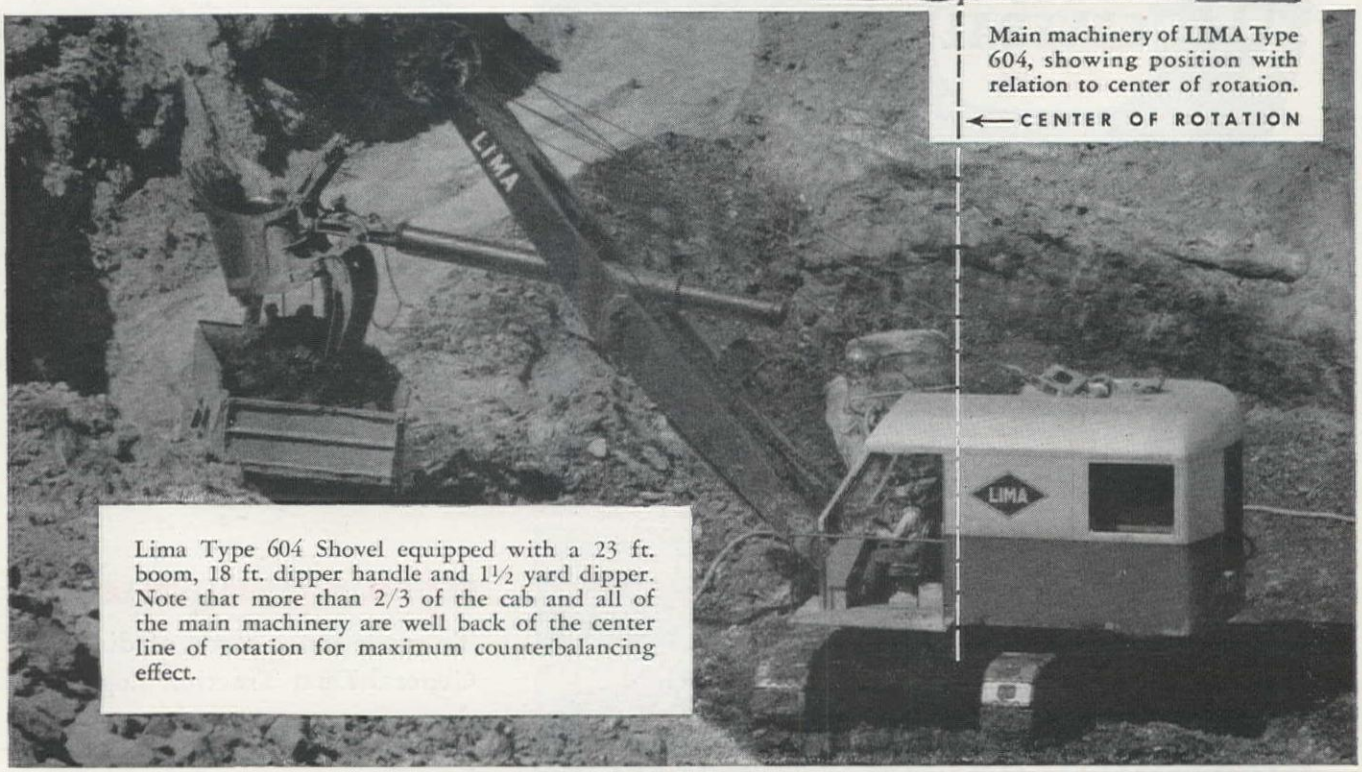
SPECIFY GENERAL TIRES ON YOUR NEW EQUIPMENT

Why the LIMA Type 604 develops the greatest capacity per lb. of weight



Main machinery of LIMA Type 604, showing position with relation to center of rotation.

←CENTER OF ROTATION



Lima Type 604 Shovel equipped with a 23 ft. boom, 18 ft. dipper handle and 1½ yard dipper. Note that more than 2/3 of the cab and all of the main machinery are well back of the center line of rotation for maximum counterbalancing effect.

● The LIMA Type 604 shovel, crane and dragline is engineered to produce greatest capacity with minimum weight. This is achieved by placing as much weight as possible *behind* the center of rotation—eliminating the need for excessive counterweight. Hook rollers on which the machinery base revolves eliminate strain from the center pintle—permitting continuous, safe operation at full capacity.

The simple, compact design of the main machinery, using the fewest number of shafts to accomplish the various operations, further contributes to efficient, trouble-free service.

These are only a few of the features which make the LIMA 604 a favorite with owners and operators. The Lima Line includes shovels ¾ to 6 yards, Cranes 13 to 110 tons and Draglines variable.

BALDWIN-LIMA-HAMILTON CORPORATION
LIMA-HAMILTON DIVISION
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SALES AGENTS—Feenaughty Machinery Co., 112 S. E. Belmont St., Portland 14, Oregon; Feenaughty Machinery Co., 600 Front St., Boise Idaho; Smith Booth Usher Co., 2001 Santa Fe Ave., Los Angeles 54, California; H. H. Neilsen Co., 216 Paxton Ave., Salt Lake City, Utah; Garfield & Company, 1232 Hearst Building, San Francisco 3, California; Cascade Industrial Supply, 515 Market St., Klamath Falls, Oregon; Contractors' Equipment & Supply, P. O. Box 456, Albuquerque, New Mexico; Modern Machinery Co., 4412 Trent Avenue, Spokane 2, Washington; Jameson Engineering Sales, 573 Dexter Horton Building, Seattle, Washington.

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Do you have some forgotten scrap?

Iron and steel scrap is critically short... turn yours in now!

Scrap is vitally needed in production of all steel. *You* can help—by collecting *now* every bit of discarded iron and steel you can find on your property.

Take a sharp look around. No matter how much or how little you have, turn it in today. Look carefully for all dormant scrap—obsolete machinery, tools, jigs, dies, fixtures. Any old or new material that has no immediate or future use.

It's easy—just call your scrap dealer. Check the Yellow Pages of your telephone directory.

Columbia Steel Company

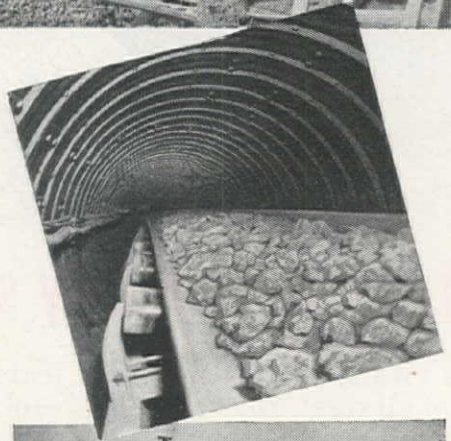
San Francisco • Los Angeles • Portland • Seattle • Salt Lake City

UNITED STATES STEEL

What's U. S. Rubber doing about rock haulage?

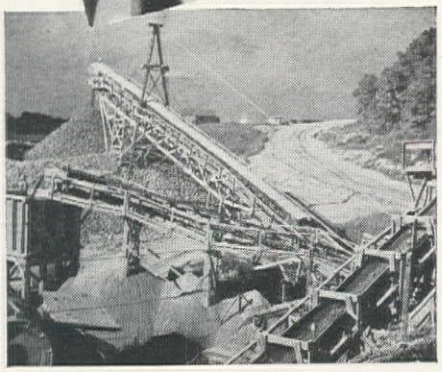
"U.S." is helping to increase the output of rock quarries, by developing conveyor belts which can handle greater loads with lower upkeep costs.

All the belts shown in these pictures of a Kentucky quarry were designed by United States Rubber Company engineers in cooperation with the quarry and equipment engineers. The ultimate result is a lowering in the quarrying cost and a rise in production—a familiar "U.S." story in every branch of industry.



These three U.S. Giant Conveyor Belts have been carrying the plant's output for 5 consecutive years.

This is the main conveyor belt, 1400 feet long. It carries the stone from the stock pile to shipping point. U.S. Matchless is the brand.



These 3 belts complete the 100% U.S. Rubber Conveyor Belt installation in the quarry.

PRODUCTS OF

U.S.RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Save Top Carrier ROLLS

with

STOODY 1027

Don't throw top carrier rolls away! They're too hard to get these days. When the tractor is down for repairs to track, sprockets, idlers or rollers—rebuild top rolls with Stoody 1027.

Stoody 1027 gives longer service, resists the wearing of flat spots when rolls freeze up with mud. Rolls should be rebuilt before too serious wear occurs.

See your Stoody dealer . . . or write for folder on welding procedure for top carrier rolls.

STOODY COMPANY
11956 EAST SLAUSON AVENUE,
WHITTIER, CALIFORNIA

WESTERN CONSTRUCTION

September 1951 Vol. 26, No. 9

The designers' responsibility

THOSE WHO DESIGN reinforced concrete structures have definite responsibilities toward the field forces carrying out these plans. Every advance in concrete technique imposes some further problems in the handling and placing of the materal. All of these technical improvements work in the direction of a better and more permanent final product, but move in the opposite direction from "workability," which is the key to field operations. This comment is not directed toward the big projects and the handling of mass concrete, but to the medium-to-small size jobs, where the field knowledge of concrete is generally limited.

Fundamentally, the problem revolves around the different responsibilities and objectives of the designer and the contractor. The designer is concerned with the long-time result. He works for the owner and his reputation depends on the appearance and behavior of the concrete during years of service. Cracks, spalling, pockets, leeching and other evidence of inadequate product of his design are to be eliminated if at all possible. From the laboratory has come increasing knowledge to help him. In a word, this technical advance has all been in the direction of taking out the water and producing a drier and harsher mix. Also, better mixes and proportioning permit savings to be made in cement, further cutting down workability.

Compare this evolution to the point of view and objective of the men in the field—the contractor and his force. To be realistic is to admit that this group is primarily concerned with placing concrete into the forms in the fastest and cheapest manner possible. Today's drier, harsher mixes represent increasing problems and especially more man-hours, which is the key to costs. On the job the complaints build up as the concrete slump decreases, for obvious reasons. To the man in the field it all seems to be a conspiracy to make his work harder.

What is the solution for harmonizing these opposing points of view, which are gradually diverging? It is useless for the designer to say that the field man should read books on the subject. He won't. Rather, the designer and all others from the office should go out of their way to explain —and explain in simple terms—the new knowledge of concrete that makes necessary the mixes specified today. Point out the engineer's responsibility to the owner in using the latest information, and advance the education of the field man in how this requires relatively dry, harsh mixes, as compared to the mixes he handled a few years ago. If every office man's visit to every job were to advance the technical knowledge of the field force this trend of misunderstanding would be reversed.

Engineers do not kiss "Queens"

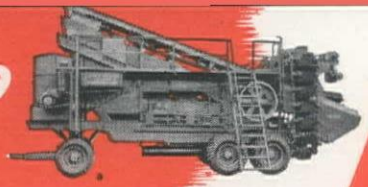
LAST MONTH the politicians, the Chambers of Commerce and the professional speechmakers were having their inning in celebrating the completion of the Central Valley Project. As the first water traversed the canals they have had much opportunity to "point with pride or view with alarm"—depending on their convictions. During the ceremonies the engineers assumed their usual positions of modesty in the background and the contractors and their men had long ago completed their work and moved to other jobs. Credit for the engineering and construction accomplishments were batted around loosely and occasionally fell on the deserving. More often, they were bestowed on persons and groups who were of more future value to the speechmaker.

In common with many other professions and industries that deal with material things, and not with people, engineers and the construction industry have years ago resigned themselves to the position of getting the job done —and well done—and then sitting back in quiet amusement while others do the talking, and occasionally ask the engineer to take a bow. But no engineer or contractor would for a minute give up the inward satisfaction or pride in accomplishment for the opportunity to make the concluding speech—or even kiss the Queen.

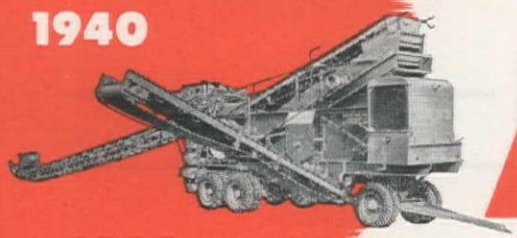
Charles H. Purcell retires

ONE OF THE NATION'S best known highway engineers and the dean of the West's highway administrators left active service with the retirement of Charles H. Purcell from the position of California Director of Public Works. During his long and distinguished career, well known throughout the West, the roads of the state developed from an embryo system to a stage which includes more miles of multi-lane highways and modern freeways than most other states of the country. His regime has been accepted as above the level of politics through reappointment by successive governors. His professional standing has been attested many times by engineering honors. His executive soundness has been proved by public approval of his administration in a state where the population increase has produced more highway problems than any other during the past decade. Today, he can retire with the knowledge that he has built the California highway system with a judicious and careful balance to include the necessary elements of the long-range and the expedient. The organization he founded has been trained to carry forward in its struggle to cope with the most severe highway problems of the West. Charlie Purcell can retire with the knowledge that he represents the highway engineer-administrator at his best, who deserves rest after a lifetime of important accomplishments.

1939



1940

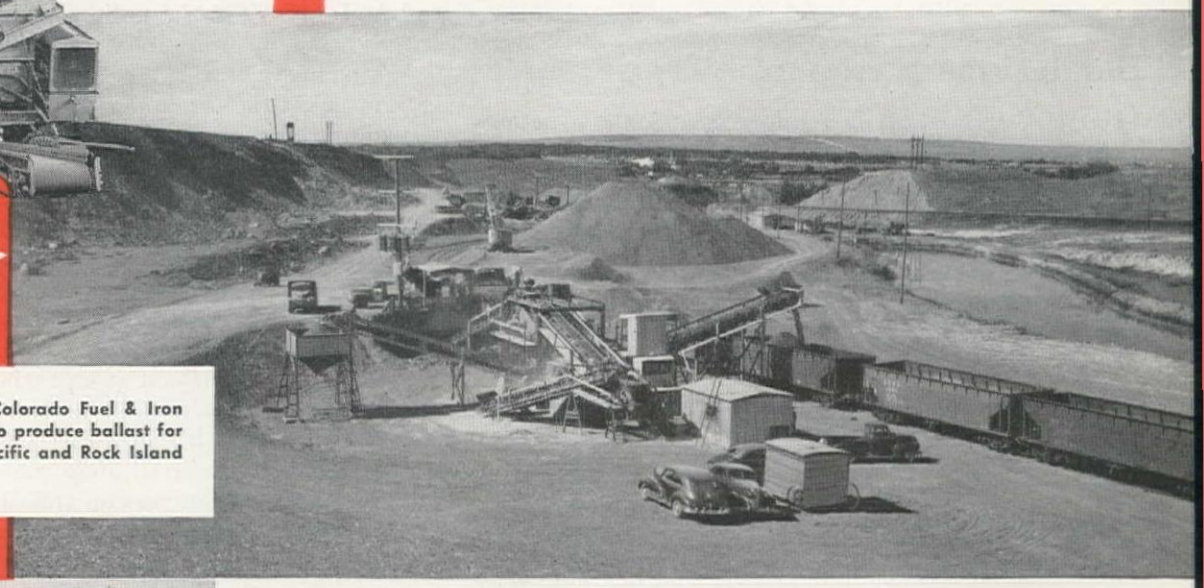


1942

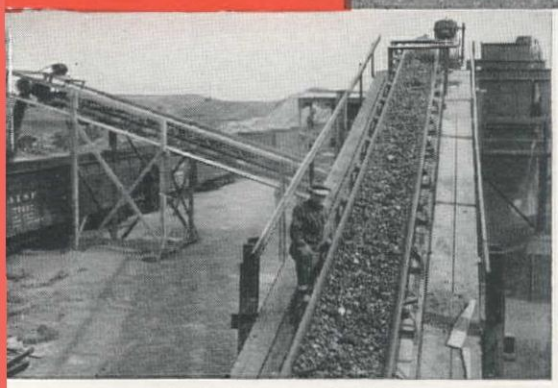
1949→

4 Austin-Western CRUSHING PLANTS

for Arthur & Allen of Pueblo, Colorado



Crushing slag from the Colorado Fuel & Iron Company's Pueblo plant to produce ballast for the Santa Fe, Missouri Pacific and Rock Island Railroads.



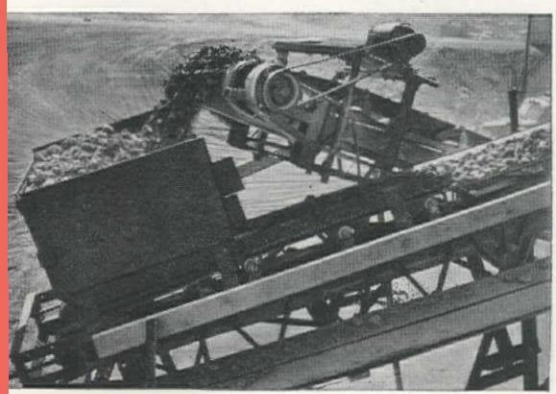
The man at the feed conveyor in the foreground is salvaging iron from the slag.

This, the fourth Austin-Western Crushing and Screening Plant purchased by Arthur & Allen over a ten-year period, has an average run of 350 tons per hour and has reached a peak output of 420 tons per hour. The finished product is, in almost all cases, 1½" minus to ⅜" plus. The percentage of crush is approximately 60.

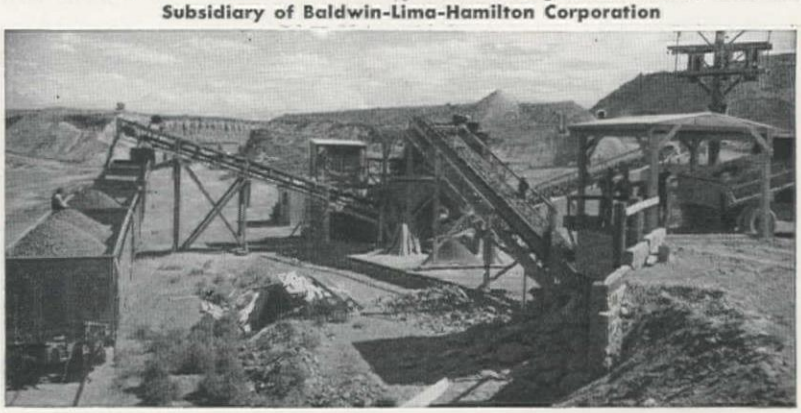
Whatever your production requirements, an Austin-Western Plant, designed and tailor-made to meet them, will do the same sort of outstanding job for you. Let's talk it over.

AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U.S.A.

Subsidiary of Baldwin-Lima-Hamilton Corporation

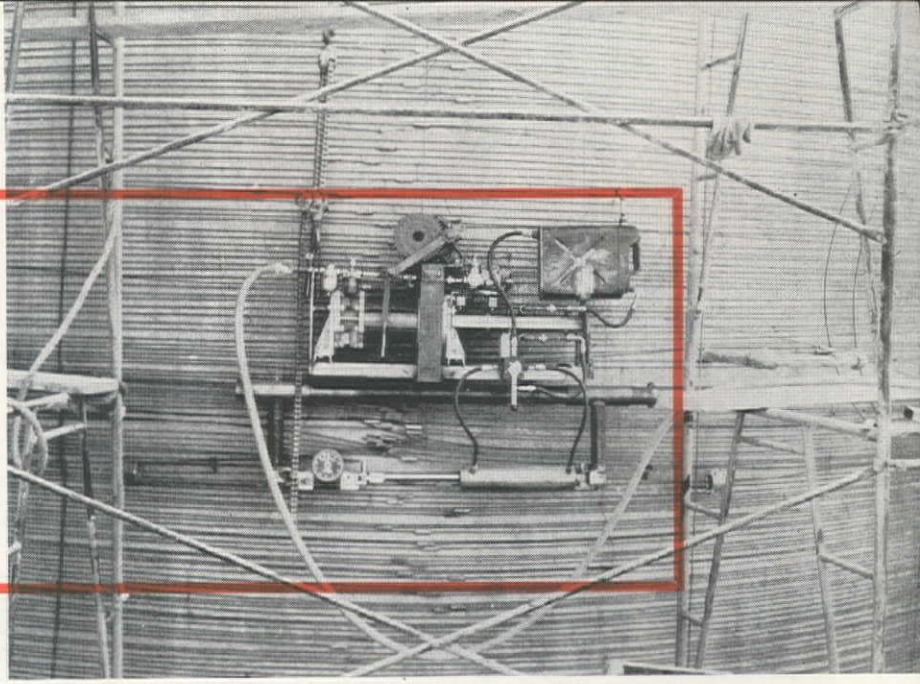


These conveyors are carrying the combined output of jaw and roll crushers.



The loading hopper is arranged to accommodate two trucks at one time.

ARIZONA—SHRIVER MACHINERY COMPANY.....*Phoenix*
CALIFORNIA—EDWARD R. BACON COMPANY.....*San Francisco 10*
CALIFORNIA—SMITH BOOTH USHER COMPANY.....*Los Angeles 54*
COLORADO—LIBERTY TRUCKS & PARTS COMPANY.....*Denver 1*
IDAHO—COLUMBIA EQUIPMENT COMPANY.....*Boise*
MONTANA—WESTERN CONSTRUCTION EQUIPMENT CO.....*Billings*
MONTANA—WESTERN CONSTRUCTION EQUIPMENT CO.....*Missoula*
NEVADA—C. D. ROEDER EQUIPMENT COMPANY.....*Reno*
NEW MEXICO—N. C. RIBBLE COMPANY.....*Albuquerque*
OREGON—COLUMBIA EQUIPMENT COMPANY.....*Portland 14*
UTAH—WESTERN MACHINERY COMPANY.....*Salt Lake City 13*
WASHINGTON—COLUMBIA EQUIPMENT COMPANY.....*Seattle*
WYOMING—WILSON EQUIPMENT & SUPPLY COMPANY.....*Cheyenne*



Four special machines like this, hydraulic-jack operated by compressed air, worked in pairs to prestress 100 wires a day during construction of eight reinforced concrete silos for cement storage. Positive control included a dynamometer to insure anchoring stress of 130,000 psi.

A new method for prestressing circular concrete structures

EIGHT CIRCULAR SILOS for cement storage, nearing completion at the Oro Grande, Calif., plant of the Riverside Cement Company, will increase storage capacity for finished cement by approximately 120,000 barrels. The structures are of prestressed concrete and their construction introduces a new development in prestressing technique featuring the separate stressing of individual wires.

Proponents of the new method feel that it has particular advantages such as the elimination of uncertainties incident to the continuous winding of wire under stress. The latter produces gradual wear on the die and a consequent change of stress in the pulled wire. The new method also provides a good control of stress and ready measurement of stress magnitude at any point on the circumference or in a wire at any height on the structure.

The silos

The eight silos are built in adjoining blocks of four, each block having a foundation slab about 88 ft. square. Pump pits are located on the central axis of the two blocks, each of three pits drawing cement radially from four silos. A fourth pit draws from two silos and provides for further expansion.

Each silo has a constant outside diameter of 37 ft., and a height of 72½ ft. from the central low point of the sloped floor to the top of the roof.

Heavy concentration of load required special design consideration. Distribution of load was provided by a reinforced concrete slab for each block of four structures. These slabs have a marginal thickness of 3 ft., 7 in., a thickness at silo centers of 4 ft., and a maximum thickness at the pump pits of 6 ft., 4 in. Design for lateral forces was based on factors of 20% of dead load and 15% of live load. The silos act as stiff vertical columns or beams, and are tied at the roof slabs. They are thus provided with horizontal diaphragms at top and bottom.

Walls of the silo structures have a slight taper, starting at 9 in. thickness at a point 4 ft. above the base. The thickness reduces to 7 in. at a point 4 ft. below the roof slab surface, then thickens to 9 in. in the 2 ft. to the bottom of the roof beams. These thicknesses include the 1-in. finish coat applied over the wall surface after stressing of the wires. The 4-ft. section at the base of the wall is thickened by fillet at its junction with the base slab.

Cast-in-place and gunite

Cast-in-place concrete was used for the foundation slab (2,250 cu. yd.), the pump pits (230 cu. yd.), and the 7-in. roof slab (290 cu. yd.). This latter item includes the 2-ft. top section of the wall cast with the roof and enclosing the roof beams. The remainder of the work —general wall construction—was of gunite. The volume of gunite required for the eight silos was 1,600 cu. yd. It was proportioned 1 part cement to 3½ parts sand. Two crews were employed during a part of the construction, but only one nozzle was in use for the major portion of the work.

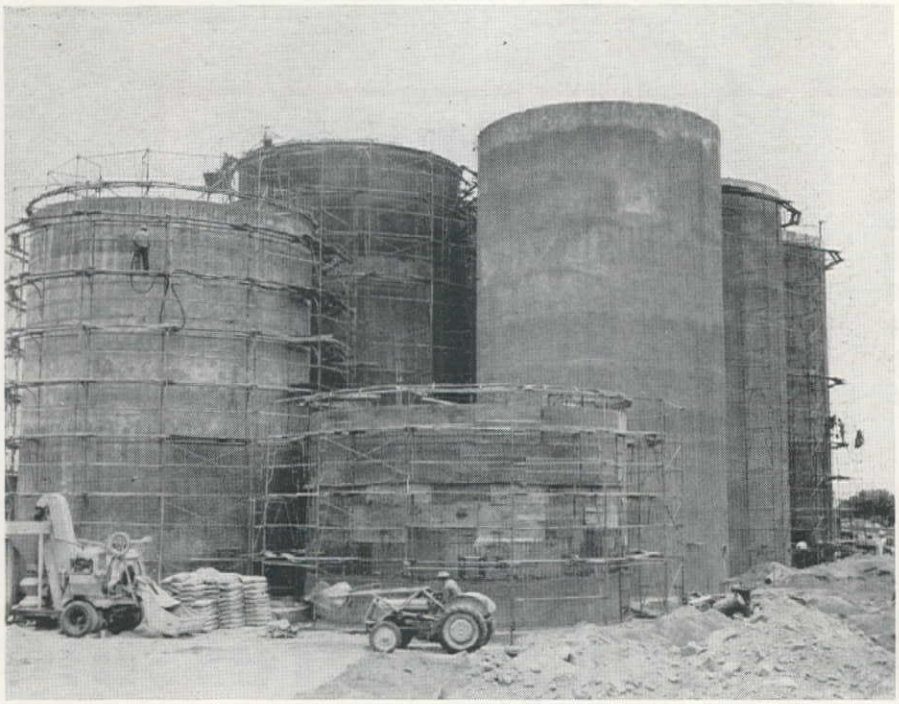
Though the lower portion of the structure was more heavily reinforced, the general wall reinforcement consisted of vertical ⅝-in. deformed bars on 15-in. centers and horizontal ½-in. bars on 24-in. centers. This light reinforcement made some provision for resistance to shrinkage and furnished sufficient stiffness of vertical steel to support the temporary forms as later described. The prestressed design, of course, obviated the need for structural reinforcement in the quantity range common to a circular structure without prestressing.

Job reports and inspection of the work indicate that the structures were built to a high degree of accuracy. Bulges of any consequence are absent, and actual measurements of a circumference calculated at 116 ft., 3 in., did not vary from that figure by more than 1½ in. One of the factors which helped promote such accuracy was the well-planned system of forming, bracing and referencing employed. Reference points were carefully set at the bottom of the wall and lines for all higher elevations always established from these original points. As the inside scaffold was erected, it was thoroughly braced and guyed. At the top of each form lift, outriggers were set from the inside scaffold and two templets attached, one to position reinforcement and one for the location of wall surface ground wires. Points at each lift were plumbed from bottom reference points at frequent intervals around the structure. The height of the bottom lift was 5 ft.; then successive lifts of 18, 28 and 17 ft. completed the 68-ft. height to the beams supporting the roof.

Plywood form panels were wired to the vertical reinforcement (outside the steel); then the inner portion of the wall was shot against this form from the inside scaffold, building up the half-section by successive passes in three coats. When the concrete was hard enough to allow removal of the temporary form, the outer half of the wall section was shot in the opposite direction from the outside scaffold. On each face, ground wires guided the finishing of the surface.

Prestressing practice

In the development of prestressed concrete, it is natural that its advantages for circular structures such as tanks were early apparent. Such structures under internal load are subject to high tensile stresses, and in conventional re-



STAGES OF CONSTRUCTION are shown here, especially height of successive lifts of formwork and gunite. Forms at right foreground are wired to vertical steel—gunite to be shot from inside structure. Outer half-section of wall is gunited after forms are removed.

inforced concrete design the trend of practice inclined to the use of very low working stresses in reinforcing steel with a consequent high percentage of reinforcement.

This condition, coupling difficulty of placement with expense, made the Hewett system attractive upon its introduction and brought the idea of prestressing to attention. Hewett's idea was basically the same as exists in more modern practice—to build a relatively thin concrete shell with minimum reinforcement and to put the concrete under initial compression. The amount of compression desired was that which would result in a return to approximately neutral stress condition when the completed structure was finally loaded. The Hewett method of approach was to apply mild steel rods as hoops, stressing them by the use of turnbuckles on the threaded rod ends.

The next step in circular concrete structure prestressing followed realization that the amount of prestress practicable with mild steel rods might be insufficient to compensate for the loss of prestress that results from volume change and creep or plastic flow under the various combinations of conditions in the life of a structure.

High-strength wire

It became apparent as the study of prestressing progressed that wire of high tensile strength would meet the requirements for such work, because liberal allowance could be made in the design for anticipated loss of stress. Many modern circular structures have been built with compressive stress transmitted to the concrete by high-strength wire. The continuous winding method has been quite generally used for such tensioning. However, a yet newer method was devised for prestressing steel in the Oro Grande plant silos.

Wire for prestressing the silos was of high-carbon steel having an ultimate tensile strength of about 222,000 psi. and a "proof stress" (at plastic strain of .002) of about 180,000 psi. The wire was of ¼-in. diameter and weighed 0.167 lb. per lin. ft. Each silo had 485 wires about its circumference, each in two parts joined in prestressing machines working simultaneously at opposite ends of a diameter. The wire spacing varied from 0.95 in. at the bottom to 4 in. at the top of the wall. Thus the wire requirement for the eight silos amounted to more than 80 mi., weighing about 38 tons.

Preparation and procedure

Against the concrete wall a series of vertical metal "ribbons" was attached, extending the full height of a silo. The ribbons were punched at calculated spacing and wires cut to predetermined length were strung around the wall and supported in the punched slots. The wire lengths were calculated to allow for elongation under design stress and to allow for heading and anchoring. They were button-headed in advance by using a press as in the case of the Arroyo Seco bridge job. (*Western Construction*—December 1950, pp. 66-69; April 1951, pp. 76-77.) Wires were stressed alternately around the silos, the intermediate wires being stressed in a later operation. Four stressing machines were built and used on the job, thus providing for two sets operating at once. Alternate wires were anchored at points on the circumference separated by 45 deg. of arc. For anchorage on the horizontal plane of a manhole, the machines operated at 90 deg. from the manhole location. Using this type of prestressing, there is no bunching of wires and no change from the uniform pattern in the area of the manhole.

Simplified to an extreme, the method of operation for prestressing and anchoring involved stressing and joining two half-perimeter lengths of wire to form a complete circle. To accomplish this, two machines were suspended at opposite sides of a silo, each gripping two wire-ends at points about 9 ft. apart. Tension was applied simultaneously

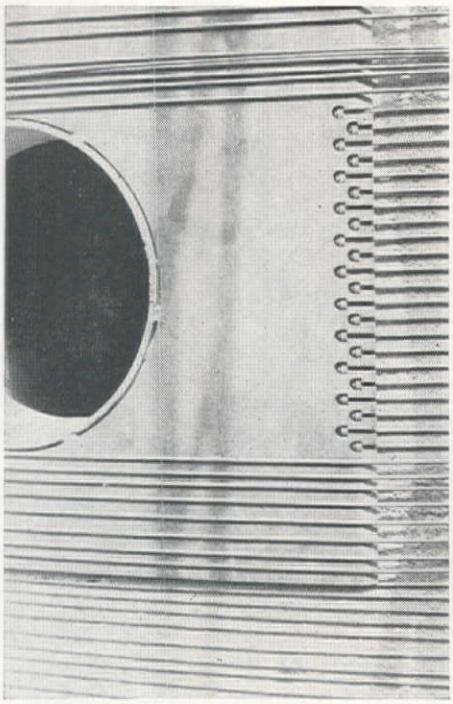
PRESTRESSING progresses with all four machines working on one silo. Second man of team (at left) handles telephone to coordinate jacking with crew on opposite side of silo.

under telephone control. Adjustment of pull and "give and take" for anchor fit was made and nuts tightened on the threaded anchor devices, while stress was automatically held at desired amount by gauge and regulator control. Wires were anchored at a tensile stress of about 130,000 psi.

Special machines

The stressing machines (see illustration), designed for the job requirements and assembled from various materials and parts, are powered by compressed air from the 100-psi. cement plant supply. Air first passes through an air cleaner to remove dust, then through a "vitalizer" to oil the air. Next in line is an on-and-off valve, then a pressure regulator with gauge. A poppet-operated valve controls flow to pressure lines entering the two sides of an air cylinder. This delivers pressure to a smaller hydraulic cylinder, proportioned to boost the pressure by a 16:1 ratio. The hydraulic cylinder, equipped with check valves, is supplied with oil from an oil storage chamber, and pressure lines lead to a 4-way valve, from which two pressure lines actuate a double-acting hydraulic jack. In line with the jack a rigid bar is so connected that it can be readily removed and a dynamometer inserted for stress measurement. The jack assembly frame rides on wheels holding it away from the wall. Arms extend outward on either side, terminating in gripping blocks. Wire enters the gripping blocks and is held securely for stressing by means of toothed wedges. The procedure of applying stress, adjusting, anchorage and release, has proved workable and readily controlled.

Presence of compressed air on the job dictated assembly of the prestressing machines described. A simpler, more universally applicable machine built by the subcontractor utilizes manual control of the hydraulic jacks.



DETAIL shows method of anchoring at manhole in order to maintain uniform wire pattern. These wires are button-headed in advance.

The four machines working in pairs have handled the stressing and anchoring of 100 circumferential wires in a day. During the month previous to this writing, when the prestressing was about 75% completed, the average rate was approximately 70 wires per working day.

After completion of the prestressing, the silos were finished by application over the wall surface of a coat of gunite 1 in. thick, to insure full protection for the tensioned wires. Many authorities on prestressing consider vertical prestressing necessary for best results on circular structures, but this is believed to apply more particularly to tanks subject to hydrostatic pressure. Storage of material such as cement will result in distribution of a greater proportion of pressure downward to the base. In this case it was not considered necessary to apply vertical prestress to the walls.

Compressed air is used throughout in the handling of cement in and out of these storage silos. Silos are loaded at the top by means of pumps; similar pumps are used for unloading at the bottom. Movement of cement from the bottom of the structure is facilitated by an installation known as "air-slide," consisting of air jets placed on radial lines from perimeter to center of the sloping floor. Flow of cement to the center is aided by the air pressure provided.

Personnel

Leeds, Hill and Jewett, consulting engineers of Los Angeles, designed the project, with N. D. Whitman, Jr., as structural engineer and T. T. Brooks as resident engineer. J. E. Haddock, Ltd., was general contractor, and D. D. Martin the superintendent. Subcontractor for prestressing was Prestressed Concrete Corp. of Kansas City, Mo., represented by T. J. Gut. Coordination of the work for Riverside Cement Co. was under the charge of Howard R. Starke, Assistant Works Manager and Director of Engineering.

Granby pumps deliver first water on Colorado-Big Thompson Project

A BIG STEP toward completion of the Colorado-Big Thompson Project in northern Colorado was celebrated in late July with the dedication of the Granby pumping plant and the first delivery of water from the Horsetooth Reservoir through the Poudre Canal.

Dedication of the pumping plant, high on the west slope of the Rocky Mountains, took place on Friday, July 20. First delivery of water from the Horsetooth Reservoir in the foothills on the east slope of the Rockies 60 mi. north of Denver, was made on Saturday, July 21, with attending ceremony.

Ultimate objective of the Colorado-Big Thompson Project is to provide a supplemental supply of water for approximately 700,000 acres of irrigated land. The first major service to 206,000 acres is scheduled next year although operation of the Granby plant will permit irrigation of considerable acreage yet this year.

This is accomplished by a diversion of a share of Colorado's portion of the waters of the upper Colorado River Basin from the west to the east slope of the Rockies through the Alva B. Adams Tunnel. From the outlet of this 9-ft., 9-in. diameter, 13.1-mi. long tunnel at elev. 8,045 ft., the water plunges through a series of power plants on a half mile descent to storage reservoirs from which it will be delivered to the water users through a distribution system of which the Poudre Canal is a key feature.

First power from the approximately 175,900 kw. of installed capacity which will ultimately be available, was delivered from Green Mountain power plant in 1943. The first water became available through the Alva B. Adams Tunnel in 1947, and there has been a small gravity flow since that time which has been used in existing irrigation systems.

However, regular operation of the Granby pumping plant will permit the lifting of a greatly increased supply of water to the level of the diversion tunnel and an increased flow to the east slope. Power for the pumping plant is supplied from the hydroelectric plants on the east and west slopes which are interconnected by a high tension transmission submarine cable through Alva B. Adams.

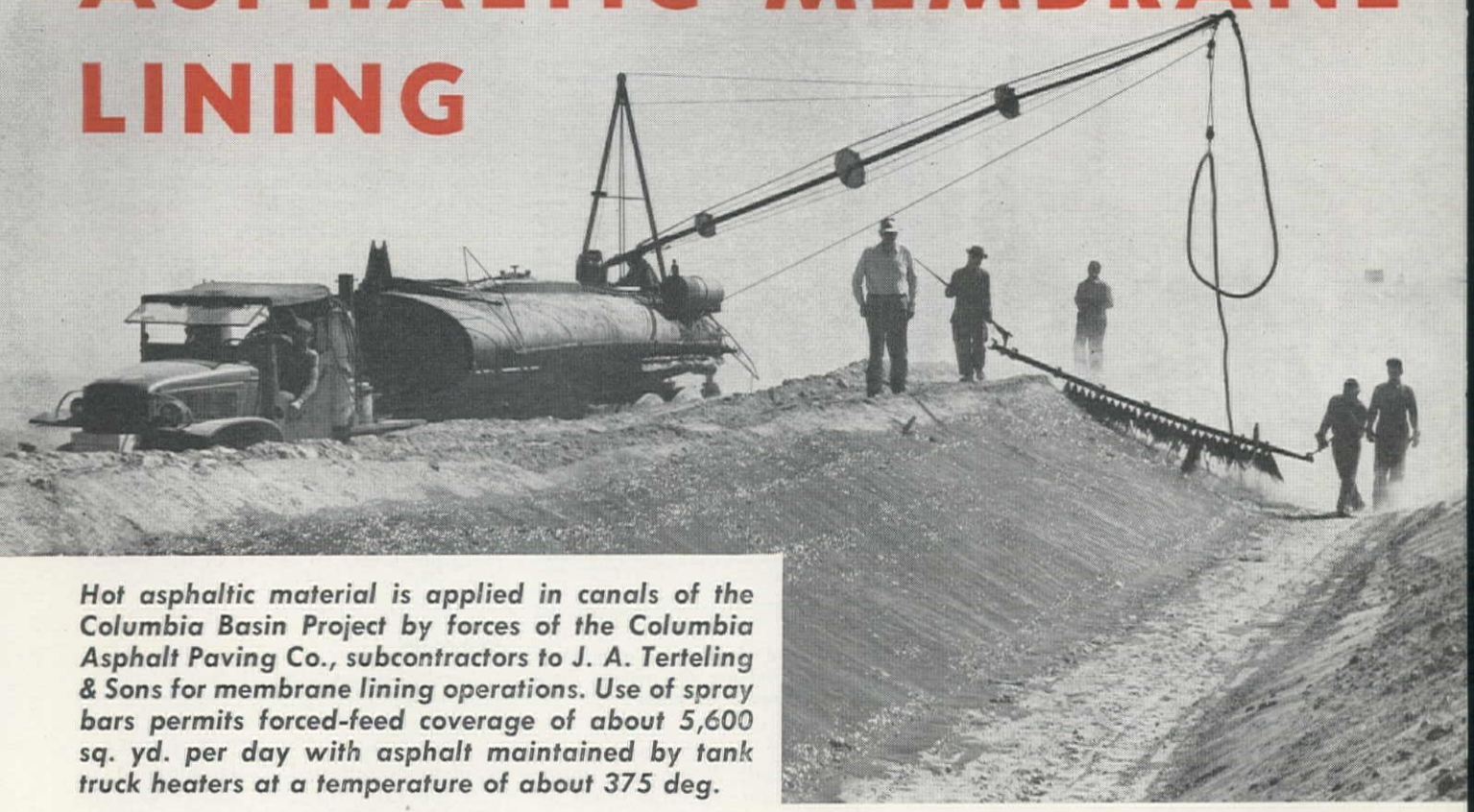
The water diverted to the east slope is replaced for downstream water users on the Colorado River by water stored in Green Mountain Reservoir, this exchange in effect permitting the conservation of spring flood waters which would otherwise go to waste, for use on the eastern slope.

The Granby pumping plant houses three turbine type pumps, each powered by a 5,000-hp. motor. The maximum lift is 186 ft. The combined capacity of the pumps is nearly one-half million gallons of water per minute. From the pump outlet, the water flows by gravity through a canal into another artificial lake, Shadow Mountain, and then into the largest natural body of water in Colorado, Grand Lake, which empties directly into the Alva B. Adams Tunnel.

When fully operative, the project will divert an average of about 257,000 acre-feet of Colorado River water annually. This will be stored in the system of terminal reservoirs, including Horsetooth, and fed into main tributaries of the South Platte River, with its ultimate destination the productive farm land of eastern Colorado.

The pumping plant was built under a $4,140,000 contract by Granby Constructors, a joint-venture firm of seven Western contractors (*Western Construction*—November 1947, pp. 75-78).

ASPHALTIC MEMBRANE LINING

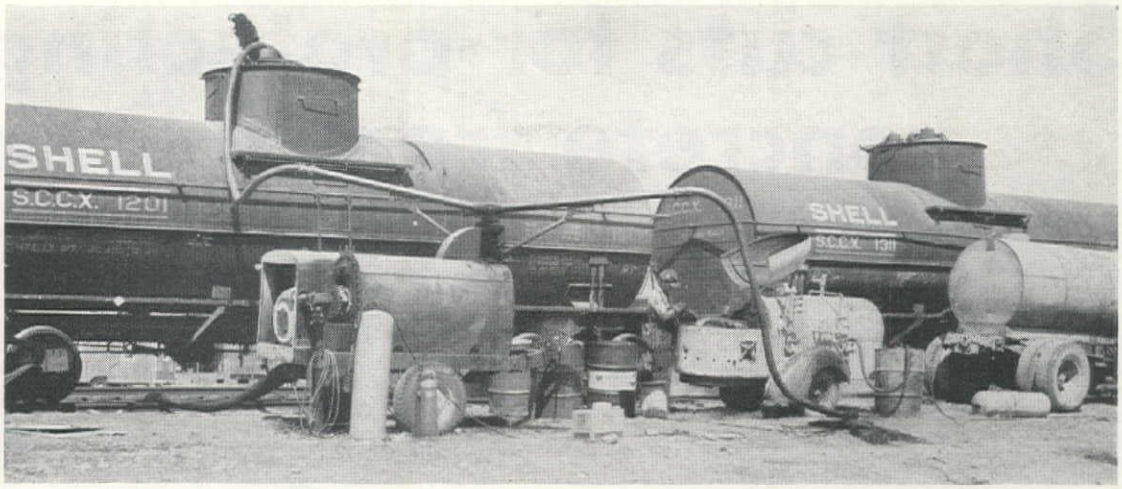


Hot asphaltic material is applied in canals of the Columbia Basin Project by forces of the Columbia Asphalt Paving Co., subcontractors to J. A. Terteling & Sons for membrane lining operations. Use of spray bars permits forced-feed coverage of about 5,600 sq. yd. per day with asphalt maintained by tank truck heaters at a temperature of about 375 deg.

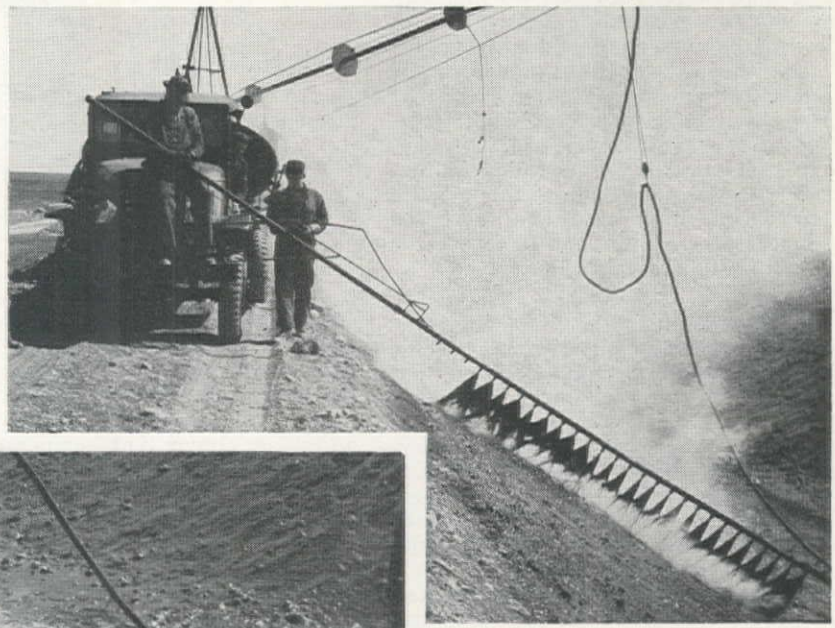
Following ditch excavation and dragging, this roller compacts side slopes. Two passes does job as tractor-roller assembly makes round trips of both right and left banks at a given height. Cable control permits adjustment of roller position in canal section. Roller is 26 x 48 in.; filled with saturated sand, it compacts at 50 lb. per lin. in.

Prepared for membrane lining operations, canal section gets final hand trimming to smooth ridges left by passage of roller. Section will be wet down just before coating with asphaltic material. Canals treated range in bottom widths from 2 to 8 ft., and in depth to 6 ft. Side slopes are 1¾:1. In order to afford gravity irrigation water to the benefited areas of the project, canals must be built partly in disturbed fill material; hence the need for impervious membrane in their construction.

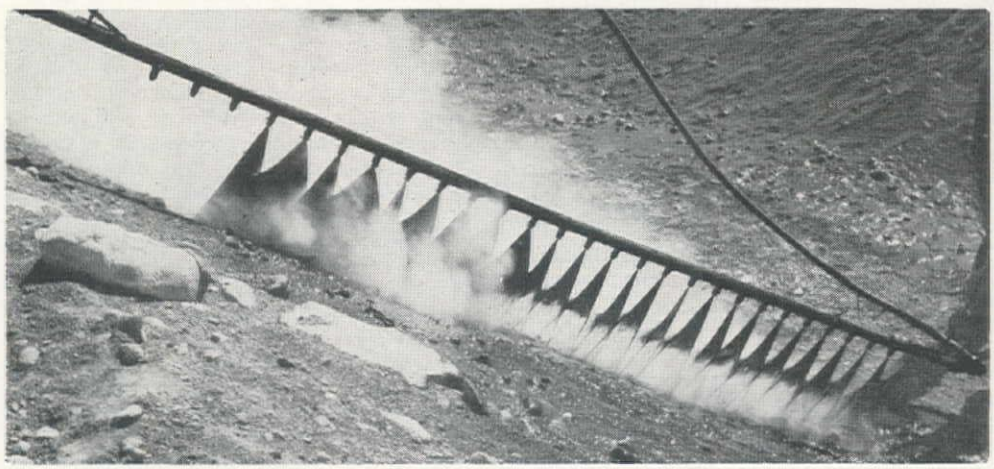
Asphaltic material is kept at 400-deg. temperature by tank car heaters at Ephrata, Wash., siding. It will be transported to job in heated 2,000- and 5,000-gal. tank semi-trailers.



Boom rigged from 2,000-gal. distributor truck carries weight of hose, permits smooth operation despite spoil bank. 16-ft. spray bar used here has 28 nozzles, can be plugged for varying slope widths. 3-nozzle bar is used for narrower canals, V-shaped bar for very small ditches.



Pressure-fed asphalt coats surface in one pass. About 0.35 gal. covers 1 sq. yd. to depth of 1/16 in. Average thickness of 5/16 in. requires 1.8 gal. per sq. yd. Day's work is 10,000 gal., representing 5,600 sq. yd. of membrane.



Asphaltic material cools to form membrane that seals section and smooths surface irregularities. Crust is relatively fragile, must be backfilled carefully to avoid fractures and leaks.

Dragline replaces spoil to protect membrane. Material is shaped but not compacted in restoring dimensions of canal section. Thickness of backfill depends on design depth of water: 12 in. for depths to 2 ft., 16 in. for depths to 4 ft., 20 in. for greater depths. Estimated unit cost of operation—dragging, rolling, applying membrane, and backfilling—is $0.75 per sq. yd. Techniques shown here have been used with equal success in the rehabilitation of existing unlined canals to combat seepage losses.

Short cuts for protecting fresh concrete from freezing

Insulation will protect winter-placed concrete during 6-day cure — If properly conserved, the heat of hydration has been found sufficient to reduce the need for expensive enclosures and heating — Laboratory and field work described

By

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Engineer
Branch of Design and Construction
Bureau of Reclamation
Denver, Colorado

CONCRETE MIX design requirements have not always meant ease of field application. Specifications for strength and durability of concrete have often necessitated field methods that were difficult and expensive, among them the protection of fresh concrete from freezing. Recent observations of the curing of winter-placed concrete, in both the laboratory and the field, indicate short cuts that may do much to obviate the presently extensive use of heating equipment in cold weather.

It has long been the practice of the Bureau of Reclamation to require that new concrete be protected from freezing for at least two weeks. Many agencies and standard specifications still use and advocate protection to this general extent, with some variation of the initial temperature required and of the period that it shall be maintained.

What engineers knew

Nevertheless, many engineers, some of them in the Bureau, doubted that such prolonged protection was prerequisite to satisfactory ultimate strength and durability. They knew of excellent service performance by concrete that had had only limited protection from freezing when new. Others had removed such concrete at various ages and found nothing inferior about it.

In one case where protection had been considerably short of that specified, drill cores of the concrete were removed for test; they were found to be fully up to standard in both strength and durability. This concrete did, however, have the benefit of such earlier maturity as had been imparted to it by addition of calcium chloride equal to 1% of the weight of cement. For several years this has been a Bureau specification for concrete placed in weather cold enough to require protection from freezing. The calcium chloride is added not so the period of protection may be reduced, but to secure added maturity during the specified period. It is not used in warm weather.

The implications of the good results from tests of the above drill cores could not be ignored, particularly since the Bureau is making every effort and taking every opportunity to simplify specifications and procedures for concrete work and yet secure sound, presentable and serviceable structures. Concurrently, a program of testing had been initiated to determine the minimum of protection from freezing required by air-entraining concrete with 1% calcium chloride, and yet secure good ultimate quality.* The curve shown (compressive strength as a function of age) is a partial summary of the results of these tests. They made it clear that, if this concrete were mixed and placed at a temperature no lower than 50 deg. F., and kept above that temperature for three days, its ultimate strength and durability would not be impaired despite early subsequent freezing.

Bureau specifications were modified accordingly, except that, as a further precaution, three additional days of protection from freezing prior to March 15 are required for concrete placed in the fall and winter and which is subject to early and repeated severe freezing. The only other precaution required is that protection be removed or discontinued in such a manner that the concrete temperature drop will be gradual and not exceed 40 deg. F. in 24 hr.

It is realized that this three- or six-day protection would be infeasible where water curing is required for longer periods. Actually the loss of water is low in winter from concrete at temperatures below 50 deg. F., except for considerable drying in heated protective enclosures; then wetting is required unless exhaust steam is used or until a sealing compound is applied. Most Bureau specifications permit use of a white-pigmented sealing compound for curing in lieu of water. As it is usually impracticable or impossible to apply it during the period of protection from freezing, it is commonly applied at the first opportunity afterward, when day temperatures are above freezing and the concrete can be wet down thoroughly, being damp but not wet as the compound is applied. Mass concrete, which is usually water-cured for two or three weeks, depending on the type of cement used, is not cured in winter following its protection from early freezing; it is considered that such concrete, having lost little moisture anyway, will resume its curing under melting snows, spring rains, and summer curing water falling from higher lifts.

Opportunity for insulation

The newly specified period of from three to six days during which concrete temperatures must be kept above freezing corresponds to the time when heat created by the hardening cement (heat of hydration) is maximum. If insulation could be devised to conserve this heat, it might prove a less expensive way to hold the desired minimum temperatures for the first few days than the usual erection and heating of enclosures. Moreover, there would be eliminated the considerable hazard of fire.

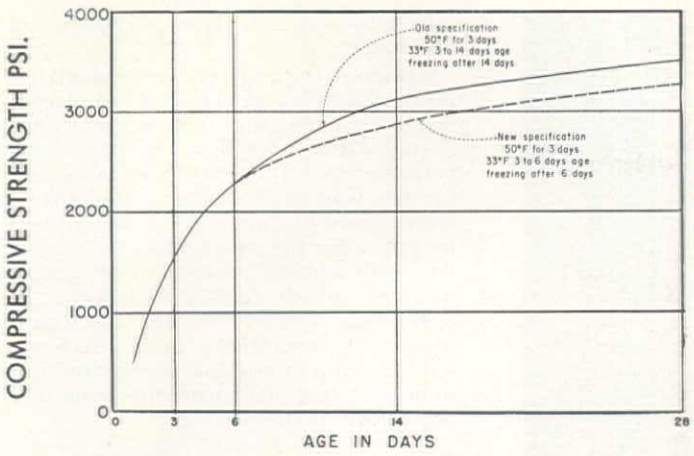
Of course, the use of straw, etc., in winter concreting operations is common. Insulation, then, is not new, but more information was needed as to how reliably it would maintain required temperatures and whether the necessary amount of insulation would be practical.

Help in winter concreting

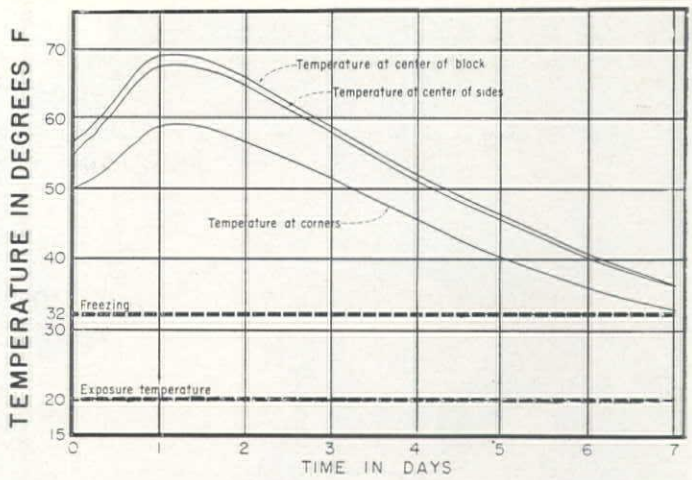
HEAT FOR CURING is the key to successful and practical winter concreting. Protection of green concrete against freezing is an engineering requirement and a construction problem. Curing temperatures below a generally accepted limit of 50 deg. F. cause serious delay in building up strength. The length of required curing time is frequently specified to be at least 14 days. Any development tending to reduce this time is of immediate importance to (1) contractors getting ready for the coming winter season and (2) engineers directing or planning jobs that will run through cold weather.

Because it outlines practical research which reduces this problem and reviews field ideas which have already proved successful, this article by Lewis Tuthill has important significance. It will have an effect on concrete operations carried out in the West this winter —and in winters to come. His information should be carefully studied by all who are concerned with concreting operations during cold weather.—Editor.

*J. J. Shideler, H. W. Brewer, and W. H. Chamberlain, "Entrained Air Simplifies Winter Curing," *Journal of the American Concrete Institute*, Proc. Vol. 47, Feb. 1951, pp. 449-59.



PERFORMANCE OF CONCRETE UNDER NEW SPECS compares well with earlier requirements. Shortened curing period makes temperature maintenance feasible by use of insulation to hold heat of hydration.



TEMPERATURE HISTORY OF 2-FT. CONCRETE CUBE insulated with 3½ in. of dry shavings shows good results. Concrete was 6-sack mix, placed at 55 deg. F.; air temperature maintained at 20 deg. F.

Computations based on assumed and existing data indicated the insulation that would be required under various weather conditions for different types of work. Laboratory and field tests were made to confirm and adjust these computations. This phase of the work will be discussed by R. E. Glover in a forthcoming issue of the *Journal of the American Concrete Institute.*

Protect edges and corners

The accompanying graph of a time-temperature relationship shows the performance of a practical amount of insulation, using planer shavings, in keeping concrete temperatures up to requirements. At a continuous outside temperature of 20 deg. F., which represents about as low an average temperature in which it is considered feasible to work, 3½ in. of shavings in plywood forms held the corner temperatures of a 2-ft. cube of 6-sack concrete above 50 deg. F. for three days, and above freezing for seven. It is important to keep in mind that corners and edges are most vulnerable to temperature drop and freezing. When protection is sufficient for these areas, it is ample elsewhere.

Heavier insulation, such as might be used on large structural work involving 6-in. form studs, was also tested. In a mock-up section of 12-in. wall, studs were sheathed outside, and the 6-in. space between form and sheathing filled with planer shavings. Top and ends of the mock-up were similarly protected. Computations indicated that, with such insulation, 5½-sack concrete placed in a 12-in. wall at 50 deg. F. would be above specified temperatures at the *edges* during exposure to an average of 0 deg. F., and at the *corners* at mean temperatures down to 20 deg. F. At 20 deg. F., the edges would be 60 deg. F. at 72 hr., and 50 deg. F. at six days; the corners would be 50 deg. F. at 72 hr., and 40 deg. F. at six days. As yet such insulation has not been used on Bureau work, but for milder fall and winter work last year on Hungry Horse power plant substructure, the wooden forms and several inches of shavings on exposed tops of walls were tried and found to provide sufficient protection.

Insulation similar to that of the mock-up described was used in the downstream face steel forms at Hungry Horse Dam. Wood strips, 1 x 2 in., were wired to the horizontal steel ribs of the form panels, providing attachment for Sisalkraft paper backed with chicken wire, which covered the panel as it was filled with planer shavings. The strips also acted to prevent heat transfer from the metal ribs. The next lift below the forms was to have been protected from freezing and quick temperature drop by a follower panel forming a 1-in. air space, using a wooden frame covered by Sisalkraft paper. These air-space panels were also to have been used at the edges of horizontal construction joints along the insulated forms, and supplemented with large Evans kerosene burning orchard heaters with downward reflectors operating over the joint area. Because severe weather closed the job down before the air-space panels were put into use, edges along the insulated forms and the remainder of the joint surfaces were pro-

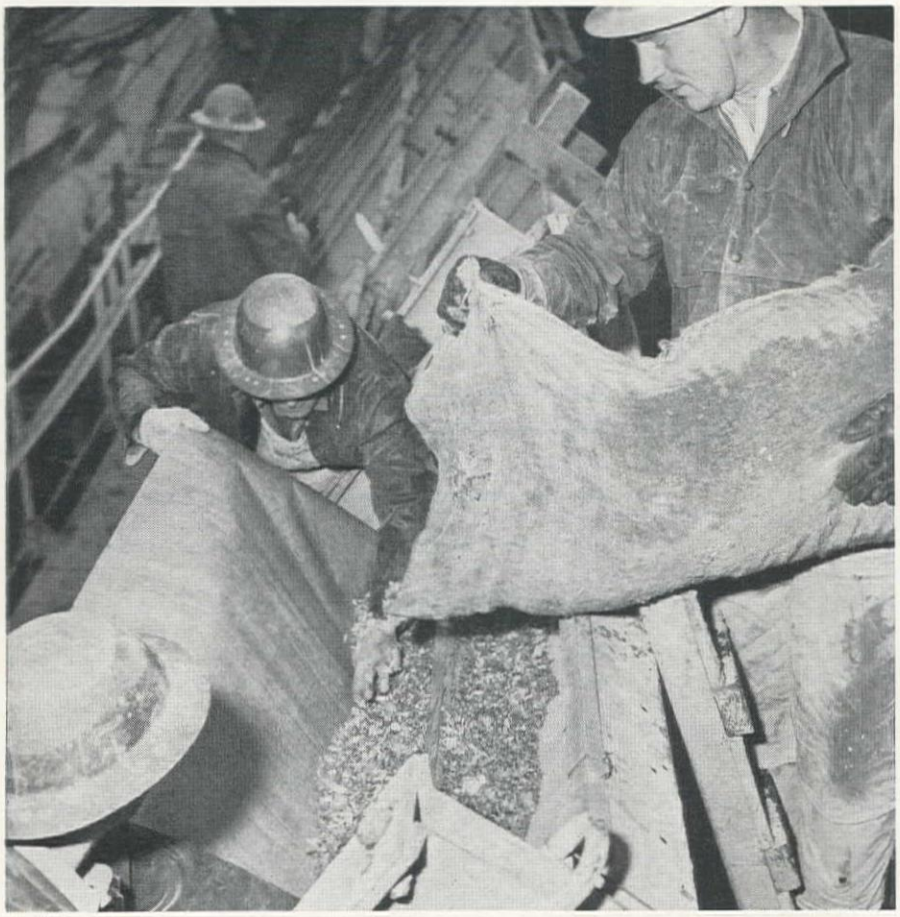
Laboratory tests point way to use of insulation

THE EXPENSE and fire hazard of heating winter-placed concrete during its curing has long made such concrete a premium item on construction projects and has recently spurred investigation to determine the feasibility of shortened periods of protection. Further incentive exists in engineers' knowledge of concrete structures which have been inadequately protected but which have performed satisfactorily both in service and in laboratory tests of drilled cores.

Specifically, tests were conducted on air-entraining concrete to ascertain whether existing Bureau of Reclamation specifications for winter concrete curing (above 50 deg. F. for at least 72 hr., and above freezing for 14 days) could be modified. Specimens were cast containing either Type II or Type V cement, and from 0% to 2% calcium chloride. A total of 1,230 samples was tested for the effects of various low curing temperatures on compressive strength and for resistance to cycles of freezing and thawing. The tests were reported in the "Journal of the American Concrete Institute," Proc. Vol. 47, Feb. 1951, pp. 449-59.

Results of these tests indicate that no permanent damage incurs to concrete made with Type II cement when moist cured at 50 deg. F. for 72 hr. and then frozen for three days. Similar concrete stored at 32 deg. F. after an identical curing period showed comparable results: 28-day strength reduced about 7%. Concrete with 2% calcium chloride exhibited greater strength in test at any age. Cycles of freezing and thawing reduced the 28-day strength markedly (30% to 40%), but eventual return to moist curing at 50 deg. F. saw an ultimate achievement of strength at least equal to that of control specimens. It was concluded that low and freezing temperatures retard development of strength but do not stop it providing there is sufficient moisture for continued hydration when the temperature is above 32 deg. F.

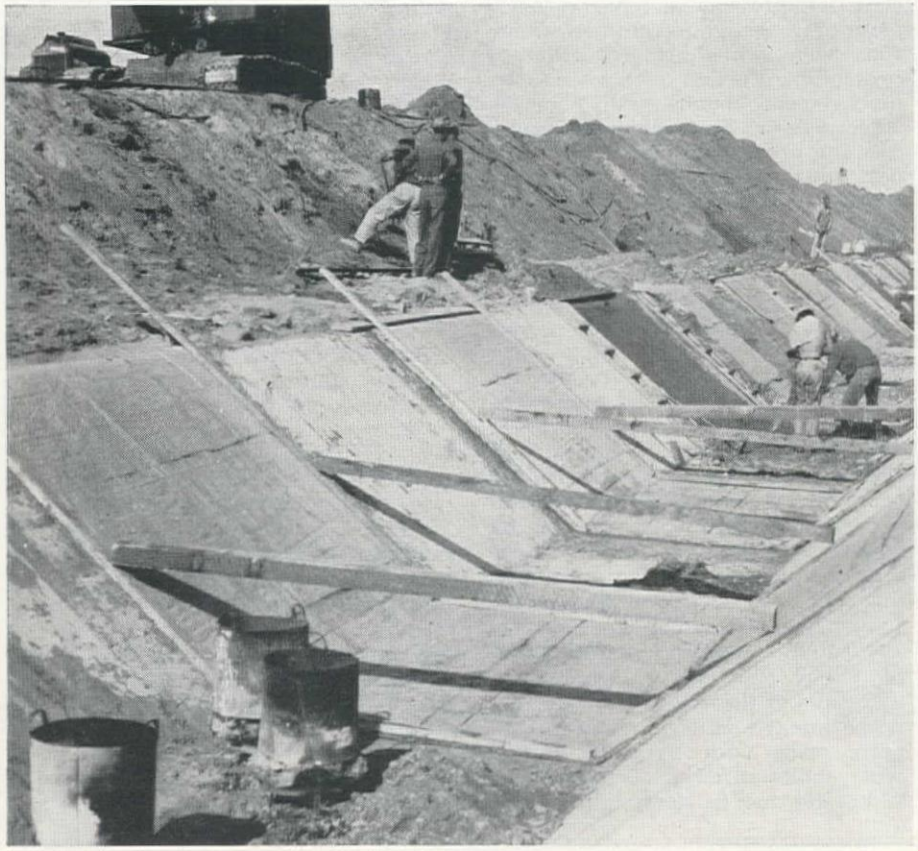
Assured of the adequacy of the shortened curing period, engineers of the Bureau of Reclamation were led to investigate the conservation of heat of hydration as a temperature control in lieu of artificial introduction of heat by stoves and blowers. Heat of hydration was found significant during the first three days of concrete curing, but: Could insulation, alone, conserve this heat to maintain the necessary minimum curing temperature of 50 deg. F.? Mr. Tuthill's article reviews resulting laboratory tests and reports also on subsequent field applications at Hungry Horse Dam in Montana and at the Fort Sumner project in New Mexico. —Editor.



TWO EXAMPLES OF PRACTICAL INSULATION

INSULATION of steel forms (above) for the downstream face of Hungry Horse Dam kept concrete above 50 deg. F. for three days and above freezing from November to January.

ONE-INCH BLANKETS of spun glass (below) protected 3-in. canal lining, kept concrete temperatures well up to requirements during freezing winter nights in New Mexico.



tected by 6 in. of planer shavings for the winter.

Although the concrete in the insulated forms was below 50 deg. F. when placed, it soon reached that temperature, where it stayed for three days. A sharp temperature drop then shut the job down for the winter, so the insulated forms were used only once. In January, two months after the concrete was placed, it was still above freezing. The severe weather, which caused suspension of operations, had frozen the aggregate processing operations and interfered with cleanup of horizontal construction joints. It had not overcome concrete protection methods.

Canal lining blanketed

At the Fort Sumner project, New Mexico, 3-in. concrete canal lining was placed last winter at elev. 4,000 ft. in alternate 10-ft. sections having a perim-

Sample temperatures recorded during winter concreting of canal lining on the Fort Sumner Project, New Mexico

CONCRETE AND AIR TEMPERATURES
Deg. F.

Age	CONCRETE Max.	CONCRETE Min.	AIR Max.	AIR Min.
Placed	58	48	50	27
1 day	54	40	56	12
2 days	48	45	22	6
3 days	48	44	26	8
4 days	33	31	16	−15

EARTH TEMPERATURES, Deg. F.

Excavation	Time	Air	Earth, at Various Depths 0.3 ft.	1.0 ft.	2.0 ft.	3.0 ft.
7-ft. hole, excavated 2 wk. before test; earth and shattered rock	8:45 a.m.	17	32	31	42	44
6-ft. hole, excavated 4 wk. before test; sandy loam	11:30 a.m.	32	38	34	40	44

eter of 24 ft. Most daytime temperatures were suitable for continuation of such work, but at night there was real possibility of damage to the concrete from freezing. Housing was out of the question and salamanders were inadequate. The contractor asked for suggestions and was told that insulating mats had good promise theoretically, although their practicality would have to be proved on the job. Accordingly, thirty mats were ordered, each 10 x 24 ft., to be made of 1-in. spun glass covered top and bottom with reinforced Sisalkraft paper.

One of these mats was laid on each section of canal lining immediately after finishing, and the edges were held down by 2 x 4's. The mats were reused many times; most were in good condition after 20 uses. Service would have been better had their edges been bound to prevent top and bottom covers tearing apart. Evidently the contractor regarded them as a practical solution to the prob-

Concluded on page 150

High strength bolts compete with rivets

New specs define assembly techniques; installations show bolts have good economy, superior clamping action — Noise reduction favors bolts for some work

THE HIGH-STRENGTH bolt, a competitor to rivets for structural steel connections, is finding new applications this year following issuance of assembly specifications by the Research Council on Riveted and Bolted Structural Joints. Already standardized in manufacture by ASTM Designation A325-49T, the high-strength bolt has been slowed in its acceptance only by lack of conclusive knowledge as to proper field technique. Knowing assembly requirements of the new specification, engineers can now determine the equipment and manpower necessary for field installation of the bolt, and thereby evaluate its relative economy in heavy construction.

Particular value of the high-strength bolt attaches to its use under conditions of dynamic loading. Whereas most structural steel assemblies are subjected only to virtually static loadings, some—notably bridges and industrial equipment—must undergo the effects of many fluctuating and cyclical dynamic loads. High-strength bolts, functioning only in tension (and to a degree three times that in other connectors), exert such a clamping force that friction alone between joined surfaces develops the strength of the structural joint. Under this condition, applied loads do not induce further stresses in the bolts and, practically speaking, the bolts do not fatigue.

Laboratory data field-supported

Slippage in high-strength bolted connections was observed to be small in tests sponsored by the Research Council. Bolt holes were drilled 1/16 in. oversize to preclude slippage that would subject the bolts to either shear or bending stress. Even so, it is pointed out that a given bolt is the equivalent of its rivet counterpart in shear.

Fatigue tests were conducted at Northwestern University in Wilson-type machines having the capacity to exert a force of 250,000 lb., in either tension or compression. Loads were varied by means of a double eccentric and measured by a dynamometer or proving ring that had been calibrated for static conditions. The machine was normally run at 180 cycles per minute, but an additional slow speed movement provided for adjusting and checking loads. A micro-switch permitted disconnection of the motor at any appreciable movement due to slippage or cracking of a specimen.

Test installations of high-strength bolts were made by the Association of American Railroads to lend field support to laboratory data. Given proper torqueing, the bolts have proved superior to the conventional rivets they replaced. These installations have shown that nuts do not tend to back off either under cyclic loadings or temperature changes.

High-strength bolts are expected to gain favor not alone for their efficiency as a connector but also for their relatively quiet method of installation. Even when torqued with impact wrenches, they show a considerable reduction in noise from that associated with riveting.

Erection of a 21-story building at the Mayo Clinic recently involved the choice between bolting and field welding. A comparative cost study led to the use of high-strength bolts. Even under conditions of direct competition with rivets, high-strength bolts have permitted savings of as much as 11% in erection costs.

May be substituted for rivets

In summary of provision of the new assembly specifications, it is to be noted that high-strength bolts may be substituted, unless specifically prohibited, for rivets of the same nominal diameter as covered by ASTM Designation A141, in any structural steel joint.

In regard to the fit of bolts in holes provided, no bearing of the bolts is expected, and "holes may be punched, subpunched and reamed, or drilled, . . . and shall be of a diameter not more than 1/16 in. in excess of the nominal bolt diameter."

Bolted surfaces shall be parallel; if not, beveled washers shall be used in compensation. In any case, at least one carburized or quenched and tempered washer shall be included under each nut and bolt head. When tightening nuts, whether by plain, torque, or power wrench, bolt tension shall be produced equal to 90% of the elastic proof load of the bolt. (Elastic proof load is approximately 10,000 psi. less than the yield point of the steel.)

Under present conditions of application and installation, inspection of high-strength bolted connections is achieved by means of loosening and re-tightening 5% or 10% of the bolts. Re-tightening procedures must be such as to permit a check of the torque necessary to restore the nut to its original position.

Investigation of high-strength bolts was commenced four years ago upon a recommendation of the American Society of Civil Engineers, whereby the Research Council was sponsored by the Engineering Foundation and functioned under its auspices. Contributory sponsors of the program also included the Association of American Railroads, American Institute of Steel Construction, American Iron and Steel Institute, Industrial Fasteners Institute, Illinois Division of Highways and the Public Roads Administration. Other societies, firms and universities provided personnel and equipment in the research.

Source material for this article was made available from the offices of the AISC by Harry B. Corlett, District Engineer, San Francisco.

Economy, superior values for high-tensile-bolted structural joints

DURING the course of research conducted under auspices of the Research Council on Riveted and Bolted Structural Joints, progress reports were prepared that outlined observations and tests made of both laboratory and field installations of high strength bolts. The following is quoted from one progress report:

"Exploratory research supports the belief that structural joints fastened with high tensile bolts will demonstrate superior values.

"Bolting is simple and economical, especially in field construction, and more particularly in small or remote jobs where the necessary assembly equipment is not readily available. Further, it would obviously be economical to leave erection or fitting-up bolts in place rather than incur the expense of their removal and replacement with rivets, if this procedure were shown to be satisfactory.

"Common structural bolts, of course, have been used for many years in certain structures. The present investigation is concerned principally with the different type behavior under cyclic loading of joints made up under the great clamping force of high-strength bolts, which is some three times that of common bolts. As an example, present specifications for bridges require that the rivets for connections subjected to a complete reversal of stress be designed on the basis of a unit stress on the rivets only one-half as great as the stress allowed for rivets not subjected to a reversal of stress. The result is that the connections for large riveted structural members subjected to a reversal of load are exceedingly large, cumbersome, and expensive. A limited number of reversed-load fatigue tests made on riveted joints for which the tension in the rivets was great enough to resist the load entirely by friction, indicated that the joints were practically unaffected by the reversal of the load. Tests on similar joints with rivets for which the tension was not great enough to enable the joint to resist the load by friction, indicated that these joints had a very low fatigue strength. This suggested the possibility of using joints with high-strength bolts, not necessarily filling the holes, which could be given sufficient tension to cause the joint to resist the load by friction."

Maintenance of private logging road carrying up to 250,000-lb. loads

After two years, and despite loads that would make a public-highway engineer shudder, no appreciable damage has been observed on Masonite Corporation's 35-mi. plant access road over the Coast Range near Ukiah, Calif.

DESIGNED FOR LOADS greatly in excess of those permitted on public highways, the Masonite Corporation's 35-mi. private logging road is entering its third year of operation with no appreciable damage to be observed from loads that may gross nearly 250,000 lb. To date most of the maintenance and repair work on what is considered to be one of the largest private highway projects constructed in recent years has been limited to nominal amounts of light blading and correcting damage caused by excessive rainfall, settlement, and clearing of expected slides. Design and construction of the highway was reviewed in *Western Construction*—June 1950, p. 79.

Constructed as a permanent hauling road, the highway traverses the California Coast Range to link the Masonite plant at Ukiah to the company's timber holding near Navarro on the coast. Modern forestry practices and a sustained yield program assure perpetual use of the road.

Use of highway

Using the road is a fleet of about 35 trucks, 11 of the large type that may gross nearly 250,000 lb., and about 24 that carry loads permissible on public highways. All trucks average two round trips per day. Approximately 10,000 loads, with an equal number of return trips, pass over the road during a one-year period. The Masonite Corporation estimates that 100,000,000 bd. ft. of logs, or over 1,000,000,000 lb., move over the road each year.

In addition to the logging trucks there are approximately 100 automobiles and pickups making an average of two trips over the road each day. A checking station with a 24-hr. guard is maintained at each end of the road and to date there has been little or no trouble with the public attempting to use this private highway. Where branch roads connect with public roads locked gates have been installed.

Design features

Starting at an elevation of 105 ft. at the timber end, the road climbs to 2,355 ft. over the crest of the Coast Range, and drops to 615 ft. at the Ukiah plant. Over the ridge the road climbs 1,200 ft. in 4½ mi. against the load. The highway has a 40-ft. width of roadway with a 30-ft. finished surface. Curvature does not exceed a maximum of 30 deg. (200-ft. radius). Grades are a maximum of 6% for loaded trucks going east and a maximum of 8% for empty trucks going west. Adverse grades steeper than 2% occupy about 12 mi. of the total length of the highway.

During the construction of the road, side-hill cuts were established on a relatively steep slope of ½:1 with the recognition that some of the ground would not stand at this slope. This design feature has proven successful in allowing the material to take its natural slope. The work of removing slide material has been more economical than handling the large quantity of material necessary to establish original flatter slopes.

The majority of the slopes that had slide possibilities have already flattened themselves and it is expected that by next summer the remainder of the slides will have occurred to permit application of the final surface to the highway. During one period of extremely heavy rainfall last winter, 6 in. fell during a single night and several slides occurred almost simultaneously. Delay in use of the road was held to a minimum by working a battery of dozers and clearing the road immediately as each slide fell.

Some of the fills have settled from 6 in. to 3 ft., but by bringing them back to grade, keeping the surface in good condition and protecting them against undue water action they have been held in good condition. Fills were deposited in horizontal layers of about 18-in. thickness and were compacted only by hauling equipment. In two or three places the original ground would not support the weight of the fill and at one place there was considerable movement beneath the fill. To correct this problem the route of the highway was shifted slightly to by-pass the unstable area.

At three fills heavy flowing springs occurred during the heavy rainfall of last winter. These springs were not present when surveys were made or during construction. One spring proved quite serious and it was necessary to excavate a trench 18 ft. deep and install a perforated pipe and several feet of gravel to permit it to pass under the fill. Wherever possible water is being tapped before it reaches a fill by French drains, open ditches or holes drilled into the slide contact by Hydraugers.

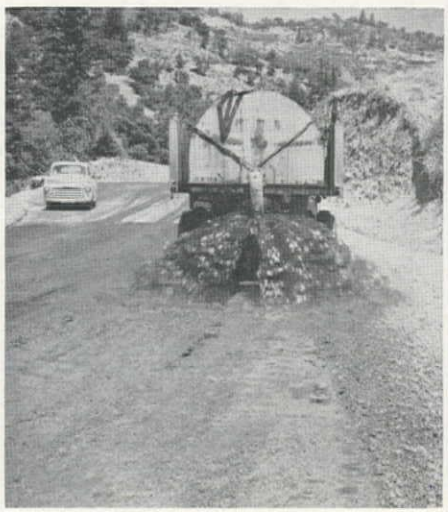
Surface wear

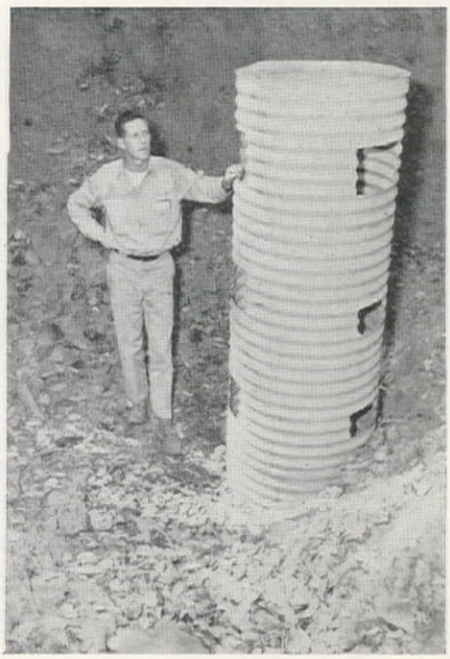
Surfaced with a 1-ft. layer of river gravel, only a few chuck holes have appeared in the 30-ft. roadway. Wear for the most part is confined to short sections that have become corrugated. Such sections are smoothed as they occur under the maintenance program. The heavy trucks have a tendency to set the gravel, whereas the light pickups and automobiles tend to kick it loose. However, there has been virtually no appreciable amount of gravel lost by wasting to the ditch.

In scattered areas, totaling about 5 mi., the soft clay and broken shale in the base would not support the gravel. In such areas this material has been exca-

BELOW—Manufacturing waste is spread on road to act as binder and provide dust control.

RIGHT—Masonite Forest Engineer E. M. Parnum inspects one of drop inlets used to prevent cross drains from clogging.

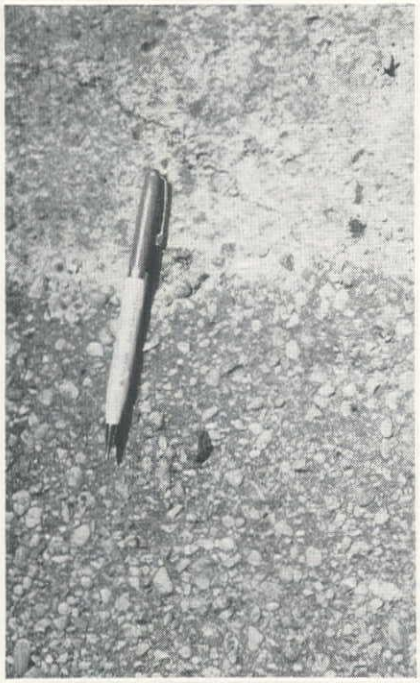




vated and replaced with 2 or 3 ft. of a base rock of pit-run, coarse sandstone from a quarry located near the timber end of the road. During the operation trucks have found a few soft spots 5 to 10 ft. under the road. When due to material these are replaced by the sandstone and if due to water conditions drains are installed as a corrective measure. When constructing the road it was decided to let the trucks find the greater majority of such areas and correct them as they occurred. By following this procedure it is enabling the Masonite Corporation to have a solid base before the application of a final surfacing.

Asphalt test

In preparation for application of a final asphalt surface a series of tests has been conducted. In the middle of last summer an asphalt surface was applied to 3 mi. of the road at different locations. The asphalt mat applied consisted of: SC2 at .3 gal. per sq. yd.; SC6 at .25 gal. per sq. yd. and screenings or pea gravel at the rate of 20 lb. per sq. yd. The procedure used in the mat preparation was to blade the road smooth, then let the trucks seek out any soft spots. This was done three times before the final surface was applied.



SURFACE obtained by application of waste is shown at top of photo. Surface with waste used as a seal coat and covered with SC6, bottom.

The cost for the mat was relatively light in spite of the three treatments and the company estimates that the surface was applied for under $2,000 per mile. Now over a year old, the test road has stood up remarkably well. The entire maintenance for the year consisted of one man with a pickup carrying about ½ yd. of gravel and towing an emulsion pot, going over the section and filling a few small holes. Approximately a half a day was required for the maintenance man to cover 1 mi. of road.

Although original design called for a super-elevation on all curves equal to one-half the standard highway requirement for 35 mph. speed, further study indicated that loaded trucks had difficulty in making turns on the 5% to 6% grades because the rise was accentuated as they came out of the "super," and the turning parts of the trucks tended to bind. In addition to this, the high loads would be far off center when traveling around the curve and due to the slow speed the danger of loads toppling over was always present. To eliminate the binding and danger of loads tipping it has been decided to establish a flat elevation on the load side of the road on all curves with adverse grades and to install super-elevation on the side used by empty trucks (see illustration). Some of these were put in during the original construction and the remainder are being installed as subsequent maintenance work is carried out. Road surface is increased from 30-ft. width to 36 ft. at all curves.

SUPER-ELEVATION design permits truck climbing hills under load to remain level while making curves, provides "super" for unloaded trucks traveling downhill.

Drainage

One of the interesting features in the road's drainage system is the use of corrugated steel-pipe drop inlets at the uphill end of cross drains to prevent sand, gravel and rocks from clogging the culvert, and still permit water to pass. Invented by one of the members of the maintenance crew and developed by the company's engineer, the drop inlets consist of a section of 36-in., 12-gauge steel culvert set in a vertical position over the end of the culvert or cross-drain. Averaging about 3 ft. in height, the sections have slots or holes cut around their circumference. If sand and silt are the predominant threat to clogging the culvert the openings are of small size, and if large rocks constitute the threat openings are of larger size.

Generally the holes are vertically rectangular and the area of the openings is equal to about one and a half times the area of the cross-section of the culverts. That is, a 12-in. culvert with a cross-section area of 113 sq. in. would be equipped with a drop inlet having about 170 sq. in. of holes or openings. Covers for the drop inlets are made from 2 x 8-in. material and are usually spaced about 1½ in. apart. By cutting holes around the entire circumference and putting on a cover, the drop inlet is still able to function in the event a slide causes material to jamb up against the back side and on the top. The culverts placed when the road was constructed, ranging in size from a minimum of 12 in., up to 108 in., show no ill effects from wear or use. The additional 25 culverts added in the road have been for the most part placed at possible slide-wash areas, and equipped with a drop inlet. Drop inlets are being installed on virtually all of the drain type culverts.

Waste product used as binder

Outstanding among the many aspects of the Masonite Corporation's maintenance program is the utilization of a waste product from its manufacturing process as a binder and dust preventative. Consisting largely of wood sugars and lignin, the waste product comes from the plant as a liquid and is evaporated to about the consistency of molasses. Ordinarily it is burned, as dumping into adjacent streams would create a serious pollution problem. Taken from the plant at about 180 deg., the heavy "goop" (so nicknamed by the local Masonite forces) is cut back with some of the thinner liquid (that has not been evaporated) and transported in two 2,000-gal. water wagons or trucks to the place of application. Application is performed at the rate of about 10,000 to 15,000 gallons per mile. A regular water wagon spout on the rear of the tank is used for spreading. When in place the liquid has an appearance similar to road oil. Although soluble in water, a 4 to 5-in. rain did not materially affect it. The liquid has a good penetration. The practice used in applying the binder usually consists of blading an area with a motor grader to smooth any rough surface before its application.

Calcium chloride was tried for dust control but due to the local humidity

and materials contained in the road it did not prove satisfactory.

In general, the maintenance program for the road will consist of repairing and improving the base until it has stabilized sufficiently to hold the loads. Then it will be surfaced. At present the maintenance program consists of: Summer—smoothing with one motor grader, application of liquid, installation of drains and Hydraugers, rebuilding necessary fills, benching slide areas and general clean-up. Winter—Twice during last winter five or six trucks worked for five weeks hauling gravel to spread on the road. About 25,000 cu. yd. gravel was spread. One motor grader worked with the trucks. Other winter work includes clearing slides as they occur. Spring—When the surface of the road is still wet, five motor graders cover the entire road, cleaning ditches, smoothing and cutting away small slides. Four laborers are maintained for the cleaning of culverts, installing new drains, culverts, drop inlets and culvert markers and for repairing fences along the road.

Organization

E. M. Parnum is forest engineer for the Masonite Corporation, in direct charge of the highway. Roy G. Wagner is forest manager and E. T. F. Wohlenberg is general manager of the Ukiah plant.

Arthur B. Siri, Inc. of Santa Rosa performs the maintenance work under contract, with Ted Siri, Ukiah manager, in charge.

The road was constructed by the Utah Construction Co. under the general direction of Fred S. Laird, project manager, and Newton Miller, project engineer.

Diversion dam and canals completed in New Mexico's Pecos River Valley

FOR THE FIRST TIME in the 87-year-old irrigation development in the Pecos River Valley near Fort Sumner, New Mexico, farmers now have a dependable system for spreading Nature's capricious supply of water over their crop lands. Construction of a new diversion dam and rehabilitation of the canal and drainage facilities have been completed by the U. S. Bureau of Reclamation.

Without fanfare or any sort of ceremonies to mark completion of the building program, farmers have tapped the distribution canals to send water flowing over their cultivated lands and pastures. The Bureau of Reclamation's engineering staff, with the exception of Construction Engineer Walter Bierce and a small force, has been transferred to other jobs in Western river basins. Bierce is remaining in Fort Sumner several weeks to direct clean-up work.

Abraham Lincoln was president of the United States when the first irrigation development came into existence at Fort Sumner. The first irrigators there were Navajo Indians, held in captivity by United States troops under the command of Kit Carson. But the farming experiences were disappointing. This initial irrigation experiment was abandoned in 1868.

Interest in an irrigation project in the area was revived in the early 1900's, a period of heavy westward migration. However, a lack of adequate engineering, coupled with floods, resulted in severe damage to the diversion works and water distribution system. Subsequent attempts to place the project on a sustaining basis were marked with failure. In the late 1940's, property owners requested the Bureau of Reclamation to investigate the valley's problems and design and construct a system to serve the 6,500-acre project. Irrigation district directors signed a contract with the Federal Government in 1949 to repay construction costs, and the Reclamation Bureau began its building program in 1950.

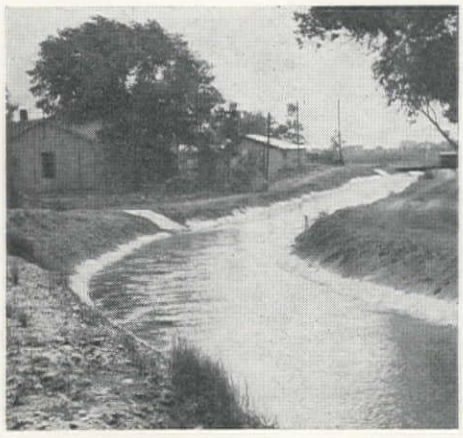
Work performed by the Bureau includes a new diversion dam, 150 ft. downstream from the original structure, 3 mi. northwest of Fort Sumner; enlargement of the canal system; installation of a pumping plant to deliver water to the project's high line canal; and rehabilitation and extension of the drainage system. The diversion dam is 50 ft. high, with a crest length of 650 ft. Much of the main and high line canals is concrete lined.

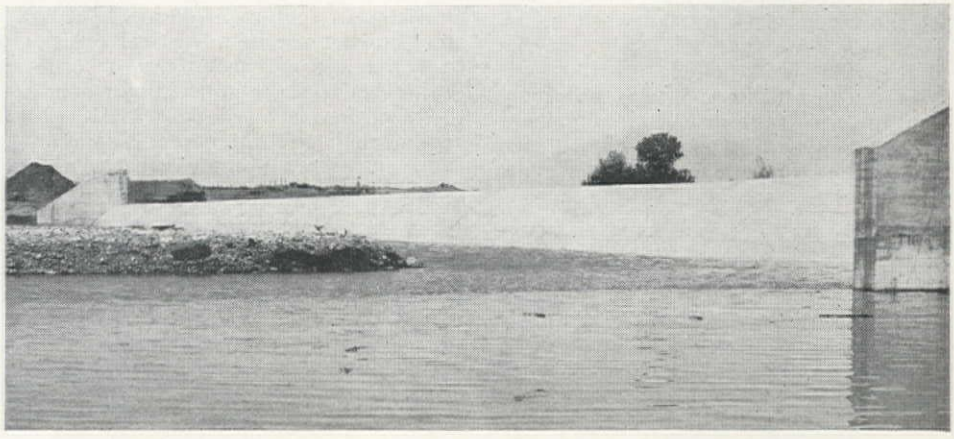
A unique feature of the project is the pumping plant. The power required for raising water from the main canal to the high line canal is obtained without cost. The power is generated by dropping water 11 ft. at one point in the system. Power created by this drop is used to pump the water to a height of 12 ft. from the main canal into the high line canal.

Principal crops grown on the Fort Sumner irrigation project include alfalfa, corn, grain sorghums, vegetables, apples and grapes.

LEFT—Section of main canal on Fort Sumner irrigation project. Much of the project's canal system is concrete-lined to conserve water.

RIGHT—New diversion dam completed by USBR diverts water from Pecos River for the irrigation of 6,500 acres.





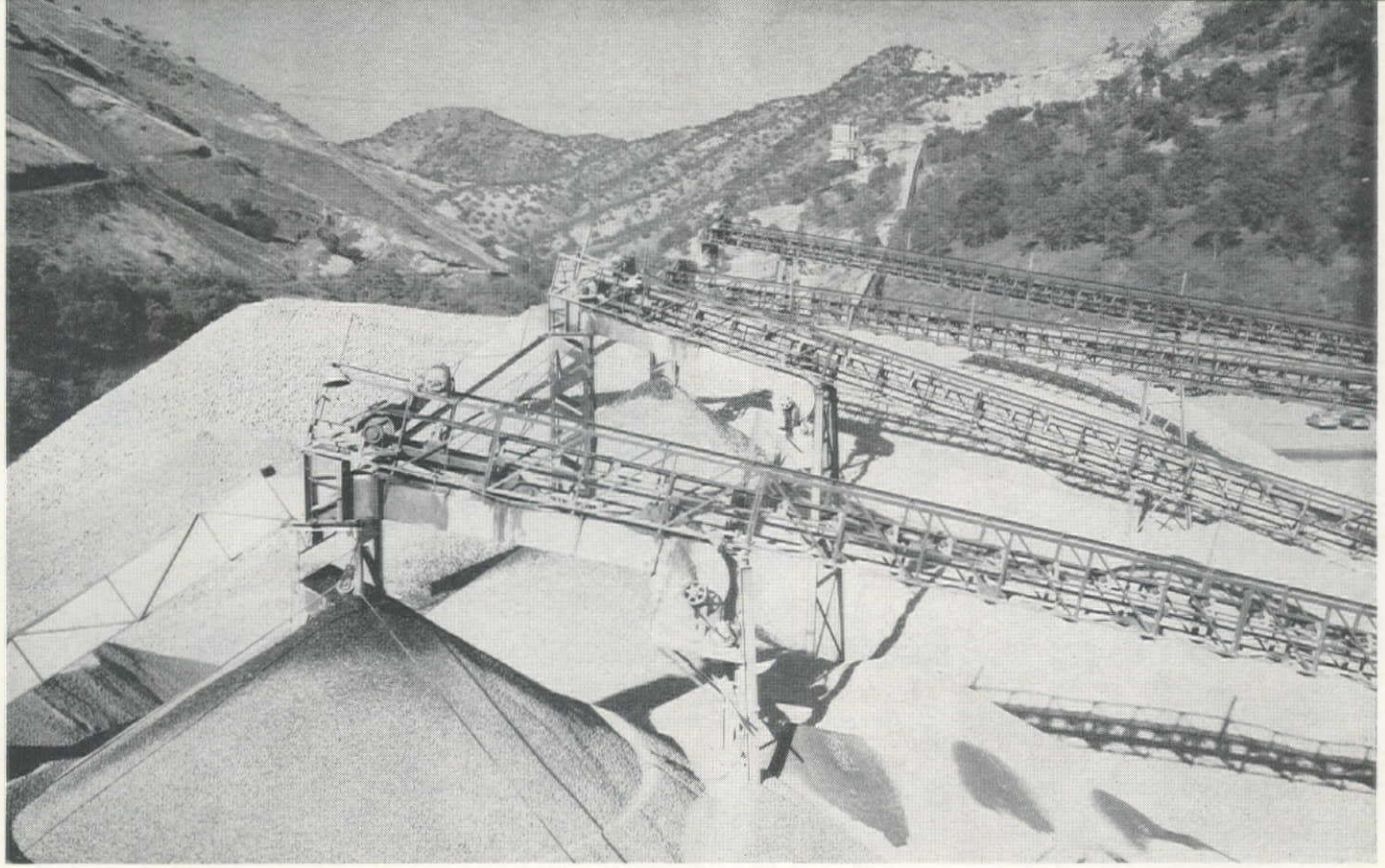
Permanent road-patching material resists freezing

A PERMANENT road-patching material that can be handled and placed in freezing weather has been tested in the eastern U. S. and is becoming available from plants at Chicago, Ill., and Utica, N. Y., for use this winter. Called Komac, the new material is a special bituminous and aggregate plant mix.

Present patching materials used in winter are only temporary to a large degree, due to the severe conditions under which they must be handled and placed. The new mix includes properties that lend it well to maintenance operations: (1) it is mixed cold in any equipment, (2) it can be stockpiled at convenient points and handled therefrom in any temperature, (3) it does not adhere to equipment, (4) it can support traffic immediately after rolling, and (5) it does not bleed in hot weather. Although currently high-priced, the new material may lead to long-range economies that will bring it into wider use.

Concrete floor surfacing looks and acts like wood

DEVELOPMENT of a concrete floor surfacing that a layman would have difficulty in telling from wood, has been announced by the research foundation of the University of Cincinnati. The new substance lends itself to staining, waxing, sanding and polishing. The development means that some of the objectionable qualities of concrete as flooring are now eliminated. The new material is almost as resilient as wood.



The plant that is producing 4,200,000 tons of—

Aggregate for concrete at Pine Flat

River sand and gravel goes through three separate screening plants in a grading operation to meet Corps of Engineers specifications for the flood control structure on Kings River—Schedule calls for placing 3,000 cu. yd. of concrete per day

WHEN A DAM construction contract is primarily a job of producing aggregate, mixing and placing concrete, the methods of securing and processing the sand and gravel represent an essential part in maintaining a production schedule designed to place 3,000 cu. yd. of concrete per day.

Before any of the 4,200,000 tons of aggregate is ready for batching at Pine Flat Dam, it has been stripped from the river channel, hauled 6 mi. in railroad cars, handled by some 38 conveyor belts, and has passed through three separate screening plants.

Pine Flat Dam is being constructed on the Kings River about 27 mi. east of Fresno, Calif., for the Corps of Engineers, Sacramento District, by Pine Flat Contractors (a joint venture) on a $24,339,776 contract.

The dam, of gravity type design, has a crest length of 1,820 ft., and rises 440 ft. from bedrock to crest. A total of 2,150,000 cu. yd. of concrete will be required to bring the dam to completion in 1953.

The Pine Flat Dam aggregate manufacturing system is distinctive in that it requires fewer men than is usually needed for the amount of production obtained. Only 55 to 60 men, working two shifts, are required to carry out operations in the pit, pit separation plant, and main plant to produce an average of 6,000 tons of finished aggregate per day.

A program of preventive maintenance, anticipating where a failure may occur and repairing it beforehand, has been effective in eliminating down-time. The majority of the plant maintenance is carried out on Saturdays when the plant is not in operation, with spot repairs carried out as required between shifts. Screens are watched closely and their life is judged on an hourly basis to determine replacement.

Water used for washing the gravel and sand in the main plant averages around 2,000 gpm. for the sand plant and 1,500 gpm. for the main coarse aggregate plant. This water is drawn from sump wells by three 1,700-gpm. pumps. Water used at the pit separation plant averages around 2,000 gpm. All waste water, containing small particles of sand, is carried from the plants in elevated gravity flumes to stilling basins, and after settling is returned to the river.

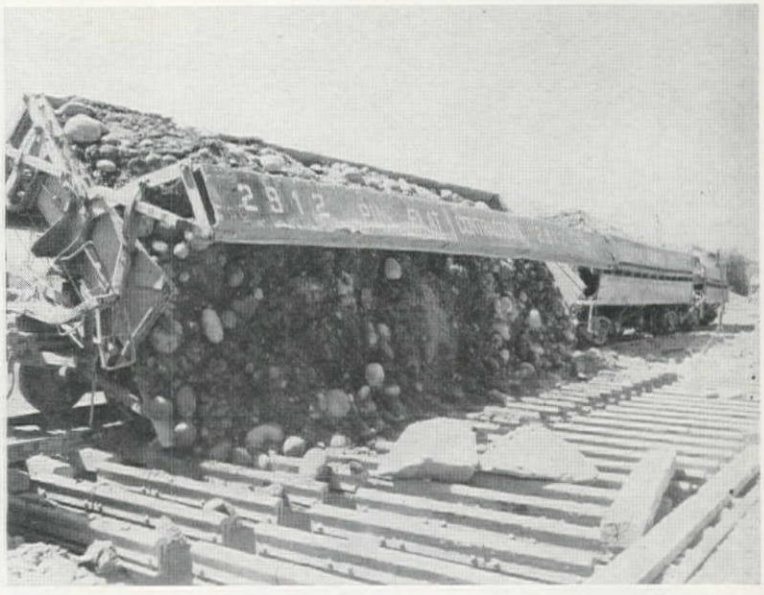
Comprised of a mixture of sand and gravel deposited throughout the years by the river, the source of material is located on the south river bank about 6 mi. downstream from the dam site and covers an area approximately 5,000 ft. long and 1,800 ft. wide. The area has been divided into two sections, an east and west pit; at present operations are being carried out in the west pit. As the pit is adjacent to the river there is constant seepage, and pumps have been installed at the west end to remove this water.

Work in the pit

Exploratory work prior to contract operations revealed the general adequacy of the deposit, but the proportions of the material encountered at any given location are quite apt to vary. Excavated material may run heavy on sand at one spot and heavy on large gravel at another. In general, waste material runs about 20% of the total yardage removed from the pit.

The pit is worked in a west-east direction in cuts ranging from 30 to 35 ft. deep and 30 to 35 ft. wide. Two trains, each consisting of a General Electric 44-ton locomotive and four Western and Kopple 30-yd. side-dump cars, are used to haul material from the pit to the 150-yd. hopper at the initial classifying or screening plant. Entering the pit from the east end, the trains move on standard gauge tracks paralleling the cut.

A Bucyrus-Erie 120-B electric shovel with 5-yd. Esco bucket loads them as they pass. While loading, the cars are



RAW MATERIAL is loaded from a 30-35-ft. face (left) and moved by four-car trains to the pit hopper (right).

pushed by the engine and a horn signal from the shovel is used to spot the cars where the shovel operator wants them. When a car is being loaded, one blast by the shovel signifies that the car is to be moved slightly ahead for another bucket load of material, and two indicate that a car is full and the next car should be moved into place.

When loaded, the trains move to the west end of the pit where they switch and leave the pit with the engine pulling the train. A diesel-powered dinky pusher assists the loaded trains up the 1½% grade out of the pit. The entrance to the pit is made on a downgrade of 5%. Once out of the pit the trains travel about 450 yd. to the hopper where one man spots the cars and unloads them.

Between three and four weeks are required to complete a cut the length of the pit. To insure continuous operation a track-laying crew commences laying another line of track paralleling the new wall of the cut as the excavation approaches the east end of the pit. Tracks are laid right up behind the shovel and the tie-in with the operating track is made as the shovel is walking back to the starting end for another cut. By following this method there is no downtime in the pit.

The primary function of the initial classifying or screening plant is to separate sand, gravel, and waste. The series of screens basically permit full recovery of all sand from the gravel. This plant has a 1,000-ton-per-hour capacity.

Separation at the pit

Material in the pit hopper is fed by reciprocating feeders to a 48-in. conveyor which carries it 297 ft. on a 3½ to 12 slope to the top of the plant. As the material leaves the head pulley it passes under a water spray, is divided into two streams by a splitter, and goes on two sets of screens. Two Tyler 5 x 12 double-deck inclined screens carry out the primary and secondary scalping operations. The top screen or deck, with 1¼-in. drill steel for screen bars, and 7-in. openings, scalps the plus 6-in. material which falls into a waste hopper. (Waste handling is described later.)

Material passing the top deck (6-in. and smaller) falls to the lower deck which has 3½-in. openings. This deck retains the 3- to 6-in. material which moves off the end of the screen to a transfer belt. A 30-in. conveyor 189 ft. long, then moves it to the gravel storage pile.

WHEN SIZE deficiencies develop in the pit-run material, the oversize waste cobbles are put through this portable plant, and the crushed product is hauled back by truck.

Material passing the lower deck (—3 in.) is then split into three streams and falls to three 5 x 12 Tyler double-deck screens. A series of water outlets fixed above the screens provide a constant heavy spray on this combination of sand and gravel as it is screened. In this series of screens, the top deck, with ⅞ by 1½-in. openings, retains the 1½- to 3-in. gravel, and the lower deck, with ½ x .202-in. mesh retains the No. 4 to 1½-in. Material from both decks falls to a transfer belt which takes it to the conveyor leading to the gravel storage pile. All sizes of aggregate, plus No. 4 to 6 in., are carried by a single conveyor to the gravel storage (4,000 tons live storage).

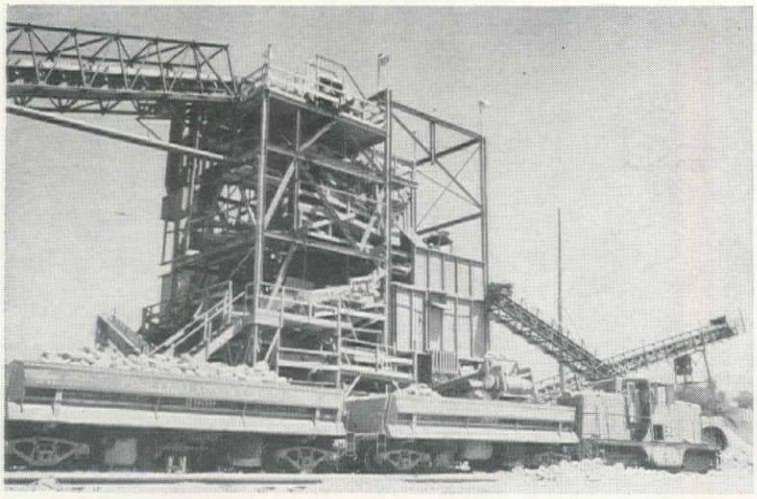
All conveyors leading to rock storage piles in the aggregate production system are equipped with rock ladders. Instead of letting the rock fall from the end of the conveyor some 20 ft. to the pile, the rock ladder permits lowering of the material to the top of the surge pile in shorter drops to reduce breakage.

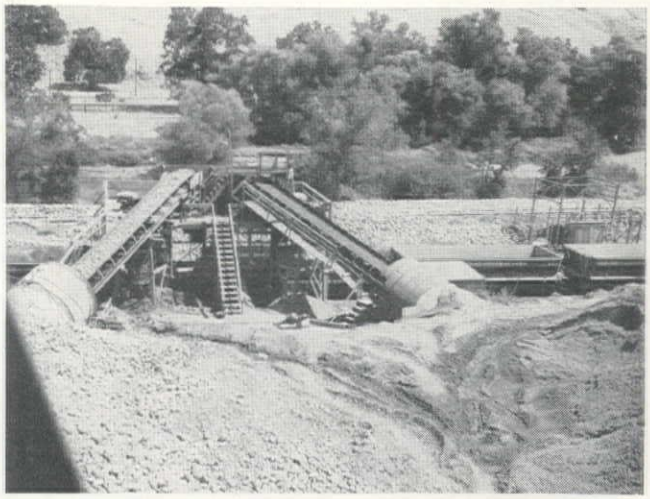
Sand (minus No. 4) passing through the lower deck of the second series of screens is carried to one 78-in. and two 60-in. Wemco dewatering screws. Waste water removed by the screws is taken to a pumping station about 100 ft. west of this plant where it is lifted to a gravity flume and carried to a stilling basin adjoining the pit. Sand leaves the dewatering process to be carried 147 ft. on a 30-in. conveyor to a sand storage pile (1,500 tons live storage). The majority of the silt in the pit run sand is washed off during the first separation.

Due to the desirability of draining the sand well before rehandling, the contractor recently installed an auxiliary sand storage pile of 1,500 tons. Sand may be routed to either of the storage piles as it leaves the plant.

Waste utilization

Waste material, the plus 6-in. cobbles scalped by the first screen in the separation plant, is used for building dikes along the bank of the river or for making up size deficiencies in the coarse aggregate, or wasted. The pit run material is sometimes deficient in the ¾ to 1½-in.





PIT SEPARATION plant produces: (1) sand, (2) gravel and (3) waste. Reclaimed sand and coarse aggregate are loaded into railroad cars for 6-mi. haul.

and 1½ to 3-in. sizes. When such deficiencies occur, a Cedarapids MorRok portable crusher is used to make them up from this cobble waste. Specifications stipulate that only 25% of each size aggregate in the concrete may be crushed rock.

Material in the waste hopper is removed by a short conveyor belt that loads a waste train. One General Electric 44-ton locomotive with two 30-yd. cars is used for waste removal. The quantity of waste is sufficient to require continuous use of this train during plant operation.

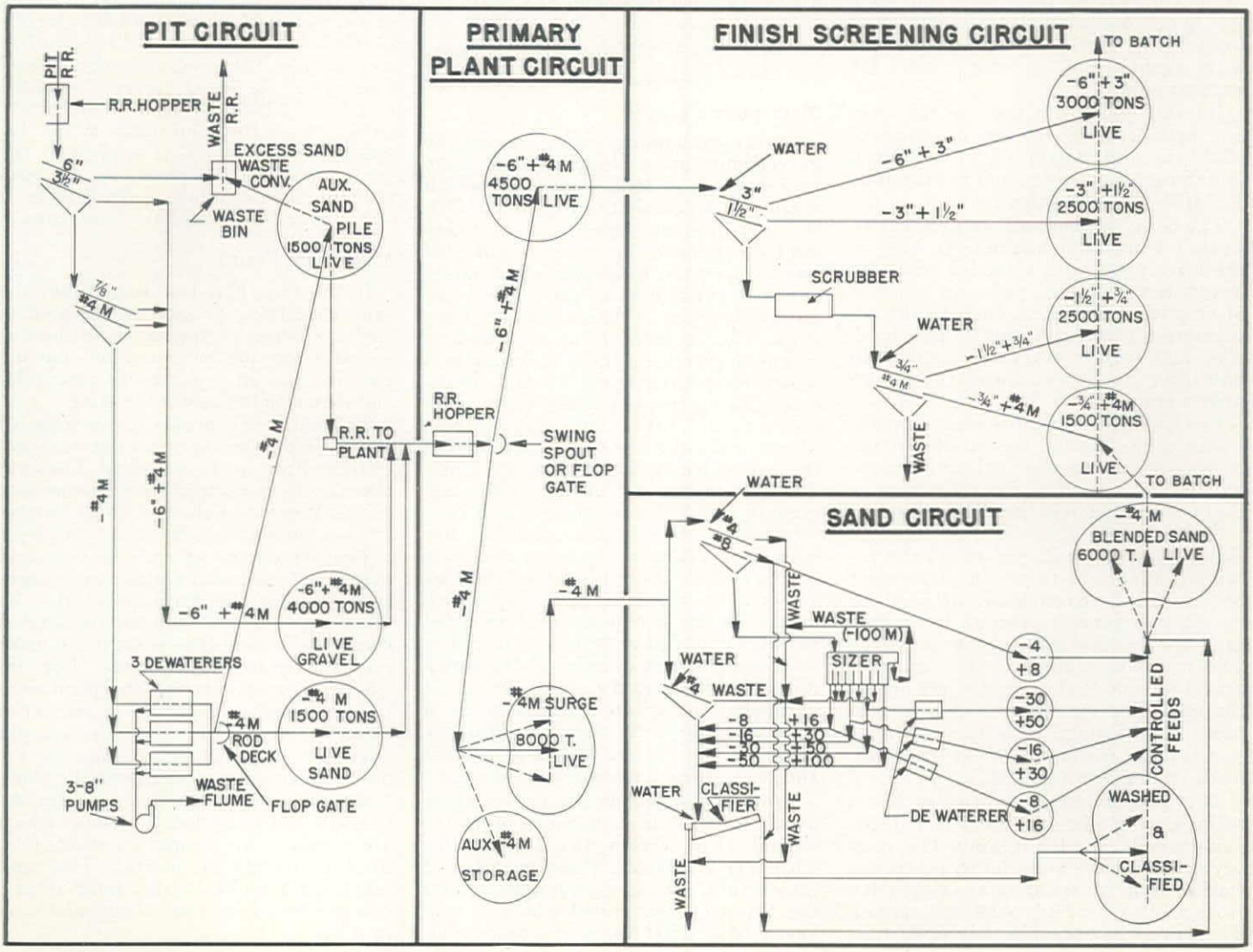
The track for the waste trains runs from the plant parallel to the river. The portable crusher is set up along this track and can be supplied directly from the waste train. A dragline is used to load the crusher. Crushed material for making up deficiencies is hauled by truck from the crusher to a storage pile near the pit hopper.

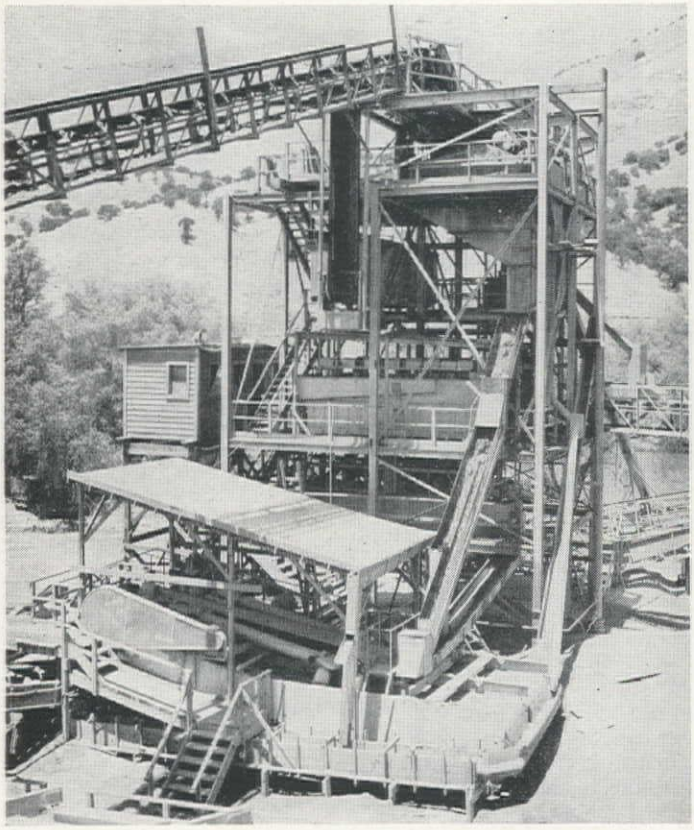
In the event the pit runs an excess of sand, it can be wasted by a conveyor that leads from a tunnel under the auxiliary pile to the waste hopper.

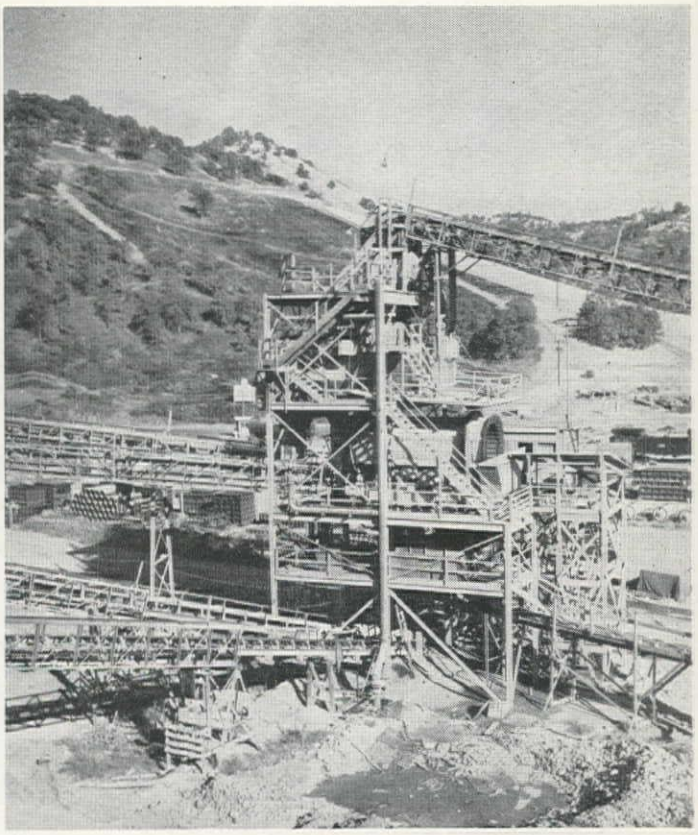
Transportation to main plant

For loading the material into railroad cars that will carry it 5½ mi. upstream to the main plant near the dam, two 48-in. and one 36-in. conveyors lead from tunnels under the main sand and rock

Flow diagram follows Pine Flat aggregate through three separate plants







MAIN PLANTS: (left) sand preparation making a specification product continuously without rehandling and blending; (right) coarse aggregate is produced in this 700-tons-per-hour plant.

storage piles to loading stations elevated above the main line railroad track. The tunnels under the main sand and rock are 10 ft. in diameter and constructed from bolted steel sections and covered with asphalt and roofing paper for waterproofing.

Hauling equipment used on the main line includes two 100-ton locomotives (Baldwin and American), two 44-ton switching locomotives, and twenty-four 30-yd. Magor side-dump cars.

The large locomotives are used exclusively for main line hauling. Arriving at the main plant with a loaded train the locomotive unhooks, picks up a string of empties, takes them back to the pit separation plant, and starts a new haul. The small engines carry out loading and unloading. Six or seven loaded cars comprise a train.

For loading at the pit separation plant a man at the loading station directs the moving of the cars. For unloading, compressed air is used to dump the cars as they are spotted over the 250-yd. hopper.

Carloads are never mixed but are either all sand or all gravel. As the receiving hopper at the main plant must be cleaned between loads of sand or gravel, the general practice is to haul sand for a period and then haul gravel. The ratio of hauling is two loads of gravel for one load of sand. Only one of the main line locomotives at a time is used for hauling, with the other as standby. A minimum of 14 trips are made during a two-shift day.

The hopper at the main plant has a reciprocating plate feeder which loads a 36-in. conveyor 168 ft. long. This conveyor carries the material to a transfer station that routes it to its respective storage pile where it is held until needed. The gravel storage pile has 4,500 tons live storage and the sand has 8,000 tons live storage.

Main plant: gravel

In the reclaiming tunnel under the gravel storage a reciprocating plate feeder loads a 36-in. conveyor which carries it 264 ft. to the top of the 700-tons-per-hr. main screening plant. Leaving the conveyor, the material is divided into two streams by a splitter and moves over the first double set of screens, double-deck 5 x 14 Allis-Chalmers Ripl-Flow. The top deck of this set, with 3½-in. openings, retains the 6- to 3-in. gravel which is spouted from the end of the screen to a conveyor which takes it directly to a 3,000-ton live storage pile. Material passing the top screen falls to the lower which has 1⅝-in. openings. This screen removes all 1½ to 3-in. aggregate which is also spouted to a conveyor and carried to a 2,500-ton live storage pile. All gravel passing the lower screen (minus 1½ in.) is routed through a 7 x 24-ft. revolving scrubber which breaks up any decomposed granite and removes collodial material and dirt. The scrubber is a large cylindrical drum with railroad rails spaced around the inside perimeter to agitate the gravel as it passes through. Water, fed into the scrubber, aids in the cleaning process and flushes out undesirable material.

From the scrubber the gravel again passes over a splitter to move on to the second set of screens, two 4 x 12 Allis-Chalmers low-heads. The top screen of this section, with ¾-in. openings, retains the 1½- to ¾-in. gravel which is conveyed to a 2,500-ton live storage pile. Fine gravel passing the top screens falls to the lower which has .175-in. openings. The ¾-in. material retained by this screen is likewise spouted to a conveyor which takes it to a 1,500-ton live storage pile. The sand and soft material that passes the lower screen is spouted to a flume which carries it to join waste coming from the sand plant. Water for washing the material is applied as the gravel enters the plant, as it goes through the scrubber, and again as it starts over the second set of screens.

Main plant: sand

In the Pine Flat Dam operations the sand classifying process is operated in such a manner as to make a continuous specification product without putting the material in separate storage piles and then rehandling for blending.

To insure the proper percentage of sizes to meet the specifications constant testing of the sand is required. Tests are taken at 30-min. intervals with standard sieves. Weight of the fractional separations is compared against the specs.

The percentage of each size of sand in the final product is controlled by regulation within the plant. Generally, by knowing what sizes make up the sand as it enters the plant the operator can make fairly accurate adjustments. For instance, if sand entering the plant contains too high percentage of size 50 to 30-mesh, then this size, in the amount over the required percentage, is removed during the trip through the plant. Naturally, if any deficiency of size appears, it can be added. The sizes which are removed are stored in stock piles until they may be needed. The sand plant, with a 250-ton-per-hour intake, can produce 1,600 tons of finished sand in 8 hr.

PERSONNEL: At the plant, George Forus, aggregate superintendent; John Fay, engineer; George Archibald, project superintendent; R. G. Rofelty, project engineer; William Blair, plant engineer. In the office Earl Jennett (center) project manager, confers with Rofelty and Guy H. Heimsoth, assistant project manager.

From the storage pile, sand is lifted by a 24-in. conveyor to the top of the plant. Entering the plant the material passes over an adjustable splitter. The general practice is to route ⅔ of the sand to a 4 x 12 Allis-Chalmers low-head screen. This screen, with .200 mesh, removes the plus No. 4 or oversize, which is wasted.

Sand passing this screen goes directly to the Dorr HX classifier at the first floor of the plant. The adjustment of the splitter and the amount sent directly to the classifier depends on the run of the sand in the raw sand storage pile. If the percentages of sizes are such that they cannot be easily adjusted to meet specifications by manipulation of the remaining one-third, then the splitter is adjusted to route less through the screen and to the classifier and more through the other processing.

The one-third of the material from the other side of the splitter falls on an Allis-Chalmers 4 x 12 double-deck screen. The top deck, with .200 mesh, removes the oversize which is wasted. The lower deck, with .120 mesh, retains the minus No. 4 to plus No. 8 which can be routed either to stockpiles or the classifier, whichever is desired. Minus No. 8 sand passing the lower deck enters a revolving feed distributor which maintains a constant feed of sand and water into the two Dorrco Sizers.

In these units the sand is separated according to the size of the individual particles. Basically the sizer is a long tank divided into eight sections or pockets. As the sand passes each pocket, streams of water, at calculated velocities, rise from the bottom of the tank. The force of the water is such as to permit a certain size of sand to settle in a pocket, and yet keep the smaller, or lighter weight grains at a level where the flow of water will carry them towards the end of the tank. Water velocity in each succeeding pocket is decreased until, as the flow reaches the end of the sizer, only the very smallest particles remain to be washed out of the sizer and wasted. Sand is removed from the sizer automatically by pressure-controlled releases.

Removal of any excess of the proper percentage for any size is carried out as it leaves the sizer. The discharge spouts are movable and can be set to route the material to a trough that will carry it to the classifier, or to another trough that leads to a dewaterer from where it is taken by conveyor to its individual stockpile. Generally, some portions of sizes 8, and 30 to 50 are removed as they leave the sizer and are stored. Minus 100, when in excess, is usually wasted. The minus 8 plus 16 is used for sand-blasting.

The washed and graded sand taken from the classifier is moved by conveyor to an intermediate sand storage pile with 4,500 tons of live storage. After draining about 72 hr., it is transferred to the finished sand stock pile (6,000 tons live storage). Here it is held for final transporting to the batching plant. The conveyor system is arranged to permit feeding sizes from minus No. 4 to plus 50 directly from their stockpiles to the conveyor leading to the finished sand stock pile. Blending of the different fractions of sand is carried out when the sand passes through the classifier, leaves the intermediate sand storage, and is deposited in the finished sand stock pile.

Transporting to batching plant

The five stock piles for finished products at the main plant are set in a single line about 500 ft. in length. The piles are established with the large gravel, minus 6 plus 3 in. in front and the finished sand in the rear. A common tunnel extends under all piles and each size of gravel and the sand have their individual feeders which can be used to load the 36-in. conveyor that takes the aggregate upstream 4,000 ft. to the batching plant.

Sand is transported up to the batching plant by itself, but the sizes of coarse aggregate are mixed for reasons of economy and capacity in transportation. Also, if the large cobbles were carried up by themselves they would have a tendency to slide or roll back on the belt and pile up. By mixing in the smaller sizes, a cushion to hold the large cobbles is established and they hold their places on the belt.

Rescreening at batching plant

While sand is not rehandled at the batching plant, but sent directly to its proper bin, gravel is rescreened in much the same manner as it was at the main plant, with the elimination of the scrubbing process. One of the major features of this rescreening process is to remove fine material caused by the gravel breaking up in transit.

Organization

Contract for the dam is held by a group of well known Western contractors as a joint venture. The group, known as Pine Flat Contractors, consists of: Guy F. Atkinson Company (sponsor); Bressi & Bevanda Constructors, Inc.; Charles L. Harney, Inc.; J. A. Jones Construction Co., and A. Teichert & Sons, Inc.

Earl Jennett is project manager for Pine Flat Contractors, George Archibald, project superintendent, Guy H. Heimsoth, assistant project manager, R. G. Rofelty, project engineer.

Other key personnel on the project includes: George Forus, aggregate superintendent; Ed Swanson, concrete superintendent; Glen Roper, rigging superintendent; Joe Lawrence, carpenter superintendent; Chas. D. (Red) Marriott, pipe superintendent; Jim Good, assistant electrical superintendent; Norman Chonle, batch plant foreman; Frank Ryan, mechanical superintendent; Paul Pulley, office manager; Fritz Hagist, chief storekeeper; Fred Bales, paymaster; William Blair, plant engineer.

The aggregate production plant was designed by company engineers and Conveyor Co., Inc., of Los Angeles. Belting was supplied by United States Rubber Co. Electrical motors for powering screens and conveyors are General Electric.

For the Corps of Engineers, R. B. Jenkinson is project engineer; C. F. Beatie, construction engineer; R. A. Macdonald, construction management engineer, and W. G. Mitchell, materials engineer.

To purify Soda Lake for irrigation project—

Flushing removes heavy mineral salts

LOOKING SOUTH across Soda Lake as pump at lower left discharges 1,000 gpm. through 8-in. pipe that crosses lake shore and parallels road in background to pass through sluiceway in Soda Lake dike at top of picture. Debris in lake bed remains from mineral salt operations before 1935.

Engineers of the Bureau of Reclamation wanted to use Soda Lake in the Columbia Basin Project canal system, but a layer of sodium carbonate in the lake was sure to contaminate project waters. Excavation of the deposit was too costly; so the Bureau is using water, 1,000 gpm., to "wash nature's face"

By CHARLES F. THOMAS
U. S. Bureau of Reclamation
Ephrata, Wash.

FLUSHING operations to remove a heavy alkalined deposit from Soda Lake, to allow inclusion of the old lake bed in the irrigation canal system of the Columbia Basin Project is currently being carried out by Bureau of Reclamation engineers near Ephrata, Wash.

In planning for the Columbia Basin Project it was discovered that the deep coulees gouged through the area and numerous basins, many of which contained lakes, could be utilized as natural channels for portions of the primary canals. Nearly five miles of coulees and the basin in which Soda Lake lies are being included in the canal system to reduce costly excavation in the tough basaltic strata that is common to the area. Some of the most rugged, badly broken, and spectacular terrain in the region is near Soda Lake.

Soda Lake, when flushed and filled with fresh water, will be a part of the Potholes East Canal which carries water from Potholes Reservoir, near the center of the project, to an area just north of Pasco.

Chemical analyses

Before the lake bed can be used as a part of the canal system, the mineral deposits which could seriously damage or ruin the irrigated lands must be removed. Analysis of water samples shows that boron, potassium, magnesium, chlorine, and various combinations of sodium are present. Sodium predominates by a high percentage and the acid and alkaline content is very injurious to vegetation, excepting certain grasses and "salt" weeds which grow under such conditions.

Preliminary explorations from test holes excavated into the lake bed, together with historical data of earlier attempts to utilize the chemical deposits for industrial use, proved the existence of a bed of sodium carbonate crystals several feet in thickness.

Preliminary lake bed explorations were carried on from a boat. Hand augers and sounding rods were used to determine the depth and thickness of the crystal beds. Analytical work has been performed in the Boise and Denver offices of the Bureau.

Test pits dug through the slime since the lake was recently de-watered have definitely located the stratum. Measurements show the crystaline bed to vary from two to four feet in thickness. The total area of the bed has not been determined but exploratory work is being continued while the leaching process is being carried out. The various chemicals identified in a preceding paragraph indicate the wide diffusion of minerals throughout the ooze of the lake bed.

The deposit of minerals is believed to have developed through the centuries by slow deposition from numerous springs in the lake basin and at lake bed level. No heavy flows have been discovered, no high pressures have been encountered, and no indication exists that shows similarly contaminated water at higher elevations. One slightly alkaline spring, suitable for drinking water, adjacent to the lake and only a few feet above the lake level will be so greatly diluted by the canal water that no future difficulties are expected.

Several plans for removing the minerals have been studied: Burying the deposit under a heavy compacted blanket of earth might not prevent the future rise of injurious chemicals and resulting water pollution. Mechanical removal of the chemical-laden silt and crystal beds would involve loading and hauling approximately 400,000 cu. yd. of wet muck. Rejecting the covering or removal left the alternate and least expensive method of removal by flushing.

"Operation Flush"

Because of the known ready solubility of the sodium crystals and expected rapid impregnation of fresh water with the latent salts of the sediment, the pumping and flushing procedure should be entirely effective. Following the pumping out of foul water, the lake is refilled with fresh water.

Large pipe manifolds have been connected to the 8-in. discharge pipe line and through 12 to 14 hose jets connected to the manifold, water is recirculated until a high percentage of salt has been

picked up. This water is then pumped from the lake into potholes lying south of the dike.

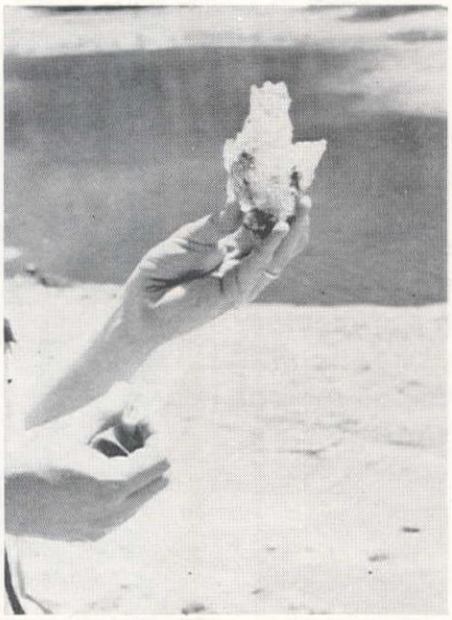
To speed the chemical pickup, blasting of the crystallized sodium has been commenced. Shallow pits are dug to the salt bed and mud-capped shots consisting of 8 sticks of 40% dynamite are exploded. The beds are thereby broken up and provide many more broken areas for water action.

When the fresh water has absorbed a high percentage of salts it is then pumped out. The program of alternately emptying and refilling will be continued until the area has been cleansed of the injurious salts and possible damage to crops and lands eliminated.

Pumping operation

At the north end of the lake a 1,000-gpm. electric centrifugal pump has been installed. Water from the lake is discharged through 3,000 ft. of 8-in. pipe into a chain of deep potholes a short distance south of Soda Lake Dike and into a coulee where the water cannot readily reach Crab Creek, a nearby fresh water stream. To reduce the pumping head the discharge line is laid through the sluiceway, thirty feet below the crest of the dam. Two to three shifts of pumping are required to pump the water from the lake.

At a site on Crab Creek, 1¼ mi. southwest of Soda Lake, another electric pump, 150-hp., and 1,500-gpm. capacity, was installed. Over a mile of lines, consisting of one line of 8-in., and one of 6-in. pipe, has been laid. Pumping against a head of 200 ft., it is estimated that this unit will return more than 1,300 gpm. of fresh water to the lake. Power for the operation of the pumps is supplied by the Washington Water Power Company, over lines especially installed for the work. Installed transformers furnish 440-volt, three-phase current for pump operation.



CRYSTALS of sodium carbonate like this formed layer that was several feet thick when flushing began.

Fresh water will be pumped from Crab Creek into Soda Lake where it will be held for approximately three days and recirculated until it has absorbed a load of chemicals. Large manifolds, to which are attached 12 hose lines, have been attached to the pump line and constant jetting is maintained to speed the chemical pickup. Careful studies are being maintained to observe the success of the plan and the rapidity with which the percentages of salts are reduced.

The pumping program has been established, and will be maintained, on a three-shifts-per-day, seven-days-a-week basis. It is estimated that it will require six months to completely remove the chemicals.

Soda Lake Dike, an earthfill structure completed last May by the Guy F. Atkinson Company, will create a greatly enlarged lake whose surface will be 118 ft. above that of the present lake and will cover nearly 1,500 acres. This dike is 1,700 ft. long, with a height of 125 ft. It averages about 300 ft. wide at the base and 30 ft. wide at the crest and has a mass of 221,000 cu. yd. of earth and rock.

When Potholes East Canal is in service, water will be released through the headworks of O'Sullivan Dam, flow a mile through an excavated channel, enter natural channels above Soda Lake and then pass into Soda Lake itself. From Soda Lake the 3,900 cfs. of water ultimately to be carried will enter another section of Potholes East Canal to be carried and distributed as irrigation water to a total of 254,000 acres of irrigable land.

Standards established for perlite concrete mix designs

THE PERLITE INSTITUTE has completed a series of five recommended standard mixes for light weight insulating perlite concrete (see table).

This is the first time the joint experience and technical knowledge of mix ratios, water cement ratios, air entraining quantities, etc., have been established. As an example, a contractor can determine exactly how much cement, perlite, gallons of water and air entraining agent must be purchased for each cubic yard of placed concrete. The designer may know in advance what the weight of the dry concrete will be and what its compressive strength will be.

With this information all elements of the building industry may be assured of the most economical way of producing the desired properties of light weight, insulating perlite concrete for roof insulation, floor and roof fill, and the compressive strength of the resulting concrete, if it is used as a structural material. Extremely light weight aggregates, such as perlite, can produce economies and advantages that heretofore have not been available in concrete. A sense of departure, however, must be recognized when perlite concrete is compared to sand and gravel concrete. They do not compete in the same field. Where the designer is accustomed to specifying a compressive strength of 2,000 to 4,000 psi. for concrete used as footings, retaining walls, columns, bridges, etc., perlite concrete frankly does not belong. On the other hand, where light weight, fire resisting, insulating concrete is desired, such as in roof and floor fill, radiant subfloor slabs, fireproofing, curtain walls, partition or wall masonry units, roof decks on short spans between steel joists —here is the field for perlite concrete.

STANDARD MIX DESIGNS
Lightweight insulation perlite concrete

DRY CONCRETE PROPERTIES			MIX PROPORTIONS BY VOLUME					MATERIALS REQUIRED FOR ONE CUBIC YARD OF PLACED CONCRETE			
Density (Lbs/cu.ft. Oven Dry)	Compressive Strength (psi. at 28 days)	Thermal Conductivity "k"	Cement (Sacks)	Perlite (cu.ft.)	Water (Gal. per Sack Cement)	Air Entraining Agent‡ (Pints)	* Wet Density as Poured (lbs./cu. ft.)	Cement (Sacks)	Perlite (cu.ft.)	Water (Gals.)	Air Entraining Agent‡ (Pints)
35	490	.93	1	4	9	1	49	6.50	26	58½	6½
29	280	.77	1	5	11	1¼	42½	5.20	26	57	6½
26	220	.70	1	6	13	1½	40	4.33	26	56½	6½
23½	160	.65	1	7	15	1¾	38	3.70	26	56	6½
21½	125	.62	1	8	17	2	37	3.25	26	55	6½

* Based on average aggregate density of 8.0/cu. ft. Strength data based on ASTM Type I Portland Cement. For higher early strengths, use ASTM Type III Portland Cement.

‡ Available from Perlite Institute Members.

Other desired properties of strength, insulation and density may be obtained by varying proportions of cement, air entrainment, or addition of supplementary aggregates. These variations can also be provided in transit-mix perlite concrete.

For best results, use the following mixing procedure:

1. Put required amount of water and air entraining agent in mixer.
2. Add portland cement and mix to uniform slurry—usually about ½ minute mixing period required.
3. Add perlite aggregate and mix until desired workability is obtained—usually about 2 minutes.

Tecolote Tunnel is advanced four miles in—

Tough going through the Coast Range

To deliver water from Cachuma Reservoir to the Santa Barbara area, Halvorson Contractors are driving the 6.4-mi. bore from two headings through sedimentary formations and the Santa Ynez fault—Concrete lining will be started as soon as the tunnel has holed through

SHEARED and slicken-sided clayey siltstone was a common formation before the north heading passed through the Santa Ynez fault.

DRIVING A TUNNEL through the Coast Range of California represents a construction job requiring skill, perseverance and resourcefulness. Under trying conditions progress is slow but steady on the Tecolote Tunnel being driven by Halvorson Contractors, for the Bureau of Reclamation as an essential feature of the Cachuma Project near Santa Barbara. For a distance of 6.4 mi. the 7-ft. (finished) horseshoe tunnel will pierce the sedimentary formations of the Coast Range, varying through all types of sandstone, siltstone and shales, including the massive Santa Ynez fault zone. Driving from both portals has now progressed a total distance of 4.1 mi. (August 1) and preparations are under way for setting up the plant for concrete lining operations, which will be started as soon as the bore has been holed through.

Tecolote Tunnel will deliver stored water from the Cachuma Reservoir to the conduit on the coast side of the range, to serve Santa Barbara and the adjacent irrigated area. General features of the project and the construction operations on Cachuma Dam were reviewed in *Western Construction*, August 1951, pp. 63-65. Complete unit bids were published in the March 1950 issue, p. 118, and a preliminary description of work at the site appeared in the issue of August 1950, pp. 67-68. The present article will describe the geological conditions encountered and the general arrangements and procedure for driving up to the present time.

Geology

The type of material to be encountered by the contractor can be most easily and briefly indicated by the terms of the geologist, even though they will give only a partial concept of the actual day-to-day working conditions. Starting at the inlet (north) end of the tunnel the formations and their approximate extent are (determined principally from surface study and subject to revision):

0— .5 mi.	Green gray to black, laminated, punky, diatomaceous shale; sometimes cherty or porcelaneous. (Monterey Formation.)
.5—1.8 mi.	Massive, soft brown to gray, calcareous, clayey siltstones and shales, with minor limestone, sandstone and concretionary beds, becoming more sandy to the south. (Rincon Formation.)
About 1.75 mi.	Santa Ynez fault zone.
1.8—3.6 mi.	Gray to black, well indurated shales, with intercalated, well cemented medium grained sandstones. (Anita Shale.)
3.6—4.0 mi.	Massive, gray, well cemented coarse sandstone. (Matilija.)
4.0—5.8 mi.	Well cemented, well bedded grayish green, micaceous shales, sandstones, and minor conglomerates. (Cozy Dell Shale.)
5.8—6.5 mi.	Massive, medium to fine grained, moderately well cemented, sandstone, with very minor interbedded shales. (Coldwater Sandstone.)

As indicated, about 1.75 mi. from the north portal the line intercepts the Santa Ynez fault which is classed as geologically active, although there has been no reported movement in historical times. This fault was produced during the formation of the Coast Range when a relative displacement of as much as 10,000 to 20,000 ft. occurred dragging the formations to the north upward with the movement on the southern side of the fault, creating a crushed and badly broken zone of several hundred feet, as described later.

All of this sedimentary rock is potential oil and gas formation and petroleum companies are following closely the driving progress and the geological structure encountered. In fact, an arrangement has been worked out by these companies and the Bureau of Reclamation by which samples are released to all interested parties jointly.

This brief review of the geological condition indicates that the more difficult conditions would be encountered on the north end, including the passage through the fault, and the following review of driving operations will be confined to the work from that portal.

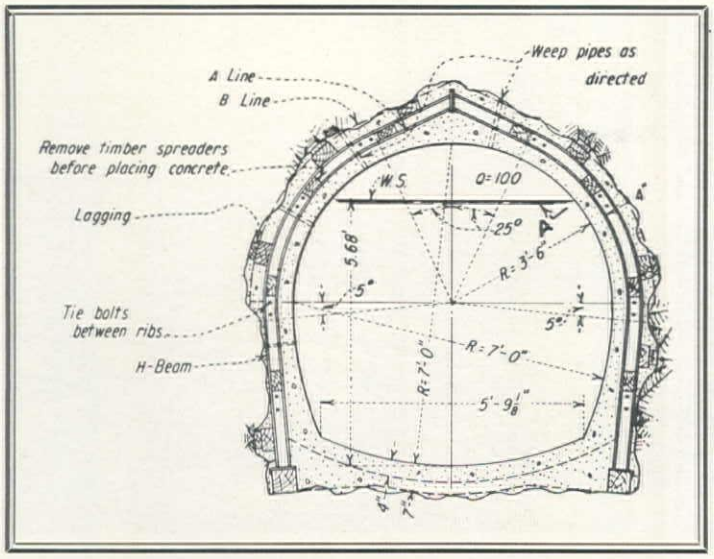
Design

In finished size the tunnel will be 7 ft. clear inside the concrete lining, and of horseshoe section. In the unsupported section the specifications call for 7 in. of concrete as a minimum with 3½ in. inside the "A" line. In the supported ground the concrete will be 4 in. thick inside the ribs.

Slope of the tunnel is 0.00025 to the south and the capacity is rated at 100 cfs. The tunnel is designed for free flow.

The inlet is controlled by an intake tower with gates set at various elevations so that the water may be taken from the reservoir at predetermined levels.

Design has recently been completed on the intake tower and the contractor plans to start construction on this feature before excavation operations are complete. The tower is a reinforced concrete structure approximately 120 ft. high from the bottom of the base to the deck which is about 15 ft. above normal high-water elevation. Deck of the tower



SECTION with steel-rib supports showing principal tunnel dimensions and the water depth at 100 sec. ft. capacity flow. Ribs are either 4- or 5-in. size and spacing varies from 5 ft. to a minimum of 2 ft. through the fault zone.

WATER in the north heading has never been a serious problem as to volume, but softens the shale and siltstone, as indicated, to make the tunnel floor difficult for track laying and maintenance.

will be reached from an access road by a 154-ft. steel bridge. Suitable fish screens and trashracks are provided over the water openings in the tower. The tunnel from the intake tower to the gate structure has been changed from a horseshoe to a circular section as this portion will operate as a pressure tunnel. The contractor has ordered his forms constructed so that they may be adapted to either the horseshoe or the circular section.

Outside installation

Electric power from existing lines is limited and as a result the compressor installation of the contractor consists of three 500-cfm. portable (diesel) units mounted on semi-permanent blocking. Electric power, which is available, is used to operate the 3,000-cfm. positive displacement blower used for ventilating.

Locomotives operating on the 24-in. gauge track are of special design with a 32-in. maximum width. Normally for this size tunnel a 40- to 44-in. width of locomotive would be used, but the need for clearance at passing-track switches made the special width necessary. Further, these locomotives will be used for hauling the lining concrete for the entire length of the tunnel, which means a maximum 13-mi. round trip and requires a 6-ton size for adequate power. The narrow width and the required battery weight results in an unusual size of locomotive, 32 in. wide and 18 ft. long. This special design was developed by Atlas Car and Manufacturing Co.

Cars are also of special design with a 32-in. width and 1½-cu. yd. capacity. Ventilating pipe is of 14-in. size, the maximum possible for the size of tunnel and equipment. Water lines are of 6-in. size.

Electric power for light and inside ventilation is carried into the tunnel at 2,300 volts and stepped down at 1,000-ft. intervals by transformer stations.

It is almost useless to try to outline driving procedure at the north heading because work at the face changes so frequently with ground conditions. Where the rock was of reasonably hard siltstone the jumbo would be set up and the drills put in a 5½-ft. round of from 18 to 30 holes. This would be mucked out in 15 to 20 car loads and the 4-in. steel ribs were set on the normal 5-ft. centers. This sequence would represent a 25 to 40-ft. advance per day.

However, any drilling plan in the north heading was subject to change almost any round. Any fixed program for work at the face is impracticable and advance is made by the method and in the units of length required by the ground. In one section auger-drills were used successfully in soft shale.

Heavy ground and pilot holes

Heavy and working ground, with pressures continuing indefinitely, have required frequent changes in the use of the steel supports and maintenance behind the face. Near the fault zone the supports were increased to the 5-in. size rib and spacing was decreased to 2 ft. with complete timber lagging. Progress through this area was correspondingly slow. Again, the lateral pressure has tended to push in the lower ends of the ribs and the foot blocks, and steel spreaders have been used in some short sections.

Specifications called for carrying forward a pilot hole each round, when necessary. The plan is to do this whenever ground conditions indicate that such a test would be prudent. This precaution was used rather irregularly during early stages, but the present requirement is to drill one of the pilot holes each round—18 to 25 ft. deep alternating in right and left sides of the face. The object of the pilot hole has been to enable the nature of the ground to be anticipated. Grouting has been carried out at several places and the greatest use amounted to 2,519 sacks of cement for a single hole.

A serious delay

About 8,500 ft. in from the portal the ground conditions were getting progressively worse when suddenly the pilot hole developed a run of water and sand estimated to be all the way from 100 to 250 cu. yd. This run was mucked back to within 45 ft. of the face and a plug consisting of sacked cement built across the tunnel. The sacked cement plug was faced with a gunite plug keyed into the surrounding rock approximately 2 ft. The sacked cement and gunite plug was built a distance back from the original heading while the sand and water were flowing, for the primary purpose of limiting the volume of sand entering the tunnel. After the plug was constructed the contractor elected to finish it with gunite in this position as the tunnel section at this station was a fairly well-cemented conglomerate, whereas the heading was a tightly compacted sand or poorly cemented sandstone. After the plug was completed, the void between the plug and the face was filled by pumping in sand. Working behind this plug, drilling was carried forward to a depth of about 100 ft. and a total of 4,600 sacks of grout pumped in. This work and the related problems caused the most serious delay in progress to date.

Ventilation system and operation

At the time of the sand and water flow, methane gas developed in the formation and a minor explosion resulted in a modification of ventilation practice. As a result, the work in this heading is now being carried forward under rules and regulations which apply to all underground work in gaseous conditions. Gas readings are taken in the heading after every round. This changeover did not cause any delay and has not interfered with driving, as the tunnel was originally equipped for the possibility of gas.

The contractor has installed a positive displacement, 3,000 cu. ft. per minute, Sutor-built blower at each portal and the fresh air is carried to the heading through a 14-in. diameter fan line. The fans may be reversed to blow or to suck as may be required. The general practice

Continued on page 150

Delivery of water in July marks—

Completion of Salt Lake Aqueduct

Thirteen years ago construction started on Deer Creek Dam to provide the main storage for the Provo River Project — Final contracts have now been completed on the terminal reservoir at the end of the 41.7-mi. aqueduct

ON JULY 16 the first water from the Salt Lake Aqueduct Division of the Provo River Project was delivered into the mains of the Metropolitan Water District. This represents an historic event in the completion of the project, built by the Bureau of Reclamation, that will deliver storage from the Deer Creek reservoir to meet increasing municipal, industrial and irrigation needs in the Provo-Salt Lake City area of Utah. The terminal reservoir at Salt Lake City, being built by Peter Kiewit Sons' Co. under a $1,259,940 contract, will be completed before the end of the year and will finish the $13,000,000 construction program on the aqueduct division of the project.

Dating back to 1935, when the citizens of Salt Lake City approved the formation of a metropolitan water district, the main project has moved forward steadily toward completion, with the exception of a short interruption during war years. A record of the coverage provided by *Western Construction*, including both descriptive articles and unit bid tabulations, is summarized in a table on this page.

Articles and news notes on Salt Lake Aqueduct

Salt Lake City votes approval of metropolitan water district	September 1935
Review of Deer Creek Project	October 1939
Deer Creek Dam construction	November 1939
Precast concrete pipe technique	November 1940
Work on aqueduct resumed (news note)	March 1943
Pipeline construction methods	November 1945
Voters approve financing to complete aqueduct	January 1947
Tunnels No. 1, 2 and 3 on aqueduct	August 1948
Contract awarded for final 5-mi. section (news note)	December 1948
General review of project	December 1949
Difficult pipeline work	February 1949

UNIT BIDS ON SALT LAKE AQUEDUCT

Deer Creek Dam	March 1938
Tunnels on aqueduct	February 1939
Salt Lake City Aqueduct (portion of)	September 1939
Weber-Provo diversion canal structures	December 1941
Provo reservoir canal	May 1944
Salt Lake Aqueduct (portion of)	August 1947
Jordan Narrows pumping plant	September 1947

All references are to issues of Western Constructon (News).

The Provo River Project is one of the first developments of the Bureau of Reclamation which provided for the extension of an irrigation development to supply municipalities with water which was found to be in excess of irrigation needs. In the case of the Salt Lake Aqueduct the finding of feasibility for the project also indicated that the irrigationists regarded the program as a definite measure to avert further encroachment of municipal requirements upon their irrigation supplies.

In passing, it is interesting to note that the project fulfills a prophesy Brigham Young made in 1856 when he said: "In time water will be brought to Salt Lake Valley from Provo Canyon."

Salt Lake City takes steps

The first formal step taken by Salt Lake City toward participation in the Provo River Project was to apply for membership in the Provo River Water Users Association, the entity that was to contract with the United States Government for repayment of project costs exclusive of the Salt Lake Aqueduct. This organization was completed in May 1935. The next step was formation of the Metropolitan Water District of Salt Lake City, approved by a majority of the electors of Salt Lake City by public election on Aug. 15, 1935. The city's interest was then assigned to the district.

Project feasibility was approved by the Secretary of the Interior on Nov. 13, 1935. It received Presidential approval Nov. 16, 1935, and final authorization was given on June 22, 1936. A contract to repay costs of the Deer Creek Divi-

sion, including a dam and reservoir, was executed by the association, of which the Salt Lake Metropolitan Water District is the largest shareholder, on June 27, 1936. A separate contract was subsequently signed by the Metropolitan Water District of Salt Lake City on Nov. 16, 1938, providing for construction of the Aqueduct Division and thus assuring the means by which the District was to convey its share of storage water to the city distribution system.

First construction in 1938

A PWA allotment of $415,000 permitted construction to go forward as a PWA project under Reclamation Law. Construction was commenced in March 1938, the storage facilities were completed in October 1941, and work commenced on the aqueduct Dec. 22, 1938

HIGH PRESSURE sections of the aqueduct totaling 5.49 mi. were of steel design.

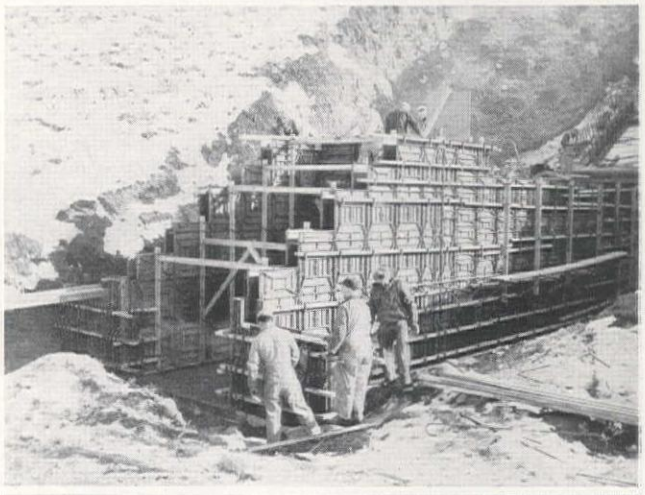
and Jan. 13, 1939 when separate contracts were let for construction of Alpine-Draper Tunnel and Olmsted Tunnel—combined length 3.5 mi.

The remaining aqueduct construction was accomplished under seven additional contracts, four of which called for 31.77 mi. of concrete pipeline and structures, two for 5.49 mi. of high head steel pipeline, and one for 0.81 mi. of tunnels. Final contract on the aqueduct proper was completed on Aug. 20, 1950 by the United Concrete Pipe Corp.

District gets 46,500 ac. ft.

The District's full subscription of 46,500 ac. ft. or 15,170 million gal. annually compares with a total consumption of 17,003 mg. for 1949 by city and outlying areas prior to availability of Deer Creek water. The 1949 consumption was equivalent to 219 gal. per day per capita, based on an estimated population served of 212,600. On this basis of 219 gal., the district's annual subscription from Deer Creek Reservoir obtainable through the aqueduct would serve an estimated additional population of 187,500 persons or

IN FINE-GRADING the side slopes of the terminal reservoir, Peter Kiewit Sons' Co. used a tractor, aided by tractor-winch, to pull a reverse blade which rested on steel screeds.



STEEL FORMS in place on the wasteway stilling pool structure at the terminal reservoir which has a 40,000-gal. capacity. The wasteway permits by-passing the aqueduct flow into Parley's Creek.

TRANSFERRING a load of cement from Dumpcrete truck to bucket which was handled by crane directly to the point-of-pour on slopes and part of floor slab. A total of 260 concrete columns support the 7½-in. slab roof.

IN THE CENTER of the reservoir floor, where the crane could not place concrete directly, Gar-Bro motor dump biggies were used to rehandle the mix.

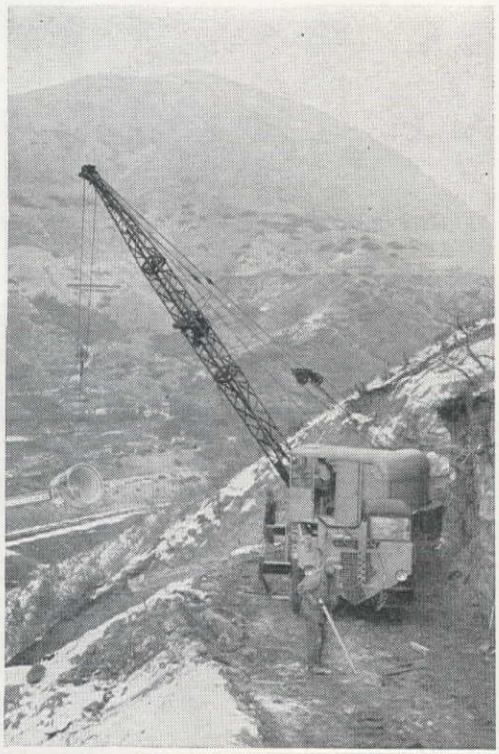
Laying 48-in. pipe on 80% grade was winter construction problem

TO PROVIDE a by-pass for the Salt Lake Aqueduct at the Terminal Reservoir a 48-in. concrete pipe wasteway was laid on a slope approaching an 80% grade to a stilling basin, which will discharge through Parley's Creek to Great Salt Lake. Contract for supplying the pipe for this wasteway was carried out by the Utah-Idaho Concrete Pipe Co. of Salt Lake City, and the sections were cast in the company's Ogden plant. About 3,200 ft. of the line at the reservoir end is on a relatively flat grade, and a sharp turn then sends the remaining 200 ft. of the line down a grade of as much as 80%.

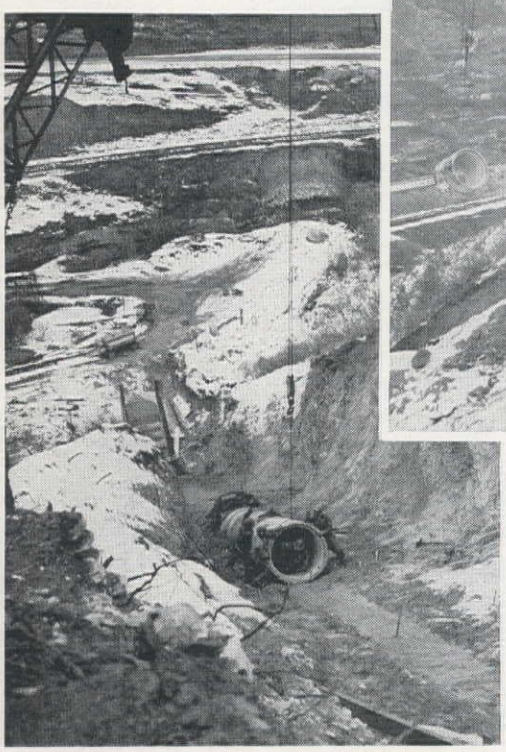
Excavation of this trench was started last October 24 and the work was rushed through the early winter, since completion of this wasteway, and its use as a by-pass was essential for the start of water deliveries from the Salt Lake Aqueduct. Fine grading was started November 7 and the first load of pipe arrived the same day. On the following day a total of 39 sections of pipe were laid. Excavation on this rush job was completed by December 2 and pipe laying was finished by December 16, except for the 46 pieces to be placed on the steep grade. Trenching was carried out by dragline, with cuts up to 25 ft. deep. About 33,000 cu. yd. of dirt was removed. The pipe was manufactured in accordance with A.S.T.M. Designation C-76-41 for circular pipe with circular reinforcement.

Weather was important for this rush job and was favorable as to temperature, but severe rains the last week of November made delivery of pipe extremely difficult. Pipe was moved on semi-trucks which were pulled or pushed through deep mud to the trench site.

Work on the wasteway was under the general direction of W. G. Waigand for Peter Kiewit Sons' Co.



RUSHED through winter weather (right) the wasteway line followed a flat grade until turning to plunge down an 80% slope.



LAYING the 48-in. pipe (left) up the steep slope from the stilling basin. This line will handle reservoir overflow or will permit by-passing.

a total population of about 400,000, assuming that the 219 gal. per day figure is an annual average.

Salt Lake City's present population, according to the 1940 census is 181,902 for the metropolitan area. Even with industrial demands on Salt Lake City water sharply increasing and population growing steadily, district officials estimate that slightly more than half of the new supply from the aqueduct plus previous supplies will be sufficient to serve the city's needs for the next 30 years. The district proposes to lease the remainder to irrigation and culinary water groups in Salt Lake City and south Salt Lake County.

District obligations

On July 1, 1951, the district paid the U. S. Government $200,000 in evidence of good faith and to apply on its $13,-043,458 obligation, for construction of the aqueduct ($11,236,671) and terminal reservoir ($1,806,787). The district has 55 years in which to pay this obligation. In addition, it is obligated to pay another estimated $7,998,000 in equal installments as provided by contract to the United States for its share of the cost of constructing Deer Creek Dam and related structures, including Duchesne Tunnel which is scheduled for completion in February 1953.

The Salt Lake Aqueduct is the principal feature of the aqueduct division of the project which also supplies domestic water to six other municipalities, including Provo, in addition to furnishing a supplemental water supply for irrigation of some 46,000 ac. of highly productive farm lands in Salt Lake and Utah counties. The steel plant at Geneva has also benefited from project water.

Water supply for the aqueduct is derived chiefly from two transbasin diversions—approximately two-thirds from the Weber River system and one-third from the Colorado River Basin. Only in occasional years can surplus water of Provo River be stored to supplement the other sources.

Immediate source of supply for the aqueduct of course is Deer Creek Reservoir, 152,600-ac.-ft. capacity. The reservoir is designed to provide a safe annual yield of 100,000 acre-feet and tends to insure the Metropolitan Water District of Salt Lake City its full subscription of 46,000 acre feet annually even in dry years.

Pipe gaskets of rubber

An interesting design development during construction of the aqueduct was a special adaptation of the bell-and-spigot type joint connecting the 20-ft. precast concrete sections of the line. This was devised by Reclamation engineers to overcome the problem of leaks that otherwise might develop due to the many turns in the line necessitated by the rugged terrain. Sealed by circumferential rubber gaskets together with inside-outside grouting, the joints are noted for their unusual water tightness.

Salt Lake Aqueduct vital statistics are:

Length: 41.7 mi.
Type of construction: Steel-reinforced,

precast concrete pipe with 7½-in. shell thickness for heads up to 150 ft., and ¼ to ½-in. plate steel for the high pressure sections comprising approximately one-eighth of the total length.

Inside diameter: 69 in.
Designed capacity: 150 sec. ft.
Elevation at intake: 5,266 ft.
Average drop per mile: 9.0 ft.
Maximum hydraulic head along line: 325 ft.
Location: The aqueduct extends from Deer Creek Reservoir about 17 mi. northeast of Provo, to the southeast city limits of Salt Lake City.
Water supply: 15,170 mg. (46,500 ac. ft.) annually.

Contracts provided for completion of all work required to deliver water through the aqueduct to the existing Samuel C. Park Reservoir, into the city's 48-in. feeder main (previously constructed), or by-passed into Parley's Creek via a 48-in. wasteway by April 1951. As soon as gates were installed in the influent and effluent lines connecting the aqueduct to the terminal reservoir, the city was able to take delivery of water during construction of the terminal reservoir.

Terminal reservoir

Contract for construction of the terminal reservoir was awarded September 20, 1950. The 40,000,000-gal. reservoir actually consists of two compartments, each of 20,000,000-gal capacity, which can be operated singly or in tandem. The reservoirs are identical structures with reinforced concrete floors, walls, and roof slabs. Inside dimensions are 197 by 344 ft. Side walls are on a 1½:1 slope for a height of 24 ft., and then rise vertically for an additional 6 ft. The roof is of flat-slab design and is supported by columns on 22-ft. centers. A 48-in. reinforced concrete pipe wasteway 3,500 ft. long and a chlorination and control house are included in the construction which is the first of its kind carried out by the Bureau of Reclamation.

Scrapers were used for the excavation, for filling berms on the sides, and between the reservoirs, and will also be used for handling the earth covering. After rough grading of the side slopes, steel rails were set to exact slope and used as screeds for precise scraping to 1½:1 by means of a tractor pulled to the top of the slope and backed down, scraping as it went with blade mounted in reverse (see illustration).

Wasteway and by-pass

The 60-in. concrete influent and effluent pipes, cast in place, convey the water from the aqueduct into and out of the reservoirs. Pipe lines and valves interconnect the effluent pipe of the No. 1 Reservoir with the influent of No. 2 so that dual operation will allow complete freedom in filling, discharging, and draining — simultaneously, alternately, or from one reservoir to the other. Each effluent and influent line has its own valve tower.

Drainage of the reservoirs into the aqueduct wasteway is accomplished through a separate system consisting of two 20-in. cast-iron drain pipes leading out under each reservoir to a junction box, thence into the wasteway. Five 4-in. tile subgrade drains in each reservoir empty into central drain boxes and thence into the wasteway.

An overflow wasteway inlet structure on the aqueduct near the terminal reservoir provides an automatic overflow system in event of emergency, or for deliberate discharge of water into the wasteway and thence to Parley's Canyon where a chute structure with stilling basin discharges into Parley's Creek and thence into Great Salt Lake, unless diverted for other purposes.

A total of 260 concrete columns 18 in. by 30½ ft. high support the 7½-in slab roof. Rubber strips of 6-in. width and cork filler material are used in the joints separating the 60 x 80-ft. concrete sections of reservoir floor and sides, serving both as expansion joints and to provide watertightness.

Personnel

Overall work on the Provo River and Salt Lake Aqueduct Projects is under the direction of the Bureau of Reclamation, Region 4, E. O. Larson, regional director; L. R. Dunkley, project engineer; W. F. Gentry, field engineer; V. B. Wonnacott, field office engineer.

W. G. Waigand is superintendent for Peter Kiewit Sons' Co. on the terminal reservoir contract.

Aluminum truck body hauls gravel with gain of ½ ton in legal payload

FOLLOWING satisfactory use of aluminum dump truck bodies for increasing payloads for routine hauling and on-the-road service, A. Teichert & Sons, Inc., Sacramento, Calif., recently added to its fleet of trucks equipped with lightweight bodies a tractor and semi-trailer unit having an aluminum dump bed, as illustrated.

Design features of the aluminum bodies and savings in payloads obtained with the single axle, single drive dump trucks placed in use last summer were reviewed previously (*Western Construction*—September 1950, pp. 88-89).

Carrying 28,000 lb. per load, the new unit is being used to transport sand and gravel from the firm's source of supply in Tracy to a plant at Stockton, a round-trip distance of 60 mi., and for delivery of hot mixes the firm supplies to local buyers. According to Marc Fosgate, Jr., engineer in charge of transportation at Teichert & Sons' Stockton plant, the lightweight body permits them to obtain legally an estimated ½ ton extra per load. (Statistics taken during operation of the first units revealed a gain of approximately 1,600 lb. on each payload.) When hauling between Stockton and Tracy the unit makes five round trips in a nine-hour day or 300 mi. per day. Drivers of the unit report that it handles as easily as a light pickup.

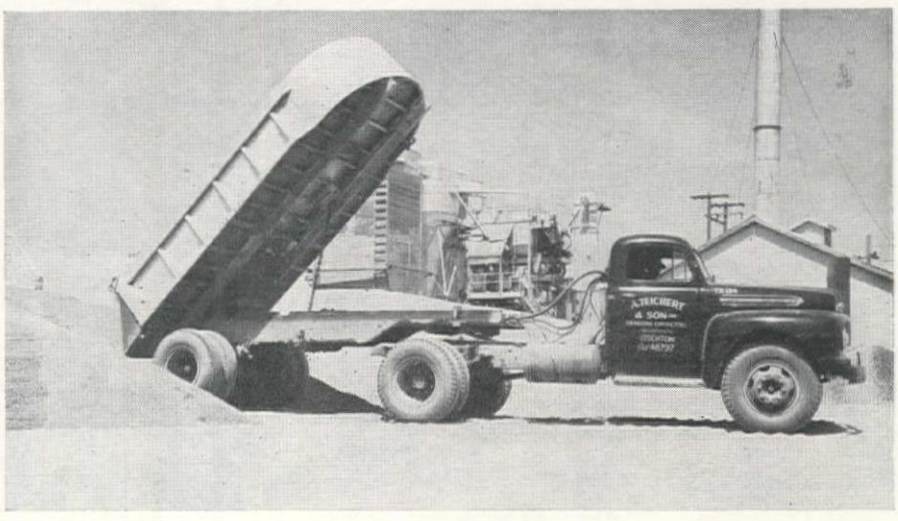
The new dump body is 16-ft. long, 7 ft. wide, and has a capacity of 7.8 cu. yd. With the exception of two steel longitudinal members of 6-in. I-beams, and the steel body hoist, it is built entirely of rolled aluminum sheets. Sheets of ⅛-in. material are used for the sides and headboards and the balance is made from 3/16-in. sheets. Cross-ribs are also aluminum. The body is mounted on a single-axle trailer and has a Ford F-8 single-axle, single-drive tractor unit.

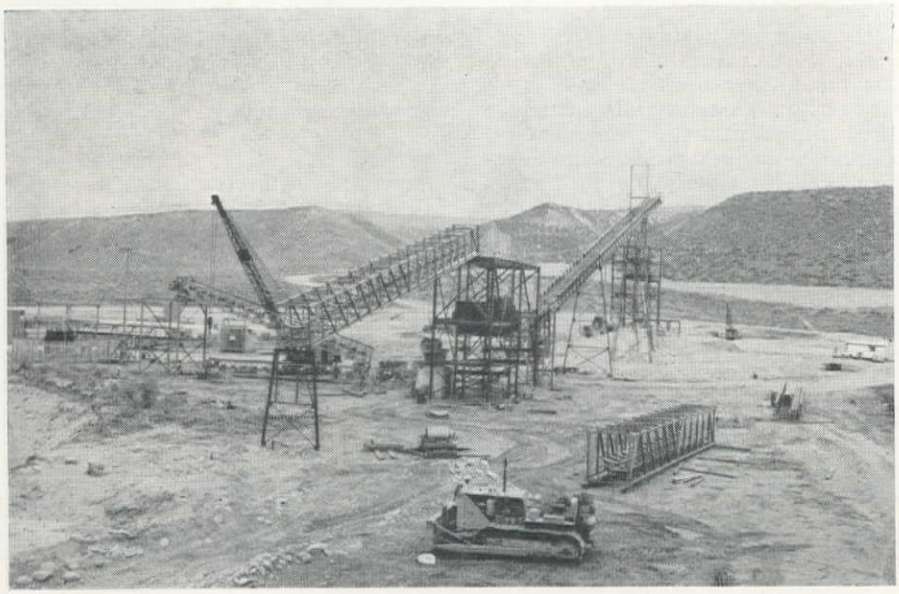
Tests conducted on the earlier trucks indicated that welded connections gave better service than riveted connections when hot materials were handled. Due to these tests the connections of the new unit are all welded.

The truck bodies have withstood abrasion from ordinary material. The aluminum will not withstand heavy impact, such as would result from stone dropped from a bucket, but ordinary loads of crushed stone, screenings, hot mix and cutbacks only tend to keep the aluminum bed shiny.

Bodies were manufactured by the Richmond Division (Calif.) of Gar Wood Industries, Inc., and use the Gar Wood model F8C cam and roller hoist.

WEIGHT SAVING in the 3/16-in. sheets of aluminum and all-welded construction enable this 7.8-cu. yd. body to handle an extra ½ ton of payload.





Erecting a 400-ton-per-hour aggregate plant at "Chief Joe"

ERECTION of an aggregate plant with a 400-ton-per-hour output for construction of Chief Joseph Dam was recently completed by Chief Joseph Builders (L. E. Dixon Co., and Arundel Corp.) on the banks of the Columbia River at Bridgeport, Wash. Under direction of the Seattle District, Corps of Engineers, the Chief Joseph project represents one of the major developments on the Columbia River. A straight, gravity overflow type, the dam will be 220 ft. high and 1,484 ft. long. The accompanying powerhouse will be the longest single such structure in the world and be equipped with 27 generators having a total rated output of 1,728,000 kw., second only to Grand Coulee. Design features and problems involved at Chief Joseph Dam were reviewed in *Western Construction*—March and November 1950, and August 1951.

Chief Joseph Builders holds the contract for the second stage, $25,967,921, which includes all concrete work within the first cofferdam, removal of cofferdam, construction of second cofferdam and concrete work inside second cofferdam on south side of the river.

Aggregate for the concrete will be taken from an area located about 3½ mi. west, or downstream, from the dam. The contractor elected to construct the plant at the quarry site and have finished aggregate trucked to the batching plant near the dam site. Aggregate transportation will be handled by a sub-contractor.

Quarry operation

For excavating material in the quarry a 120-B Bucyrus-Erie electric shovel with 6-yd. bucket will load an 8-cu. yd. pit hopper with a double-acting feeder. The pit hopper sits on a 48-in. pendulum conveyor 120 ft. long. Material will be carried on the pendulum conveyor to the primary crusher, a 30 x 42 Pioneer jaw crusher with 12-in. grizzly which rides on a rail car. The pendulum conveyor is connected to the crusher rail car by a universal joint that permits it to have both horizontal and vertical movement, with a swing of 180 deg. around the crusher. Crusher is 34 ft., 6 in. high and its car is blocked on rails on a 10-in. gauge.

In operation the shovel will work in a circular course around the pit hopper. When the circle has been completed and shovel can no longer reach the hopper without moving, it will pick up the hopper and pendulum conveyor and swing it to a new position. This will continue until the shovel and hopper have swung in a full 180-deg. arc around the crusher. The conveyor which carries material from crusher to transfer point is so constructed as to allow sections to be added. After excavation has moved in a full arc around the crusher a section is added to this conveyor which in effect places the crushing unit a greater distance from the transfer point and farther into the pit. It is estimated that this conveyor will reach a full 400 ft. before the project is completed.

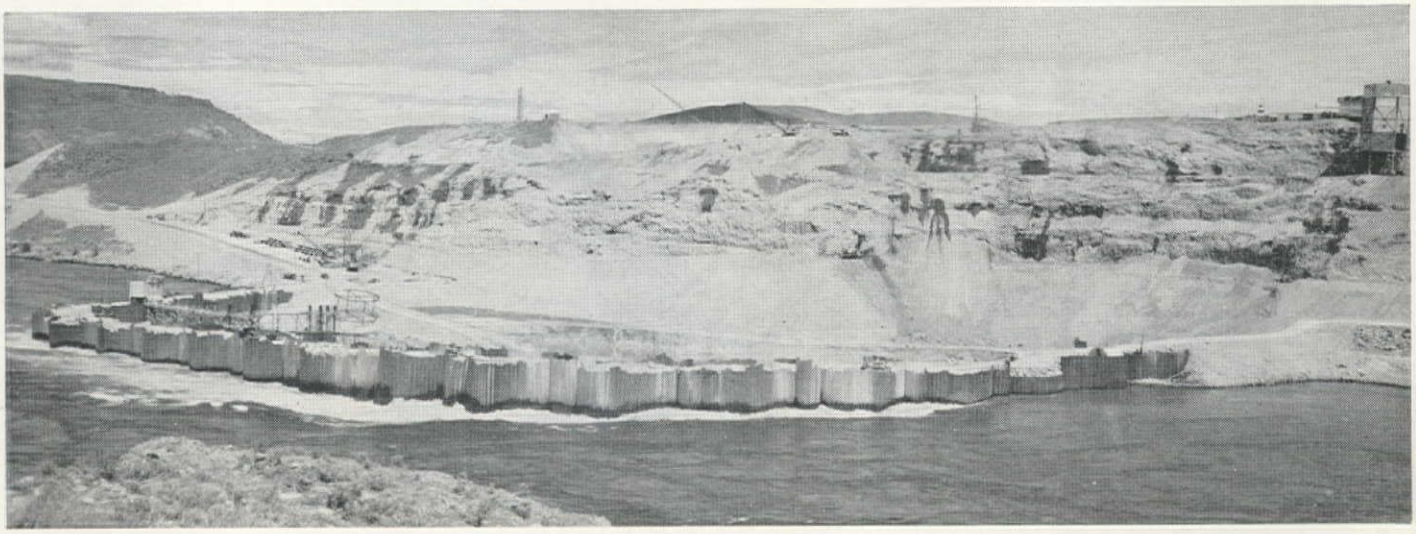
Aggregate plant

A 42-in. inclined conveyor carries material from the transfer point in the pit to a scalping building located on the rim of the quarry. Here material is passed through a 6 x 12-in. single deck screen. Plus 6-in. rock, separated by this screen, is passed through a 24 x 26-in. Lipman jaw crusher, travels away from the scalping building to a transfer point, then returns to rejoin other rock to pass through a 4 x 10-in. double-deck screen. This screen retains all rock above 1½ in. All minus 1½-in. material is carried by conveyor to one side and wasted.

The remainder of the material goes to a surge pile with a 16,500-ton live storage capacity. This storage capacity enables the back end of the plant to operate for three 8-hr. days in the event the front or finish section of the plant shuts down. Material from the surge pile drops through a reciprocating feeder onto a conveyor which carries it to the screening building. The tunnel reaching to the center of the surge pile, as are all tunnels in the plant, is a square concrete-

Concluded on page 112

FIRST COFFERDAM at the Chief Joseph Dam site. Aggregate plant (shown being erected in view at top of page) is at quarry site 3½ mi. downstream.



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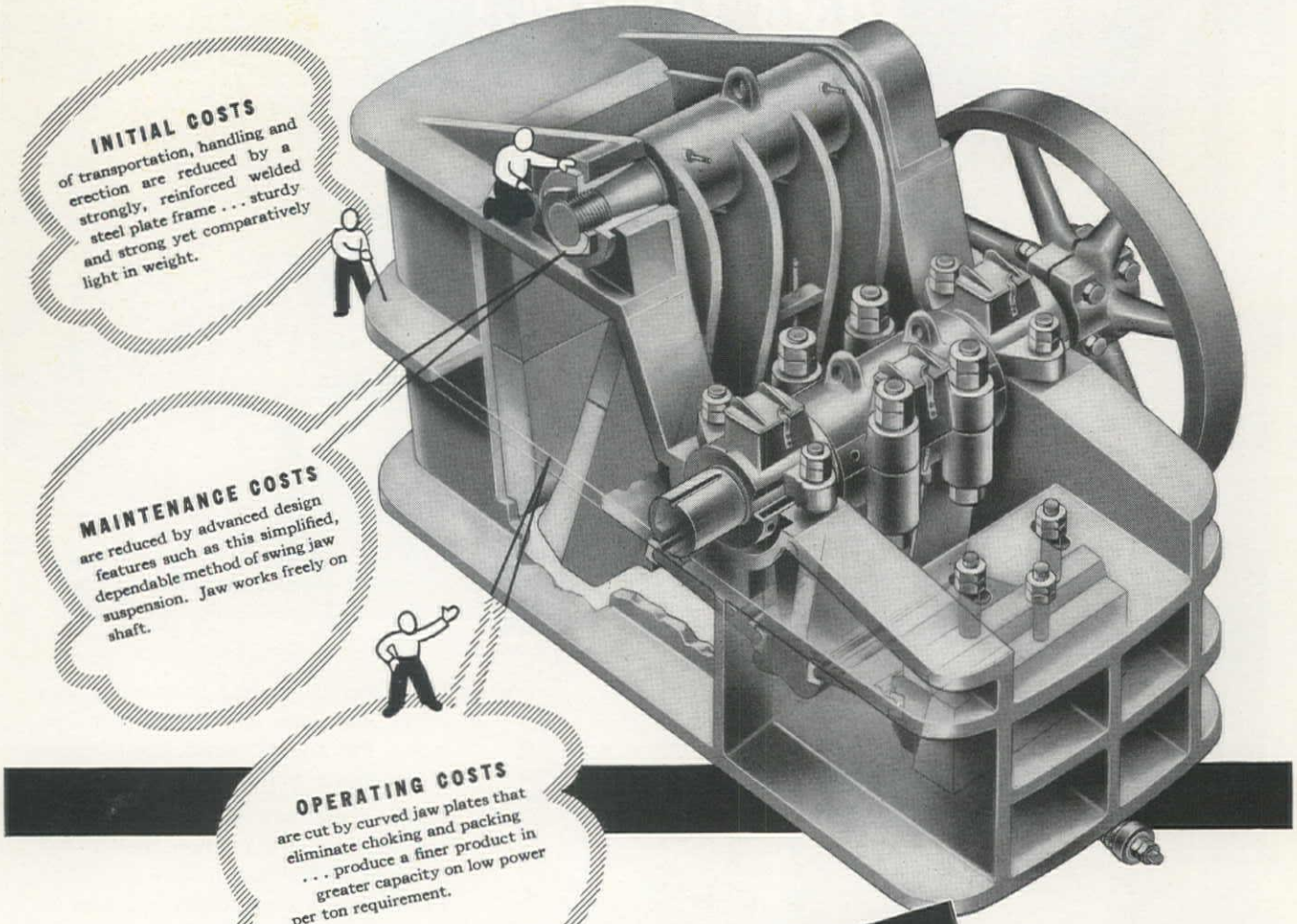

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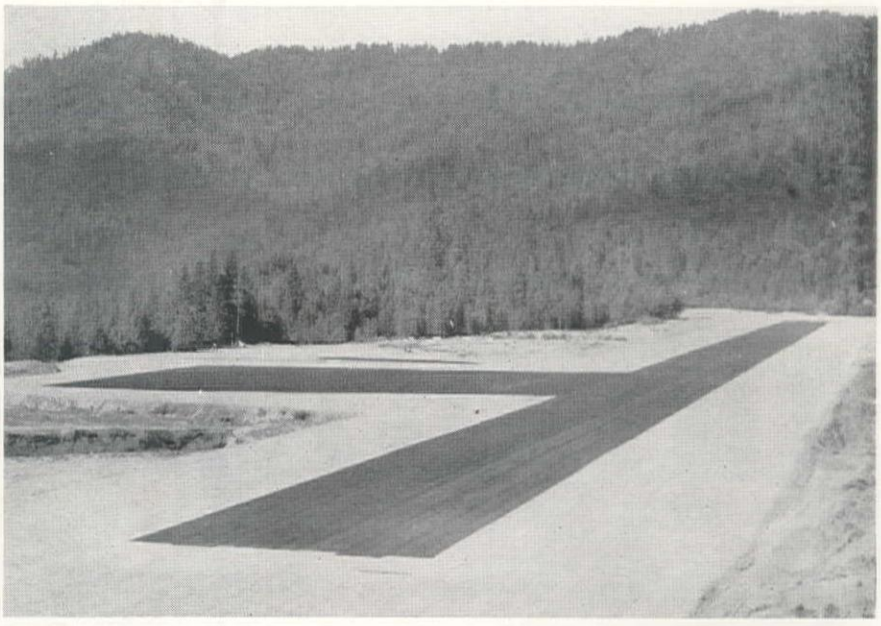
Airport built by government "joint venture"

Forest Service cooperates with County and CAA to build airstrip in national forest — Possibility this procedure could be considered by other counties and municipalities in the West



FOR THE FIRST TIME the U. S. Forest Service has cooperated with a county and the Civil Aeronautics Administration in building an airport (landing strip) with joint Federal and local funds at a location in a national forest. The project has been carried out in Siskiyou County, northwestern California, and involves a 200 x 3,000-ft. landing strip with necessary aprons and parking area. Funds were supplied by the Forest Service, Siskiyou County and the CAA.

The project will be of distinct value to the Forest Service in providing a much needed landing place for fire control and general forest administration; the relatively rough and forested area of Siskiyou County secures an addition to its local airplane landing facilities; and the CAA adds an intermediate emergency landing field along the Pacific Coast in northern California. Operation and maintenance of the completed field will be by the county under special permit.

Of particular significance to the construction industry is the possibility that this type of "joint venture" in airport building might be considered by other counties and municipalities throughout the West in cooperation with the U. S. Forest Service.

Procedure outlined

In general, the preliminary procedure involved the following steps: (1) need determined by Forest Service, (2) inclusion of proposed field secured in National Airport Plan of CAA; (3) tentative plans and cost estimates prepared; (4) site acquired, which in this case was easy because forest land was used; (5) agreement completed with the county for contribution to cover cost, and agreement prepared to cover operation of airport; (6) application made to CAA; (7) final plans and estimates prepared following CAA approval; (8) construction started.

The location of the site is close to the Klamath River, about ½ mi. from the small town of Happy Camp in the far northwest corner of California. A relatively level area is available in this location. Conferences with Siskiyou County authorities developed the fact that a landing strip in this area would be of mutual advantage to the Forest Service and the locality. Following negotiations, a tentative agreement was reached by which allocation of funds would be as follows:

Siskiyou County	$15,000
U. S. Forest Service	17,150
CAA (tentative)	32,150
	$64,300

This was the original estimate of cost, which included clearing, grading, drainage, fencing, access road and wind cone. The original plan did not call for surfacing.

Too remote for contractors

Although CAA participation in any project exceeding $15,000 normally requires contract construction, this provision may be eliminated in remote areas where contractors are not interested in the work and equipment and men are available from the Forest Service organization. As a result the work was carried out by forces of the Forest Service.

Actual construction operations, which started in July 1950, did not involve any unusual procedure and included clearing of the site and grading with tractor and scraper aided by a motor grader. Clearing involved a total of about 60 ac. and the grading included about 71,000 cu. yd. During October 1950 the area received a total rainfall of 20.25 in., of which 10.34 in. fell within a single 48-hr. period. This rainfall resulted in extensive settlement in the fill which had been placed during the preceding two months and reached a maximum of 3 ft. over the deepest part of the fill. Some problems were encountered in handling the run-off and as a result minor changes were made in the original plan for handling drainage and surface run-off.

After allowing the fill to settle during winter months, the field was brought up to final grade and an oil dust palliative was applied for a width of 75 ft. and a total length of 3,000 ft. This surfacing consisted of the application of MC2 penetration oil, .25 gal. per sq. yd., applied at 250 deg. plus under 40-50 lb. pressure by tank truck. There are no immediate plans for additional surfacing, but it is anticipated that the dust palliative which was applied will be dissipated by the volume of plane use which will necessitate some action to provide a more stable surfacing.

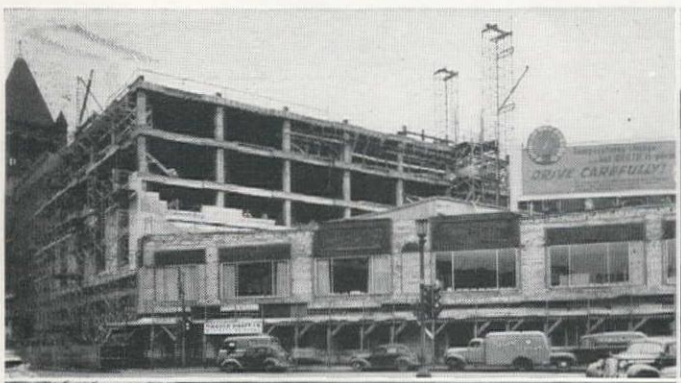
Upon completion of the project, the airport was turned over to Siskiyou County under special use permit by the Forest Service for operation and maintenance under the terms of the permit at a dedication ceremony sponsored by Happy Camp Grange on August 5. Principal speaker at the dedication ceremony was Congressman Engle, whose efforts in behalf of the project expedited its approval by the Civil Aeronautics Administration. Several members of the County Board of Supervisors, State Senator Randolph Collier, members of the Grange, a representative of the State of California Aeronautics Commission and representatives of the Civil Aeronautics Administration and the Forest Service and local flying organizations also participated in the dedication. Congressman Engle laid particular emphasis on the fact that the airport was constructed to original specifications and in addition was given an oil surfacing at a total cost of $58,000, which is less than the original estimate.

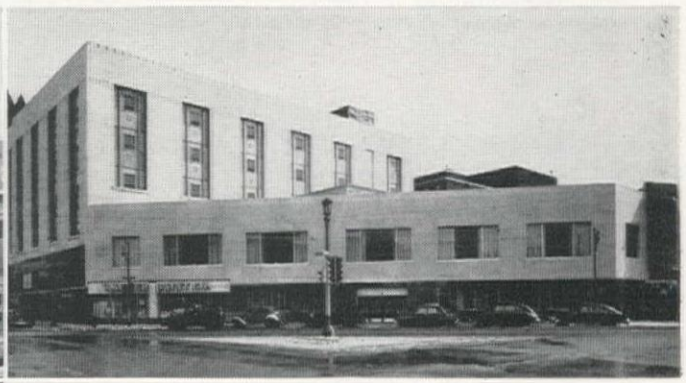
Personnel

The project was carried out under the direction of the U. S. Forest Service from the regional office in San Francisco. J. J. Byrne is regional engineer, California Region. R. W. Bower is forest supervisor of Klamath Forest, T. A. Bigelow is forest engineer, and J. R. Pratley was construction engineer on the project.

Carl G. Hand is district engineer for CAA, Northern California area, and C. W. Bates, airport engineer, served as inspector representing the CAA.

3 years— no down time





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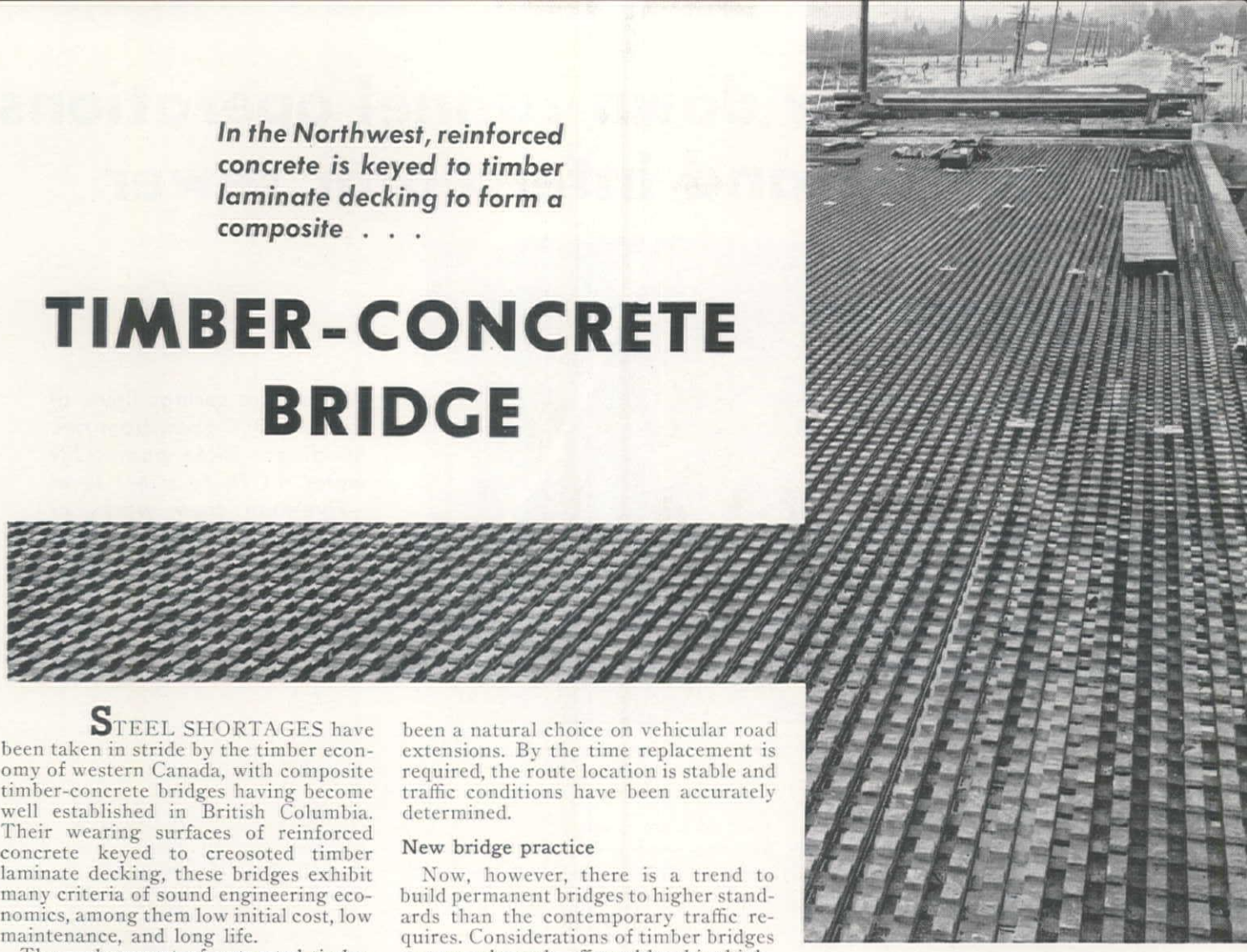
In the Northwest, reinforced concrete is keyed to timber laminate decking to form a composite . . .

TIMBER-CONCRETE BRIDGE



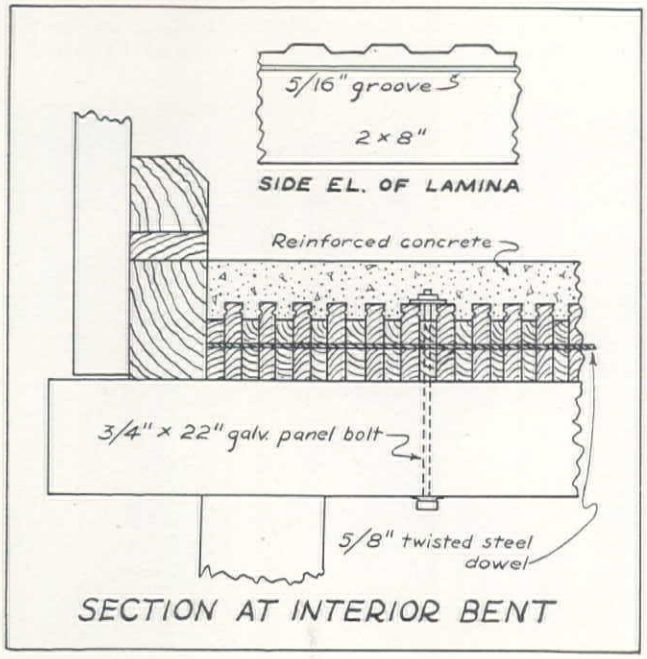
STEEL SHORTAGES have been taken in stride by the timber economy of western Canada, with composite timber-concrete bridges having become well established in British Columbia. Their wearing surfaces of reinforced concrete keyed to creosoted timber laminate decking, these bridges exhibit many criteria of sound engineering economics, among them low initial cost, low maintenance, and long life.

The replacement of untreated timber railroad trestles by steel and concrete bridges, or by fill, or by creosoted timber structures does not minimize the economy of the original trestles. Availability of time, money and materials has always influenced the bridge designer; such considerations led in an earlier day to untreated timber construction. Similarly, untreated timber structures have been a natural choice on vehicular road extensions. By the time replacement is required, the route location is stable and traffic conditions have been accurately determined.

New bridge practice

Now, however, there is a trend to build permanent bridges to higher standards than the contemporary traffic requires. Considerations of timber bridges are not adversely affected by this thinking: there is today no relevant economy to be gained in construction of a modern timber bridge to less than three-lane width or for less than an H-20 loading.

About 15 years ago the British Columbia Provincial Department of Public Works was among the pioneers in developing composite timber-concrete bridges. Designs for that time remain basically unchanged today: creosoted timber laminate decking is covered by reinforced concrete in such a manner that the timber and steel take all tension, and the concrete all compression. In this manner, each material functions with efficient and economical results.



TYPICAL CROSS-SECTIONS show mode of construction of timber laminate decking to develop unified action with reinforced concrete slab.

Construction techniques have been developed to keep the timber-concrete bridge in the economic picture. In earlier bridges, the concrete was keyed to the timber by triangular shear plates and uplift prevention spikes. Today both plates and spikes have been replaced by the practice of grooving and dapping the timber laminates, a process that permits a greater degree of prefabrication and more effective creosote treatment.

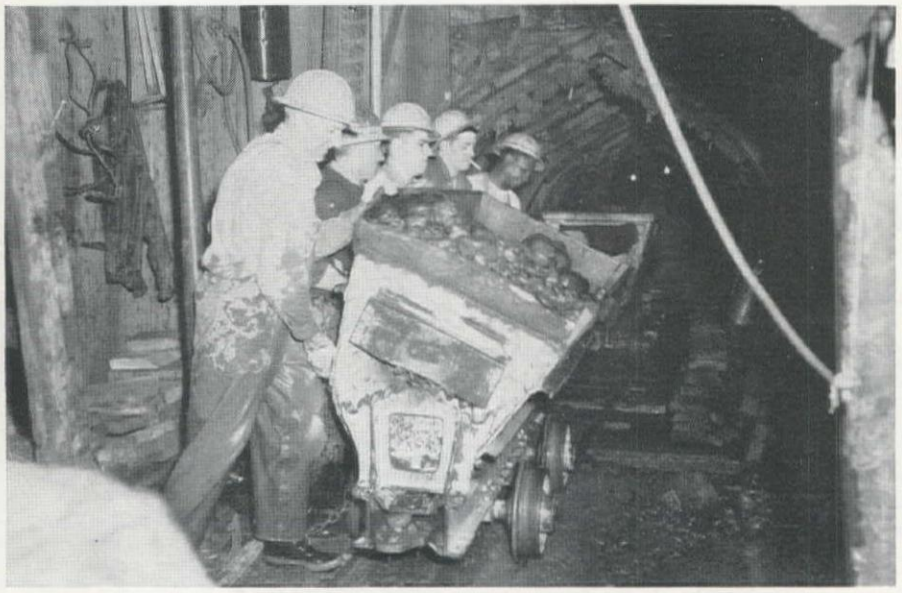
Applicability of modern treated-timber construction is not limited to small structures, though the practical limiting distance between trestle bents is about 20 ft. For longer clear spans, timber trusses or laminated timber girders provide a supporting medium.

Multiple glued members

Such built-up structures do present problems, however. A conventional trussed bridge, with the deck on the lower truss chord, cannot easily be made attractive in ordinary timber construction. On the other hand, under-deck trusses require high clearances; and both types require top quality floor

Concluded on page 91

Springs slow down tunnel operations on Portland interceptor sewer



WELL RUBBERED UP for protection against flow of water, tunnel crew dumps muck car at shaft. Muck is removed from shaft by clamshell bucket.

Water from springs flows at rate of 1,300 gpm. from two headings—Three pumps lift water 44 ft. to street level —Five-man crew works at each of six headings along route of 13,200-ft. interceptor sewer route

TUNNEL DRIVING operations of the Kuckenberg Construction Co. on the Portland sewer project were slowed considerably when the route of the 13,200-ft. Grand Avenue interceptor crossed the path of heavy flowing underground springs. During excavation of a ¼-mi. length of the tunnel the water from the springs flowed at the rate of 1,300 gpm. from the two headings being worked from one of the shafts. Three pumps, located in the shaft, were used to lift the water 44 ft. to the street level.

The interceptor sewer, being carried out under a $1,701,815 contract, is an important part of Portland's current program for solving sewage disposal problems for a growing population and for elimination of pollution of the Willamette River. The unit now being constructed will collect flow from several small outfalls on the east side of the city and carry it to a pumping station for delivery to a treatment plant. Funds for the project were made available by a $12,000,000 bond issue approved in 1944, supplemented by taxes on sewer connections. The entire project contains approximately 30 units, each of which is being constructed under separate contract. Ultimate expenditure will be about $17,000,000.

Driving operation

The contract called for finished diameters of 5½ and 6 ft. inside the concrete lining. Specifications provided for concrete of 9-in. maximum thickness, or 5 in. thick inside the steel ribs.

In excavating the tunnel, shafts were established roughly 1,500 ft. apart along the sewer's route. The tunnel was then driven from two headings at each shaft. Three shafts, with six headings, were used with crews operating on a 2-shift-per day basis. These vertical shafts varied in size to a maximum width of 40 ft., and were generally square in section.

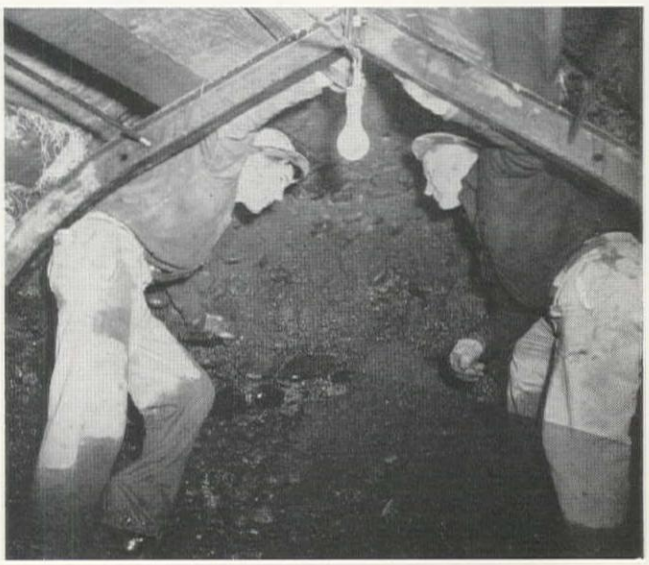
The sewer is designed for gravity flow and virtually all is laid under city streets, with the depth below the surface varying from 28 to 70 ft. During excavation, work generally progressed at an average of 100 lin. ft. of driven tunnel per shift. However, at the two headings where the underground flow was encountered, the distance made at each of the two headings was cut nearly in half.

Crew and equipment

A five-man crew consisting of two miners, two chuck tenders, and one mucking machine operator was used at each heading. One nipper was used in each shaft. Equipment consisted of five Joy muckers, one Eimco mucker and two Mancha trammers. Air was supplied by Chicago Pneumatic and Ingersoll-Rand compressors.

Excavation and shoring

Excavation was carried out by mucking machine, except for a minimum amount of hand excavation required to install the ribs and spreader across the invert of the tunnel. Material in the tunnel area was a mixture of sand, gravel and cobblestones and offered no serious problem. Occasional use of a small air hammer or spade was required. In operation the mucking machine loaded the cars which were hauled to the shaft and dumped. At the shaft the cars would be dumped by the crew and the material



CHECKING SPILING at tunnel heading are tunnel foreman Don R. Hawe (left) and Robert Stevens, night shift superintendent.

INSTALLING breast boards in the Portland interceptor sewer tunnel. Tunnel foreman Don R. Hawe stands by to hand sprag to workman bracing breast board against ring

taken by clamshell buckets to waiting dump trucks on the street above. The clamshell bucket was also used for lowering supporting materials and lagging for use in the tunnel.

Rib steel was fabricated from 4-in. I-beams in two sections and was installed at 4-ft. centers. Rings were supported at the bottom by timber foot blocks and a 5-ft. timber spreader was laid across the tunnel invert. Lagging was all 2-in. material. Breast boards were required through all of this wet ground. When excavation reached a point where steel was to be set, a piece of timber would be placed across the breast boards and supported by a ram held by the mucking machine. The mucking machine would hold the breast boards while the bracing or sprags were removed.

Mucking machine rams

As soon as the sprags were removed the area at the bottom of the tunnel would be cleared from the ring footings within a minimum of delay. As soon as the foot blocks were in place the two sections of the steel rib would be brought to the heading, set up and bolted at the top. The invert of the tunnel was then brought to grade and the spreader inserted. Ample amounts of excelsior were placed behind breast boards and lagging to cut down the flow of water.

With the steel support in place the excavation would proceed a short distance, then stop to permit installation of spiling. Spiling 9 to 10 ft. long was used to go with the 4-ft. spacing of the steel sets. The spiling would be placed in starting position and one man would hold it. Then the ram would be placed against the back end and the mucking machine would apply pressure to drive it into place.

For placing the concrete lining the contractor elected to use Pressweld equipment. The Pressweld unit, operating on 125 psi. of air, is set up at the top of the shaft with the pipe that transports the concrete passing down the shaft and into the tunnel. As placing proceeds sections of pipe are added with the discharge unit at the placing end of the pipe supported and moved by cable-operated cart. Lining operations will also be carried out in both directions from the shafts.

Placing concrete

Only 200 lin. ft. of steel tunnel forms are being used in placing the lining, since they are stripped within 10 hours after concrete is poured. The general practice is to place concrete during the day shift, then commence stripping, moving forms and setting up from where the pour was started with the swing shift, and continue the forming operations with the graveyard shift. The jumbo for moving the form sections consists of a 30-ft. rail supported at each end by a dolly which rides the rails in the tunnel. Forms are used for lining of the arch and sides of the tunnel with the bottom or invert concrete placed separately. From 150 to 200 ft. of tunnel lining can be placed during an eight-hour shift.

Organization

Lee Gordon is general superintendent for Kuckenberg Construction Co., with Robert Stevens acting as night superintendent. Don R. Hawe and I. W. Dunn are tunnel foremen. Daniel E. Currin is engineer for the City of Portland. Two Portland firms, Stevens & Koon and John W. Cunningham and Associates are in charge of engineering on the project. A. M. Rawn of Los Angeles has been consultant on planning special phases of the sewerage project.

Timber-concrete bridge

. . . Continued from page 89

beams of considerable length and large cross-section that are increasingly difficult to procure. Use of glued laminates in bridge chords and floor beams is one solution, but not necessarily the best or cheapest. For clear spans up to 50 ft., structural needs would seem to be fulfilled by either multiple glued laminated timber girders or multiple under-deck trusses with laminate timber decking, all members creosoted. Preliminary designs of girder spans are being advanced in eastern Canada, but it is felt for several reasons that multiple truss designs are more applicable and economical in the West.

Initial costs of the composite timber-concrete bridge are low; prefabrication expedites erection and cuts the labor cost increment. Over an estimated 40-year life, maintenance costs compare favorably with those of other structural types. Low demolition cost and high salvage value ease the replacement burden. And finally, of importance today, the composite timber-concrete bridge makes little use of critical materials.

Plans prepared

In the interest of municipalities that could profit by standardized bridge plans, the Vancouver firm of Swan, Rhodes and Wooster, consulting engineers, is preparing typical and readily adaptable designs for trestled composite bridges and also designs for a series of multiple under-deck trussed spans ranging in length up to 50 ft. These plans will be made available without charge through B. C. Coast Woods Trade Extension Bureau, 837 West Hastings St., Vancouver, B. C.

Next unit of Portland sewer system up for bids soon

ANOTHER UNIT in Portland's $17,000,000 sewage disposal system is nearing the bidding stage: specifications have been completed for construction of two parallel submarine pipelines that will cross the Willamette River carrying west-side sewage to the east-side interceptor and disposal plant. Construction of the $1,700,000 interceptor is described in *Western Construction* this month on the accompanying pages.

River crossing of the new unit will be made with cast iron pipes of 30- and 43-in. diameter laid from the existing pumping plant at the foot of S.W. Ankeny St., which is being remodeled for the installation of bigger pumps. The pipelines will be laid on a route that proceeds north about 500 ft. along the outside of the harbor wall, then across the channel to join the east-side interceptor at N. Irving and Occident Ave.

THE CITY COUNCIL of Longview, Wash., has called for bids on a portion of that city's $1,000,000 sewerage project. The work involves trunk sewer extensions and pumping stations on two streets.

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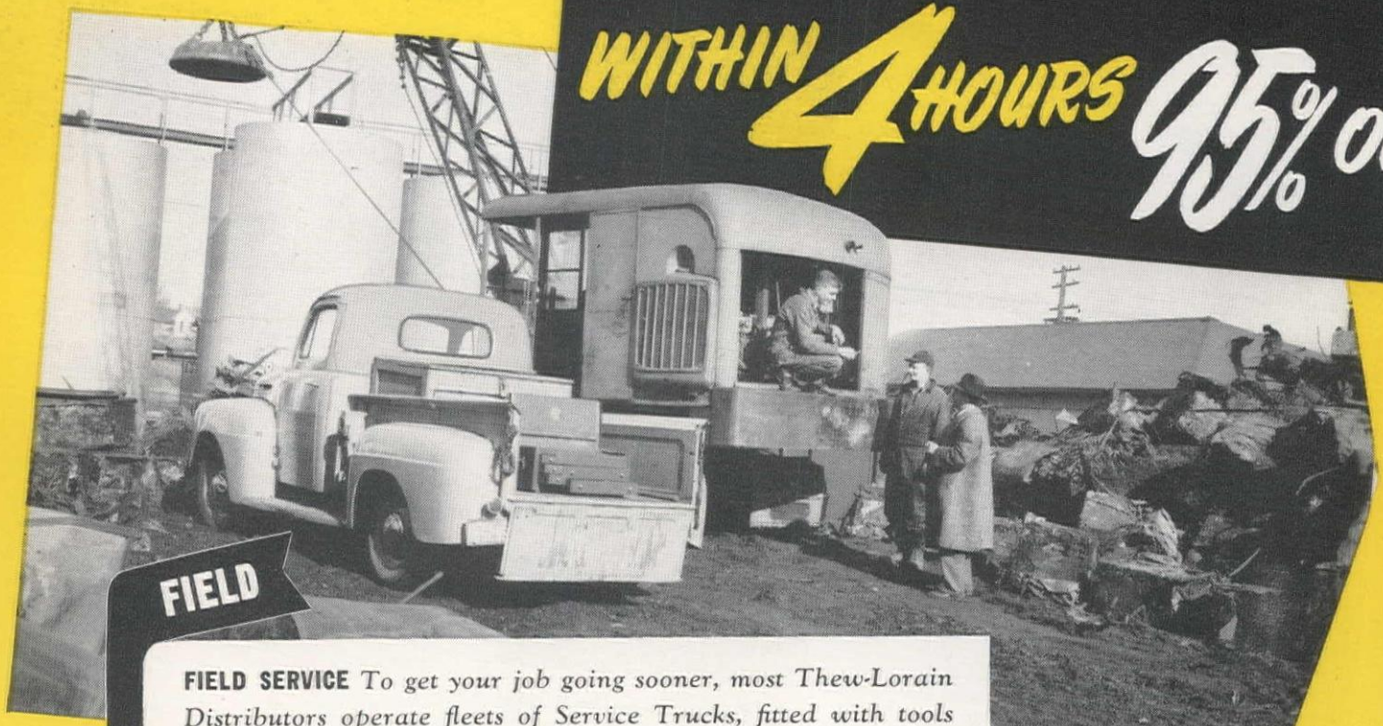

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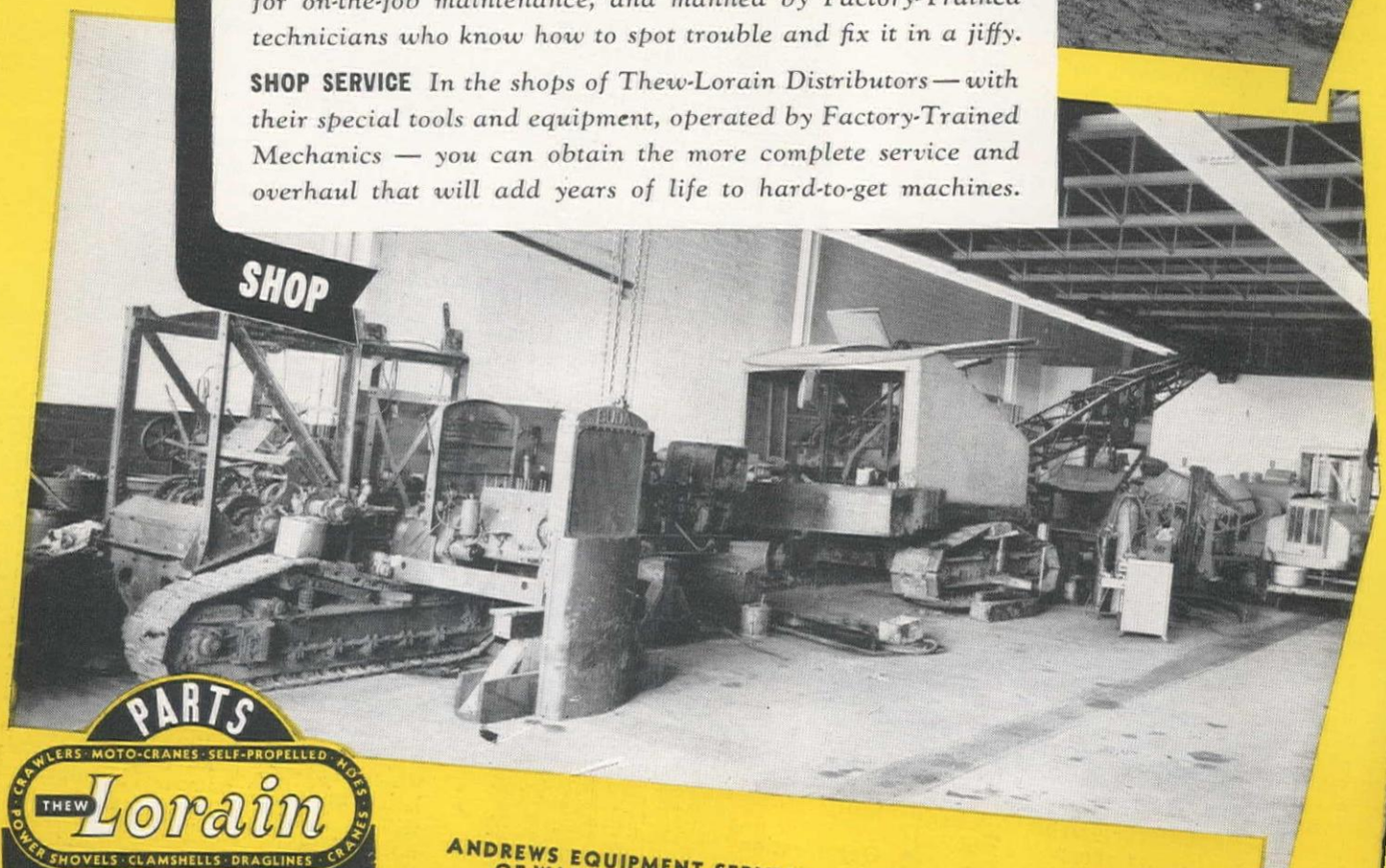

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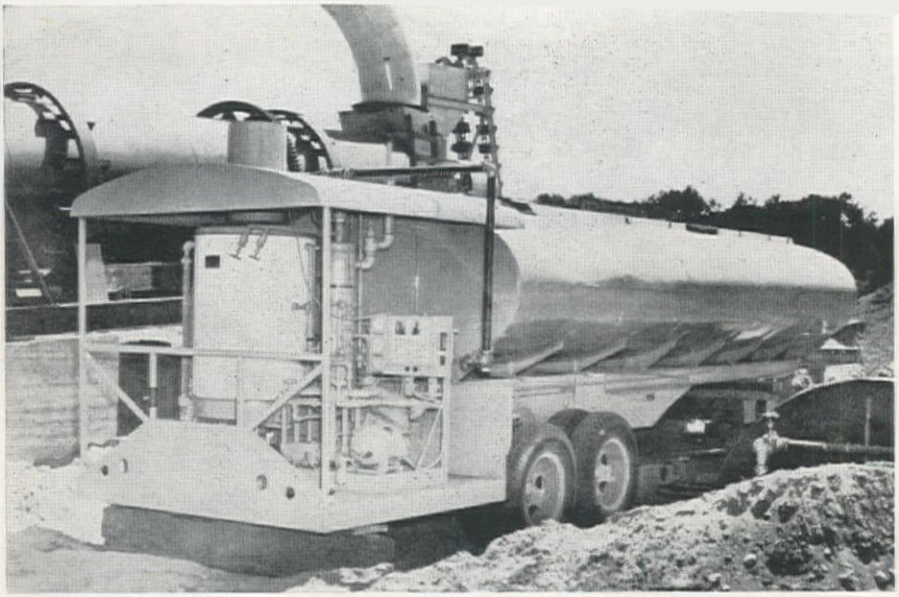
Combine these skilled and trained Lorain technicians, only a few hours away, with on-hand Lorain-Engineered Parts and you have an unbeatable combination . . . and one of the big important advantages that protect the investment of every Lorain owner and keep Lorains on the job for many years. If you want to "keep 'em digging" in the days and years ahead, your Thew-Lorain Distributor is the man to see!

THE THEW SHOVEL CO., LORAIN, OHIO

THE LORAIN®

SHOVELS • CRANE • DRAGLINE • HOES • CLAMSHELLS • MOTO-CRANES



100-hp. steam generator ready in 5 minutes at asphalt plant

VIEW AT LEFT is of United Concrete Pipe Corporation's 2,500-gal. diesel oil and boiler feed water service tank with 100-hp. Clayton forced recirculation steam generator mounted at the rear. This combination unit is constructed in such a manner that when it arrives on the job, it is only necessary to run the steam lines to the plant and dryer. The generator is ready to operate within 5 min. after hook-up has been completed. Condensates from the jackets can be returned to the water storage tank for re-use. United purchased the generator from Madsen Iron Works of Huntington Park, Calif.

Domestic devotion deserves diplomas

— say Stanford CE grads

MARRIED MEN among the civil engineering graduates at Stanford University last June early realized that their final grades would be a measure not only of their academic devotion but also of their wives' domestic devotion. Accordingly, special commencement ceremonies on June 6 saw the award of diplomas to the wives of 26 seniors, conferring upon them the honorary degree of "resident engineer." Entitling the wives "to all the rights, privileges and attentions previously denied," the diplomas bear the signatures of Dr. Eugene L. Grant, head of the Civil Engineering department; Dr. Frederick E. Terman, Dean of the School of Engineering; President Wallace Sterling of the University, and Max Rothe, president of the ASCE student chapter.

The Leland Stanford Junior University
Student Chapter of the American Society of Civil Engineers

Know All Ye Men By These Presents
The Trustees of the Chapter hereby confer upon

who has unceasingly pressed the Studies and Endured all Examinations the Honorary Degree of

Resident Engineer (with great appreciation)

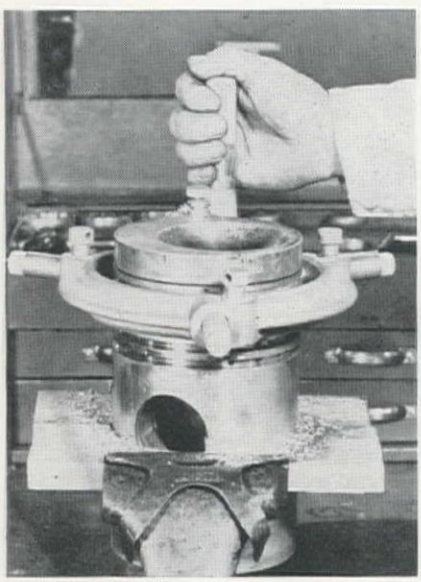
with all the Rights, Privileges and Attentions previously denied

Given at Stanford University in the State of California on the Day of in the Year of Our Lord One Thousand Nine Hundred and Fifty-

LELAND STANFORD JUNIOR UNIVERSITY ORGANIZED 1891

Civil Engineering **President of the University**

School of Engineering **President of the Chapter**



"MANULATHE" in position ready for regrooving, left. The tool is rotated in a clockwise direction by the handle shown. Rate of tool feed is .0035 in. for each handle revolution.

Precision hand tool for regrooving diesel pistons

WITH MATERIAL for new machines and replacement parts in short supply, the application of practical methods for prolonging the life of parts to keep machines operating is becoming increasingly important. Many parts, seemingly worn out, must now be salvaged.

A conservation program has been in progress at Caterpillar Tractor Co., and one practice which has been encouraged is the regrooving of diesel engine pistons, a job that essentially doubles their life. The point of greatest wear on a piston is the top ring groove, so if the piston is otherwise sound, remachining the groove for a "wide" top ring can give many additional hours of life to the pistons. The regrooving is accomplished either by turning the piston on a very accurate engine lathe, or by performing the job with a precision hand-operated tool known as the "Manulathe."

The Manulathe provides a very accurate and fast method of regrooving pistons. It will produce results equal to those obtainable on the best engine lathe, and is equally adaptable to all-aluminum as well as cast iron insert type pistons.

The tool consists of a cast ring with three locating pins and a Carboloy cutting tool. The cutting edge is fed into the work with each revolution of the Manulathe about the piston. Since the tool is accurately located on the piston and rate of feed is constant, very precise results are obtained.

CONSTRUCTION DESIGN CHART

CXXXV... Deflection of iron pipe

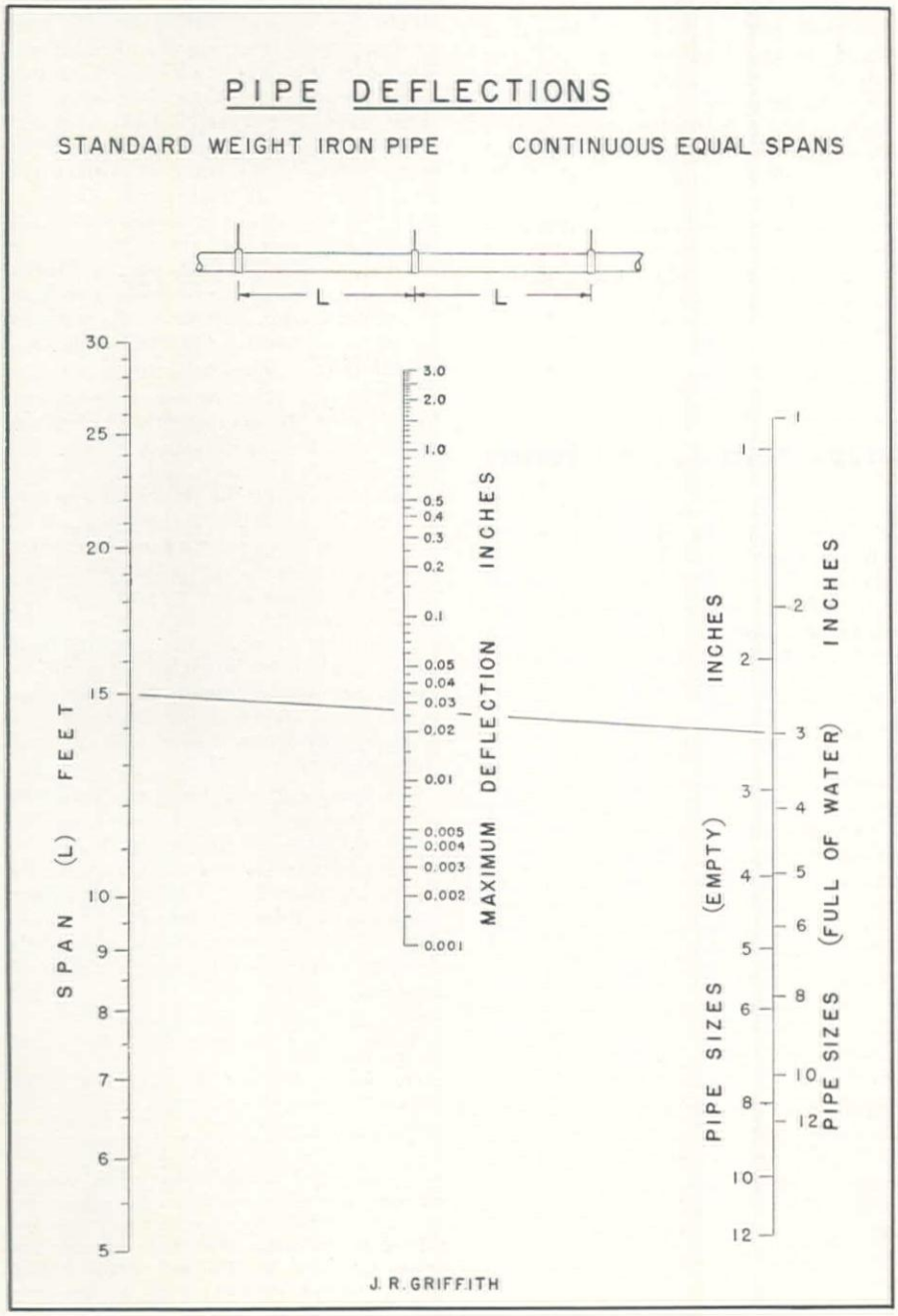
By
JAMES R. GRIFFITH
Seattle, Wash.

WHEN SPACING pipe hangers or supports for water, air, steam or gas lines, the maximum deflection must frequently be determined. A chart was presented in the April 1951 issue for the determination of flexural stress. In the accompanying article it was mentioned that the deflection in the pipe was more frequently the controlling factor in spacing of the hangers. The chart herein presented provides a means of quickly solving for the maximum deflections in standard weight iron pipe.

If the hangers are uniformly spaced, the slope of the deflection curve is zero at each support. The equation for the maximum deflection, under such conditions, is identical to that for a single span having fixed ends. The deflection formula for a uniformly distributed load is then

$$\text{Maximum deflection} = \frac{w L^4}{384\,EI}$$

The chart automatically solves this equation by the use of a single straight line intersecting all scales.



It will be noted that for a simple span beam having a uniformly distributed load, the maximum deflection is determined by the expression

$$\text{Maximum deflection} = \frac{5\,wL^4}{384\,EI}$$

which gives a result five times greater than the value obtained for a fixed end mean with the same loading. Thus if it is desired to obtain the deflection of a pipe as a simple span, the value obtained by the chart should be multiplied by the factor (5).

The right hand scale, showing pipe sizes, has two sets of values, one for empty pipe, and one for pipe full of water. The empty pipe scale should be used for steam and air pipe lines. I have drawn a solution line on the chart for a 3-in. pipe full of water on a 15-ft. span. A maximum deflection of 0.028 in. will be noted on the central scale.

In order to check this value and to illustrate the comparable accuracy of the chart, we have the following:

From standard tables

3-in. standard weight pipe

Outside diameter =	3.5 in.
Inside diameter =	3.068 in.
Weight of pipe =	7.62 lb. per ft.
Weight of water contents =	3.06
Total weight =	10.68 lb. per ft.
Moment of inertia =	3.017 in.^{4}

Substituting in the deflection formula

$$\text{Maximum deflection} = \frac{w L^4}{384\,EI}$$

$$= \frac{10.68 \times 15^4 \times 12^3}{384 \times 30{,}000{,}000 \times 3.017}$$

$$= 0.0293 \text{ in.}$$

While the deflection scale has been extended to include a maximum value of 3.0 in., the higher deflections should be used with caution and only after checking the result of flexural stress. On the chart published in the April 1951 issue, a solution line was drawn for the same assumptions used above. Therein it was seen that a 3-in. diameter standard weight iron pipe full of water, supported at 15-ft. equal intervals, the maximum flexural stress was 1,700 psi.

REPORTS *from the* COURTS

By
HOWARD S. BURNSIDE
Registered Professional Engineer
Attorney at Law

Contractor's equipment taxed twice

WHEN PERSONAL property taxes are assessed on construction equipment by two different taxing authorities it is the contractor's obligation to pay the taxes which were first validly assessed. Otherwise, the contractor may be in the position of having paid taxes twice without the protection of statutes which are aimed at preventing double taxation. This situation is illustrated in a recent Arizona case.

On April 8, 1947 Yuma County assessed taxes on certain equipment brought into the county by a road construction contractor early in the month. A few weeks later a representative of the contractor delivered a list of personal property which included this equipment to the Cochise County Assessor's office. The contractor's office was in Cochise County and the equipment also had been there on the first of the year and up to the time in April when it was moved to Yuma County. Subsequently Cochise County assessed taxes on the same equipment and the contractor paid these taxes as levied, ignoring the Yuma County taxes. (A state statute prevented double taxation).

About a year later when Yuma County sought to collect its taxes the equipment had been moved so suit was brought to recover them. In this action the lower court decided and the Supreme Court of Arizona agreed that the Yuma County tax was a valid tax. It was not double taxation; the court pointed out that in paying the tax to Cochise County the contractor was a mere volunteer. "Its duty was to pay the tax where it was first assessed and levied."[1]

The technical aspect of this case centered in an interpretation of the statutes. The contractor asserted that Cochise County had a valid and prior tax lien as of the first of the year which precluded another tax by Yuma County. On this point the court held that the statute[2] upon which the contractor relied applied to real and secured personal property but not to unsecured personal property like construction equipment.

[1] Packard Contracting Co. v. Roberts, 222 P. 2d 791.
[2] Sect. 73-506, A.C.A. 1939.

Contract for engineering services void . . . no funds

THE AUTHORITY of municipalities to incur obligations such as contracting for professional engineering services is largely a matter of local law. The various states provide such authority, usually very specifically, in their Constitutions, Political Codes or otherwise. All persons, including engineers, it is presumed, know the law and are aware of matters of public record. Since contracts undertaken by municipalities without authority or proper appropriation of funds cannot be enforced, the burden of determining the validity of the contract may be on the individual so as to assure his ultimate reimbursement for services. This is demonstrated by the case at hand wherein a consulting engineer could not collect his fee because no funds were earmarked or made available for the purpose.

Following an election at which the voters approved sewer bonds, the Board of Trustees of the Town (the defendant in this case) approved and ratified an existing contract under which the plaintiff was to render professional engineering services as required. On the strength of this the plaintiff proceeded to prepare plans and specifications for the sewer system and they were subsequently approved by the Board.

The bond issue was approved by the Attorney General but the bonds were never delivered to the purchaser and the Town never actually received any money from them. The reason for this was that two months after the plans were approved a new Board of Trustees adopted a resolution to the effect that the sewer system was not necessary and the bonds should be cancelled.

At no time were plaintiff's fees included in revenues provided for in the estimate of current expenses for the Town nor were funds on hand during any of the years involved for the payment of services. The plaintiff had relied (perhaps without serious consideration or with a sincere desire to expedite the work), on the proceeds of the bonds which actually were sold but, as noted above, never paid for or delivered. The net result was that the plaintiff was not paid for his services for the simple reason that there were no funds out of which he could be paid.

Legally the contract would be void for lack of authority. The decision of the court was based on the fact that the bonds were never delivered and that the Town never received the funds. No funds, no authority to contract with respect to such funds.[1]

[1] McMaster v. Town of Byars. 223 P. 2d 545.

Owner's liability for furnishing defective tools

IN A CASE involving injury to the employees of the general contractor due to the failure of scaffolding erected by the owner, the court citing other authorities and the general American rule said: "This is the rule applied in this state . . . A contractee who agreed to provide a contractor with a particular instrumentality for the purposes of the stipulated work is ordinarily liable for any injury which a servant of the contractor may sustain, during the progress of the work, by reason of a defect which was known to the principal employer, or which he might have discovered by the exercise of reasonable care, at the time when the instrumentality was turned over to the contractor . . . In California such liability (of the owner who furnishes the tool, instrument or other chattel) is based upon the grounds of the failure of the principal to exercise the ordinary care which is due to everybody, without regard to contract, under principles announced in . . . the Civil Code."[1]

In this situation it was discovered shortly after the accident that the plank on the scaffold had knots in it near the place where it broke and was cross-grained, resulting in its breaking and splitting on a bias. On the question of whether the owner, a corporation, knew of the defect the court quoted an earlier decision—"it was not necessary to show actual knowledge of a dangerous condition in order to make out a prima facie case of negligence but where it could be reasonably inferable that the condition was created by the employees of the company, the management was charged with notice thereof."[2]

The fact that a person employed to work on premises for the benefit of the owner accepts an appliance from the owner and uses it does not necessarily relieve the owner of liability for injury caused by a hidden defect in the appliance, if, in the exercise of reasonable care the owner should have discovered the defect.[3]

[1] Martin v. Food Machinery Corp. 100 C.A. 2d 244; 223 P. 2d 293.
[2] Oldham v. A. T. & S. F. Ry. Co. 85 C.A. 2d 214.
[3] Moran v. Zenith Oil Co. 92 C.A. 2d 236.

Twenty-one legal decisions that affect contractors' and engineers' operations have been reviewed by Mr. Burnside since his department was initiated in November 1950. As a valuable reference, these will be tabulated in the Annual Index, to be published as part of the December 1951 issue.

SAVED

$12.50 to $25.00 an hour!

Laying a half-inch top course of hot mix.

Rear wheels down and the machine is off to start the parallel course.

YOUR Adnun Retractable Wheels cut the cost of your short hauls. Supposing you have been working a week down one side of a job and want to get back to start the parallel course – it takes just a few minutes time to let down your Adnun Retractable Wheels and hoist the Adnun up to the tail gate of your truck. You are back at the beginning and ready to start on the new course before you could load the ordinary black top spreader on a trailer!

You don't even have to have a truck! The Adnun on its wheels will travel back to the beginning of the average job on its own power before you could load and unload other equipment from a trailer.

The Adnun cuts truck and trailer rental, saving you costs up to $12.50 to $25.00 an hour and it saves time in loading and unloading.

Add to this feature Adnun versatility of spreading aggregates, Adnun ability to lay a tighter joint for safer roads, lower upkeep costs, freedom from rebuilding and other features that reduce construction costs and increase output. Ask for the booklets, "11 Basic Things..." and "Roads That Last". They bring out some new thoughts on asphalt paving equipment.

THE FOOTE COMPANY, INC.

Subsidiary of Blaw-Knox Co.

1940 State Street, Nunda, New York

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TRADE MARK REGISTERED

BLACK TOP PAVER

A BLAW-KNOX PRODUCT — FROM FORMS TO PAVER TO-FINISHER... ALL YOUR PAVING EQUIPMENT — IN ONE PACKAGE from BLAW-KNOX

A Great New Diesel That Will Pay You Dividends for Years to Come

Now the dream of every hauler comes true—a superb truck, *with an engine built to pull a million miles and more!*

For here is General Motors' "Million-Miler" Diesel—combining the famous two-cycle efficiency and lighter-weight design that have made GMC's first in heavy-duty hauling—*with new developments never before achieved in Diesel engineering:*

Automatic Fuel Modulation

First, the "Million-Miler" has a built-in brain—a revolutionary GM-engineered device called the Fuel Modulator. This absolute feed control prevents abuse, eliminates inefficiency at low engine speeds—automatically feeds this new Diesel the right measure of fuel and air, *regardless of throttle pressure.* As a result, maximum efficiency is maintained in the low engine speed range—watched over by a unit ever proportioning the perfect mix.

The result is a master Diesel that saves fuel, prevents lugging and sludging at low speeds. But that's only part of the story.

Freer Breathing at High Speeds

For next, GM engineers worked out a new timing cycle for exhaust valves in this engine—keeping the ports open for prolonged scavenging of burned gases from the cylinders.

The result is a clean-burning Diesel that takes great gulps of rich, fresh air even at the topmost speeds—insuring complete combustion, maximum power, more "go" from every ounce of fuel you use.

Here is an engine that is never fed more than it needs—and makes the most of what it gets! A clean, carbon-free Diesel that delivers 12½% more horsepower than its famous GMC forerunners of equal size and weight!

We earnestly urge you to get the facts on these new four- and six-cylinder models at your GMC dealers'. These stalwart GMC's come in a wide variety of trucks, tractors and six-wheelers—to handle any loads from 24,000 GVW up. *And every one has the sensational new GM Diesel engine—every one is powered to go a million miles and more!*

HERE'S WHAT "MILLION-MILE" ENGINEERING MEANS!

★ **AUTOMATIC FUEL MODULATION**—master-mixes air and fuel—makes every ounce count. Prevents lugging and sludging at low engine speeds.

★ **FREER-BREATHING, CLEAN-BURNING**—New 170° camshaft keeps exhaust valve ports open longer, completely scavenges chambers for maximum combustion, *refreshed power!*

★ **SUPER-STRONG CRANKSHAFT SERVICE**—Tocco-Hardened, specially processed to be unaffected by stress peaks of toughest "load-toting" range.

★ **RENEWABLE CYLINDER LINER INSERTS**—provide a solid seat for cylinder liners. Won't drive down. Add extra rigidity and life.

★ **HEAVIER-PROPORTIONED CYLINDER HEAD**—Heavier ribs and struts minimize deflections. New stud bosses with deeper grip.

★ **METAL-TO-METAL HEAD AND BLOCK**—with revolutionary individual aperture sealings. Conventional gasket eliminated.

★ **NEW INJECTOR ROCKER ARMS**—New Pallet-type design improves contact, gives longer life.

★ **CHROME-PLATED PISTON RINGS**—for increased ring and cylinder life.

★ **IMPROVED EXHAUST VALVE DESIGN**—New 30° seat-angle, with long-time Stellite facing.

★ **NEW OIL CONTROL RINGS**—with three times longer life.

And! Major parts interchangeability between four- and six-cylinder models greatly reduces parts inventory for operators of mixed GMC fleets!

GMC

GASOLINE & DIESEL TRUCKS

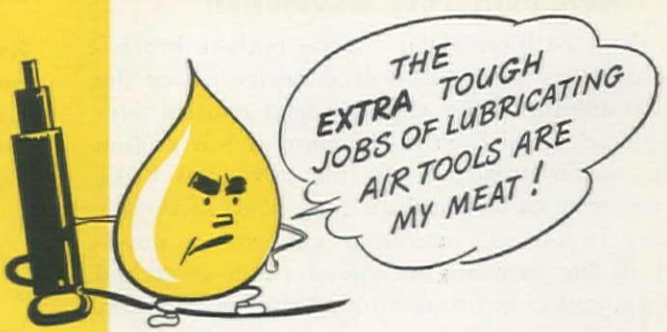
½ TO 20 TONS

GM GENERAL MOTORS

Your key to greater hauling profits

GMC Truck & Coach Division of General Motors

Protect your HARDEST WORKING air tools with Shell Tonna Oil F



Shell has built into Shell Tonna Oil F every quality needed to assure protective lubrication under the most severe operating conditions . . .

EXTRA ADHESIVE so it will stick tight to fast moving surfaces. That helps keep oil consumption down, too

CONTAINS EXTREME PRESSURE ADDITIVE to give it the tough body and high film strength to safeguard against surface scoring — under any conditions

EMULSIFIES READILY with moisture so it won't be washed away by moisture entering the tool through the air line. Its emulsibility is an extra safeguard against rust, too

If any of your air tools are subjected to exceptionally hard usage, then the surest way to protect them — to keep them on the job — is to lubricate them with Shell Tonna Oil F.

SHELL

MEETS INGERSOLL-RAND STANDARD 5M5

NEWS OF WESTERN CONSTRUCTION SEPTEMBER, 1951

S. F. aqueduct expansion nears completion

CAPACITY of the Bay Division of the San Francisco Aqueduct will be boosted from 110 mgd. to 186 mgd. late this year upon completion of a third pipeline extending from the Coast Range tunnel to the Pulgas tunnel south of Crystal Springs Reservoir.

Maintenance and defense considerations in part dictated the choice of an all-land location for the 34-mi. conduit, which rounds the southern tip of San Francisco Bay on an 80-ft. right-of-way that will accommodate an additional pipeline in the future.

The first of three contracts let in construction of the new line covered an 8.6-mi. section of 78-in. reinforced concrete pipe, extending from the Irvington portal to the vicinity of Milpitas. Contractor for this portion was United Concrete Pipe Corp., which also is constructing the last section, an 8.1-mi. stretch of 72-in. reinforced concrete pipe from the Stanford University campus to the Pulgas tunnel. The intermediate section, 17.1 mi. in length, is 72-in. (lined) steel pipe placed by Artukovich Bros. and Steve P. Rados, Inc.

Only tunnel of the project is an 810-ft. section at the southerly, or beginning, end of the third section, under a portion of the Stanford golf course. A horseshoe section 130 in. in diameter, this tunnel will contain a 91-in. steel pipe to be embedded in 15 in. of concrete and lined by the Centriline process. The net diameter of 90 in. will be sufficient to contain the flow from an additional pipeline to be built in the future.

Costs of the three contract sections were $2,147,582, $4,097,546, and $2,098,832. Construction engineer for the San Francisco Water Department is Carl A. Lauenstein.

More power to Oregon from Deschutes

WITH PRELIMINARY approval given by staff counsel of the FPC to its proposed $22,000,000 Pelton Dam, the Portland General Electric Co. has announced plans for a second Deschutes River hydroelectric project near the confluence of the Deschutes and Metolius rivers. Round Butte Dam, to be located just above backwater of the Pelton reservoir, would create a head of about 285 ft., and add 225,000-kw. power capacity to resources in the Northwest.

Detailed specifications for the new dam must await the results of a $150,000 investigation of the site, which will not be conducted until a preliminary permit is granted. The proposed site is on the Deschutes River, ½ mi. below the mouth of the Metolius; impounded water would back up eight or ten miles into the canyons of the Deschutes, Crooked and Metolius rivers.

Steel shortage stifles Wyoming highways

STEEL ALLOCATION to the Wyoming State Highway Department has been cut 41% for the fourth quarter of 1951 compared to the third quarter. With a backlog of 914 tons of steel on order, six Federal Aid projects are already affected by the shortage, which includes material for bridge, culvert, fencing and guard-rail construction. State highway officials indicated that even the securing of a priority rating does not provide steel because "shopping" usually develops information that steel is not even available when its purchase has been sanctioned by the Government.

In general, this situation, which represents a threat to highway construction, is common to all state highway departments. It will result in strong and immediate action to be taken by the American Association of State Highway Officials. The AASHO headquarters considers the situation as representing a lack of understanding and appreciation of the position of highway construction in the present defense program. Although some improvement in allocation has been made for highway work, the shortage of steel finds highway departments handicapped in securing the types of products required for their operations in spite of this official allocation.

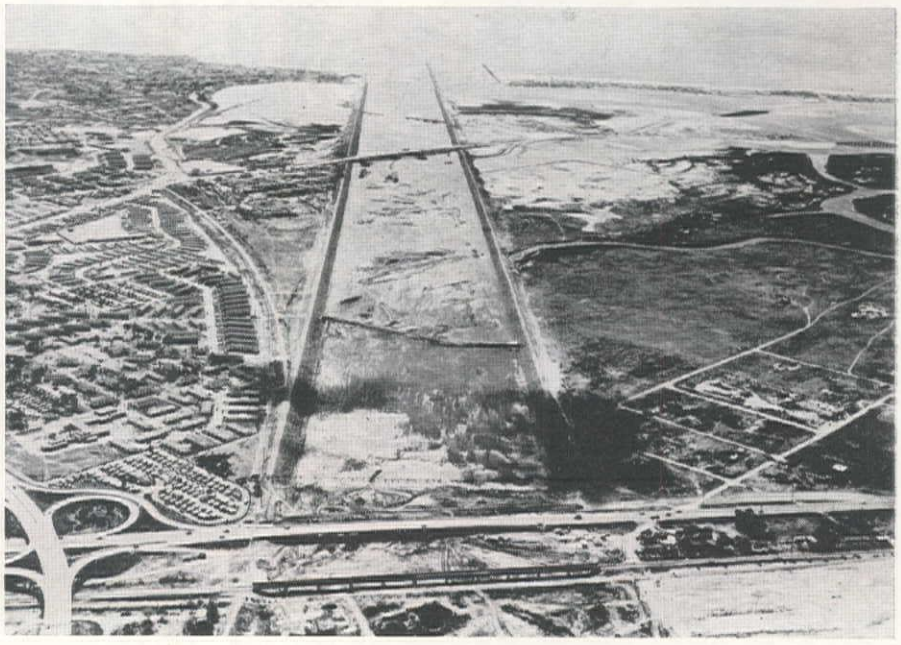
Idaho cities 3 mi. closer on new U. S. Highway 95

MOTORISTS got their first chance to drive the newest section of the North and South State Highway, south of Moscow, Idaho. The $438,000 project along 8.5 mi. was brought to a close by Max Kuney & Co. early last month.

Construction was started late last summer on the remodeling of this portion of U. S. 95. The new road eliminates many curves and cuts the distance between Moscow and Lewiston by about 3 mi. Although the new highway bypasses Genesee, it will be joined by a link route shortly.

LEVEES AND JETTIES DEFINE SAN DIEGO'S MISSION BAY FLOODWAY

Designed to discharge San Diego River flood peaks of 115,000 cfs., this channel is a feature of the city's plans for recreational development of its Mission Bay area. Providing 27,000 cfs. greater capacity than the old channel, the new floodway is protected throughout its 20,000-ft. length by stone-faced earth levees. Five bridges —four highway and one railroad—span the 800-ft. width. The completed project will provide a 1,900-acre small craft basin and 1,700 acres of park lands.



Western Test Road Site to Be in Idaho

IDAHO is to be the location of the Western States test road authorized by the Western Association of State Highway Officials at its annual conference last June. (*Western Construction*—August 1951, pp. 78-79.) Selected for construction and test is a portion of U. S. Highway 191 about 10 mi. south of Malad City in Oneida County. Announcement of the $300,000 project was made early last month by Earle Miller, State Highway Engineer of Idaho.

Provisions of the WASHO resolution of sponsorship included specification of a flexible, bituminous pavement for the test purposes. Financing of the investigation will be handled cooperatively by the interested Western States. Technical representation of the motor carrier industry will be provided by the Western Highway Institute and the American Trucking Associations, Inc.

Idaho to dedicate new bridge at Blue Creek Bay

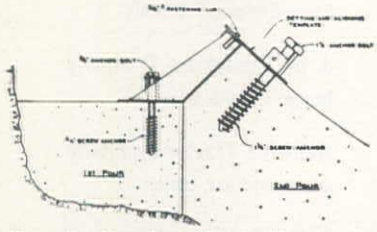
COMPLETED several months ago, Blue Creek Bay Bridge on Lake Coeur d'Alene in Idaho will be dedicated on September 14 following final work on U. S. Highway 10 beyond the west approach of the bridge. Dedication of the new bridge marks completion of a unique project designed by the Bureau of Public Roads to bridge an arm of Lake Coeur d'Alene at a grade elevation only about 35 ft. above the lake surface but 340 ft. above bedrock. Design problems of the structure were presented in *Western Construction* for April 1950, pp. 96-97, and contractor's operations reviewed in the December issue, pp. 57-60.

Chosen in preference to $2,000,000 suspension and pontoon designs, the final plan utilized a series of 30-ft. square steel piers that were barged into position and used as guides for the driving of steel and concrete bearing columns at each of the four corners. The contract was executed by Paul Jarvis, Inc., Seattle, on a bid of $871,155.

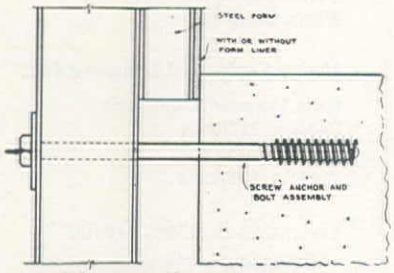
Joint (ad)ventures for Army engineer personnel

SLIPSTICKS and olive drab from five Western States converged on field headquarters at Ft. Lewis, Wash., for joint operations. Engineer groups participating were: the 365th, Reno, Nev.; the 992nd Aviation Engineers, Helena, Mont.; the 883rd Engineer Maintenance Battalion of Oregon; the 359th Construction Battalion from Idaho, and the 3839th and 2nd mobilization units from Washington.

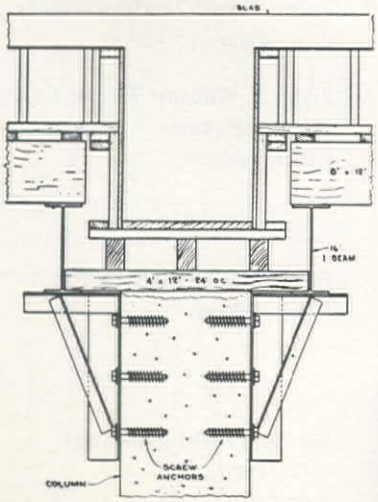
Lt. Col. Edward L. Pine, secretary-manager of the Nevada AGC, headed the combined units.



For Anchoring Tunnel Forms



With Cantilever Forms on Dam Construction



Supporting Temporary Brackets for False Work.

PROVIDE TEMPORARY OR PERMANENT SUPPORT

Providing a tight safe fastening invulnerable to shock and vibration, Superior Screw Anchors and Bolts are widely used in heavy concrete construction for *temporary* anchorage for steel tunnel forms, false work support brackets, cantilever steel forms for gravity dams and similar structures. Their use also permits convenient lifting of precast concrete slabs, beams and piles.

Easily assembled, Superior Screw Anchors and Bolts are ideal for numerous practical applications such as *permanent* anchors for cleats, fenders and other accessories to concrete structures.

Anchor bolts can be removed quickly with a wrench. No strength is lost by returning the bolt to the anchor. The full bearing of the coarse bolt thread is on the firmly imbedded anchor which provides steel bearing for the thread.

Superior Screw Anchors are available for ⅜″ to 1¼″ bolts.

Remember—when you use SUPERIOR you are assured of the *best* in design, material, and workmanship. Request a copy of our new Catalog 500—it contains a valuable table for spacing studs, wales, and form ties.

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New York Office: 1775 Broadway, New York 19, N. Y.
Pacific Coast Plant: 2100 Williams St., San Leandro, Calif.

Aluminum plant planned for Kitimat, B. C.

EXPANSION of the Canadian aluminum industry is to be undertaken at Kitimat, B. C., by the Aluminum Company of Canada, Ltd., with an expenditure in 1951 of $23,000,000 under an eventual $160,000,000 construction program. Four years of studies have indicated the feasibility of a smelting plant at Kitimat, to derive its power from Provincial hydro-electric projects in the immediate area, about 400 mi. north of Vancouver.

Raw material for operation of the plant, bauxite from sources in the Caribbean, will be delivered to the site either by sea via Douglas Channel or by a proposed railroad or vehicular route from Terrace, a point on the C.N.R. Skeena River line about 100 mi. east of Prince Rupert and 40 mi. north of Kitimat.

During the three-year construction period, power facilities will be built to provide an initial 800,000 hp., utilizing a total head of 2,500 ft. to be developed by a 10-mi. tunnel from a chain of interior lakes through the coastal mountains to a subterranean powerhouse near the Kemano River, 49 mi. southeast of Kitimat. Officials of the Aluminum Company foresee an eventual population at Kitimat of 50,000, though they emphasize that the growth will be gradual. Operation of the Kitimat plant will add from 88,000 to 110,000 pounds annually to Canadian aluminum production. Together with the output of another new plant planned for northeastern Quebec, the added annual production should total 165,000 tons, or 27.3% of the Dominion total.

Bond issue floated on Washington highways

HIGHWAY BONDS totaling approximately $66,700,000 were approved in Washington, and large finance companies were notified last month that the bonds are now for sale.

Allocation of the funds includes expenditure of about two-thirds of the total on improving Highway 99 between the Oregon and Canadian borders. Projects scheduled for remainder of the funds include building truck passing lanes over Snoqualmie Pass, Columbia Basin farm-to-market roads, a refinancing of the Agate Pass Bridge, which would make it toll-free, and construction of a bridge to span the Columbia River between Kennewick and Pasco.

Missouri River gets big head: propose to punish

A PLAN TO PUNISH the Missouri River for its recent flooding activities by removing it from its old stamping grounds met defeat at the hands of the Corps of Engineers.

In a Senate subcommittee hearing, Senator Thye (Rep., Minn.) pointed out that the familiar old landmark flows south to Kansas City, then angles off to the east. Was it possible, the Senator asked Brig. Gen. C. H. Chorpenning, deputy chief, Corps of Engineers, to divert the river southward at this point?

Gen. Chorpenning indicated that the Corps of Engineers was not afraid to tackle anything—even the temperamental Missouri River—but he advised the Senator that costs involved in such a project would be prohibitive. Chorpenning also advanced the idea that residents of river towns would probably be quite unhappy if the friendly lapping (or overlapping) of their river was removed entirely.

Apparently, further discussion of the Missouri's punishment will be postponed until it and the committee pull themselves together.

Hungry Horse concreting: best by a dam site

ONE OF THE MOST important requirements for those keeping records on concrete placement at Hungry Horse Dam, Mont., seems to be an eraser. Just after July figures were released at 232,288 cu. yd., it was necessary to revise them upwards to total 235,651 cu. yd.

Since records are being set monthly, weekly and daily, it is believed the concrete mixing plant has set a record for building the world's largest dams. Records set at Hoover, Friant and Shasta Dams have been bettered, and the plant is now concentrating on surpassing concrete production records at the two plants of the Grand Coulee project.

Prime contractor at Hungry Horse is the General-Shea-Morrison joint venture, which announces that 1,800,000 cu. yd. of concrete is now in place at the dam. Eventually, 3,100,000 cu. yd. will be in place, making Hungry Horse the third highest and fourth largest dam in the world.

With concrete placing proceeding at such a rate the closing of the diversion tunnel is scheduled for September.

Plans formulated for ASCE chapter in Alaska

GAIL A. HATHAWAY, special assistant to the chief engineer, Corps of Engineers, Washington, D. C., spoke to 43 Alaska engineers in Juneau, and it looks as though Alaska might have a chapter of the American Society of Civil Engineers.

The no-host dinner was arranged by George M. Tapley, chief of the engineering division, Alaska Road Commission, and A. F. Ghiglione, chief engineer, was master of ceremonies.

Hathaway, touring the territory on behalf of the ASCE, addressed the group on the history of the engineering profession. The group was interested in starting a chapter of the ASCE for the fast-growing Alaska engineering population, and after Hathaway's talk, it was decided to forward a petition for a charter to the New York headquarters. There is an established chapter of the ASCE in the U. S. Territory of Hawaii.

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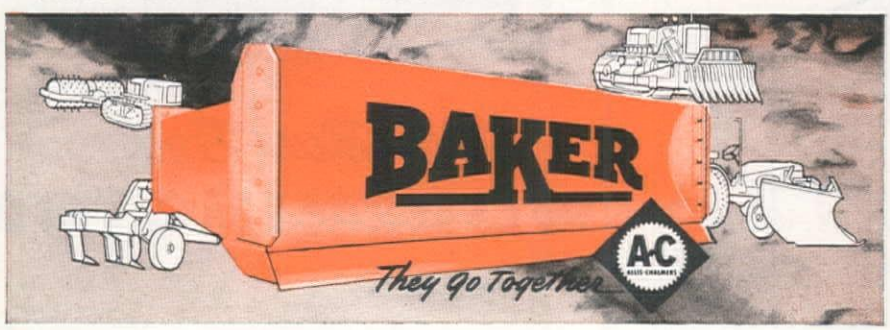

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Alaskan resources inventoried by USBR

THE INDUSTRIAL potential of Alaska is delineated in a current report of the Department of the Interior presenting results of reconnaissance engineering and economic studies made in the Territory. In particular, hydroelectric power sites have been located that represent almost 50,000,000,000 kw-hr. capacity. Initiated by Congress in 1949, the Alaskan investigations have been conducted cooperatively by Federal and local agencies, and the results reported without specific recommendations for action, rather as an inventory of resources.

Alaska's natural mineral wealth is noted for its strategic value and also for its value as an economic frontier for American industry. The report points out, however, the necessity of hydroelectric development as prerequisite to continued expansion. Already civilian and military power needs in the vicinities of Fairbanks, Anchorage and Nome are approaching the present installed capacity.

In its conclusions, the report emphasizes the role of a singe resource, water, in Alaska's economic future. To attract industry and insure stable growth, not only hydroelectric power is necessary: adequate agricultural production must be developed, through reclamation, drainage, clearing, and irrigation of about 87,000 acres. Municipal and industrial water supplies must be firmed; in some areas existing well supplies are becoming contaminated. Measures to aid flood control and navigation on Alaska's rivers will take on new significance.

Presently under construction is the first Federal power plant of the proposed development program, the Eklutna project, authorized in 1950 to provide 143,000,000 kw-hr. of hydroelectric power to the Anchorage and Palmer areas. The project includes the 4½-mi. Eklutna tunnel from Eklutna Lake to a 30,000-kw. plant on Knik Arm Flats.

Suggested for immediate further investigation are water resources of the Big Susitna River basin, transmountain diversion of water from the Lewes River (Yukon) drainage basin in Canada to the Taiya River outlet near Skagway, and power sites in southeastern Alaska where pulp industries seek to establish mills.

Reconnaissance power studies indicate 72 sites that could develop near 50,000,000,000 kw-hr. Multiple-purpose control of waters at one of these sites, Wood Canyon on the Copper River, calls for a 700-ft. dam, second in height only to Hoover Dam on the Colorado. Another reservoir site, on the Kuskokwim River, would involve impoundment of 230,000,000 acre feet of water over a ten-year period. A tabulation of Alaska's power potential, as summarized in the Interior Department report, follows:

Region and Area	Installed Capacity (kw.)	Annual Firm Production (kw-hr.)
Ketchikan Area	133,000	730,000,000
Wrangell Area	218,000	1,250,000,000
Sitka Area	58,000	320,000,000
Angoon Area	37,000	210,000,000
Juneau Area	1,775,000	9,760,000,000
Subtotal: Southeastern Region	2,221,000	12,270,000,000
Gulf of Alaska Area	1,744,000	9,780,000,000
Cook Inlet Area	1,519,000	8,660,000,000
Subtotal: South Central Region	3,263,000	18,440,000,000
Kuskokwim River Basin	850,000	4,800,000,000
Upper Yukon River Area	44,000	250,000,000
Yukon Flats Area	1,500,000	8,800,000,000
Tanana River Basin	156,000	890,000,000
Subtotal: Yukon-Kuskokwim Region	2,550,000	14,740,000,000
Subtotal: Seward Peninsula Region	35,000	200,000,000
Subtotal: Arctic Region	225,000	1,280,000,000
Total	8,294,000	46,930,000,000

NEWS IN BRIEF

Boysen embankment hits mark

SCHEDULED for topping out early this fall, the embankment at Boysen Dam in Wyoming is reaching its maximum crest height this month. The 1,500,000-cu. yd. structure on the Big Horn River is a multi-purpose unit of the USBR Missouri River Basin Project and will provide power, conservation, flood control and other benefits. Design features and construction operations were covered in *Western Construction*—July 1951, pp. 77-80.

Bureau engineers expect completion of the dam this year and are scheduling operation of the 72,000,000-kw-hr. power plant for next spring. A contract has been awarded for installation of generators and other power plant equipment.

On the terminal reservoir of the Salt Lake Aqueduct project (see p. 80) Peter Kiewit Sons' Co. used this movable hand-hoisting rig to lower the cages of column reinforcing from the roof forming.

Simple repair tools

FIVE SIMPLE TOOLS, quickly and easily made from inexpensive materials found in most service shops, are aiding in the salvage and reconditioning of final drive bellows seals in track-type tractors, thereby helping extend the nation's supply of copper and tin.

The materials for repair are readily available, the tools required can be easily fabricated in any shop, and the technique is not difficult, according to Caterpillar Tractor Co. A program for the conservation of these seals is now being carried on by this firm and its world-wide distributor organization as part of a large-scale, long-range field repair and conservation program involving many parts made of alloy steels, copper, aluminum, brass and bronze going into Caterpillar machines.

These tools include a T-handle for removing bellows seals; a shaping tool or "dolly" with shaping pliers used to "iron out" corrugations, making them smooth and uniform in size; a seal spreader for expanding the seal and exposing the breaks making them accessible for repairs; a crowfoot punch for bringing the retaining rings back to shape on a flat steel plate.

In the past it has been common practice to replace all worn or damaged final drive bellows seals with new parts rather than attempt repair of the bellows. Many bellows are rendered useless because of the serious damage occurring during removal. It is also known that accumulations of mud and dirt plus the adhesive strength of the cement used in assembling the seal gaskets, make bellows seal removal difficult.

However, by careful removal and the relatively easy process of replacing the cork-leather gasket and the cork facing, about 50% of all bellows seals can be returned to immediate service. Many other seals which have been damaged during operation or removal can be successfully repaired by soldering patches of thin brass (salvaged from seals damaged beyond repair) over the fractured area.

New unit in highway program

CONCRETE PLACING started last month on another link in the Denver-Colorado Springs superhighway, the second largest concrete paving contract ever let by the Colorado State Highway Department (largest was the contract for current construction on the Denver-Boulder Turnpike).

Northwestern Engineering Co., Denver, Colo., and Western Contractors, Sioux City, Iowa, rolled heavy equipment into place and began construction on the 8.6-mi. highway which is to be two lanes on the flat and three lanes on hills. Eventually the work will result in a four-lane highway between Denver and Colorado Springs. It is hoped that this section of the project to Castle Rock will be completed this year.

C. J. Strike Dam rises on Snake River

HALF-WAY POINT in construction of C. J. Strike Dam on the Snake River in Idaho has been reached by forces of Morrison-Knudsen Co., Inc., builders of the dam for Idaho Power Co. With the spillway section above river level, water is being diverted through sluiceways and earthfill construction commenced across the old river channel. When completed, C. J. Strike Dam will be 3,220 ft. long, 115 ft. high, and will contain about 2,000,000 cu. yd. of material.

Turbine installation in the powerhouse has been started; the first of three generators is planned for operation by the end of the year. Eventual capacity of the entire hydroelectric installation is 90,000 kw., and its cost $18,000,000.

Test assembly in shops of Gunderson Engineering Corp., Portland, shows size of 25-ton gantry slated for McNary Dam Contractors. Four of these units, 35 x 40 ft., and 20 ft. high, will support Clyde Whirley cranes having a capacity of 35 tons at 75-ft. boom radius.

Progress on Idaho dam

ALBENI FALLS dam site on the Pend Oreille River in Idaho got its first taste of concrete Aug. 1. (See *Western Construction*—Aug. 1950, p. 88; Dec. 1950, p. 75.)

About 500 cu. yd. of foundation for the north spillway abutment was involved in the pour at the Corps of Engineers' $31,000,000 project. The spillway replaces the central falls in the river.

Pouring will continue until the middle of October on a 24-hr. schedule. Plans for continued construction of the dam after the present contracts expire received a serious blow when a House appropriations committee voted down a $10,000,000 budget request recently. It is still hoped that the money will be granted in time for the next construction season.

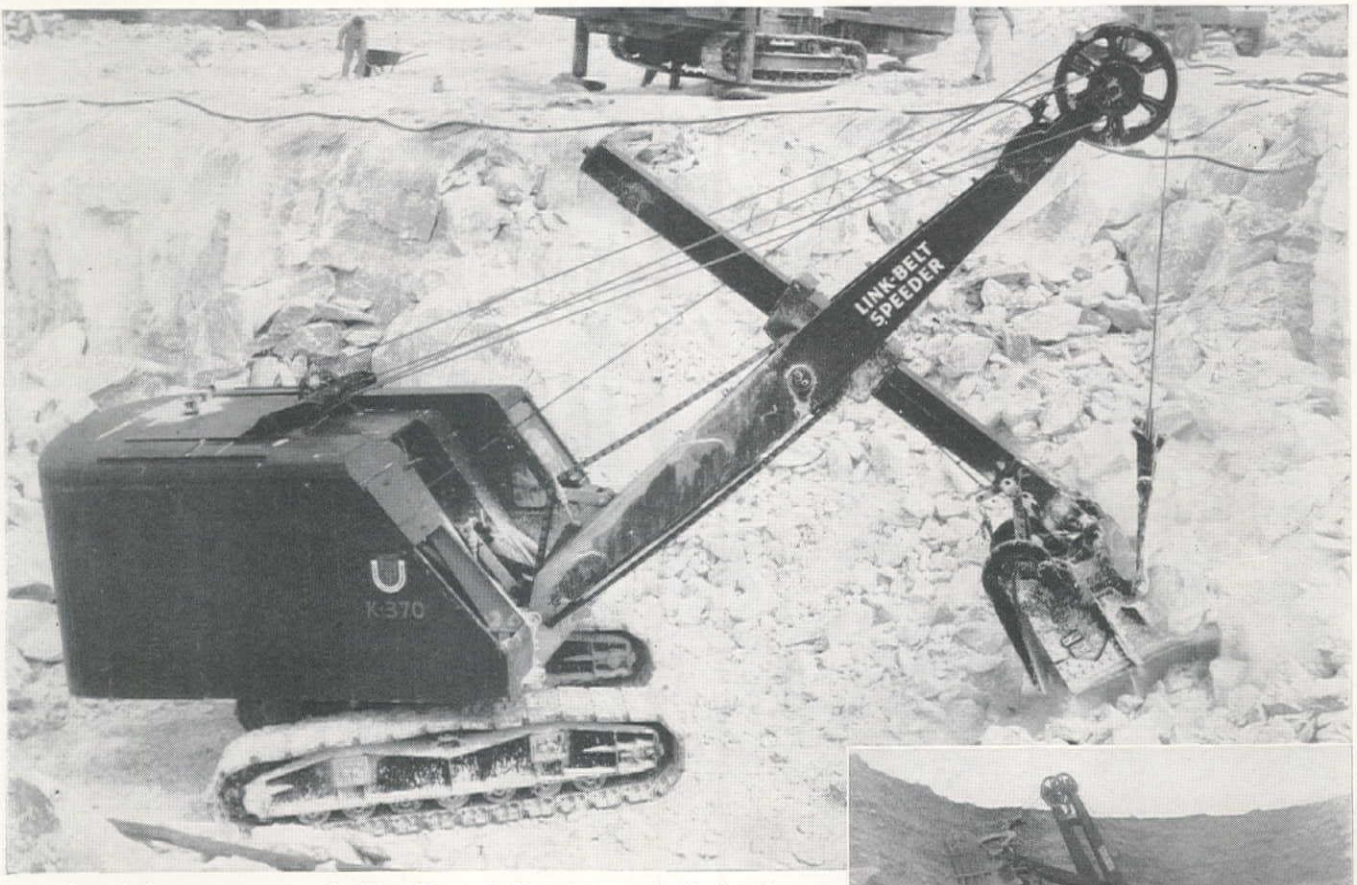
Directory of state highway officials

THE 1951 ROSTER of State Highway Officials and Engineers, an annual production of the American Road Builders' Association, is now ready for distribution. In a handy pocket size, 66 pages, the booklet contains the names, titles and addresses of highway department personnel of all states and the U. S. Bureau of Public Roads. It is brought out each year in collaboration with the state highway departments. For those who wish to keep their highway department lists up to date, the information is invaluable. It sells for $1.00 postpaid. Obtainable from ARBA, International Bldg., Washington 4, D. C.

Core drill standards published

THE DIAMOND CORE Drill Manufacturers Association announces publication of its Standards Bulletin No. 1. The Bulletin lists all the various types and sizes of core drill equipment in general use for which standards have now been written in whole or in part. The

Their first LINK-BELT SPEEDER sold them 15 more!



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Electric-powered Link-Belt Speeder heavy-duty shovels at work in a gravel deposit.

Crawler mounted Link-Belt Speeders filling a Redi-Mix concrete plant.

Self-propelled, rubber-tired Link-Belt Speeders used for aggregate loading.

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publication clearly shows these parts, with cutaway drawings and nominal dimensions.

Standards Bulletin No. 1 represents the collected knowledge, experience and thought of the 16 member companies of the Diamond Core Drill Manufacturers Association, following the work of the Association's technical committee.

Copies may be obtained at a cost of 50 cents each from Diamond Core Drill Manufacturers Association, 122 East 42nd Street, New York 17, N. Y.

Cheyenne residents still drink water

RESIDENTS of Cheyenne, Wyoming, noted with pleasure that Pole Mountain watershed seems to be withstanding rising mid-summer demands for water without too much strain. Measurements show that the supply is about 85% of normal at a time when city demand sometimes reaches 12,000,000 gal. per day.

In the east and northeast sections of the city, water pressure problems have occurred during peak usage periods, but even in the most extended sections pressure remains at about 60 lb., which is above the national municipal water pressure average of 40 to 45 lb.

Pressure will be increased, however, with the construction of a new reservoir west of the city and completion of a 30-in. main to supplement the 16-in. and 30-in. mains now nearing completion. Plans are under way for improvement of the city's distribution lines next year, and this is expected to further solve the problem.

Late spring rain and snow were credited with keeping the water supply intact to fully meet summer demands. Figures taken this year compare favorably with those measurements taken during a comparable period last year.

Australia seeks Western bidders

THE STATE RIVERS and Water Supply Commission, Victoria, Australia, is requesting bids from Western firms for the construction of the first stage enlargement of the Waranga Western Main Channel, located about 100 mi. north of Melbourne.

The threefold enlargement of the first stage of 41 mi. of channel to a capacity of 3,000 cfs. will involve approximately 10,000,000 cu. yd. of earthwork in addition to the construction of regulating structures, cross-drainage works, 50 road and railway bridges and other items which will require approximately 30,000 cu. yd. of reinforced concrete. When the work is completed this channel will be the largest in Australia.

The construction of this channel will be a major work carried out as part of the enlargement of the Goulburn Irrigation System to enable distribution of the additional water which will be available when the Utah Construction Company of California completes its contract for the building of the Big Eildon Dam (*Western Construction*—Aug. 1951, p. 68) on the Goulburn River, to store 2,750,000 acre-feet.

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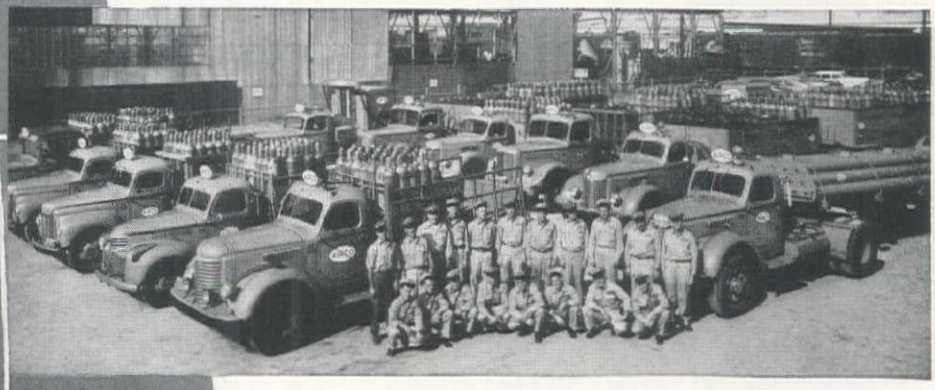

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Erecting aggregate plant at "Chief Joe"

. . . Continued from page 84

lined ditch covered by a half-round corrugated steel culvert.

From the screening building, material is stored in stockpiles according to size. Production and live storage capacity for the individual sizes are: minus 6-in. to plus 3-in., 92 tons per hour and 2,700 tons storage; minus 3-in. to 1½-in., 84 tph., and 2,000 tons; minus 1½-in. to ¾-in., 76 tph., and 2,000 tons; minus ¾-in. to No. 4, 52 tph., and 1,350 tons. Production of minus No. 4 to No. 16, with 1,200 tons live storage, and minus No. 16 sand, 3,600 tons live storage, is 96 tph.

Due to a shortage of adequate fines the contractor is required to manufacture his own. The minus No. 4 to plus No. 16 is reduced by a 6 x 12 Marcy Rod Mill to minus No. 16. Minus No. 16 sand is processed by a sand classifier in the screening house. The smaller aggregates and sand are blended as desired in a two-compartment bin with the blending being done by weigh feeders. An estimated 1,835,000 tons of aggregate will be needed for the 1,000,000 cu. yd. of concrete scheduled to be used. The plant was designed and supplied by Conveyor Co., Los Angeles, and erected by the contractor.

Personnel

W. N. Evans is project manager for Chief Joseph Builders with J. P. Williams as general superintendent and L. K. Parker as project engineer. Tony Frietas supervised erection of aggregate plant with Jack G. Keith, Los Angeles, acting as consultant. Stan Fraser was carpentry foreman, and Thomas "Blackie" Anderson was steel foreman. (See picture in "Supervising the Jobs" section.)

CALENDAR OF MEETINGS

Sept. 15—Concrete Products Assn. of Washington, fall meeting, at Spokane.

Sept. 24-25—American Water Works Association, Rocky Mountain Section, annual convention at Cosmopolitan Hotel, Denver.

Sept. 24-27—Institute of Traffic Engineers, annual convention at Ambassador Hotel, Los Angeles.

October 11-12—Structural Engineers Association of California, annual meeting, at Yosemite National Park, Calif.

October 14-17—League of California Cities, annual convention, at San Francisco.

October 15-17—League of Oregon Cities, annual convention, at Multnomah Hotel, Portland.

October 21-24—American Bridge, Tunnel and Turnpike Association, annual convention, at St. Francis Hotel, San Francisco.

October 22-25—American Society of Civil Engineers, Annual Convention, at New York City, N. Y.

October 23-26—American Association of State Highway Officials, fall meeting, at Fontinelle Hotel, Omaha, Nebraska.

October 23-26—California Section, American Water Works Association, annual meeting, at Fairmont Hotel, San Francisco.

ENGINEERS ON THE MOVE

Consulting engineers **Ralph A. Tudor**, San Francisco, Calif., **Ralph Smillie**, New York City, and **John Parcel**, St. Louis, Mo., are engaged in a preliminary

Tudor

Smillie

study on plans to build a bridge across Puget Sound in Washington. The three will review all the plans and proposals presented for spanning the Sound and decide which is the most feasible.

* * *

William I. Morgan, general engineer, who has been employed at the Grand Coulee Dam since April 1938, retires from the Bureau of Reclamation. Morgan was responsible for about $5,000,000 worth of government equipment in use under contracts for repair of the spillway bucket and face of the dam and improvements of the Columbia River channel.

* * *

A. F. Wilber is now acting chief, Development Division, Bureau of Reclamation, Klamath Falls, Ore. He is engaged in planning development of land and water resources, particularly with regard to agriculture. He was formerly chief civil engineer, United Western Investigation, Bureau of Reclamation, Salt Lake City, Utah.

* * *

Donald B. Best, Chelan County, Wash., is the new president of the Washington county engineers. **I. W. Pouttu**, Pacific County, is the new vice president and **A. C. Winnett**, Columbia County, is secretary-treasurer.

* * *

Elmer G. Aitken is now civil engineer at the Atomic Energy Commission's Reactor Testing Station, Idaho Falls, Idaho. He comes to his new post from Billings, Mont., where he was a civil engineer with the Bureau of Reclamation.

* * *

Ralph Miln resigns as Clackamas County, Ore., roadmaster to devote more time to his duties as county surveyor and engineer.

* * *

W. C. Funk becomes deputy manager of the Atomic Energy Commission's Idaho Operations Office. He has been assistant manager of the office since June 1949. Funk graduated from Montana State College in 1932 as an electrical engineer. He was at one time first civil assistant to the Fort Peck Area engineer, Corps of Engineers.

* * *

***Charles H. Purcell*, Director of Public Works in California, retires. (See item below.)**

Charles H. Purcell retires as Director of Public Works in the State of California. Retirement was made necessary by failing health. Purcell's administration of California's public works projects included personal supervision of plans and surveys for construction of the San Francisco-Oakland Bay Bridge. In the course of his public career, Purcell has been with the Oregon State Highway Department and District Engineer for the Bureau of Public Roads in Portland, Ore. In 1928, he became California state highway engineer and remained in this position until his appointment as Director of Public Works in 1943.

* * *

Charles L. Nichols, formerly with Peter Kiewit Son's Co. on the Ross Dam power project, is now job engineer with Dames & Moore, San Francisco, Calif.

* * *

Jefferson C. Boyer is assistant office engineer with the U. S. Army Corps of Engineers on construction of Lookout Point Reservoir, Lowell, Ore. He was formerly with the Corps of Engineers on Detroit Dam project in Oregon.

* * *

Doyle F. Boen, who recently assumed the duties of general manager and chief engineer of The Eastern Municipal Water District, including Hemet, San Jacinto and Perris, Calif., is working out details for the distribution of Colorado River water to the 59,000 acres included in the system. Annexation by the Metropolitan Water District of Southern California made use of Colorado River water possible.

* * *

A. E. Sanderson, supervising engineer for the Public Building Service, General Services Administration, has retired

Hveem succeeds Stanton as California highways Materials and Research Engineer

Stanton

Hveem

THIRTY-NINE years of State service preceded the retirement of Thomas E. Stanton, Materials and Research Engineer of the California Division of Highways.

Following his employment in April 1912 as assistant division engineer in Division VI, Stanton rose to the status of assistant State highway engineer in 1921. Appointed materials and research engineer in 1928, he achieved international note in the following years for his investigations of the durability of portland cement concrete. For this work he received the Wason Medal in 1934 and the Norman Medal in 1943.

Born in Los Angeles in 1881, Stanton received his A.B. from St. Vincent's College in 1899 and then went on to the University of California, from which he graduated in 1904 with a B.S. in mining. Seven years of surveying and engineering for the City Engineer's office followed prior to his entry into state service in 1912.

Stanton's accomplishments have not been limited to his engineering career. He has been an active participant in committee affairs of the American Society of Civil Engineers and was one of the organizing forces of both the California State Employees' Association and the State Employees' Retirement System.

Succeeding to Stanton's position as materials and research engineer is his assistant, F. N. Hveem. Also a national figure in the field of highway research, Hveem is particularly known for his studies of bituminous surfacing materials, including the introduction of special tests for evaluation of their various characteristics.

Hveem's career with the state dates from 1917, his work in the Materials and Research Department from 1929, a year after Stanton's appointment as department head.

after a 35-year government career. Sanderson plans to enter private business in California but will remain in Washington temporarily as special consultant to PBS Commissioner **W. E. Reynolds** on reactivation of government-owned war plants. **Otis R. Poss** succeeds Sanderson.

* * *

R. C. Mielenz, L. P. Witte and **O. J. Glantz** received the American Society for Testing Materials' Sanford E. Thompson Award for their paper entitled "Effect of Calcination on Natural Pozzolans." The award was presented to the three Bureau of Reclamation men for outstanding research on concrete and concrete aggregates.

* * *

Bartsch

Lester W. Bartsch becomes assistant regional director of the Bureau of Reclamation's Region 6, which covers all of Montana east of the Continental Divide, the northern half of Wyoming east of the Divide, and North and South Dakota. Bartsch, who was formerly principal administrative assistant to the Bureau's chief engineer in Denver, Colo., will make his new headquarters at Billings, Mont. In his new capacity, Bartsch will assist in the direction and administration of the Bureau's program for the irrigation of new lands; production, transmission and marketing of hydroelectric power, etc. He has been with the Bureau for 20 years.

SEAOC to meet

THE ANNUAL MEETING of the Structural Engineers Association of California will be held in Yosemite National Park on October 11 and 12. The technical program is divided into three half-day sections, including papers on timber, concrete and steel design. Committee reports will be made on the "Current Status of Wood Diaphragm Design" and the "Steel Research Program." Arthur W. Anderson, consulting engineer of

On August 15 **Robert Leighton,** Lovelock, Nev., takes over as assistant state engineer of Nevada. He succeeds **Hugh A. Shamberger** who recently became state engineer in Nevada, replacing **A. M. Smith** who retired.

* * *

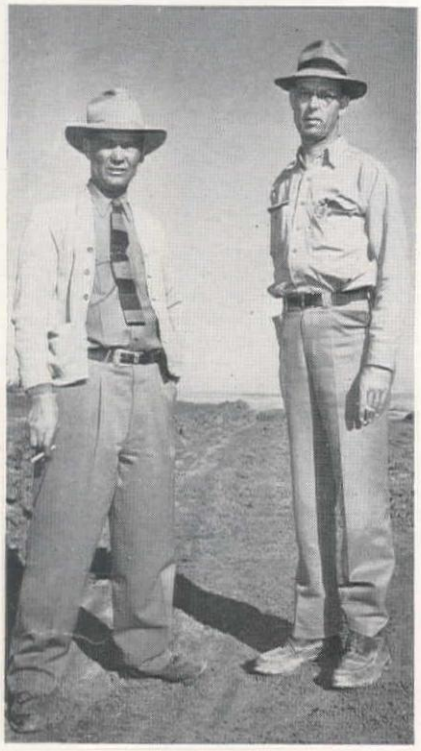
P. H. Van Etten, assistant state engineer in California's Division of Water Resources, retires after 22 years of service. He has been in charge of various studies to determine potential water resources throughout the state, and one of his recent studies led to the proposed Feather River Project. He participated in early studies which laid the ground-

work for the Central Valley Project and bringing Colorado River water to the San Diego area. In 1914, Van Etten designed and built the South San Joaquin Irrigation District's canal system, while working for the Bay City Water Co. Van Etten intends to make his home in Stockton, and open offices as a consulting engineer.

* * *

E. O. Slater, president and manager, Smith-Emery Co., Los Angeles, Calif., is a new member of the board of directors of American Society For Testing Materials.

* * *



***Jess McCreight*, right, new West Coast engineer, Utah Construction Co. (See item below.) *James Fogg*, left, is now Utah's project manager at Eildon Dam, Australia. (*Western Construction*—August 1951, p. 68.)**

J. F. McCreight is now West Coast District engineer for The Utah Construction Co., Richmond, Calif. McCreight was project engineer at Bonny Dam, Colo., when that Bureau of Reclamation project was brought to completion two years ahead of schedule. **Guy V. Sperry** is the new manager of the West Coast District of Utah Construction Co. He was formerly chief estimator for the company in its San Francisco, Calif., office.

* * *

N. K. Williams retires from the Bureau of Reclamation after 15 years of service. Williams' interest in dam construction and water resources has taken him on an extended tour of major projects in the West since his retirement. He is now living in Ft. Pierce, Florida.

* * *

W. M. Hector is now county engineer in Douglas County, Ore. He is engaged in county road construction near Roseburg. Hector was formerly county engineer of Klamath County, Ore.

DEATHS

Joseph P. Riley, 72, retired contractor, died in Glendale, Calif.

* * *

John T. Watson, building contractor, died May 30 in San Fernando, Calif., Veteran's Hospital at the age of 53.

* * *

Charles H. Duering, 78, contractor and builder, died June 6 in a Los Angeles, Calif., hospital.

* * *

Lawrence L. Reed, vice president of Reed & Martin, general contractors of Fairbanks, Alaska, died June 2 in a New Washington Hospital. Reed had lived in Alaska for the past 18 years.

* * *

Robert H. Brandt, 74, retired civil engineer, died June 12 in Pasadena, Calif.

* * *

James D. Nelson, 30, former construction superintendent, died from a self-inflicted bullet wound July 4 in his Phoenix, Ariz., home.

* * *

Charles M. Coff, 57, died June 25 in Denver, Colorado. He was chief of the schedules and progress section of the Construction Division, Bureau of Reclamation. Prior to his work with the Bureau, Coff had been state bridge engineer in Nebraska and with the Corps of Engineers.

* * *

Clarence I. Munzer, 62, contractor and builder, died July 3 in Los Angeles, Calif., after an illness of several months.

* * *

Walter H. Engstrom, 54, building contractor, died while on a visit to Longview, Ore. Engstrom's home was in Los Angeles, Calif.

* * *

Ivan J. Kipp, 63, structural engineer, died July 12 at Wadsworth Hospital, Sawtelle veterans home, Los Angeles, Calif.

* * *

John Callister Lyman, 70, former civil engineer and surveyor in Salt Lake City, Utah, died in San Bernardino, Calif.

* * *

Wendell T. Hedgcock, former chief engineer of the City Building Department, Denver, Colo., died recently. He had been chief building inspector in Denver until 1944 when he resigned to start a general contracting firm.

* * *

Dominic Fiorito, 67, owner of the Seattle Contracting Co., died July 22. Fiorito and his three brothers started their first construction company in the Pacific Northwest in 1912.

SUPERVISING THE JOBS

Bald Mountain Tunnel construction is being supervised by **Frank Merrick** for Winston Bros. Company. This part of the Colorado-Big Thompson project started on March 19, 1951. Merrick reports that the crew portaled in on April 1 working one shift. From April 23 three shifts were used. So far the ground has been pretty well supported and June 19 the tunnel was in 2,086.5 ft.

* * *

The Bureau of Reclamation's tunneling project 8 mi. west of Loveland, Colo., is being supervised by **Jerry Fox. K. S. Mitty** is project manager, and K. S. Mitty Construction Co. has the $1,066,940 contract. The project is part of the Colorado-Big Thompson project and consists of constructing a pressure tunnel 8 ft. in diameter, to be 5,800 lin. ft. in length. The project began in July 1950 and concrete lining is now being started. Completion date is March 1952.

* * *

Freeman J. Kyle is the general superintendent on the Bureau of Reclamation's power and pumping plant construction west of Loveland, Colo. **Fred J. Petterson** is project manager for Winston Bros. Construction Co. on the $2,240,350 project. To date 160,000 cu. yd. of earth and 60,000 of rock have been excavated for the powerhouse. The job began in April 1951 and should be completed by March 1953.

* * *

San Luis wasteway construction near Los Banos, Calif., is being supervised by **Frank B. Anderson. Bob West** is assistant superintendent and **Jess Garver** is grade superintendent. **Bob Ames** is project manager for Western Contracting Corp. **Herb Alexander** is master mechanic. **Dee M. Wren** is field engineer for the Bureau of Reclamation, and **O. H. Folsom** is resident engineer.

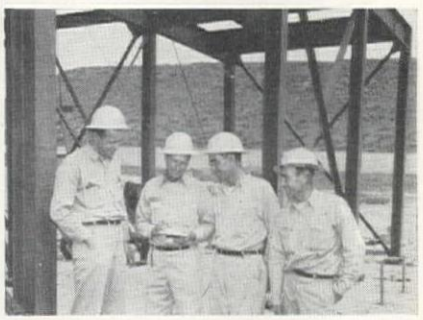
* * *

B. F. Kelly, Jr. is job superintendent for Armstrong & Armstrong, Roswell, N. Mex., on construction of the Deming-Lordsburg section of Highway 70-80 in Luna County, N. Mex. **Clyde Rossow** is grading foreman, **T. C. Carr** is bridge foreman, **Paul Taylor** is crusher foreman on the $910,986 job. **R. L. Devers** is structure foreman.

* * *

Tunnel construction for Big Cliff Dam downstream from Detroit Dam is being supervised by **Hank Ewert.** Night walker is **Ed Shea. W. F. Rennebohn** is project manager for Shea Co. on all jobs in this area.

* * *



ERECTING aggregate plant at Chief Joseph Dam in Washington (see article on page 84 of this issue). From left: *Jack G. Keith*, consulting engineer; *Stan Fraser*, carpentry foreman; *Tony Freitas*, plant superintendent; and *Thomas (Blackie) Anderson*, steel foreman.

* * *

Construction of the First Methodist Church in Wenatchee, Wash., by A. A. Vandivort Construction Co. is being supervised by **W. D. Boblet** with **J. C. Henderson** and **C. R. Craghead** as foremen.

* * *

Rock crushing and road building near Amboy, Wash., is being supervised by **Robert Hughes** with **A. Hughes** as foreman. **Tommy Hughes** is head mechanic for Smith Bros., Vancouver, Wash. The job is being done for Harbor Plywood Corp., Hoquiam, Wash.

* * *

Salinas Valley Memorial Hospital construction, Salinas, Calif., is being supervised by **"Tony" A. Maroni. Art Fabian** and **H. (Bud) McAbee** are carpenter foremen for Parker, Steffins & Pearce, San Francisco contractors. The $2,500,000 project should be completed in June 1952. **Vern Ostendorf** is resident engineer. **Bob Garrow** is job engineer.

* * *

Taxiway and runway extensions for Los Angeles International Airport, Los Angeles, Calif., is being supervised by **Earl Boswell. Cliff Ward** is grade foreman for Hensler Construction Corp. **Harry Vogel** is master mechanic on the $550,000 project which should be finished this month. **Jack Parker** is resident engineer.

* * *

Grain elevator construction in Lewiston, Mont., is a $250,000 project of Victor Construction Co., Lewiston.

* * *

Peabody & Co., Seattle, have several jobs under way in Washington. In Pasco, construction of the $600,000 reinforced concrete Sacajawer Apart-

Down-time Dopes . . . . . by Anderson

This month's "Down-time Dopes" is based on an idea suggested by R. V. Killewich, resident engineer in Alaska, who says it was prompted by the type of labor available in the Territory. Have you seen any "down-time dopes" running loose in office or field lately? Write Editor, *Western Construction*, 609 Mission St., San Francisco, Calif., and we'll be glad to immortalize him in a cartoon. You'll receive credit for the idea.

ments is being supervised by **Glen W. Wilt** with **Clyde Garlow** as carpenter foreman. In Moses Lake, **Elmer Gjertson** is job superintendent for Peabody and **Ray Grudier** is carpenter foreman on construction of a fire and crash station. **Pat Jones** is job foreman on residence construction in Pasco.

* * *

Rudolph Olheiser is general superintendent for Olheiser Construction Co. on the erection of the $158,000 St. Joseph's Catholic Church in Dickinson, N. Dak.

* * *

R. Garity is job superintendent for Arthur G. McKee, Cleveland, Ohio contractor, on construction of Union Oil Co.'s catalytic cracking plant in Wilmington, Calif. **Elmer N. Martin, William M. Duby, Ferris Moore** and **J. C. MacIssac** are supervising the erection of the plant. **Lloyd O. Voll** is chief engineer. The job is scheduled for completion April 1, 1952.

* * *

Foster Manning is general superintendent for Henry George & Son, Spokane, Wash., on construction of elevators for Southern Pacific Grain and Growers, Inc., at Kennewick, Wash. The project, which is being built by the slip form method, will cost $1,500,000. **Cliff Bestrom** is general foreman, **Les Bestrom,** caprenter foreman along with **Ben Savage** and **Gene Welch. Bruce Stedman** is labor foreman and **Owen Lierman** is ironworker foreman.

* * *

Construction of George Washington Bridge in Richland, Wash., is being supervised by **Gus Lorenz. Ole Ronmark** is carpenter foreman for Manson Construction & Engineering Co., Seattle, on the $472,000 project. **Adolph Fosness** is pile-driver foreman along with **Bud Curtis. Bill Fowler** is in charge of ironwork.

* * *

In Moses Lake, Washington, where Lease & Leigland is constructing barracks and mess facilities for Larson Air Force Base, **Lee E. Woods** is general superintendent with **W. L. Layne** as his assistant. **Leslie V. Kennedy** is utility foreman, **Henry P. Ross,** prefab yard foreman, and **John Pritchard** is carpenter foreman with **Earl Key, Herb Reynolds** and **Pete Valdez. Kenneth F. Dietrick** is labor foreman. **S. A. Eberhardt** is office engineer and **Mike Thill** is field engineer.

* * *

S. O. Dingman is now office manager for North Atlantic Construction Co., Minneapolis, Minn.

* * *

Second stage construction of Albeni Falls Dam near Priest River, Idaho, is being supervised by **J. D. Heckart** with **W. B. Money** as his assistant. Donavan-James, contractor, has **"Dutch" Peters** as rock superintendent, with **Wayne Tilson** as his assistant. **Joe Heckart** and **Harley Stevens** are carpenter foremen, and **Lew Lloyd** is labor foreman. **George**

Roskowyk is rigger foreman and **Tony Rossmier** is ironworker foreman. **A. R. Bacon** is project manager, **W. L. Davis, Jr.,** project engineer, and **James F. Grafton** is resident engineer for U. S. Army Corps of Engineers.

* * *

Harry E. Jeffrey, general contractor, Underwood, N. Dak., has completed two projects recently. Construction wound up on the $30,000 Washburn School and the $70,000 Memorial Building, also in Washburn.

* * *

Installation of pipe line in Medford, Ore., is being supervised by **Harold Gourlie** for Morrison-Knudsen Co., Inc. **R. E. Mayfield** is assistant superintendent on the $420,000 project. The project, which began October 1, 1950 and is scheduled for completion September 1, 1951, will be 30 mi. in total length. Thirteen miles have been completed to date.

* * *

In Ft. Collins, Colo., where the Bureau of Reclamation's $1,955,000 tunnel project is under way, **L. A. Stiles** is general superintendent for **G. L. Tarlton,** contractor. The project is scheduled for completion in May 1953. **Harry Werner** is engineer.

* * *

Construction of expansion facilities for Pacific Coast Paper Mills of Washington, Inc., Bellingham, is being supervised by **Lud Swanberg. Dan Arco** and **T. M. Peters** are caprenter foremen for Howard S. Wright Co. **Vard Bliven** is labor foreman and **Cal Larson** is steel foreman. Howard S. Wright Co. also has the contract for extension of Puget Sound Pulp Mills facilities in Bellingham. **J. L. Harris** is general superintendent on this project, with **W. T. Plank** as carpenter foreman, **Axel Swanberg** as labor foreman and **Al R. Berg** as steel foreman.

* * *

Pieler Construction Co., Seattle, Wash., has a rock gravel and hot plant at Oak Harbor, Wash., for work at the Navy Base near-by. **Al Hughes** is superintendent, **Kenny Hughes** is plant superintendent, **Tom Guy** is crusher foreman, and **H. S. Dodd** is structure superintendent.

* * *

The $321,000 construction of the Hollywood Blvd. overcrossing on the Hollywood Freeway in Los Angeles, Calif., is being supervised and managed by **Frank Muren. Jeff Kasler** is assistant superintendent for Frederickson & Kasler. **E. C. Skaggs** is carpenter foreman on the project, which began in March of this year and is scheduled for completion March 1, 1952. **F. Exter** is steel foreman for Bethlehem Pacific Coast Steel Co., subcontractor for reinforced steel.

* * *

Construction of a final feature of the Hyperion sewage plant, El Segundo, Calif., is being supervised by **H. A. Roscoe. Al Fewell** is carpenter superintendend for Peter Kiewit Sons' Co. and Fred Early, joint venturers on the $1,500,000 project. **Rex Hammon** is labor foreman on the project, which is scheduled for completion in November.

* * *

Oberg Construction Co. has **Oscar Kringlen** as general superintendent on construction of the Sepulveda Blvd. subway in Los Angeles, Calif. **Nils Oberg** is assistant superintendent on the $1,600,000 project for the City of Los Angeles and the Civil Aeronautics Administration. **John Myles** is master mechanic on the project, which is scheduled to end in April 1952. Resident engineer is **Charles Newkirk.**

* * *

Harbor Freeway construction in Los Angeles, Calif., is being supervised by **C. A. Rice** with **Henry Kreuzer** as his assistant. The job, which includes construction of five bridges, two underpasses and excavation of 190,000 cu. yd., is under contract to Winston Bros. Construction Co. **Rudy Brozovich** is concrete foreman, **V. I. Grose** is labor foreman and **A. E. Johnson,** carpenter foreman on the $956,067 project. **H. J. Yount** is project manager.

* * *

Adler Construction Co., Loveland, Colo., has **Nolan Wallace** as superintendent on construction of the Pole Hill Power Plant and access road, Estes Park Foothills Power Aqueduct, Colorado-Big Thompson Project. Work on the $741,740 project got under way November 1950 and was 41% complete July 1, 1951. **Oswald Zerb** is concrete foreman, **Lester Gowey,** steel foreman, **Earl Tay-**

lor is carpenter foreman, and **Willard Gates,** carpenter foreman. Drilling and powder foreman is **Ralph Naylor,** and equipment maintenance foreman is **Hans Schilling. Mac Kinzel** is supply foreman. Project engineer is **James Dittus** and **Edgar Sheldon** is office manager. The job is scheduled for completion July 4, 1952. Construction of the North Poudre Supply Canal for Colorado-Big Thompson Project is another Adler Construction Co. project. Actual work on this job began June 15, 1951 with **A. B. (Abe) Farnsworth** as superintendent. The $756,450 project is scheduled for completion May 25, 1953. **Oscar Mitchell** is excavation foreman, **Paul Statler** is grade foreman and **Bernard A. Adler** is lubrication foreman. Schilling, Kinzel, Dittus and Sheldon are performing the same functions (see above) on both projects, which are within a 20-mi. radius of Loveland, Colo. **Harold C. Adler** is personally supervising the progress of both projects.

* * *

The Gaasland Company, Inc., has five jobs under way in Alaska. **Roy Gaasland** is in charge of all operations for the company and **Basil Porter** is general manager. The general superintendents are: **Clyde Hovick, Elwin Shields** and **W. E. (Brownie) Greeton. Sam Baker** is project manager. Total cost of the projects is about $9,500,000.

* * *

Herbert Robertson is job superintendent for Newport Construction Co., Portland, Ore., on construction of the Salisbury-Baker section of the Baker Unity Highway in Oregon. The $399,185 job includes 8.73 mi. of grading and paving and construction of a 76-ft. concrete bridge.

* * *

A. F. Konda is supervising construction of the Norris-Bozeman Highway in Madison County, Mont. **Yoe Yurck** is grade foreman for Naranche & Konda, contractor on the $150,999 project.

* * *

Adolph Haidlen is the new superintendent on speed-up construction of 10 mi. of Going-to-the-Sun highway in Glacier National Park from Logan Creek to Logan Pass, Mont. He succeeds **George Rothwell,** who transfers to Seattle, Wash. Morrison-Knudsen Co., Inc., is the holder of the $378,741 contract.

* * *

E. L. Cowan is constructing Lincoln School, Great Falls, Mont., on a $500,000 contract from School District No. 1. The job began in April 1951 and is scheduled for completion in March 1952. **J. M. Carroll** is the engineer.

* * *

Lou Parker is general superintendent for Baruch Corp. on construction of the maternity and pediatrics pavilion at Cedars of Lebanon Hospital, Hollywood, Calif. **Eddie Holmdahl** is assisting Parker on the project, **Bill Timmers** is carpenter foreman and **Tony Lopez** is labor foreman. The job should be finished July 1, 1952.

CONTRACTS

A Summary of Bids and Awards For Major Projects in the West

★★

Alaska

$6,329,364—**Grove, Shepherd, Wilson and Kruge,** 247 Park Ave., New York, N. Y.—Low bid for construction of an Army Communications Station at Kenai; by Corps of Engineers.

$1,000,000 (approx.)—**A. J. Hopper,** Seattle, Wash.—Contract awarded for construction of a complete bulk liquid fuel system to be spread over the Ocean Dock area, Ft. Richardson and Elmendorf; by Corps of Engineers.

$348,878—**G. William Hufeisen,** Box 1194, Anchorage—Low bid for construction of 30 two-bedroom residences and utilities for the Eklutna Project; by Bureau of Reclamation.

$6,020,410—**C. F. Lytle, Green Construction Co.,** and **S. Birch & Sons Construction Co.,** joint venturers, 208 Central Bldg., Seattle, Wash.—Contract awarded for construction of outside utilities servicing Eielson Air Force Base; by Corps of Engineers.

$1,839,059—**S. Macri Construction Co.** and **A. G. Rushlight,** Anchorage—Contract awarded for construction of water treatment facilities and sewage treatment plant at Ladd Air Force Base; by Corps of Engineers.

$1,983,000—**J. H. Pomeroy & Co., Inc.,** 333 Montgomery St., San Francisco, Calif.—Contract awarded for construction, by October 1952, of a composite administration building at Ft. Richardson; by Corps of Engineers.

Arizona

$126,661—**Lyle Price Construction Co.,** P. O. Box 548, Flagstaff—Low bid for construction of Route 12, Globe-Holbrook National Forest Highway, to be 8.0 mi. long, including grading, surfacing and construction of a bridge, in Navajo County, Sitgreaves National Forest; by Bureau of Public Roads.

California

$278,948—**J. R. Armstrong,** 400 Central, El Cerrito—Low bid for construction of a state highway in Sonoma County at various locations between Cloverdale and Santa Rosa, a net distance of about 8.9 mi. to be graded and surfaced with plant-mixed surfacing; by State Division of Highways.

$321,897—**Boddum & Peterson,** 2315 Curry St., Long Beach—Low bid for construction of a state highway on Pomona Blvd. between Ferris Ave. and Portrero Grande Dr., about 2.3 mi. long, to be graded and paved with asphalt concrete; by State Division of Highways.

$2,772,777—**John E. Brahagh & Son,** 105 Sheridan Ave., Piedmont—Low bid for construction of McClymonds High School, Oakland; by Oakland Board of Education.

$13,000,000 (approx.)—**Buttress & McClellan, Inc.,** 1900 Beverly Blvd., Los Angeles—Letter of intent signed for construction of a guided missile plant in Pomona; by Consolidated Vultee Aircraft Co.

$2,590,205—**Chicago Bridge & Iron Co.,** 200 Bush St., San Francisco—Low bid for construction of a steel shell and support structure for 8-ft. supersonic wind tunnel at Moffett Field; by National Advisory Committee, for Ames Aeronautics Laboratory.

$255,113—**Eaton & Smith,** 1215 Michigan St., San Francisco—Low bid for construction of a state highway in Alpine County between 1.5 mi. and 2.5 mi. northeasterly of Woodfords, near Markleeville, a total net distance of 1.1 mi.; roadbeds to be graded, imported base material to be placed, bituminous surfacing treatment applied and the existing bridge over the East Carson River, about 1.5 mi. southeast of Markleeville to be repaired and a new reinforced concrete bridge to be constructed across Silver Creek; by State Division of Highways.

$164,082—**R. A. Erwin,** P. O. Box 244, Colton—Low bid for construction of a county highway on Hole and Holden Aves., between West Riverside city limits and Arlington Ave., about 3.6 mi. in length to be graded, cement treated base, and surfaced with plant-mixed surfacing; by State Division of Highways.

$2,007,473—**Fredericksen & Kasler,** 212-13th St., Sacramento—Low bid for construction of a state highway 0.6 mi. north of Devore, about 9.3 mi. in length to be graded and surfaced with plant-mixed surfacing on base material, and four reinforced concrete bridges and two culverts to be constructed to provide a freeway with 4-lane divided roadbed, San Bernardino County; by State Division of Highways.

$109,483—**Granite Construction Co.,** P. O. Box 900, Watsonville—Low bid for construction of a county highway in Santa Cruz and Santa Clara counties on Summit Rd., between Route 5 and Woodwardia, about 1.3 mi. in length to be graded and surfaced with crusher run base and prime coat and seal coat to be applied; by State Division of Highways.

$257,203—**Harms Bros.,** 5261 Stockton Blvd., Sacramento—Low bid for construction of a state highway in Alpine County between 1.3 mi. and 2.6 mi. east of Picketts, about 1.3 mi. in length, to be graded, surfaced with road mixed surfacing on imported base material, and construction of a reinforced concrete girder bridge across West Fork Carson River; by State Division of Highways.

$146,059—**C. V. Kenworthy,** Rt. 2, Box 654, Stockton—Low bid for construction of a county highway in Mono County, between Alpine County line and U. S. Route 395, portions about 4 mi. net length, to be graded and drainage structures to be installed on about 3.6 mi. of existing roadbed; by State Division of Highways.

$212,842—**Charles MacClosky Co.,** 112 Market Street, San Francisco—Low bid for construction of a county highway in Los Angeles County, across San Gabriel River, on Imperial Highway, a reinforced concrete girder bridge to be constructed; by State Division of Highways.

$6,758,000—**M & K Corporation, Fredrickson & Watson,** and **Piombo Construction Co.,** joint venturers, 200 Financial Center Bldg., San Francisco—Contract awarded for construction of the new Atascadero State Hospital for the Department of Mental Hygiene; by State Department of Public Works.

$193,703—**Matich Bros. Paving Co.,** Colton—Low bid for construction of a county highway in San Bernardino County on Sierra Ave., between Valley Freeway and Highland Ave., about 4.7 mi. in length to be graded to provide additional width and surfaced with plant-mixed surfacing on cement treated base; by State Division of Highways.

$1,045,743—**George Miller Construction Co.** and **Parce Construction Co.,** joint venturers, 3032 Bandini Blvd., Los Angeles—Contract awarded for construction of a sanitary sewer system in Kern County, Union Ave. Sanitation District; by Kern County Board of Supervisors.

$1,937,885—**Nomellini Construction Co.,** 939 Marengo Rd., Stockton—Contract awarded for general construction of the receiving and treatment unit, Stockton State Hospital; by State Division of Architecture.

$212,493—**Lars Oberg,** P. O. Box 640, Inglewood—Low bid for construction of a county highway across San Gabriel River on Center St., a reinforced concrete bridge to be constructed; by State Division of Highways.

$270,478—**E. G. Perham,** 1128 Stearns Dr., Los Angeles—Low bid for construction of a county highway across Rio Hondo, on Florence Ave., a reinforced concrete and structural steel bridge to be constructed; by State Division of Highways.

$176,641—**Pike & Hill, Carey Bros.,** and **Bailey,** P. O. Box 27, Diablo—Low bid for construction of a county highway in Sonoma County, on Petaluma-Valley Ford Highway, between 1.0 mi. east and 1.7 mi. west of Valley Ford, about 19 mi. west of Petaluma, about 27 mi. in length to be graded and surfaced with imported base material on imported sub-base material and class B double seal coat and penetration treatment applied; by State Division of Highways.

$149,386—**J. R. Reeves,** P. O. Box 1072, Sacramento—Low bid for construction of a state highway on Greenback Lane, between Main Ave. in Orangevale Colony and Folsom-Auburn Rd., about 1.5 mi. of roadway to be graded, imported sub-base material and untreated rock base to be placed and surfaced with plant-mixed surfacing, Sacramento County; by State Division of Highways.

$313,618—**Richter Bros.,** P. O. Box 1511, Oroville—Low bid for highway improvements in Sierra County between 1.4 mi. east of Yuba County line and 1.5 mi. west of the North Yuba River, about 0.8 mi. in length to be graded and bituminous surfacing treatment applied and a reinforced concrete girder bridge across Indian Creek to be constructed; by State Division of Highways.

$2,000,000—**William Simpson Construction Co.,** 816 W. 5th St., Los Angeles—Contract awarded for construction of a 4-story office building in Los Angeles; by Massachusetts Mutual Life Insurance Co.

$372,510—**John Strona,** 1538 Philadelphia St., Pomona—Low bid for construction of a county highway across Rio Hondo, on Beverly Blvd., a combination reinforced concrete and structural steel bridge; by State Division of Highways.

$266,184—**C. B. Tuttle Co.,** 268 Belmont Ave., Long Beach—Low bid for construction of a county highway in Riverside County across Santa Ana River on Crestmore Rd., near Riverside, a steel plate girder bridge; by State Division of Highways.

$2,537,790—**United Concrete Pipe Corp.,** Box 425, Baldwin Park—Low bid for construction of a state highway in Los Angeles County on Santa Ana Freeway, between Todd Ave. and 0.2 mi. southeast of Lakewood Blvd., about 2 mi. in net length to be graded and surfaced with portland cement concrete on cement treated sub-grade; acceleration and deceleration lanes to be surfaced with plant-mixed surfacing on untreated rock base; 4 grade separation structures and a bridge across the Rio Hondo to be constructed to provide a freeway with a 6-lane divided roadway; by State Division of Highways.

$1,000,000—**Ford J. Twaits Co.,** 449 S. Beaudry St., Los Angeles—Contract awarded for construction of a 4-story reinforced concrete library building at Claremont College; by Claremont College.

Colorado

$106,000—**Floyd Haake,** 111 Lovato Lane, Santa Fe, N. Mex.—Low bid for construction of the Dolores-Rico route in Montezuma County, San Juan National Forest, to be 1.6 mi. in length, a 20-ft. wide roadbed and a bridge roadway 26 ft. wide; by Bureau of Public Roads.

$151,066—**J. H. & N. M. Monaghan & Assoc. Cos.,** Rt. 1, Derby—Contract awarded for grading, draining, base course surfacing and miscellaneous work on 7.4 mi. of the Slater east road; by State Highway Department.

Idaho

$121,209—**Le Grand Johnson,** 595 E. 1st So., Logan, Utah—Contract awarded for construction of the Bancroft-Alexander road in Caribou County; by State Highway Department.

$223,345—**Peter Kiewit Sons' Co.,** P. O. Box 875, Sheridan, Wyo.—Contract awarded for construction of the Dubois West Section, Idaho Central Highway, Clark County; by State Highway Department.

$564,000—**Peter Kiewit Sons' Co.,** P. O. Box 875, Sheridan, Wyo.—Contract awarded for construction of the Rio Bridge northerly road, Jerome County; by State Highway Department.

Montana

$212,053—**Inland Construction Co.,** 3867 Leavenworth St., Omaha, Neb.—Contract awarded for construction of the Olive-Miles City Highway in Powder River and Custer counties, to be 7.8 mi. in length, including grading, gravel surfacing, placing road-mix oil and construction of small drainage structures; by State Highway Commission.

$546,300—**Peter Kiewit Sons' Co.,** Box 875, Sheridan, Wyo.—Contract awarded for construction of the Monicka-Kalispell highway in Lincoln and Flathead counties, to be 9.4 mi. of grading, gravel surfacing, road-mix oil treatment and small drainage structures to be constructed; by State Highway Commission.

Nevada

$1,747,473—**Lembke, Clough & King,** 1927 Fremont St., Las Vegas—Contract awarded for construction of a sewage disposal unit and miscellaneous buildings near Las Vegas; by U. S. Atomic Energy Commission.

$106,077—**George E. Miller,** P. O. Box 1728, Reno—Contract awarded for construction of a portion of the State Highway System in Eureka County from Garden Pass to 30 mi. south of Palisade, to be 30.1 mi. in length; by State Highway Department.

$259,990—**Wells Cargo, Inc.,** Reno—Contract awarded for construction of a portion of the State Highway System in Lander County, from a junction with U. S. 50 at Austin to a point approximately 38 mi. north Austin-Battle Mountain Road; by State Highway Department.

Oregon

$298,888—**Babler Bros. & Rogers Constr.,** 4617 S.W. Milwaukie Ave., Portland—Low bid for construction of the Nyssa-Adrian section of the Nyssa-Adrian highway in Malheur County, to be graded and paved; by State Highway Commission.

$227,361—**J. N. Conley,** 4332 N.E. Royal Ct., Portland—Contract awarded for construction of the Big Creek section of the Colum-

bia River Highway, about 10.7 mi. east of Astoria, about 2.04 mi. of grading, construction of 100-ft. concrete grade separation structures, a 156-ft. concrete bridge, one 8 x 8-ft. box culvert, and a 4 x 4-ft. box culvert extension; by State Highway Commission.

$149,696—**D & H Paving Co.**, Vancouver, Wash.—Low bid for construction of the Hayesville-Salem (Lana Ave.) section of the Pacific East Highway in Marion County to be graded and paved; by State Highway Commission.

$341,105—**K. F. Jacobsen & Co., Inc.**, and **J. M. Arenz**, joint venturers, 0445 S.W. Porter St., Portland—Contract awarded for construction of the Fairview-Sundial section of the T. H. Banfield Expressway near Fairview, to be 1.4 mi. in length, including grading, paving and construction of 2 concrete viaducts; by State Highway Commission.

$449,224—**Leonard & Slate Oregon Ltd.**, 7805 S.W. 40th Ave., Portland—Low bid for the Cannon Beach-Arcadia section of the Oregon Coast Highway in Clatsop County to be graded and bituminous macadam surfacing applied; by State Highway Commission.

$589,959—**McNutt Bros.**, 351½ E. Broadway, Eugene—Low bid for construction of the Rocky Creek-Wocus Marsh section of Klamath Lake secondary highway in Klamath County; by State Highway Commission.

$399,185—**Newport Construction Co.**, 7031 N.E. Halsey St., Portland—Contract awarded for construction of the Salisbury-Baker section of the Baker-Unity Highway, 8.73 mi. of grading and paving, construction of a 76-ft. concrete bridge and furnishing 2,660 cu. yd. crushed gravel in stockpiles; by State Highway Commission.

$456,125—**Parker-Schram Co.**, 200 Builders Exchange Bldg., Portland—Contract awarded for construction of the Meridian Dam-Duval Creek section of the Willamette Highway from 0.4 mi. east of Lowell Bridge easterly, 11.7 mi. of topping and paving, also furnishing 7,500 cu. yd. of crushed gravel in stockpile; by State Highway Commission.

$479,600—**Parker-Schram Co.**, 200 Builders Exchange Bldg., Portland—Contract awarded for construction of the Hood River-Mosier section of the Columbia River Highway near Hood River, about 7.36 mi. of topping and slope protection; by State Highway Commission.

Utah

$176,653—**Germer, Abbott & Waldron Construction Co.**, Tremonton—Contract awarded for construction of the Idaho State Line-Curlew Junction highways; by State Road Commission.

$1,500,000 (approx.)—**Stone & Webster Engineering Corp.**, 90 Broad St., New York, N. Y.—Contract awarded for design and construction of 5,000-kw. steam power plant, Cedar City; by Southern Utah Power Co.

Washington

$173,283—**Bennett Campbell, Inc.**, 815 Seaboard Bldg., Seattle—Contract awarded for construction of the Grays Harbor County Rd., Vesta and Vesta School Bridges and approaches, Grays Harbor County, to be .36 mi. in length; by State Highway Department.

$112,304—**Birch McCartney**, Veradale—Contract awarded for construction of Secondary State Highway 6-B, Davis Lake to Usk, Pend Oreille County, to be 4.2 mi. in length; by State Highway Department.

$221,347—**Columbia Asphalt Paving Co.**, Yakima—Contract awarded for surfacing, fencing and seeding work at the Yakima Training Center; by Corps of Engineers.

$194,129—**N. Fiorito Co.**, 844 W. 48th St., Seattle—Contract awarded for construction of King County Road, Middle Road, King County; to be 3.0 mi. in length; by State Highway Department.

$246,161—**N. Fiorito Co.**, 844 W. 48th St., Seattle—Contract awarded for construction of Primary State Highway 2, Grand Ridge to Preston in King County, to be .7 mi. in length; by State Highway Department.

$210,725—**Grant Construction Co.**, Box 351, Coeur d'Alene, Idaho—Contract awarded for construction of Secondary State Highway 3-H, Tilma to Latah, Whitman and Spokane counties, to be 7.5 mi. in length; by State Highway Department.

$194,852—**Hugh Govan**, Port Angeles—Low bid for grading

4.2 mi. of the Olympic Highway in Clallam and Jefferson counties; by Bureau of Public Roads.

$433,064—**Peter Kiewit Sons' Co.,** 1300 Aloha St., Seattle—Low bid for earthwork and structures, West Canal Station, Frenchman Hills Wasteway Station, Columbia Basin Project; by Bureau of Public Roads.

$181,977—**Thomas Scalzo Co.,** 3211 Airport Way, Seattle—Contract awarded for construction of Secondary State Highway 1, Mukilteo north, Snohomish County, to be .9 mi. in length; by State Highway Department.

$510,276—**J. A. Terteling & Sons, Inc.,** Box 1428, Boise, Idaho—Contract awarded for construction of Walla Walla River railroad bridge for the Union Pacific relocation and the overpass for Washington State Highway 3 at Wallula, Walla Walla County; by Corps of Engineers.

$421,293—**White Bros. Co.,** Box 276, Walla Walla—Contract awarded for highway construction along Primary State Highway Chehalis north, Lewis County, to be 2.129 mi. in length; by State Highway Department.

Wyoming

$137,375—**Asbell Construction Co.,** Riverton—Contract awarded for construction of a state highway on 6.1 mi. of the Huleet-Aladdin Rd. in Creek County, including grading, draining, base course surfacing and miscellaneous work; by State Highway Department.

$413,377—**Flora Construction Corp., Flora Engineering Co.,** Rt. 3, Box 234, Denver, Colo.—Low bid for schedules 1 and 2, construction of the Boysen Unit of the Missouri River Basin Project; by Bureau of Reclamation.

$110,515—**Huntley Construction Co.,** Rock Springs—Contract awarded for construction of a state highway on 2.8 mi. of the Evanston-Ft. Bridger rd. in Uinta County, including grading, draining, base course surfacing, oil treatment by the road-mix method and miscellaneous work; by State Highway Department.

$358,685—**Peter Kiewit Sons' Co.,** P. O. Box 875, Sheridan—Contract awarded for construction of a state highway along 6.6 mi. of the Cheyenne-Pine Bluffs rd. in Laramie County, including grading, draining, base course surfacing, 1 reinforced concrete culvert and miscellaneous work; by State Highway Department.

$145,105—**Knisely-Moore,** Box 77, Douglas—Contract awarded for construction of a state highway on 19.1 mi. of the Gillette-Douglas road in Converse County, including base course surfacing, oil treatment by the road-mix method and miscellaneous work; by State Highway Department.

$103,983—**Leach Bros.,** Box 152, Buffalo—Contract awarded for grading, draining and miscellaneous work on 5.1 mi. of the Douglas-Cold Springs road in Converse County; by State Highway Department.

$238,775—**Long Construction Co., Inc.,** Box 1291, Billings, Mont.—Low bid for earthwork, asphaltic membrane lining and structures, Coulee Crossing relocation, Willwood Canal, Willwood Division, Shoshone Project; by Bureau of Reclamation.

$108,829—**McClellan and McQueen, Inc.,** and **The Van Dyke Co., Inc.,** P. O. Box 425, Worland—Low bid for construction of the Lovell Substation, Transmission Division, Missouri River Basin Project; by Bureau of Reclamation.

$388,088—**J. H. & N. M. Monaghan & Assoc. Cos.,** Rt. 1, Derby,

Colo.—Contract awarded for construction of a state highway on 10.5 mi. of the Burgess Junction-Shell road, in Sheridan and Big Horn Counties, including grading, draining, base course surfacing, surface treatment and miscellaneous work; by State Highway Department.

$163,035—**Peter Kiewit Sons' Co.,** P. O. Box 875, Sheridan—Low bid for earthwork, structures, track and communications line relocation of Chicago and Northwestern Railway, Boysen Reservoir; by Bureau of Reclamation.

$124,624—**Charles M. Smith,** Box 508, Thermopolis—Contract awarded for construction of a 3-span continuous bridge over the No Wood River at Bonanza crossing, and miscellaneous work on 0.2 mi. of the Manderson-Hyattville road in Big Horn County; by State Highway Department.

$138,096—**Woodward Construction Co.,** Box 1046, Rock Springs—Contract awarded for construction of a state highway on 12.0 mi. of the Rock Springs-Hiawatha road in Sweetwater County, including base-course surfacing, oil treatment by the road-mix method and miscellaneous work; by State Highway Department.

Miscellaneous

$282,097—**Williston Construction Co.,** Williston, N. Dak.—Low bid for construction of Bismarck-De Vaul 69-kv. transmission line, Transmission Division, Missouri River Basin Project; by Bureau of Reclamation.

$470,901—**D. L. Varney,** 503 Redick Tower Bldg., Omaha, Neb.—Low bid for Schedules 1 and 4, construction of the Huron, Mount Vernon, Sioux Falls, and Watertown substation, Transmission Division, Missouri River Basin Project, S. Dak.; by Bureau of Reclamation.

$2,212,508—**Peter Kiewit Sons' Co.,** Box 875, Sheridan, Wyo.—Low bid for earthwork, canal lining and structures for the Missouri River Basin Project, Angostura Unit, Cheyenne Division, situated near Hot Springs, S. Dak.; by Bureau of Reclamation.

$1,159,666—**C. F. Lytle Co., R. N. Campsey Construction Co.,** and **B. & C. Construction Co.,** joint venturers, 2238 Oneida St., Denver, Colo.—Low bid for schedule 1 and 2 construction of the Rapid City-Wall-Midland 115-kv. transmission line, So. Dak. Transmission Division, Missouri River Basin Project; by Bureau of Reclamation.

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

CHARLES GLOCKE becomes the manager of the *Four Wheel Drive Auto Co.'s* service division. Glocke has been with the Clintonville, Wis. firm since 1934. He has been field service manager since 1945.

☆ ☆ ☆

THOMAS WATKINS, formerly Long Beach, manager for *Republic Supply Company of California,* becomes manager of the company's Fresno branch warehouse and store. Watkins replaces RALPH ABBOTT, who will remain in Fresno as San Joaquin Valley representative for *Carrier Corporation.* MARK L. BANKS, Republic supply salesman, is the new Long Beach manager.

☆ ☆ ☆

Wicker Wood Equipment Company becomes *Dart Truck Company,* Kansas City, Mo., dealer for the State of California. The new distributor maintains headquarters at 6900 Tajunga Avenue, North Hollywood, Calif. and at 215 - 23rd St., Sacramento, Calif.

☆ ☆ ☆

Straub Manufacturing Co., Inc., Oakland, Calif., appoints *Construction Equipment Company,* Spokane, Wash., as exclusive eastern Washington representative of Kue-Ken crushers.

☆ ☆ ☆

Robinson

CHARLES ROBINSON is a member of *Bay Equipment Co.'s* sales staff. He has the San Francisco and Marin County territory for the Richmond, Calif., distributor of *Worthington Pump & Machinery Co.; Ransome Machinery Co.; Pettibone - Mulliken Corp.; Universal Engineering Co.,* and *Haiss Manufacturing Co.*

☆ ☆ ☆

ROBERT D. LINN becomes office manager for *The Tractor Sales Corp.,* Los Angeles, Calif. Prior to accepting his new position, Linn was vice president of the *A. O. Miller Waterproofing and Paint Company,* Los Angeles.

☆ ☆ ☆

HARRY W. HOWARD, manager of Pacific region of *General Motors Truck and Coach Division,* Oakland, Calif., retires after 29 years of continuous service with the company. J. W. DAVID, GMC zone manager, Los Angeles, Calif., also retires after 21 years of continuous service. The merger of the Los Angeles and Oakland zones under F. A. HOYT was announced. Hoyt will be responsible for all *GMC* activities in California, Arizona and Western Nevada.

☆ ☆ ☆

With the start of operations at the new Burbank, Calif., plant of *Aero-Coupling Corp., Aeroquip Corp.* subsidiary, the firm's extensive expansion program has reached completion. The expansion included work on Eastern sites and was started a year ago to cope with increasing military and industrial orders.

☆ ☆ ☆

Worthington Pump and Machinery Co. appoints WILLIAM J. FLEMING manager of the Construction Equipment Sales Division. JOHN S. BACHMAN continues to be in charge of field sales with the title of assistant manager. The Dunellen, N. J., plant will continue to be headquarters for both men. HERBERT E. GALLISON is appointed manager of Worthington's Industrial Mixes Sales Division, to succeed J. C. LUKAS, who has resigned.

Gallison

Fleming

☆ ☆ ☆

DAVID R. WARNER is the new Near-Western district sales manager for *Miller Electric Manufacturing Co.,* Appleton, Wis. Nebraska, Wyoming and Colorado are included in his territory. The firm manufactures welding equipment.

☆ ☆ ☆

ROBERT F. GOUDGE, *Goodman Manufacturing Co.,* joins the sales staff of GEORGE CLEMENS, district manager at Salt Lake City, Utah. Goudge is a graduate engineer from New Mexico School of Mines.

☆ ☆ ☆

Northern California offices and warehouse facilities were opened by *Davidson Plywood & Lumber Co.,* Los Angeles, Calif. The new branch is located at 1930 Carroll Ave. and Newhall, San Francisco. RALPH MANNION will manage the new operation. The new warehouse covers 20,000 sq. ft. of floor space, and includes facilities for prompt loading of customer trucks. Specialty items for lumber dealers will be included in the products handled by the office.

☆ ☆ ☆

ROBERT H. MADDAN, JR. is now division vice president in charge of the *Central Sales Division* of *Columbia Steel Co.* Offices are located in the Russ Building, Montgomery St., San Francisco, Calif. Maddan will be succeeded as manager of sales by ALEX WALKER.

☆ ☆ ☆

Broms

GRAYDON BROMS is now district representative in the West for *Hyster Company.* Brom's territory includes most of Oregon, Washington, Idaho, western Montana, Yukon Territory, British Columbia and Alaska. He has been with Hyster for 12 years, in the shop, service and order departments.

☆ ☆ ☆

BOB DUFFY takes over as national sales manager for Brik-Toter Conveyors, made by *Mar-Rail Conveyor Company,* Pawtucket, R. I. Duffy will organize a national network of distributors for the *Brik-Toter Division.* He plans to cover the entire country during the next 18 months calling on prospective distributors and general contractors.

☆ ☆ ☆

Dietrich-Collins Equipment, Ltd., Vancouver, B. C., becomes a distributor for Chicago Pneumatic construction equipment in British Columbia.

☆ ☆ ☆

Heil Equipment Co. of Northern California announces its appointment as distributor for Omaha Standard Center Dump Trailers and Liken Truck Transit Concrete Mixers in Northern California and western Nevada.

☆ ☆ ☆

ANDREW LORENTZEN recently joined the parts department of the *Sacramento Valley Tractor Co.,* Sacramento, Calif.

☆ ☆ ☆

BILL DAVIS recently joined the sales staff of the *Moore Equipment Co.,* Sacramento, Calif., according to TED MACKRELL, branch manager.

☆ ☆ ☆

HARRY B. NORRIS, 45, died suddenly on July 15. He was for many years sales manager of the *Crook Company,* Los Angeles, Calif.

☆ ☆ ☆

J. L. ONEAL becomes regional service representative for *Cummins Engine Co.,* with headquarters in Los Angeles, Calif. He was previously with their Denver, Colo., office.

☆ ☆ ☆

Wilson-Albrecht Co., Inc., St. Louis Park, Minn., scaffolding manufacturer, announces an expanded distribution program that will introduce new "Waco" sectional scaffolding outlets in a number of

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

metropolitan areas. Dealer areas in the West under consideration by the firm are: Salt Lake City, Utah; Portland, Ore., and Seattle, Wash. Exclusive distribution franchises will be awarded in each locality.

☆ ☆ ☆

B. F. Goodrich has completed its new $5,000,000 belt plant in Akron, Ohio. The new plant is 317 by 180 ft., and has 150,000 sq. ft. of floor space. Conveyor belting in single rolls up to 35 tons in weight can be produced there.

☆ ☆ ☆

ROY W. JOHNSON, former general sales manager for *Republic Supply Co. of California,* is now executive vice president. His jurisdiction covers all departments of the organization throughout California. W. DALE RUSSELL, senior vice president, replaces Johnson.

☆ ☆ ☆

Ets-Hokin & Galvan, San Francisco, adds BERNARD C. ASHOFF to its sales staff. He will cover Northern California calling on architects and engineers and will specialize in products manufactured by *D. W. Onan & Sons, Pyrene Co., C-O-Two Fire Equipment Co.* and *Sani-Pry Co.* Ashoff was previously with *Douglas Aircraft Co., Pacific Safety Devices Co., Remington Rand* and *Specialty Mfg. Co.* He is well-known throughout this territory.

☆ ☆ ☆

V. DE P. GERBEREUX has a new assignment as manager of the Centrifugal Pump Sales Division of *Worthington Pump and Machinery Corp.* He succeeds A. H. BORCHARDT, who becomes vice president in charge of centrifugal, reciprocating and vertical turbine pump sales. Gerbereux is the inventor of a specific speed slide rule and an acid valve, as well as the author of

Gerbereux *Borchardt*

the centrifugal pump section of Kent's Handbook. Worthington's Compressor Division will have E. A. MURRAY as its new manager. HERMAN H. MILLER, former manager, relinquishes management of the division and will serve as a consultant to his successor for the next six months until he retires. A. H. BORCHARDT will have the overall responsibility for the sale of the firm's entire line of pumping equipment, including centrifugal, reciprocating and vertical turbine pumps. Borchardt joined Worthington after graduation from Columbia University with a mechanical engineering degree. He served as a draftsman, field engineer and sales engineer, and then in 1929 became manager of the Centrifugal Pump Sales Department. In 1934 Borchardt became assistant vice president and manager of Centrifugal Pumps Application and Sales Division.

☆ ☆ ☆

The Rucker Co., Oakland, Calif., designers and manufacturers of hydraulic and pneumatic equipment, announces the appointment of RICHARD B. WORL as sales engineer in charge of the Seattle, Wash., office.

☆ ☆ ☆

BROOKS KITCHEL is the new purchasing agent for the Fontana, Calif., Works of *Kaiser Steel Corp.* Kitchel replaces R. N. STURTRIDGE, who resigns.

☆ ☆ ☆

Grand opening of *Nelson Equipment Co.'s* new Seattle, Wash., headquarters at 3706 Airport Way prompted the arrival of SCOTT S. CORBETT, JR., president, and other company officials. With Corbett, and the entire staff from the Portland, Ore., office, were TOM MILLER, sales manager, and RALPH INGRAM, service manager. Easily 400 people were received by General Manager ROBERT VADNAIS, and representatives were present from the manufacturers whose equipment lines Nelson distributes. The new headquarters boast 7,500 sq. ft. of space for offices, parts shops and repair

facilities. A field repair squad also operates out of the new building and about 30,000 sq. ft. of space are available adjacent to the building. The new facilities are designed for increased service by an increased staff.

☆ ☆ ☆

Nine acres on tidewater in the Duwamish district of Seattle, Wash., were purchased by Kaiser Gypsum Division, *Henry J. Kaiser Co.*, as the site of a proposed plant that would be the first complete gypsum products factory in the Northwest area of Washington, Oregon and Idaho. The property cost $100,000 and an additional expenditure of $25,000 is planned for filling, grading, and improving the land prior to construction. Plans call for construction of a three-kettle calcining plant and a gypsum board plant capable of producing 100,000,000 sq. ft. per year. Estimated cost of the plant is $2,500,000.

☆ ☆ ☆

Completion of the new engineering laboratory at the Ferguson Park headquarters of *Henry Ferguson, Inc.*, was celebrated at a presentation ceremony August 8. The new laboratory contains 48,000 sq. ft. of floor space and incorporates the most modern innovations in industrial design, testing, laboratory and manufacturing operations. The Detroit, Mich., tractor firm erected its first building on the 72-acre Ferguson Park site in 1948 and future plans call for construction of an administration building.

☆ ☆ ☆

COLLIS DRULEY, who spent a number of years in Alaska in charge of construction and mining jobs, and L. E. COLE, former factory representative for *Diamond Iron Works*, join the sales staff of *Contractors Equipment Corp.*, Portland, Ore.

☆ ☆ ☆

Moore Paving Co., 1313 Pico Blvd., Santa Monica, Calif., is new Los Angeles area distributor for *Troyer Driveway Service's* Super Seal.

☆ ☆ ☆

Atlas Mineral Products Co., Houston, Tex., announces the appointment of EDISON C. SICKMAN, formerly sales coordinator, as general sales manager.

☆ ☆ ☆

HOWARD J. DAUPHINEE is a new addition to the valve sales staff of *Jenkins Bros.* He will cover the Northern California territory for Jenkins Bros., working out of their San Francisco, Calif., office.

☆ ☆ ☆

Masonite Corporation's new plant at Ukiah, Calif., is shipping hardboards to lumber and supply dealers in the Western Sales Division. Prior to the plant's opening, all shipments were made from the main plant at Laurel, Miss. The new distribution plant is expected to speed deliveries to dealers in eight Western states.

☆ ☆ ☆

JAMES C. BARNEY is assistant manager of sales for the wire rope division of *John A. Roebling's Sons Co.* He will headquarter at the firm's home office, Trenton, N. J.

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NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Continued from page 127

Barney started his association with the company as a clerical assistant at the firm's Los Angeles, Calif., office, where he became office manager. He covered the California oil fields as sales representative and then became assistant manager of the Los Angeles district office.

☆ ☆ ☆

Pettibone-Mulliken Corp., Chicago, Ill., announces a major reorganization in its sales policies. W. E. MADDEN, formerly vice president of *George Haiss Mfg. Co., Inc.*, is the new director of sales and J. M. HUME, formerly vice president of *Universal Engineering Corp.*, becomes his assistant. In addition to the three companies

Madden ***Hume***

mentioned above, the new director will also guide the sales policies of *Hammermills, Inc.* The sales direction of Railway Track Materials and the Beardsley & Piper Division of Pettibone-Mulliken will not undergo a change.

☆ ☆ ☆

JOHN E. RENNER takes over as general sales manager for *Lincoln Engineering Co.*, manufacturer of lubrication equipment at St. Louis, Mo. Renner will direct sales of the company's Automotive, Agricultural and Industrial Divisions.

☆ ☆ ☆

CECIL R. BENSON is appointed Northern California cable specialist for Pacific District of *General Electric's Construction Materials Department.* Benson is a graduate of Stanford University and a G-E employee for 25 years. He transfers from the Apparatus Department, where he served as sales manager of the Oakland Transformer plant. He will maintain offices at 1853 Folsom St., San Francisco.

☆ ☆ ☆

The *Wicx-Merit Glove Company*, formerly located at 1085 Mission St., San Francisco, Calif., has moved to 1121 Seventh St., Oakland. Wicx gloves are distributed direct from factory to wearer. A free illustrated catalog is available upon request.

☆ ☆ ☆

Arcadia Metal Products opens a Northern California office at 715 Bryant St., San

Continued on page 130

UNIT BID PRICES

Selected Bid Abstracts for Typical Western Projects

Irrigation . . .

Earthwork, canal lining and structures on the Wellton-Mohawk Project

Arizona—Gila Project—Bureau of Reclamation. Marshall, Haas & Royce, Belmont, Calif., with a bid of $1,719,348, was low for Schedule 2 construction of earthwork, canal lining and structures, Mohawk Canal and Tyson Protective Dike and Outlet Channel, Wellton-Mohawk Division. Unit prices were as follows:

(1) Marshall, Haas & Royce.....$1,719,348
(2) Western Contracting Corporation.... 1,863,274
(3) Morrison-Knudsen Co., Inc. $1,994,259
(4) Engineers' estimate 1,660,733

		(1)	(2)	(3)	(4)
785,500	cu. yd. excavation for canal	.16	.21	.265	.18
24,000	sta. cu. yd. overhaul for canal, Tyson outlet channel, and other drainage channels and dikes	.05	.05	.027	.04
1,305,000	cu. yd. excav. for Tyron outlet channel and other drainage channels and dikes	.20	.21	.255	.17
750,000	cu. yd. constructing embankments for Tyson protective dike and Growler protective dike above railroad	.20	.21	.265	.19
940,000	sta. cu. yd. overhaul for Tyson protective dike and Growler protective dike above railroad	.03	.005	.027	.02
191,000	cu. yd. compacting embankments	.30	.12	.57	.30
7,405	cu. yd. excavation for structures	1.00	2.28	.45	1.00
5,856	cu. yd. backfill about structures	1.50	1.00	1.00	.75
1,967	cu. yd. compacting backfill	1.50	3.30	2.30	3.00
940	cu. yd. backfill at top of concrete lining	1.50	3.70	1.40	1.50
30,000	cu. yd. backfill on 4-ft. berm above top of concrete lining	.50	.30	.30	.50
184,000	sq. yd. trimming earth foundations for concrete lining	.50	.64	.465	.50
38,000	cu. yd. rip-rap	4.00	3.60	3.47	3.50
618	cu. yd. concrete in structures	80.00	94.00	98.00	75.00
48	cu. yd. concrete in floor slabs and slope pavings	50.00	54.00	98.00	45.00
410	cu. yd. concrete in box culvert	70.00	66.00	98.00	65.00
15,900	cu. yd. concrete in canal lining	17.00	17.35	15.00	16.00
29,710	bbl. furnishing and handling cement	5.00	5.50	5.65	5.50
136,865	lb. furn. and placing reinforcement bars	.15	.15	.15	.15
172	sq. ft. furn. and placing ½-in. elastic filler matls. in joints	2.00	2.00	2.00	2.00
276	sq. ft. furn. and placing 1-in. elastic filler matl. in joints	3.00	3.00	3.00	2.50
1,200	lin. ft. placing rubber water stops in joints	1.50	3.20	.85	1.50
32	M.B.M. furn. and erecting untreated timber in structs.	250.00	405.00	300.00	300.00
4	M.B.M. furn. and erecting treated timber in structs.	350.00	405.00	350.00	350.00
167	lin. ft. furn. and laying 12-in. irrigation pipe	2.50	2.50	2.50	2.75
64	lin. ft. furn. and laying 18-in. std. str. conc. culv. pipe	6.00	6.20	7.00	6.50
288	lin. ft. furn. and laying 24-in. std. str. conc. culv. pipe	10.00	10.30	10.00	9.50
192	lin. ft. furn. and laying 30-in. std. str. conc. culv. pipe	12.00	14.50	14.00	12.00
32	lin. ft. furn. and laying 42-in. std. str. conc. culv. pipe	20.00	25.00	25.00	20.00
28	lin. ft. furn. and laying 48-in. std. str. conc. culv. pipe	25.00	30.00	31.00	25.00
56	lin. ft. furn. and laying 54-in. std. str. conc. culv. pipe	30.00	40.00	40.00	30.00
30	lin. ft. furn. and jacking 54-in. extra str. conc. culv. pipe under railroad	100.00	140.00	120.00	125.00
34	lin. ft. furn. and laying 54-in. extra str. conc. culv. pipe	40.00	74.00	65.00	50.00
18,690	lb. furn. and installing screwlift gates	.60	.68	.60	.60
26,800	lb. furn. and installing radial gates and hoists	.80	1.40	1.30	.70
4,900	lb. furn. and installing miscel. metalwork	1.00	.80	.70	.60

Earthwork, canal lining, tunnel and structures on the Colorado-Big Thompson Project

Colorado—Colorado-Big Thompson Project—Bureau of Reclamation. Winston Bros. Co., Monrovia, Calif., with a bid of $1,149,211, was low for construction of earthwork, canal lining, tunnel and structures, Horsetooth Feeder Canal. Unit prices were as follows:

(1) Winston Bros. Co. $1,149,211
(2) A. S. Horner Construction Co..... 1,304,900
(3) Peter Kiewit Sons' Co. 1,339,140
(4) Young and Smith Construction Co...$1,371,830
(5) Broderick Construction Co..... 1,546,094
(6) Engineer's estimate 1,458,015

		(1)	(2)	(3)	(4)	(5)	(6)
245,000	cu. yd. excavation, common, for canal	.30	.55	.55	.40	.40	.60
60,700	cu. yd. excavation, rock, for canal	1.00	.55	.55	1.50	2.10	1.70
51,000	sta. cu. yd. overhaul	.03	.05	.05	.03	.03	.04
42,500	cu. yd. connecting embankments	.25	.30	.27	.40	.30	.40
16,900	cu. yd. excav., common, for drainage channels, diversion channels, and dikes	.40	.50	.40	1.00	.90	.75
350	cu. yd. excav., rock, for drainage channels, diversion channels, and dikes	3.00	3.00	4.00	3.00	4.00	3.50
7,300	cu. yd. excav., all classes, for roadway	1.00	1.25	1.00	.75	.75	1.25
3,100	cu. yd. excav., all classes, in tunnel	25.00	26.40	35.00	30.00	30.00	30.00
20	cu. yd. excav., all classes, for tunnel enlargement	35.00	33.00	70.00	60.00	50.00	50.00
52,643	sq. yd. trimming earth foundations for conc. canal lining	1.20	1.40	1.50	1.50	1.50	.60
26,136	sq. yd. preparing rock foundtns. for conc. lining	1.20	1.40	1.50	1.50	2.50	1.60
18,000	cu. yd. excav., common, for structs.	.70	1.25	1.25	.70	1.50	1.25
13,000	cu. yd. excav., rock, for structs.	2.30	3.80	1.25	3.00	3.50	3.50
19,000	cu. yd. backfill about structures	.50	.65	.80	.50	.40	.60
6,500	cu. yd. compacting backfill	3.00	5.60	4.00	4.00	4.50	4.00
3,300	cu. yd. backfill at top of conc. canal lining	1.40	1.25	1.00	1.50	1.50	1.00
750	sq. yd. dryrock paving	6.00	5.10	6.00	3.50	8.00	5.50
500	cu. yd. rip-rap	4.00	6.20	4.00	7.00	8.00	6.00
200	cu. yd. gravel bedding under rip-rap	5.00	5.70	6.00	4.00	5.00	5.00
90,000	lb. furn. and installing permanent steel tunnel supports	.20	.27	.22	.16	.18	.20
36	M.B.M. furn. and erecting perm. timbering in tunnel	200.00	295.00	250.00	300.00	270.00	300.00
60	lin. ft. drilling feeler or pilot holes ahead of tunnel excav.	3.00	1.60	4.00	2.00	3.00	3.56
60	lin. ft. drilling grout holes through conc. tunnel lining	3.00	5.50	4.00	2.00	1.85	2.50

(Continued on next page)

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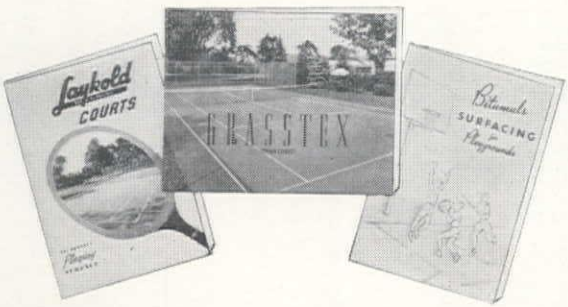

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NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Continued from page 128

Francisco, Calif. BYRON NELSON is in charge as Northern California representative. He will be handling service and promotion among architects and appointing new dealers in Northern California cities to handle Arcadia products. Arcadia specializes in manufacturing horizontal sliding steel sash and doors and architectural specialties.

☆ ☆ ☆

Cummins-Chicago Corp. announces two major appointments. MITCHELL A. KAPLAND is now in charge of sales activities for all four divisions of Cummins-Chicago

Mitchell

Kapland

Corp. He will supervise sales policies for all branch offices, representatives and distributors of the Portable Tool Division, Fred W. Wappat Division, Government Division and Business Machines Division. The other appointment goes to ROBERT E. MITCHELL, who is now field sales manager of Cummins Portable Tool Division. He will be in charge of sales training activities, execute company's sales policies and programs.

NEWS of MANUFACTURERS

Directors of *The White Motor Company* have elected WILLIAM G. STERNBERG a vice president, in charge of the Sterling Division. ERNEST R. STERNBERG becomes general manager and J. P. DRAGIN is the new vice president in charge of finance for the Sterling Division. The Sterling Division was created when *Sterling Motor Truck Co.* was acquired by White.

☆ ☆ ☆

M. B. GARBER, director of sales of *The Thew Shovel Co.*, Lorain, Ohio, has been appointed director of the Construction Machinery Division of the National Production Authority.

☆ ☆ ☆

Calaveras Cement Co., San Andreas, Calif., announces that elimination of construction bottlenecks might make it pos-

Continued on page 132

UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
100 lb. furn. and placing grout pipes and connections	1.00	1.10	.75	1.00	1.50	1.20
600 cu. ft. pressure grouting	3.00	2.20	5.00	3.00	2.50	3.00
30 lin. ft. furn. matls. and constr. underdrains, incl. 6-in. diam. sewerpipe with uncem. joints	2.00	2.35	3.00	2.00	3.20	5.00
500 lin. ft. furn. and laying 6-in. diam. sewerpipe with cemented joints	2.00	3.35	1.50	2.00	2.65	3.00
4,000 cu. yd. concrete in structs.	60.00	50.00	54.00	60.00	68.00	60.00
9,500 cu. yd. concrete in canal lining	19.00	26.70	24.00	26.00	23.80	32.00
1,020 cu. yd. concrete in tunnel lining	35.00	52.00	43.50	40.00	45.00	40.00
21,930 bbl. furn. and handling cement	5.00	4.40	5.80	5.30	7.35	5.20
717,000 lb. furn. and placing reinf. bars	.14	.13	.16	.16	.20	.16
225 sq. ft. furn. and placing elastic filler matl. in jts.	2.00	2.00	2.50	2.00	1.85	1.80
2,100 lin. ft. placing rubber water stops in joints	1.00	2.50	2.00	1.50	.90	1.30
8 M.B.M. furn. and erect. timber in structs.	400.00	350.00	400.00	350.00	285.00	300.00
3.7 M.B.M. removing and recrecting bull head timb	150.00	100.00	150.00	300.00	150.00	120.00
7 cattle guards furn. and const. H-5 cattle guards	400.00	500.00	$1,100	500.00	550.00	550.00
1 cattle guard furn. and constr. H-15 cattle guards	$1,200	$2,200	$3,000	$1,500	$1,600	$1,600
.8 mi. removing fences	900.00	300.00	200.00	$1,000	300.00	300.00
6 mi. furn. and erecting barbed-wire r/w fences	$1,400	$1,600	$2,000	$2,000	$1,800	$1,600
2 gates furn. and installing wire fence gates	100.00	25.00	30.00	40.00	10.00	20.00
55 lin. ft. furn. and installing chain-link fence	5.00	4.00	5.00	5.00	4.00	3.00
36 lin. ft. furn and laying 36-in. diam. std. str. conc. culvert pipe	14.00	15.00	18.00	14.00	15.00	14.00
38 lin. ft. furn. and laying 24-in. diam. corru.-metal pipe	6.00	6.00	7.00	10.00	8.00	7.00
58 lin. ft. furn. and laying 30-in. diam. corru.-metal pipe	7.00	8.00	8.00	10.00	10.00	9.00
46 lin. ft. furn. and laying 48-in. diam. corru.-metal pipe	14.00	15.00	17.00	14.00	15.00	18.00
1 shelter furn. and erecting gaging station shelter	600.00	400.00	500.00	$2,500	350.00	300.00
16,000 lb. furn. and erecting struct. steel in farm bridge	.20	.30	.35	.25	.26	.20
Lump sum, furn. and installing domestic and stock water pipe lines	$4,000	$1,800	$10,000	$1,000	$4,000	$1,800
2,100 lb. furn. and installing screw-lift gates	.40	.50	1.00	1.00	.68	.60
1,600 lb. furn. and installing embedded metalwork for radial gates	1.00	.80	1.00	1.00	1.30	.45
3,100 lb. furn. and installing miscl. metalwork	1.00	1.50	1.00	1.00	1.60	.60

Armor and rip-rap channel slope protection at Grand Coulee Dam

Washington—Columbia Basin Project—Bureau of Reclamation. Pacific Bridge Co., San Francisco, Calif., with a bid of $2,199,800, was low for construction of river channel slope protection, Grand Coulee Dam, Columbia Basin Project. Unit prices were as follows:

(1) Pacific Bridge Co. ..... $2,199,800 (2) Engineer's estimate $1,689,000

	(1)	(2)
60,000 ton producing and placing armor rock on right riverbank	9.50	10.00
24,000 ton producing and delivering armor rock to stockpile area	9.30	9.00
71,500 ton producing and placing armor rock on left riverbank	13.40	10.00
24,000 ton producing and placing rip-rap rock	2.50	3.00
102,000 ton transporting rip-rap rock and armor rock on cross river ferry	.50	.50
Lump sum, installing, dismantling, and removing cross river ferry	$337,500	$351,000

Power . . .

Excavation, concrete lining and structures for Eklutna Tunnel in Alaska

Alaska—Eklutna Project—Bureau of Reclamation. Peter Kiewit Sons' Co., Omaha, Neb. and Morrison-Knudsen Co., Inc, Boise, Idaho, joint venturers, were low bidders for construction of Eklutna Tunnel. The bid of $21,321,695 was 90% above the engineers' estimate. The project includes general excavation, excavation for enlargement of tunnel; excavation for gate shaft and surge tank; drilling feeler or pilot holes; tunnel supports; concrete in tunnel lining; concrete in gate shaft and surge tank; concrete in cut-and-cover section; plate-steel liner in tunnel and cut-and-cover section; lines and grades for tunnel construction; draining, lighting and ventilating tunnel; drilling grout holes; pipe for grouting; pressure grouting, and intake structure. Unit prices were as follows:

(1) Peter Kiewit Sons' Co. and Morrison-Knudsen Co., Inc. $21,321,695
(2) William A. Smith Contracting Co., Inc., and Kansas Brown and Root, Inc. 22,798,432
(3) Engineers' estimate 11,205,105

	(1)	(2)	(3)
205,000 cu. yd. excav., open cut, for inlet, first 205,000 cu. yd.	6.00	2.20	2.20
205,000 cu. yd. excav., open cut, for inlet, over 205,000 cu. yd.	2.00	1.10	.50
Lump sum, constructing and installing intake trashrack section	$480,000	$735,000	$130,000
Lump sum, constructing and installing intake transition section	$120,000	$735,000	$40,000
Lump sum, constructing and installing intake bulkhead section	$80,000	$735,000	$25,000
225 lin. ft. furn. and installing 9-ft. diam. precast conduit	$2,500	$3,000	700.00
711.5 lin. ft. constr. tunnel betw. station 20+00 and station 27+11.50	$2,500	$3,000	900.00
21,000 cu. yd. excav., in open cut, for gate shaft	3.00	.75	3.00
920 cu. yd. excav. for gate shaft	500.00	235.00	60.00
5,700 cu. yd. excav. for surge tank	175.00	16.00	70.00
87,600 cu. yd. excav. in tunnel	100.00	75.00	46.00
200 cu. yd. excav. for tunnel enlargement	100.00	110.00	60.00
1,000 cu. yd. backfill about intake structure	10.00	8.85	7.00
1,975,000 lb. furn. and installing permanent steel tunnel supports	.25	.40	.30
795 M.B.M. furn. and erecting permanent timbering in tunnel	400.00	$1,000	350.00
12,200 lin. ft. furn. and installing tunnel roof support bolts	3.00	4.40	4.00
2,500 lin. ft. drilling feeler or pilot holes ahead of tunnel excav.	10.00	7.40	2.00
2,500 lin. ft. drilling grout holes	10.00	7.40	3.00
7,500 lb. furn. and placing grout pipes and connections	.60	4.40	1.50
25,000 cu. ft. pressure grouting	5.00	7.40	3.00
390 cu. yd. concrete in gate shaft	200.00	300.00	85.00
1,235 cu. yd. concrete in surge tank	200.00	210.00	90.00
27,420 cu. yd. concrete in tunnel lining	100.00	150.00	55.00
3,070 cu. yd. concrete around penstock	100.00	150.00	70.00
54,500 bbl. furnishing and handling cement	10.00	20.00	10.00
5,651,000 lb. furnishing and placing reinforcement bars	.20	.32	.25
955,000 lb. istalling penstock	.20	.35	.20
24,000 lb. installing frames and guides for bulkhead and fixed-wheel gates and hoist support beams	.10	.35	.25

(Continued on next page)

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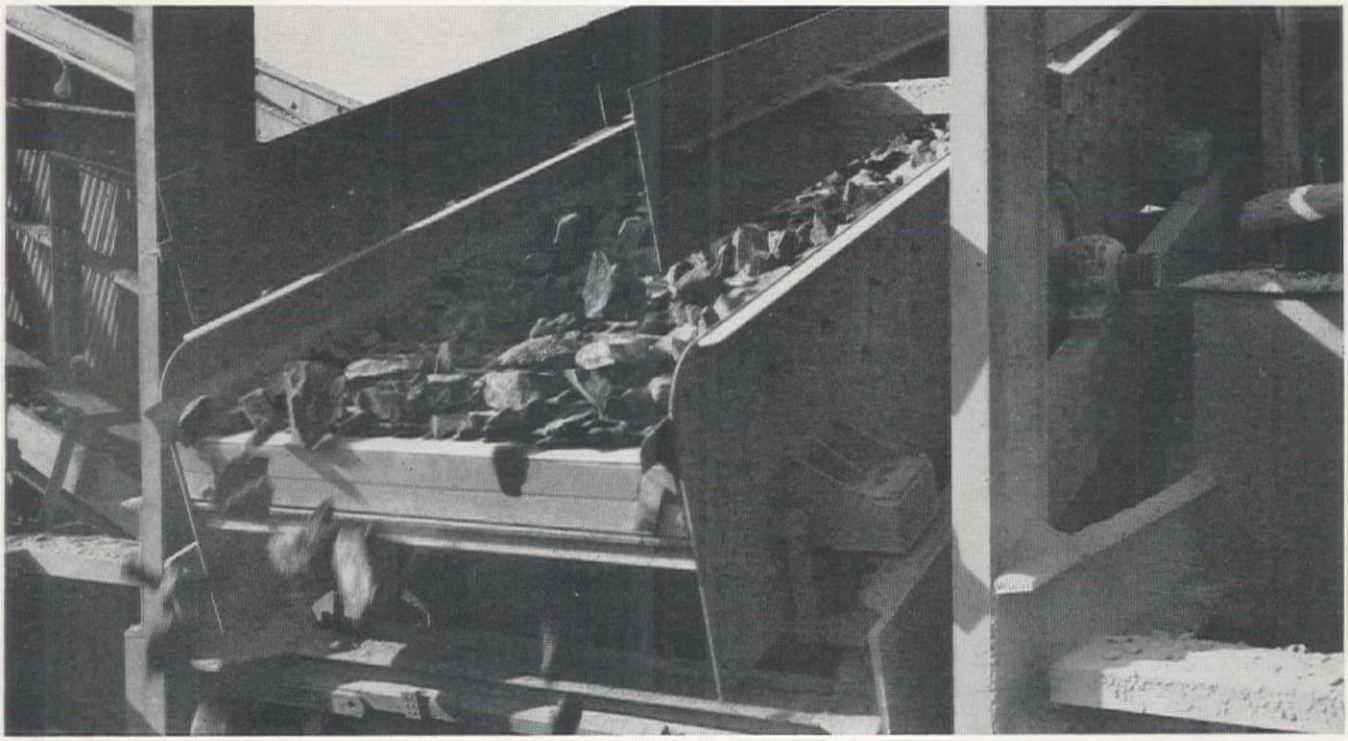

Photograph on the job, Gates, New York Dolomite Plant

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NEWS of MANUFACTURERS

Continued from page 130

sible to complete its fourth kiln and put it into operation in March 1952—ninety days ahead of schedule. Ground has been broken already for the kiln piers. Operation of the new kiln will increase the company's production of clinker by 50%.

☆ ☆ ☆

***Robert E. Huthsteiner* is the new president of Cummins Engine Co. (See item below.)**

New president of *Cummins Engine Co., Inc.*, is ROBERT E. HUTHSTEINER. He succeeds J. IRWIN MILLER, who becomes chairman of the board. Huthsteiner, formerly executive vice president, has been with the firm for 10 years in important sales and management positions.

☆ ☆ ☆

HOWARD J. DAVIS is now assistant to *Colorado Fuel & Iron Co.* vice president A. F. FRANZ. Davis joined the firm in 1940 to establish a welded wire fabric division at the Pueblo mill. In June 1947 he was appointed manager of product research and development and in 1949 he was made assistant general manager of commercial sales for the Colorado Division. He was assistant to vice president of sales prior to his new appointment. Davis will headquarter in the firm's general offices in Denver.

☆ ☆ ☆

A. D. Schader Company, Inc., San Francisco, Calif., announces its receipt of two military contracts: Sharpe General Depot, U. S. Army, Lathrop, Calif., railroad rehabilitation in the amount of $367,479 and Sierra Ordnance Depot, U. S. Army, Herlong, Calif., railroad rehabilitation in the amount of $288,480.

☆ ☆ ☆

Caterpillar Tractor Co., San Leandro, Calif., has been awarded a $22,000,000 order by the U. S. Army Corps of Engineers for three of its larger models of track-type tractors. The award includes options for additional machines and parts which could bring the total contract to approximately $32,000,000 according to E. B. ENGLISH, Governmental Division manager.

☆ ☆ ☆

JOHN P. COURTRIGHT becomes executive vice president of *The Marion Power Shovel Co.*, Marion, Ohio. Courtright has served the company for several years as vice president in charge of sales and service and continues this work in his new position.

UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)
41,000 lb. installing fixed-wheel and bulkhead gates	.10	.22	.18
21,000 lb. installing fixed-wheel and bulkhead gate hoists	.10	.35	.20
2,250 lb. installing control apparatus and piping for bulkhead and fixed-wheel gates	.50	1.60	.50
Lump sum. furn. and installing 18-in. diam. vent pipe	$5,000	$5,200	$2,500
14,000 lb. installing gate shaft and surge tank metal work	.40	1.15	.25
7,200 lb. erecting structural steel in surge tank roof	.40	.75	.20
20 sq. ft. furn. and installing steel swinging door	15.00	7.40	15.00
300 cu. yd. excav., stripping borrow area and surface of dam embank.	3.00	4.40	1.20
500 cu. yd. earth-fill embankment for dam	1.00	4.40	1.00
60 cu. yd. sand and gravel blanket under riprap	4.00	7.40	5.00
2,000 cu. yd. riprap	8.00	9.00	6.00
Lump sum, constr. of anchor and extension to exist. sheet steel piling	$12,000	$19,000	$8,500
750 lin. ft. furn. and driving timber piles	5.00	9.00	6.00
Lump sum, moving deck of existing trestle	$25,000	$4,400	$6,000

100-ton indoor bridge crane at Big Cliff Dam Powerhouse

Oregon—Willamette River Basin Project—Corps of Engineers. Cyclops Iron Works, San Francisco, Calif., with a bid of $82,514, was low for a 100-ton indoor bridge crane for the Big Cliff Dam powerhouse. Unit prices were as follows:

(1) Cyclops Iron Works ..... $ 82,514
(2) Judson Pacific-Murphy Corp. 88,720
(3) Moffett Engineering Company 110,545
(4) Ederer Engineering Company $113,100
(5) Harnischfeger Corp. 121,750
(6) Pacific Coast Engineering Co. 138,300

	(1)	(2)	(3)	(4)	(5)	(6)
1 ea. 100-ton double trolley, electric motor-operated overhead traveling crane	$78,132	$84,712	$103,100	$110,400	$117,950	$133,800
1 ea. lifting beam for use with the crane	$ 2,882	$ 2,508	$ 5,945	$ 1,200	$ 2,300	$ 3,000
30 man-day services of a supervising erector during erection and testing of the crane	50.00	50.00	50.00	50.00	50.00	50.00

Steel penstock construction on Colorado-Big Thompson Project

Colorado—Colorado-Big Thompson Project—Bureau of Reclamation. Southwest Welding & Manufacturing Co., Alhambra, Calif., submitted a bid of $1,692,337 on schedules 1 through 4 of steel penstock construction for Pole Hill Power Plant, Estes Park-Foothills Aqueduct. The firm also bid on four schedules of construction for steel penstocks at Flatiron Power and Pumping Plant. Southwest Welding & Manufacturing Co. stipulated that it would not accept the contract unless it included combinations of schedules 1, 3, 5 and 7 or schedules 2, 4, 6 and 8. It was also stipulated that Winston Bros. Co., Monrovia, Calif. would perform all sub-contract work on all items except five in the first and second schedule combinations acceptable. Consolidated Western Steel Corp., which bid $817,720 on schedules 1 and 3 of the Pole Hill job, stipulated that it would accept the contract only if awarded all sections on which it submitted a bid. The firm bid on four sections in all. Unit prices are presented below for the four schedules of construction on the Pole Hill penstocks.

(1) Southwest Welding & Manufacturing Co. $1,692,337
(2) Consolidated Western Steel Corp..... 817,720 (Scheds. 1 and 3 only)
(3) Engineers' estimate $1,677,178

Sub-Contract:
(1) Winston Bros. Co. ..... $350,426 (Sched. 1)
(2) Engineers' estimate $140,282

SCHEDULE NO. 1

Pole Hill penstock, upper portion from Station 498+55.70 to Station 507+15.33, steel penstock with sleeve coupled field girth joints.

	(1)	(2)	(3)
935 cu. yd. excavation, all classes	25.00	14.70	3.00
465 cu. yd. backfill	4.00	1.68	1.00
465 cu. yd. compacting backfill	7.00	7.35	4.00
70,000 lb. furn. and placing reinf. bars, ⅝- to ⅞-in. diam., inclusive	.25	.18	.15
875 cu. yd. concrete	115.00	47.25	50.00
1,312 bbl. furnishing and handling cement	7.00	5.25	5.50
Lump sum, furnishing and installing steel penstock	$148,763	$171,684	$150,000

SCHEDULE NO. 2

Pole Hill penstock, upper portion from Station 498+55.70 to Station 507+15.29, steel penstock with welded or riveted field girth joints.

	(1)		(3)
475 sq. yd. excavation, all classes	35.00	.....	3.00
225 cu. yd. backfill	4.00	.....	1.00
225 cu. yd. compacting backfill	7.00	.....	4.00
44,200 lb. furn. and placing reinf. bars, ⅝- to ⅞-in. diam., inclusive	.25	.....	.15
550 cu. yd. concrete	150.00	.....	50.00
825 bbl. furnishing and handling cement	7.00	.....	5.50
Lump sum, furnishing and installing steel penstock	$159,467	.....	$150,000

SCHEDULE NO. 3

Pole Hill penstock, lower portion from Station 507+15.33 to Station 517+03.25, steel penstock with sleeve coupled field girth joints.

	(1)	(2)	(3)
1,290 cu. yd. excavation, all classes	27.00	14.70	3.00
1,095 cu. yd. backfill	4.00	1.68	1.00
1,095 cu. yd. compacting backfill	7.00	7.35	4.00
104,000 lb. furn. and placing reinf. bars, ⅝- to ⅞-in. diam., inclusive	.25	.18	.15
16,000 lb. furn. and placing reinf. bars, 1-in. diam. and larger	.25	.18	.15
1,500 cu. yd. concrete	90.00	47.25	45.00
2,250 bbl. furnishing and handling cement	7.00	5.25	5.50
171 sq. ft. furnishing and placing 1-in. corkboard joint filler	4.00	3.10	2.00
Lump sum, furnishing and installing steel penstock	$338,470	$433,593	$500,000

SCHEDULE NO. 4

Pole Hill penstock, lower portion from Station 507+15.29 to Station 517+03.25, steel penstock with welded or riveted field girth joints.

	(1)		(3)
675 cu. yd. excavation, all classes	30.00	.....	3.00
790 cu. yd. backfill	4.00	.....	1.00
790 cu. yd. compacting backfill	7.00	.....	4.00
66,800 lb. furn. and placing reinf. bars, ⅝- to ⅞-in. diam., inclusive	.25	.....	.15
16,000 lb. furn. and placing reinf. bars, 1-in. diam. and larger	.25	.....	.15
1,035 cu. yd. concrete	110.00	.....	45.00
1,550 bbl. furnishing and handling cement	7.00	.....	5.50

(Continued on next page)

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"We don't dig footage, we dig miles!"

Yes . . . George McDonnell, operator, says that's what they do at Levittown Housing Development with the MICHIGAN ½ yd. Truck Excavator owned by Levitt & Sons, Inc.

"We move all over the field with it," states McDonnell, "and run back and forth to Roslyn, about thirteen miles in only an hour. The MICHIGAN is easy to operate, too — after all, you have air to do the work."

And when it comes to service, Construction Equipment Corp., Long Island City, MICHIGAN dealer, rates "tops" with McDonnell.

Martone Sewage Disposal Co., subcontractor at Levittown, has a MICHIGAN ⅜ yd. Truck Excavator. Mr. Martone states: "We can get it in and out of small places easily. It does a *lot* of work!" James Pepe, operator, volunteered: "I've run MICHIGANS for years. They're the easiest to operate."

These opinions of MICHIGAN Excavator-Cranes are typical from profit-wise contractors. When *you* need an excavator-crane . . . investigate *MICHIGAN* . . . you'll agree it's *your best buy*. Write, wire or phone for details.

MICHIGAN POWER SHOVEL COMPANY

430 Second Street, Benton Harbor, Michigan, U. S. A.

UNIT BID PRICES . . . CONTINUED

	(1)		(3)
171 sq. ft. furnishing and placing 1-in. corkboard joint filler	4.00	.....	2.00
Lump sum, furnishing and installing steel penstock	$368,060	.....	$500,000

SUB-CONTRACT—SCHEDULE NO. 1
Pole Hill penstock, upper portion.

	(1)	(2)
2,600 cu. yd. excavation, all classes	23.00	3.00
2,400 cu. yd. backfill	8.00	1.00
600 cu. yd. bedding material, excav., hauling, and placing	10.00	2.00
600 cu. yd. compacting backfill and bedding	4.00	4.00
190 cu. yd. concrete in structures	130.00	60.00
1,200 bbl. furnishing and handling cement	8.00	5.50
6,700 lb. furnishing and placing reinf. bars in structures	.18	.16
100 lb. furnishing and installing miscl. metalwork	1.00	.70
28,000 lb. furnishing and installing steel pipe stubs	.50	.50
130 sq. ft. furnishing and placing asbestos packing	4.00	1.00
140 lin. ft. furnishing and laying concrete pipe, symbol A96NC50	225.00	82.00
70 lin. ft. furnishing and laying concrete pipe, symbol A96NC75	230.00	87.00
70 lin. ft. furnishing and laying concrete pipe, symbol A96NC100	230.00	92.00
70 lin. ft. furnishing and laying concrete pipe, symbol A96C125	235.00	96.00
70 lin. ft. furnishing and laying concrete pipe, symbol A96C150	235.00	101.00
70 lin. ft. furnishing and laying concrete pipe, symbol A96C175	240.00	105.00
60 lin. ft. furnishing and laying concrete pipe, symbol A96C200	240.00	110.00
80 lin. ft. furnishing and laying concrete pipe, symbol A96C225	245.00	114.00
80 lin. ft. furnishing and laying concrete pipe, symbol A96C250	250.00	119.00
80 lin. ft. furnishing and laying concrete pipe, symbol A96C275	250.00	123.00
80 lin. ft. furnishing and laying concrete pipe, symbol A96C300	255.00	129.00
20 lin. ft. furnishing and laying concrete pipe, symbol A96C325	255.00	133.00

Dam . . .

Big Cliff concrete gravity dam and powerhouse

Oregon—Willamette River Basin Project—Corps of Engineers. Guy F. Atkinson Co. and Ostrander Construction Co., joint venturers, Portland, with a bid of $6,541,996 were sole bidders for part A construction of a concrete gravity dam and powerhouse on the North Santiam River, Big Cliff Project, Willamette River Basin. Unit prices were as follows:

(1) Guy F. Atkinson Co. and Ostrander Construction Co. $6,541,996
(2) Contracting Officer's Estimate 4,430,951

	(1)	(2)
1 job diversion and unwatering	$920,000	$183,300
86,700 cu. yd. excavation, common for dam and powerhouse	5.00	1.15
94,000 cu. yd. excavation, solid rock for dam and powerhouse	5.00	3.82
1 job Big Cliff powerhouse access road construction, complete	$5,000	$3,970
60,000 cu. yd. railroad grade backfill	1.00	.76
7,500 cu. yd. dumped stone revetment, in place	1.55	3.73
2,600 cu. yd. dumped and rearranged stone revetment, in place	3.00	3.40
1,250 cu. yd. structural backfill, in place	3.00	2.40
21,200 sq. ft. line drilling, general	2.40	1.60
10,000 sq. ft. line drilling, south abutment	2.15	1.20
7,200 sq. yd. final foundation cleanup	3.00	3.20
600 lin. ft. guard rail, in place	5.50	3.40
1 job constr. and removal of temp. railroad spur track and removal of track to Detroit Dam	$50,000	$14,990
FOUNDATION EXPLORATION AND GROUTING		
14,000 lin. ft. drilling EX grout holes	3.10	3.25
1,400 lin. ft. drilling EX exploratory holes, depth 0 to 160 ft.	3.60	3.50
2,500 lin. ft. drilling NX exploratory holes, depth 0 to 200 ft.	9.50	9.90
200 lin. ft. overburden drilling, depth 0 to 50 ft.	10.50	9.00
400 lin. ft. drilling to recover 6-in. diam. core, depth 0 to 50 ft.	24.00	17.30
5,200 lin. ft. drilling NX drain holes, depth 0 to 75 ft.	6.50	9.40
320 lin. ft. drilling 3-in. wagon drill holes, depth 0 to 25 ft.	1.20	1.15
8,400 bag pressure grouting	3.50	2.70
50 ea. fixed payment for grout pump connection	10.00	10.00
18,000 lb. miscl. pipe and fitting for grouting and drainage, in place	.70	.60
CONCRETE WORK		
120,000 bbl. cement, portland	5.40	5.06
74,500 cu. yd. concrete, mass in dam	16.25	14.70
3,900 cu. yd. concrete mass, stilling basin	15.00	11.20
6,800 cu. yd. concrete, stilling basin slab	22.00	17.50
6,300 cu. yd. concrete, structural Big Cliff Dam	60.00	41.40
1 job construction of concrete diversion tunnel plug	$60,000	$21,500
7,800 cu. yd. conc., Big Cliff powerhouse below elev. 1,120	55.00	28.60
3,400 cu. yd. concrete, Big Cliff powerhouse above elev. 1,120	70 00	55.00
300 cu. yd. concrete, Big Cliff powerhouse access road retaining wall	35.00	24.30
3,250 cu. yd. concrete for concreted revetment	18.50	13.00
10 cu. yd. non-shrink grout turbine embedded parts	140.00	55.00
830 sq. yd. concrete paving	10.00	7.80
15,100 lin. ft. drilling for and grouting anchor bars	2.15	1.74
350 lin. ft. 6-in. diam. porous drain tile in place	7.00	4.00
1,600 lin. ft. 8-in. diam. open joint drain tile, in place	3.20	2.65
200 lin. ft. 6-in. diam. split drain tile, Big Cliff powerhouse draft tube, in place	2.50	1.83
1 job catch basins and drains Big Cliff powerhouse area, in place	$3,000	$2,150
STRUCTURAL STEEL AND MISCELLANEOUS METALWORK		
6,000 lb. parapet hand railing, in place	.60	.52
1,506,000 lb. steel reinforcement, in place	.135	.139
112,400 lb. structural steel, embedded, in place	.34	.40
325,000 lb. structural steel, in place	.25	.224
31,200 lb. corrosion-resisting steel, in place	1.25	.82
27,400 lb. steel rails, in place	.36	.196
213,800 lb. fabricated steel penstock, in place	.47	.37
60 lin. ft. radiographing field welded joint intersections	18.00	30.00
1 job—set price moving in radiographing equipment	500.00	500.00
1 job penstock hydrostatic test	$20,000	$20,900
46,000 lb. miscellaneous metal, in place	.55	.52
7,400 lb. pipe handrailing, in place	.80	.70
12,000 lb. cast iron pipe and fittings, in place	.54	.42

(Continued on next page)

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UNIT BID PRICES . . . CONTINUED

		(1)	(2)
39,400	lb. miscel. steel pipe, fittings and valves, in place	.54	.44
3,860	lb. copper water stops, in place	1.80	1.70
205,000	lb. tainter gate material, in place	.53	.47
	INSTALLATION OF GOVERNMENT FURNISHED EQUIPMENT		
1	job installation of penstock gate embedded parts	$5,000	$5,315
1	job installation of penstock gate and machinery	$12,000	$5,900
1	job erection and installation of Big Cliff turbine embedded parts and generator foundation bolts	$125,000	$29,900
1	job installation of 100-ton Big Cliff bridge crane	$17,500	$14,200
1	job installation of draft tube stop logs at Big Cliff	$4,000	$1,550
	BUILDINGS		
1	job miscl. features to complete Big Cliff powerhouse	$90,000	$43,200
	MECHANICAL EQUIPMENT		
1	job pumps, unwatering, drainage and sewer at Big Cliff	$20,000	$9,360
1	job one penstock fill line gate and gate lift	$2,500	950.00
1	job engine generator, in place, at Big Cliff	$20,000	$10,000
1	job one 10-ton monorail hoist complete at Big Cliff	$4,500	$5,080
1	job domestic water treatment system, complete, at Big Cliff	$12,000	$9,730
	ELECTRICAL		
100	lin. ft. 3-in. galvanized conduit and fittings, in place	6.00	3.85
465	lin. ft. 2-in. galvanized conduit and fittings, in place	4.50	2.95
1,605	lin. ft. 1½-in. galvanized conduit and fittings, in place	2.10	2.25
920	lin. ft. 1¼-in. galvanized conduit and fittings, in place	2.00	1.90
2,300	lin. ft. 1-in. galvanized conduit and fittings, in place	1.80	1.70
5,420	lin. ft. ¾-in. galvanized conduit and fittings, in place	1.40	1.48
220	lb. electrical cabinet and special boxes galvanized sheet steel, in place	1.30	2.25
2,000	lb. cast iron boxes, in place	2.00	2.40
20	ea. roadway lighting fixtures, less wiring and lamp	120.00	105.40
25	ea. flush mounted wall lighting fixture, box only installed	35.00	52.00
2	ea. flush mounted ceiling lighting fixture, box only installed, less wiring and lamp	35.00	43.00
5,000	lb. copper ground conductor, in place	1.20	1.60
1,500	lin. ft. 1-in. ground rod, copper clad, in place	1.70	2.20
1	ea. transformer, 50 kva., dry type 480-120/240 volt	950.00	775.00
1	ea. transformer, 10 kva., dry type 480-120/240 volt	350.00	270.00
3	ea. unit heater, 20 kw, 3 phase, 480 volts	300.00	365.00
2	ea. unit heater, 15 kw, 3 phase, 480 volt	300.00	295.00
2	ea. unit heater, 5 kw, 3 phase, 480 volt	275.00	195.00
1	ea. unit heater, 2 kw, single phase, 240 volt	120.00	185.00
2	ea. unit heater, 1½ kw, single phase, 240 volt	110.00	185.00
1	job header duct and accessories to Q-ceiling, in place	$1,000	460.00
1	job tainter gate seal heaters	$2,000	$1,650

Bridge and Grade Separation . . .

Reinforced Concrete Bridge on San Gabriel River

California—Los Angeles County—State. Oberg & Cook, Gardena, with a bid of $199,301, was low before the State Division of Highways for construction of a County highway across the San Gabriel River on Orangethorpe Ave.; a reinforced concrete girder bridge. Unit prices were as follows:

(1) Oberg & Cook $199,301
(2) Chas. MacClosky Co. 209,881
(3) E. G. Perham 216,808
(4) C. B. Tuttle Co. $218,162
(5) John Strong 228,872
(6) Byerts & Sons 244,851

		(1)	(2)	(3)	(4)	(5)	(6)
Lump sum,	removing existing bridge	$5,000	$5,000	$11,000	$11,000	$18,011	$11,500
1,380	cu. yd. struct. excav.	10.00	16.00	16.00	8.00	15.00	12.00
330	cu. yd. Cl. "A" P.C.C. (footing block)	40.00	30.00	50.00	40.00	32.00	25.00
1,530	cu. yd. Cl. "A" P.C.C. (struct.)	52.50	55.00	50.00	55.00	55.50	70.00
15,290	lb. miscl. steel	.35	.40	.40	.45	.35	.40
6,175	lin. ft. furn. cast-in-place conc. piling	3.00	3.00	3.50	3.45	4.50	3.40
158	ea. driving piles	100.00	95.00	100.00	136.00	50.00	135.00
350,000	lb. bar reinf. steel	.10	.11	.10	.11	.10	.11
Lump sum,	chain link fence and gates	$1,000	$1,300	$1,500	500.00	$2,617	$1,200
600	lin. ft. steel railing	13.00	12.00	12.00	13.50	13.50	13.00
Lump sum,	office facilities	$2,000	$1,100	$2,000	$1,000	$3,130	750.00
Lump sum,	restoring channel lining	$1,500	$1,000	$1,500	$1,000	$4,800	$4,750

Concrete and Steel Bridge on North Fork of Mad River

California—Humboldt County—State. G. M. Carr, Bati Rocca and John Burman & Sons, Eureka, with a bid of $367,195, were low before the State Division of Highways for construction of a State highway at North Fork of the Mad River, about 7.5 mi. east of Blue Lake; a structural steel and reinforced bridge to be constructed and about ½ mi. of approaches to be graded and surfaced with plant-mixed material on cement-treated base. Unit prices were as follows:

(1) G. M. Carr, Bati Rocca and John Burman & Sons $367,195
(2) Mercer Fraser Co. & Mercer Fraser Gas Co., Inc. 382,587

		(1)	(2)
6	acre clearing and grubbing	750.00	$2,000
41,500	cu. yd. roadway excavation	1.00	1.20
4,800	cu. yd. trench excavation	1.50	1.50
280	cu. yd. struct. excav. Type "A"	20.00	21.00
1,380	cu. yd. struct. excav. Type "B"	12.00	11.00
230	cu. yd. ditch and channel excav.	2.00	2.00
1,180,000	sta. yd. overhaul	.005	.005
Lump sum,	dev. water supply and furn. watering equip.	$2,000	$5,000
1,500	M. gal. applying water	2.00	2.20
21	sta. finishing roadway	20.00	50.00
2,700	cu. yd. imp. subbase material	2.75	3.00
1,300	cu. yd. imp. base material	4.00	4.50
185	bbl. portland cement (C.T.B.)	6.00	5.25
5,100	sq. yd. mix. and compact. (C.T.B.)	.30	.50
5	ton liquid asph., SC-2 (pr. ct.)	60.00	60.00
875	ton. min. aggre. (P.M.S.)	7.50	7.00

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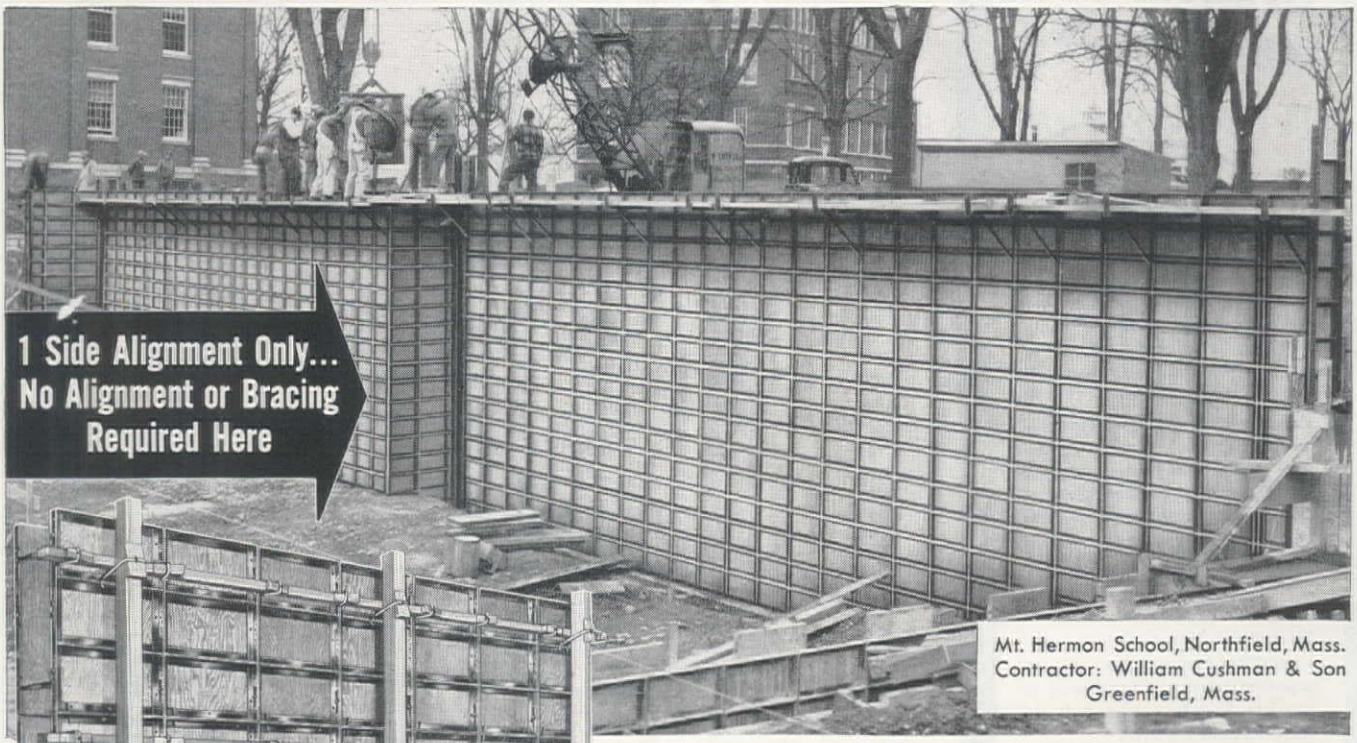

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Contractor: William Cushman & Son
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METHOD	LUMBER REQ'D	AVERAGE RE-USAGE	LUMBER EXPENDED PER USE
Conventional Forms	2400 bd. ft.	6 times	400 bd. ft.
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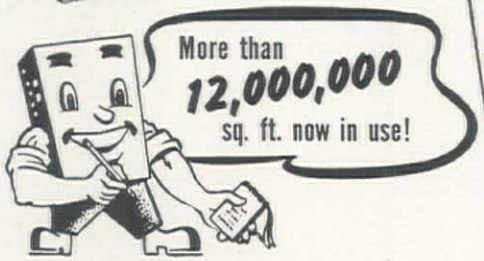

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UNIT BID PRICES . . . CONTINUED

		(1)	(2)
44	ton paving asph. (P.M.S.)	35.00	36.00
4	ton liquid asph., MC-5 (sl. ct.)	60.00	60.00
1	ton asphaltic emuls. (sl. ct.)	60.00	60.00
40	cu. yd. screenings (sl. ct.)	8.00	10.00
3	cu. yd. sand (sl. ct.)	5.00	5.00
130	cu. yd. Cl. "A" P.C.C. (footing blocks)	36.00	38.50
1,046	cu. yd. Cl. "A" P.C.C. (structures)	70.00	66.00
710	lin. ft. concrete railing	8.00	15.00
455,000	lb. structural steel	.23	.21
Lump sum,	cleaning and painting structural steel	$7,980	$7,980
575	lin. ft. furn. steel piling	5.50	5.55
28	ea. driving piles	125.00	125.00
39	ea. right-of-way monuments	7.00	8.00
19	ea. guide posts	7.00	8.75
13	ea. culvert markers	7.00	8.75
2	ea. clearance markers	15.00	8.00
20	lin. ft. 8-in. C.M.P. (16 gauge)	2.00	2.90
312	lin. ft. 18-in. C.M.P. (16 gauge)	4.50	7.90
326	lin. ft. 24-in. C.M.P. (10 gauge)	9.25	11.80
400	lin. ft. 8-in. P.M.P. underdrains	2.25	3.25
1,300	cu. yd. filter material	4.00	4.00
30	lin. ft. 8-in. C.M.P. down drains (16 gauge)	2.15	3.10
76	lin. ft. 12-in. C.M.P. down drains (16 gauge)	3.10	4.30
1	ea. spillway assembly	35.00	68.00
1	ea. spillway assembly down drain slip joint	20.00	75.00
132,450	lb. bar reinf. steel	.12	.11
3	ea. redwood covers for drop inlets	15.00	15.00
1,500	sq. yd. obliterating existing road	.10	.05
60	lin. ft. railway trestle	315.00	325.00
Lump sum,	removing existing bridge	$6,000	$7,000
100	lin. ft. metal plate guard railing	4.50	4.80

Reinforced Concrete Box Culvert

California—Sonoma County—State. Wheeler Construction Co., Oakland, with a bid of $23,529, was low before the State Division of Highways for construction of a State highway in Sonoma County at Sleephouse Creek, about 2.6 mi. west of Duncan Mills; a reinforced concrete box culvert to be constructed and about 250 ft. of roadway to be graded and bituminous surface treatment applied thereto. Unit prices were as follows:

(1) Wheeler Construction Co. $23,529
(2) Helwig Construction Co. 24,708
(3) Charles S. Moore & Robert R. Murdock $24,803
(4) G. M. Carr & Bati Rocca 24,978

		(1)	(2)	(3)	(4)
Lump sum,	clearing and grubbing	$3,000	$1,000	425.00	800.00
310	cu. yd. structure excavation	1.20	3.00	3.00	4.00
1,900	cu. yd. imported borrow	1.90	2.00	2.35	3.00
130	cu. yd. imported base material	1.50	5.00	4.50	4.00
Lump sum,	developing water supply and furn. watering equip.	553.00	500.00	250.00	600.00
65	M. gal. applying water	1.50	3.00	2.00	3.00
615	sq. yd. preparing, mixing and shaping surface (BST)	.45	.60	1.50	.25
4	ton liquid asphalt SC-3 (BST)	39.00	50.00	50.00	50.00
175	cu. yd. Class "A" P.C.C. (structure)	49.00	60.00	65.00	59.00
23	cu. yd. sacked concrete rip-rap	33.00	40.00	32.00	40.00
8	ea. right-of-way monuments	10.00	15.00	10.00	8.00
105	lin. ft. new property fence	1.90	1.00	2.00	1.00
23,600	lb. bar reinforcing steel	.12	.13	.15	.12
Lump sum,	removing existing bridge	$2,500	$2,000	550.00	$1,000

Tunnel . . .

Concrete-Lined Tunnel in Gaviota Gorge

California—Santa Barbara County—State. Rhoades-Shofner Construction Co., Inc., Los Angeles, with a bid of $464,929, was low before the State Division of Highways for construction of a State highway in Santa Barbara County at Gaviota Gorge, about 1.5 mi. south of Las Cruces; a concrete-lined tunnel to be constructed and about 0.1 mi. of roadway to be graded and paved with portland cement concrete. Unit prices were as follows:

(1) Rhoades-Shofner Construction Co., Inc. $464,929
(2) Macco Corporation $797,429

		(1)	(2)
16	cu. yd. removing concrete	8.00	12.00
20	sta. clearing and grubbing	100.00	400.00
20,000	cu. yd. roadway excavation	2.50	3.00
1,900	cu. yd. struct. excavation	5.00	6.00
12,500	cu. yd. tunnel excavation	11.80	26.60
1,070	cu. yd. selected backfill	3.50	4.00
90,000	sta. yd. overhaul	.005	.03
6	cu. yd. imp. base material	6.00	4.00
216	cu. yd. pervious base material	8.50	8.00
1,290	sq. yd. preparing subgrade	.10	.20
Lump sum,	dev. water supply and furn. wat. equip.	$6,500	$15,000
1,500	M. gal. applying water	1.50	3.00
362	cu. yd. P.C.C. pavement	25.00	25.00
202	ea. pavement tie bolt assemblies	.80	1.00
1,400	cu. yd. Cl. "A" P.C.C. (structures)	65.00	100.00
1,636	cu. yd. Cl. "A" P.C.C. (tunnel lining)	65.00	100.00
54	lin. ft. rubber waterstops	3.00	2.00
28	ea. tunnel weepers	25.00	40.00
120	ea. grout pipes	5.00	8.00
86	lin. ft. 2-in. standard pipe	1.50	3.00
8	cu. yd. P.C.C. gutters	35.00	50.00
13	ea. right-of-way monuments	10.00	8.00
0.4	mi. new property fence	$1,200	$3,000
2	ea. drive gates	60.00	100.00
200	lin. ft. 8-in. C.M.P. (16 gauge)	1.90	7.50
62	lin. ft. 12-in. C.M.P. (16 gauge)	3.00	5.00
120	lin. ft. 18-in. C.M.P. (16 gauge)	4.20	4.00
210	lin. ft. 24-in. C.M.P. (14 gauge)	6.20	5.00
194	lin. ft. 48-in. C.M.P. (12 gauge)	18.00	19.37

(Continued on next page)

194	lin. ft. 6-in. P.M.P. (16 ga.)	2.00	5.00
4	lin. ft. 12-in. P.M.P. (16 gauge)	3.00	3.00
40	lin. ft. 18-in. P.M.P. (16 gauge)	4.40	4.00
25	cu. yd. filter material	10.00	10.00
1	ea. 18-in. C.M.P. 45 degree elbow	25.00	20.00
1	ea. 18-in. to 48-in. C.M.P. tee	120.00	25.00
114	lin. ft. 4-in. vitrified clay pipe	2.00	1.50
170,000	lbs. bar reinf. steel	.10	.14
50	ea. ¾-in. grouted anchor bars	6.00	10.00
100	lin. ft. 8-in. cast iron soil pipe	12.00	8.00
20	lin. ft. 12-in. cast iron soil pipe	17.00	12.00
4	ea. corr. metal tree wells	200.00	150.00
Lump sum,	lighting equipment	$5,000	$6,000

Highway and Street . . .

Grading, crushed gravel base and cutback asphalt seal in Wyoming

Wyoming—Fremont and Teton Counties—Bureau of Public Roads. Strong Company, Springville, Utah, with a bid of $269,000, was low for construction of the Wind River Route in Teton and Shoshone National Forests, to be 22 ft. wide and 18.1 mi. in length. Unit prices were as follows:

(1) Strong Company $269,000
(2) Stanley H. Arkwright 288,475
(3) Knisely-Moore Co. 292,205
(4) Northwestern Engineering Co. $313,520
(5) Peter Kiewit Sons' Co. 342,470
(6) Engineer's estimate 226,730

		(1)	(2)	(3)	(4)	(5)	(6)
	Miscellaneous force account work	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
1,000	cu. yd. unclassified excavation	1.00	2.00	3.00	2.00	1.25	1.00
700	cu. yd. unclassified excav. for structs.	4.00	4.00	4.00	6.00	5.00	4.00
1,000	cu. yd. unclassified excav. for borrow, Case 1	1.00	2.00	1.00	2.00	1.25	1.00
1,000	cu. yd. mi. spec. overhaul of borrow (1,000-ft. free haul)	.30	.25	.30	.30	.30	.30
170	unit watering of base course, Item 52A	2.00	2.00	3.00	2.00	3.00	2.00
Lump sum,	providing and maint. water plant or plants	$1,000	$3,000	200.00	500.00	300.00	600.00
50	hr. power roller for base course, Item 52A	10.00	10.00	10.00	7.00	10.00	8.00
Lump sum,	providing and maint. power roller or rollers for project	$1,000	$1,000	400.00	$1,000	300.00	600.00
5,600	ton cr. gravel or cr. stone base course, Class 2, grading D-1	2.00	2.35	3.70	2.90	3.40	2.00
15,000	gal. MC cutback asph., Grade 0 for prime coat	.20	.20	.28	.24	.20	.16
2,300	ton cover aggre. for Type 3 seal coat, grading B	5.00	6.00	8.00	7.50	7.50	6.00
115,000	gal. RC cutback asph., grade 2 or 3 for seal coat	.20	.20	.25	.24	.20	.16
27,000	ton (Cl. F pavement, Type F-1) plant mixture, grading B	4.20	5.50	4.90	6.00	7.37	4.00
316,000	gal. asphalt, Grade 200-300, for Type F-1	.18	.16	.18	.16	.16	.15
65	cu. yd. conc., Cl. "A" (air-entrained conc., low-alkali cement)	100.00	100.00	95.00	100.00	100.00	80.00
6,000	lb. structural steel, furn., fabr., and erected	.40	.65	.50	.50	.35	.40
1,030	lin. ft. 12-in. C.G.S.M. culvert pipe	3.00	5.50	4.00	6.00	4.00	3.00
1,000	lin. ft. 6-in. perf. C.G.S.M. underdrain	2.00	6.00	6.00	6.80	6.00	5.00
300	ea. timber guide posts with warning reflectors (treated)	9.00	5.00	6.50	7.00	10.00	6.00

Bituminous penetration macadam surfacing in Washington

Washington—Lewis County—State. The Department of Highways rejected the low bid of $707,975 by N. Fiorito Co., Seattle, for construction of State Highway No. 5 and 5L, Morton to Fern Gap, to be 4.8 mi. in length. Osberg Construction Co., Seattle, with a bid of $729,493 was second low. Unit prices were as follows:

(1) N. Fiorito Co. $707,975
(2) Osberg Construction Co. $729,493

		(1)	(2)
73.5	acres clearing	550.00	700.00
41.8	acres grubbing	550.00	400.00
437,080	cu. yd. unclassified excav., incl. haul of 600 ft.	.70	.65
7,680	cu. yd. common trench excav., incl. haul of 600 ft.	2.50	1.50
287,700	cu. yd. stas. overhaul	.015	.02
2,406	M. cu. yd. stas. overhaul	5.00	6.00
5,590	cu. yd. excav. of unsuitable material, incl. haul	.75	.75
2,540	cu. yd. structure excav.	2.50	3.00
167	days tamping roller	55.00	60.00
167	days pneumatic-tired roller	55.00	50.00
74	days mechanical tamper	45.00	40.00
18,960	lin. ft. slope treatment Class A	.15	.15
281.0	stas. (100 ft.) finishing roadway	15.00	15.00
1,610	M. gals. water in place	3.00	4.00
100	cu. yd. gravel backfill for drains, in place	10.00	10.00
320	cu. yd. gravel backfill for foundations, in place	3.50	3.00
220	cu. yd. special rock backfill for foundations in place	4.00	2.00
1,100	cu. yd. special roadway borrow, including haul	2.00	1.25
13,180	ton crushed stone surfacing top course in place	1.85	1.90
12,740	ton crushed stone surfacing base course in place	1.75	1.90
11,500	tons crushed stone surfacing top course in stockpile	1.70	1.90
1,800	ton crushed stone surfacing base course in stockpile	1.65	1.90
45,840	ton ballast in place	1.45	1.65
1,000	ton ballast in stockpile	1.25	1.55
	MINERAL AGGREGATE FOR NON-SKID SINGLE SEAL TREATMENT—SCHEDULE A		
3,000	ton coarse crushed screenings ⅝-in. - ¼-in. in stockpile	1.90	2.50
1,300	ton fine crushed screenings ¼-in. - 0-in. in stockpile	1.90	2.50
	MINERAL AGGREGATE FOR BITUMINOUS PENETRATION MACADAM—TYPE D		
4,300	ton base rock 1½-in. - ¾-in. in stockpile	1.65	2.10
1,300	ton keystone ¾-in. - ½-in. in stockpile	1.65	2.10
1,700	ton coarse cr. screenings ½-in. - No. 4 sieve in stockpile	1.65	2.10
500	ton fine cr. screenings No. 4 sieve - 0 in stockpile	1.65	2.10
	TYPE I-1 ASPHALTIC CONCRETE PAVEMENT		
208	ton Class C wearing course in place	15.00	16.00
264	ton Class L leveling course in place	15.00	16.00
	OTHER ITEMS		
72	lin. ft. hlf. rnd. pl. cor. met. culv. pipe No. 16 ga. 18-in. diam. in place	4.00	5.00
1,556	lin. ft. cement concrete curb and gutter in place	2.50	5.00

(Continued on next page)

UNIT BID PRICES . . . CONTINUED

		(1)	(2)
35	lin. ft. removing existing cement concrete curb	1.00	.50
269	cu. yd. concrete Class A in place	70.00	100.00
1	cu. yd. concrete Class C in place	100.00	100.00
285	sq. yd. mortar lining in place	5.50	10.00
1,600	lb. wire mesh in place	.30	.15
35,950	lb. steel reinforcing bars in place	.14	.15
255	lin. ft. conc. or V.C. drain pipe 10-in. diam. in place	1.25	1.50
381	lin. ft. plain concrete culvert pipe 12-in. diam. in place	1.50	2.00
1,029	lin. ft. std. reinf. conc. culv. pipe 18-in. diam. in place	4.00	5.00
726	lin. ft. std. reinf. conc. culv. pipe 24-in. diam. in place	7.00	7.50
543	lin. ft. std. reinf. conc. culv. pipe 30-in. diam. in place	8.00	10.00
243	lin. ft. std. reinf. conc. culv. pipe 36-in. diam. in place	10.00	15.00
69	lin. ft. std. reinf. conc. culv. pipe 48-in. diam. in place	15.00	22.00
60	lin. ft. relaying reinf. conc. culv. pipe 18-in. diam.	4.00	3.00
40	lin. ft. plain conc. or V.C. sewer pipe 6-in. diam. in place	1.00	1.00
9	lin. ft. plain conc. or V.C. sewer pipe 8-in. diam. in place	2.00	1.25
160	lin. ft. galvanized iron water pipe 1-in. diam. in place	1.00	.40
460	lin. ft. galvanized iron water pipe 1¼-in. diam. in place	1.50	.60
60	lin. ft. removing galvanized iron water pipe 1-in. diam.	.50	.25
390	lin. ft. removing galvanized iron water pipe 1¼-in. diam.	.50	.25
630	lin. ft. remov. and relay. galv. iron water pipe 1-in. diam.	1.00	.35
20	lin. ft. remov. and relay. galv. iron water pipe 1¼-in. diam.	1.00	.55
20	lin. ft. remov. and relay. galv. iron water pipe 1½-in. diam.	1.00	.75
20	lin. ft. remov. and relay. galv. iron water pipe 2-in. diam.	1.00	1.00
1	only adjusting existing lamphole to grade	15.00	30.00
6	only adjusting existing manholes to grade	50.00	50.00
2	only catch basins in place	200.00	150.00
2	only removing existing catch basins	50.00	50.00
181	only reinf. conc. right-of-way markers in place	7.00	5.00
2	only monument cases and covers in place	50.00	50.00
70	sq. yd. one course portland cem. conc. sidewalk in place	5.00	5.50
88	sq. yd. cem. conc. driveways 3-day mix, 6-in. section in place	7.00	7.00
125	sq. yd. remov. existing cem. conc. driveways and sidewalks	1.00	1.00
	BRIDGE		
45	cu. yd. structure excavation	5.00	8.00
180	cu. yd. concrete Class A in place	80.00	100.00
173	lin. ft. reinforced concrete bridge railing in place	10.00	10.00
40,000	lb. steel reinforcing bars in place	.14	.15
1,440	lin. ft. furnishing precast concrete piling	5.75	6.00
32	only driving precast concrete piles in place	125.00	100.00
1	only furn. and driving precast concrete test pile	$1,000	$1,000

Grading, drainage and select borrow subgrade in Colorado

Colorado—Montezuma County—Bureau of Public Roads. Floyd Haake, Santa Fe, N. Mex., with a bid of $96,222, was low for construction of the Dolores-Rico Route in San Juan National Forest, to be 1.6 mi. in length with a roadbed 20-ft. in width and a bridge roadway 26-ft. in width. Unit prices were as follows:

(1) Floyd Haake ..... $ 96,222
(2) Sorenson Bros. 98,787
(3) Gardner Construction Co. 120,707
(4) E. J. Rippy & Sons $122,070
(5) Colorado Constructors, Inc. 123,434

		(1)	(2)	(3)	(4)	(5)
	Miscellaneous force account work	$1,000	$1,000	$1,000	$1,000	$1,000
8	acre clearing and grubbing	450.00	$1,200	$1,200	700.00	600.00
43,000	cu. yd. unclassified excavation	.70	.40	.70	.80	1.00
440	cu. yd. unclass. excav. for structs.	6.00	1.00	12.00	5.00	5.00
10,000	cu. yd. unclass. excav. for borrow, Case 1	.60	.37	.75	.80	1.00
60,000	sta. yd. overhaul (1,000 ft. free haul)	.03	.016	.02	.03	.03
13,100	cu. yd. mi. special overhaul of borrow (1,000 ft. free haul)	.20	.18	.30	.20	.30
3,000	lin. ft. furrow ditches	.40	.16	.40	.50	.50
1,000	unit watering of embankment, Item 29	1.00	1.56	1.00	2.00	2.00
Lump sum,	providing and maintaining water plant or plants	600.00	500.00	700.00	500.00	500.00
350	hr. rolling of embankment, Item 29	8.00	4.70	12.00	15.00	10.00
5,100	cu. yd. selected borrow for subgrade	1.50	2.05	2.50	2.00	2.00
226	cu. yd. conc. Class A (air-entrained conc. low alkali cement)	65.00	108.00	97.00	80.00	80.00
46,000	lb. reinforcing steel	.20	.23	.16	.25	.20
8	cu. yd. cement rubble masonry	25.00	60.00	75.00	100.00	60.00
664	lin. ft. 24-in. C.G.S.M. culvert pipe	7.00	7.00	7.50	10.00	7.00
19	ea. 24-in. metal pipe end sections	50.00	51.85	60.00	100.00	60.00
60	cu. yd. loose rip-rap	5.00	3.63	10.00	10.00	6.00
8	ea. conc. maintenance marker posts	15.00	12.00	15.00	25.00	12.00
12,100	lin. ft. barbed wire fence, Type 1	.30	.52	.25	.40	.30
3	ea. gates, 12-ft.	30.00	37.00	60.00	20.00	10.00
60	ea. timber guide posts with warning reflectors (treated)	10.00	6.00	6.00	7.00	6.00
196	lin. ft. railing	4.00	3.63	10.00	10.00	5.00

Housing . . .

Thirty temporary residences on the Eklutna Project in Alaska

Alaska—Eklutna Project—Bureau of Reclamation. C. William Hufeisen, with a bid of $121,355, was low for construction of thirty 2-bedroom temporary residences and utilities at Palmer. Unit prices were as follows:

(1) C. William Hufeisen, Builder $121,355
(2) Davis Construction Co. 141,231
(3) Denali Construction Co., Inc. $153,418
(4) Engineers' estimate 117,151

		(1)	(2)	(3)	(4)
120	cu. yd. excavation for residence	18.34	8.07	20.50	1.60
100	cu. yd. concrete for residences	78.00	121.00	128.00	100.00
Lump sum,	constructing ten 2-bedroom residences	L.S.	L.S.	L.S.	$97,500
580	lin. ft. excav. and backfill of pipe trenches 4 to 7 ft. deep	1.10	3.30	1.60	1.55
1,740	lin. ft. excav. and backfill of pipe trenches 7 to 10 ft. deep	1.375	3.30	2.00	1.95
600	lin. ft. furn. and laying 1-in. galv.-steel pipe for water service lines	.825	1.31	1.00	1.15
250	lin. ft. furn. and laying ¾-in. galv.-steel pipe for water service lines	.715	1.08	.90	1.00
16	assemb. furn. and installing ¾-in. curb stop and service box assemb.	30.80	68.20	35.00	27.00
400	lin. ft. furn. and laying 2-in. galv.-steel pipe and fit'gs for water main	1.65	1.63	2.00	1.80
1	assemb. furn. and installing 2-in. gate valve and valve-box assembly	57.20	94.60	65.00	30.00
2	assemb. furn. and installing fire-hydrant assemblies	352.00	726.00	400.00	325.00
800	lin. ft. furn. and laying 4-in. pipe and fittings for sewer serv. lines	2.20	2.77	2.00	1.45
400	lin. ft. furn. and laying 6-in. pipe and fittings for sewer main	3.30	3.44	3.00	1.80
1	manhole constructing sewer manhole 6 ft. deep	525.00	500.00	700.00	375.00
2	ft. constr. sewer manhole each addtl. foot over 6 ft. deep	35.00	25.00	100.00	70.00

NEW LITERATURE

901

72-page book of tables to guide steel buyers

To help steel users get the most out of available steels, **United States Steel Co.** offers a free 72-page booklet, "Tables of Multiple Lengths." This valuable publication is designed to help minimize waste in cutting steel. The tables in the booklet can be used to determine the exact size of any given number of lengths that can be cut from a longer length. To give an idea of how the tables work: Suppose a steel user orders 15-ft. bars that he later cuts into 3-ft. lengths. If a mill should roll, say, a 69-ft. bar, only four 15-ft. usable lengths can be cut from it. However, if multiple lengths of 3-ft. units had been ordered, 23 usable 3-ft. units could have been cut from the same 69-ft. bar. These tables are compiled on the basis of dead lengths and make no allowance for loss of material in recutting.

902

24-page truck mixer guide with detailed specifications

Chain Belt Co. offers a new, 24-page truck-mixer bulletin on its Horizontal and Adjusta-Hite Moto-Mixers. Filled with detailed information that every operator interested in pre-mixed and truck-mixed concrete will want to know, the bulletin gives the outstanding features and improvements of the mixers, amply illustrated for clarification. Photographs show the simplicity of Rex's new, improved transmission, and the advantages of drop-forged, flame-hardened,

drum rollers are shown and explained. Included is a description of an important improvement recently added: a new style pivot point on the axis of the Adjusta-Hite Moto-Mixer, which has been moved forward directly under the load, reducing stresses on the frame and allowing substantial weight reduction. The booklet points out the user benefits of water pump relocation and the more efficient pump drive which simplifies maintenance and adjustment. A water seal of greater durability and efficiency is fully explained. Bulletin No. 51-29, with valuable tables, is offered to those interested in truck mixer performance.

903

Statistical guide to selecting conveyor or elevator belts

A handy reference guide in 16 pages of charts, tables and graphs is now offered by **Thermoid Co.** How to select the right conveyor or electric belt for the materials to be handled is the chief information the booklet puts over, and advice is also offered for determining capacities, speeds, weights and number of plies required. Careful study of this guide could lead to many economies and the right type of equipment for the job.

904

Here's a chance to get "Cat" DW20-DW21 tractor guide

With illustrations down to the smallest detail, complete specifications and a colorful display of information, **Caterpillar Tractor Co.** is offering a new 24-page booklet called "Caterpillar Diesel DW20-DW21 Tractors." The booklet features the new 6-cylinder supercharged DW20 and DW21 diesel engine. It points out the merits of the exclusive fuel injection system developed by Caterpillar and includes design and performance data on the 225-hp. engine. Additional information is presented in specifications of the DW20 and DW21, the No. 20S bulldozer, the No. 27 cable control, the W20 wagon, and No. 20 and 21 scrapers.

Continued on page 151

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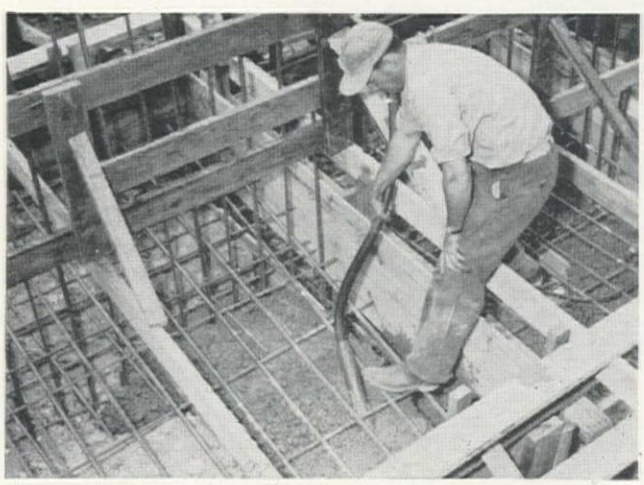
905

New concrete vibrator has optional 10-, 15-, 20-ft. hose lengths

Independent Pneumatic Tool Co. announces this newly designed concrete vibrator. In addition to offering optional lengths of 10-, 15- and 20-ft. combination air and exhaust hose, instead of the standard 5-ft. length, the tool features a ball-bearing rotary air motor and vibrator unit sealed in a

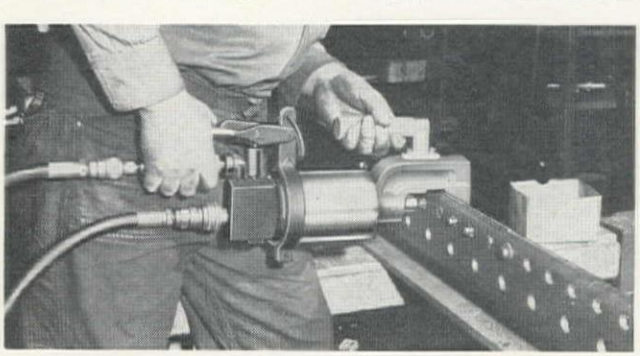


steel cylinder. Designed to compact freshly poured concrete and to direct its movement as it is poured into the form, the new No. 521 vibrator consists of a 2¾-in. diameter steel cylinder 17½ in. long at the end of a combination air and exhaust hose. Additional features of the new Thor tool include: an adjustable automatic air line oiler, a roll-type throttle providing up to 8,000 vibrations per minute and an exclusive steel sleeve around the vibrator unit eliminating possibility of grease loss from bearings.

906

Rivet heads get "squeeze play" from Guillotine Riveteer

Utilizing hydraulic pressure, this portable riveter delivers 60,000-lb. thrust through the hydraulic ram and will drive ⅝-in. cold rivets. The operator merely presses the hand valve



to actuate the ram and start a "squeezing action" rather than the customary hammering of the rivet head. Release of the valve provides automatic retraction. Full thrust is delivered over the entire stroke and no adjustment is needed between rivets of different lengths as is required on air-operated riveting equipment. According to the **Manco Manufacturing Co.**, the unit requires little or no maintenance, and specially designed oil seals prevent leakage both at maximum pressure and at no pressure. Adaptations of the basic Guillotine are also available for cutting steel bars, wire rope and electric cable. The Guillotine Riveteer may be obtained with a variety of portable pump units for actuating the hydraulic pressure, including compressed air and electric.

907

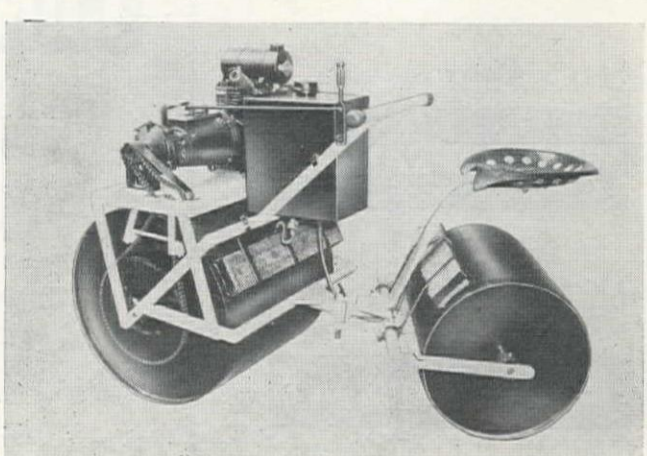
Ratchet principle applied to load binder boosts load chain action to 20½ in.

Since this load binder works on the ratchet hoist principle, it will take up or slack off a load chain any amount up to a full 20½ in.—or more if a longer chain is used in the binder. This advantage over eccentric-type binders is especially important with "springy" loads where the binding chain or cable must be tightened by force through considerable distance in order fully to secure the load. If a load settles in transit, the new unit is easily tightened any amount without the necessity of releasing the entire load to take a new "grab." Full strokes can be used for rapid take-up; half strokes permit minute adjustments. To speed operation, the binder chain may be pulled freely through the ratchet when not under load. The new Hoist-Binder, produced by **Coffing Hoist Co.**, weighs only 10 lb., and will exert a pull of 3,000 lb.

908

Versatile new roller designed for small contractor needs

Three models of the Motoroller are available from **Gabb Manufacturing Co.**, and eight accessories make any of the models interchangeable. All three rollers have welded and



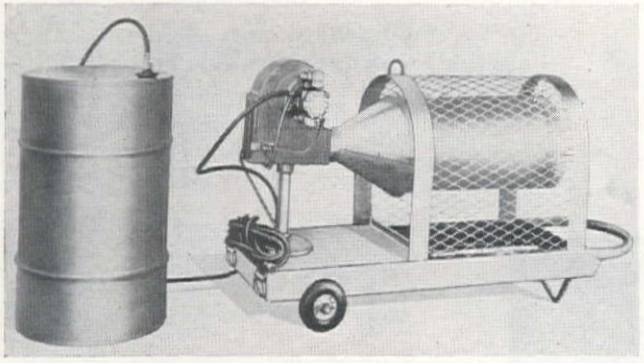
bolted steel construction, Briggs and Stratton or Clinton engines, V-belt and chain-driven power train, and weights ranging from 280 to 325 lb. empty and 625 to 860 lb. full. Series AR Tandem model weighs 355 lb. empty and 890 lb.

full. The main roll is 24 x 24-in., 12 gauge, and the tandem roll is 18 x 24-in., 12 gauge. Design of the machine makes it suitable for a great number of small rolling operations. The accessories available make the models an important addition to the equipment of contractors who require versatility in their equipment.

909

New portable oil-fired heater produces 189,000 BTU's per hour

This new portable "Eco-Temp" oil-fired radiant heater is a tremendous heat producer for any temporary or permanent application. It burns No. 2 fuel oil on a high-combustion



economical basis and requires only regular 110-volt, 60-cycle, single phase electrical connection. The versatile device can be used for drying plaster, paint, concrete and other materials and surfaces. It will thaw frozen areas and moving parts, can be used in space heating to create comfort or reduce cold-weather waiting time in new construction, etc. Fuel is supplied to the heater through hose of any length attached to fuel oil drum. Fuel consumption is only 1.35 gal. per hour. The heater is 48 in. long and 18 in. wide, and is a product of **Arthur C. Baumann.**

910

Additional power supply increases 2-way radiophone utility

Motorola, Inc. is now producing a new Pack Set Power Supply designed to increase the utility of the Motorola FM 2-way radiophone pack unit by making it convertible to semi-

fixed or mobile application while preserving the dry battery supply for portable operation only. A plug-in power connection and switching facilities on the pack unit permit quick and easy transfer from internal dry battery power supply to an external power source. The power supply makes it possible to operate the pack set from either a 117-volt AC or a 6-volt DC primary power supply. It employs rugged, all-steel, welded construction and is finished in an attractive gray Hammerloid enamel.

911

Air starting motors crank gasoline and diesel engines

These two new air starting motors for cranking gasoline and diesel engines are expected to be used in the lumbering, heavy construction and power fields. They are designed by **Ingersoll-Rand Co.** for cranking engines with piston displacements up to more than 3,500 cu. in. Although normally operated by compressed air, they are also suitable for operation on natural gas where available at sufficient pressure. These starters eliminate the necessity of generators, banks of storage batteries, and the costs of battery maintenance and replacement. They are not affected by climatic conditions and are easily installed. Available in two sizes; the size 9BM, which develops up to 16 hp., and requires approximately 7 cu. ft. of air per start; and the size 20BM, which develops up to 41 hp., and requires approximately 16 cu. ft. of air per start. The smaller size weighs 40 lb., and the larger size, 103 lb.

912

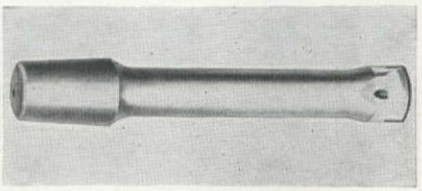
Sparklers now used in cutting concrete and asphalt

Clipper Diamond Blades and a Clipper Concrete Saw are designed to work on streets, building floors, drives, walks, runways, etc. Concrete containing limestone aggregate can be sliced up to 10 ft. per minute when cutting at a depth of 1 in. Asphalt containing the same aggregate, and cut to the same depth, can be sliced at the rate of 12 ft. per minute. Specifications of the new Clipper (Concrete) Diamond Blades are available for all types of aggregate and age of concrete. These blades are manufactured in diameters from 8- to 18-in., and in thicknesses of 5/32- to 7/64-in., for use on any type concrete saw. Manufactured by **Clipper Manufacturing Co.**

913

Plug drill bit sets 13-seconds-per-hole record

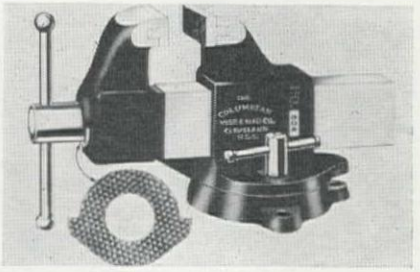
Thunderbolt Carbide Tipped Granite Plug Drill Bit for plug and feather work recently set a new speed record of 13 seconds per hole (average) for wet drilling of ¾-in. holes, 3½ in. deep. The record was established as an average after using a large number of Thunderbolt bits in many holes. It was not necessary to sharpen the **New England Carbide Tool Co., Inc.** product until 75 to 100 holes had been drilled, depending upon conditions. Each bit is made of heat-treated alloy steel—hollow-drilled for water or air. Grading instructions and a grinding template are supplied.



914

New machinists' vise eliminates "end play"

An outstanding feature of this new line of machinists' vises is the graphite-bronze self-lubricating thrust bearing located at the front of the sliding jaw. This absorbs thrust of the steel screw head, provides easy and positive operation, prevents wear and eliminates "end play." Columbian Machinists' Vises, made by **The Columbian Vise & Manufacturing Co.**, are made in all standard sizes—3- to 8-in. jaw widths.



915

Portable press designed for use with hydraulic puller

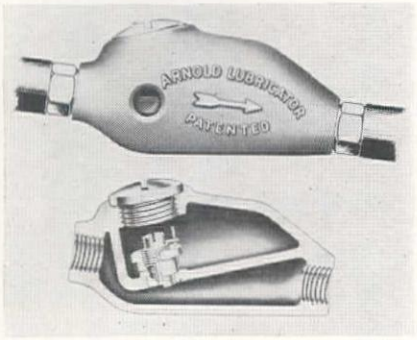
This portable and compact press for use with the **Owatonna Tool Co.'s** Power-Twin Hydraulic Puller has a base of only 20 x 20 in. It takes up a small

amount of space, but it is big enough to handle many jobs in a small contractor's shop. The pedestal press is designed especially for use with the OTC Power-Twin 17½-ton ram, and can be located almost anywhere in the shop or easily moved to jobs. Mounting a strong, practical, open-throat press plate it provides almost unlimited vertical adjustment for pushing or pulling jobs. It can be used for removing or installing pinions, bearings, gears, shafts and bushings.

916

New lubricator gets pneumatic tools oiled

With a capacity of ½ pt. of oil, the new size Arnold lubricator is designed for lubricating pneumatic tools. When placed in the air line, this lubricator supplies a flow of "oiled air" to the working parts of the tool. An adjustable feeder enables the operator to adjust the oil flow to the needs of the job. Oil may be



added under line pressure; a new pressure-proof window reveals at all times exactly how much oil is in the lubricator. Because it is made of a light-weight alloy, the lubricator causes no perceptible drag on the air line, and its shape allows it to be pulled around corners without catching. This new No. 2 model is 7 in. long, 3½ in. wide and 3½ in. high. Total weight is 32 oz. **Rucker Co.** is the manufacturer.

917

Two secondary pinions drive output gear in new motors

By using two secondary pinions to drive the output gear, the effective torque rating of a conventional single pinion and gear unit has been doubled. Incorporating the use of a splined herringbone pinion to divide equally the load between the two secondary pinions, the type GL Syncrogear produces high torque at low speeds while occupying only a fraction of the space required of a conventional drive. Available with rating of 5 to 25 hp., and with speeds from 30 to 84 rpm., the type GL, manufactured by **U. S. Electrical Motors, Inc.**, has the advanced features of asbestos-protected windings, normalized castings, solid centricast rotors and Lubriflush lubrication.

918

Horizontal mixers get improved chain drum drive

Available in three sizes with maximum capacities of 3 yd., 4½ yd., and 5½ yd., is the **Chain Belt Co.** Moto Mixer

with the new single-strand chain drum drive. The single-strand chain gives greater overall efficiency and lower chain maintenance costs. All Moto Mixers are now equipped with drop-forged, frame-hardened drum rollers. Alloy metals and improvements in fabrication methods have resulted in a stronger, substantially lighter frame, permitting more strength in parts that need it and still lowering weight of the entire machinery. The newly located water pump is driven by a V-belt directly from the engine crankshaft.

919

Fast concrete production where 6-cu. ft. mixer needed

The water tank on this new Rex 6-S concrete mixer has been relocated to the top of the mixer to permit faster water entry, faster batching and more con-

crete per hour. It is now equipped with a "see-in" clear, unbreakable plastic check valve for elimination of guesswork in the water supply. The new water valve can be completely overhauled by simply replacing two rubber washers and one rubber "O" ring. Pillow blocks have replaced bushings on the countershaft and bearings are now used on the winding drum to provide greater durability. Rex construction equipment is manufactured by Chain Belt Co.

920

Spotlight provides 100,000 candlepower, 300-watt rating

This new high-intensity spotlight is designed to concentrate its entire light output in a long-throw, oval-shaped narrow floodlighting beam that is recommended for area protection lighting. Produced by Stonco Electric Products Co., the new spotlight is made of noncorrosive cast aluminum throughout, has a universally adjustable cast-aluminum swivel air threaded ½ in. NPT to fit a variety of standard interchangeable accessories, such as flat base, weatherproof junction boxes, wall brackets, wiring troughs, etc. Up to five units can be mounted to a single cluster light assembly so that all lights in a cluster would have to go out before total darkness is possible.

921

Silicone base liquid protects masonry surfaces

One application of this new liquid, H2-O-NO, keeps water out of masonry for periods up to five years. The product also repels soot and dirt, minimizes

efflorescence and reduces spalling. Because it is made with highly penetrating solvents, H2-O-NO is said to enter from 1/16 in. to 3/8 in. into mortar upon application. It then forms a silicone lining for the microscopic masonry pores and waterproofs the pore walls. It does not plug up the pores or prevent transpiration of air. The new product is made by **The Chem Industrial Co.**

922

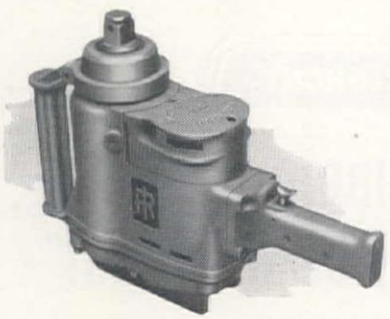
Filing and setting tool for circular saw blades

This combination, two-in-one tool, the Sharp-Set, is used to keep circular saw blades in efficient cutting condition. It is adjustable for blade diameters from 6 to 18 in., and accommodates all standard size and shape arbors. The tool, produced by **Clark & Sawyer, Inc.,** can be carried in a tool box and used right on the job to assure keen saw performance. At one end of the Sharp-Set there is a tool steel "hammer and anvil" matched at 15 deg. to give the saw blade the proper set. The other end has a tension bar for filing the teeth under the proper tension. A built-in clamping device for convenient fastening in a vertical position is available when the tool is used for saw filing.

923

Here is an answer to tough nut running jobs

Ingersoll-Rand Co. announces a new universal electric Impactool for tough nut running jobs in truck, bus and in-



dustrial maintenance fields. The size 34U Impactool has a 1-in. square driver and is rated for bolts up to 1¼-in. size. The tool employs a universal electric motor and a proven I-R Impact Unit, placed side by side to reduce overall height and permit handling truck U-bolt nuts without jacking up the truck. The impact mechanism automatically converts the power of the electric motor to hundreds of rotary impacts whenever sufficient resistance to turning is met. These powerful rotary impacts quickly run nuts up tight, or remove the most stubborn rusted or frozen nuts. No kick or twist is transmitted to the operator under any condition. The tool is 10-3/16 in. high, 4¾ in. wide and 14⅞ in. long excluding the adjustable grip handle.

924

Engine oils produced to fight adverse conditions

Ursa Oil X Sup. One 10, 20, 30, 40 and 50 is produced by **The Texas Company** for the lubrication of heavy-duty gasoline engines and automotive-type diesel engines which are operated under adverse conditions. It delivers satisfactory protection in service employing diesel fuels up to 1.0%, or higher, sulfur content.

925

Saw needs less power and has fewer teeth

The new Safti-Cut has only 8 or 12 cutting teeth instead of approximately 100 as found on most conventional blades. It gives smoother cuts faster and uses approximately 30% less power. The cutting teeth of the saw blade project only .020 in. above the non-cutting edge. This prevents loading up of the blade teeth, which often causes blades to crack, and permits the non-cutting edge to control the bite of the blade. Fewer cutting teeth reduces noise created by the action and makes resharpening easy. The danger of spontaneous combustion is eliminated since the blade produces chips instead of sawdust. Safti-Cuts are available in 6- to 16-in. diameters for any style arbor hole. The new design is produced by **Western Saw Manufacturers, Inc.**

926

New development promises longer life for batteries

Ultra Start is a new battery just announced by **The Electric Storage Battery Co.** The Ultra Start's longevity secrets are silvium, a corrosion resisting

grid metal mode of lead, silver and other components; a new type high-capacity active material; a low specific gravity electrolyte and the new Pormax plastic separator.

927

"Kick-Back" apron guards power saw operators

Wherever the danger exists of forcible ejection of lumber against the operator of a power-driven saw, **Industrial Products Co.** suggests the use of its new

IPCO sawyer's "Kick-Back" apron. The product allows for protection from the diaphragm to below the waist. The apron has a heavy fiber shield on the inside, bound and strapped in convex position to cover the abdomen. The back of the apron is padded with hair felt for comfort and additional resistance in absorbing the force from a kick-back. The outside covering is a heavy white canvas.

928

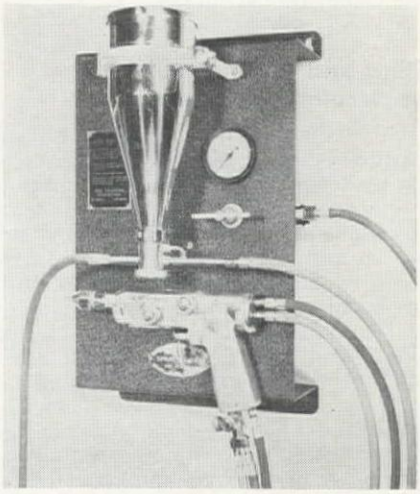
Arc welders get remote voltage control

The Mullenbach Arctrol is a foot-operated variable resistor that plugs into many standard welding units and can be quickly installed on most others. It gives instant selection or variation of any welding heat within capacity of the machine wherever the operator is working. Because of its flexibility of control, the Arctrol is extremely useful on precision welding operations. Voltage can be varied during welding, instantly changed to meet variations in fit-up and position, or even to extinguish the arc at completion of the weld, thus avoiding cratering. Faster welding speed results because heat can be kept at the most efficient peak for the job conditions. Arctrol can be applied to most DC welders, and to some types of AC machines. Its use in no way limits the capacity of the welder nor use of the regular voltage control. Arctrol is a product of **Mullenbach Electrical Manufacturing Co.**

929

Improved "Spraywelder" for applying hard facing alloys

The Spraywelder, now available in a new model, is a powder metallizing unit used to execute the Sprayweld Process of the **Wall Colmonoy Corp.** The process consists of applying uniform overlays of Colmonoy hard facing alloys using metallizing procedures, and then bonding the overlay to the base metal. The Spraywelder can also be used to apply metal powder castings such as copper, brass, stainless, aluminum and



zinc. This new model offers lighter weight, eye-level air gauge, greater capacity air filter, more positive air and powder control valves, a new trigger mechanism and an increased cooling chamber. Priced at $385.00 complete, as shown in the accompanying photograph. The instrument shown is the Model "B" Spraywelder.

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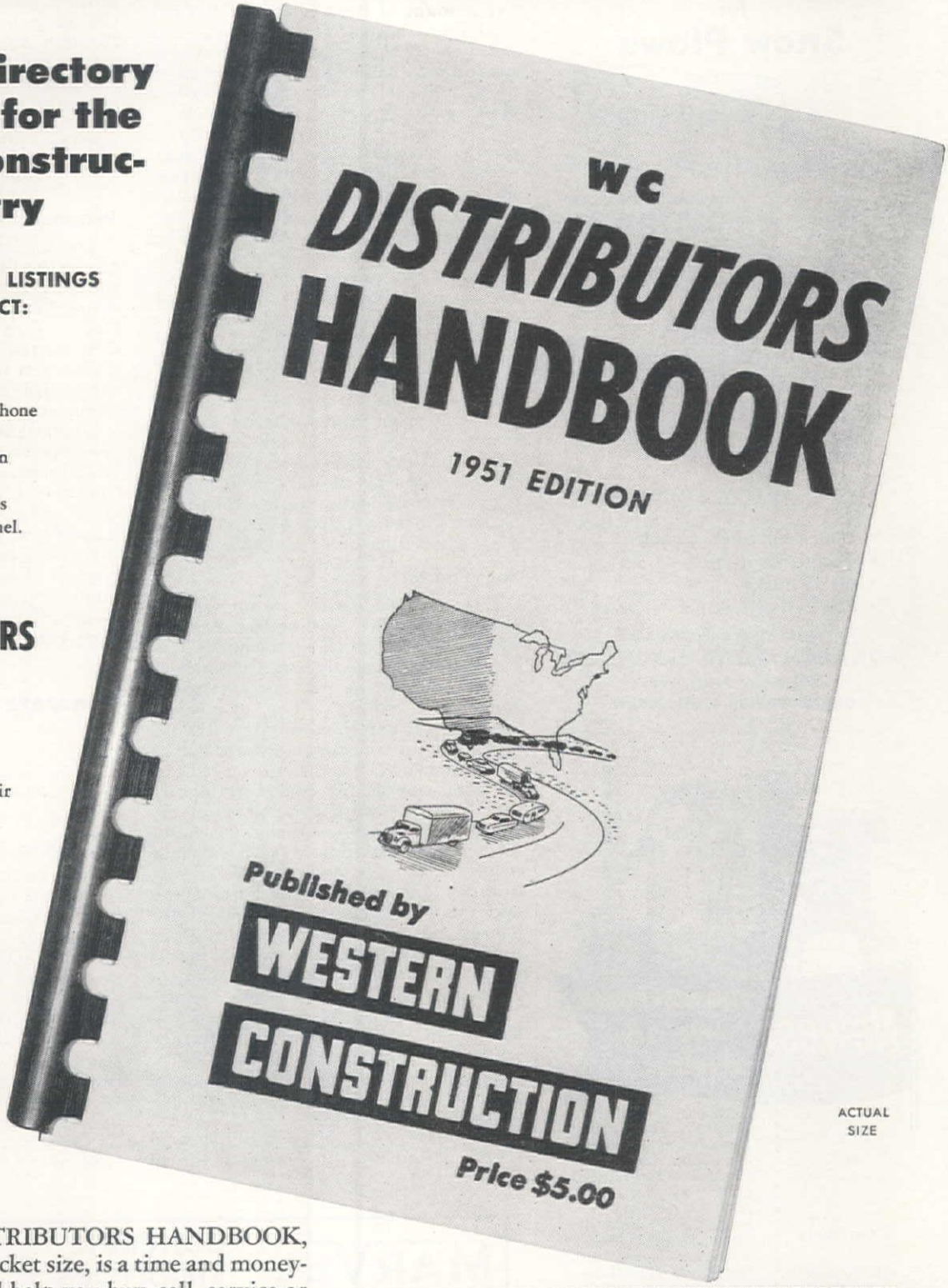
Names and addresses of construction equipment manufacturers (listed alphabetically for entire United States); the products they make; their Western branches; key personnel; Western distributors.

PRODUCTS

Alphabetical listing of products with names of all manufacturers making each product.



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Tecolote Tunnel

. . . Continued from page 79

is to run the fan on blow, giving a positive amount of fresh air at the heading at all times, until after the round is shot. After the shot the fans are reversed to suck until the heading is relieved of powder fumes and then fans turned on blow again.

Water has not been too serious a problem in the north heading since most of the formation has been dry. Seepage has occurred in minor amounts and the resulting problem has been in connection with maintenance of the hauling track. The shale and siltstone tend to soften in the presence of the seepage and make track work a constant headache. The contractor has brought in a considerable amount of gravel for ballasting.

The present plan for handling this water is to install portable pumps to pick it up from sumps where it collects from ditches.

Car passing tracks are provided at 2,000-ft. intervals near the face as driving advances. Further back in the tunnel passing tracks are left permanently at 5,000-ft. distances for regular hauling.

South portal

As indicated earlier in the article, work at the south heading has been carried out under much better conditions. The material is mostly hard siltstone and is drilled and shot in fairly standard rounds of 5 to 6 ft.

One feature in this heading is the development of considerable water, which was anticipated. Increasingly large flows of water and heavy concentrations of "rain" have been encountered in the south portal since last February. Some unsuccessful attempts have been made to grout off these flows, but at present drainage has been effected by pipelines and pumps. This water is being discharged into the Goleta section of the South Coast conduit, which is nearly complete, and delivered to the City of Santa Barbara and Montecito County Water District for domestic use to alleviate, in part, their water shortage which has been occasioned by the prolonged drought. Discharge at the portal is at present averaging about 1,800 gal. per min.

The driving of the Tecolote tunnel represents one of the difficult tunnel jobs of the West and has encountered problems similar to those which developed in the driving of the Coast Range tunnels on the Hetch Hetchy project. This Hetch Hetchy tunnel was the only other major job extending through the backbone of the Coast Range for any considerable distance.

Operations at Tecolote have been generally in line with expectations and although time has been lost the progress has been achieved through well organized and well directed field operations in spite of difficult natural problems.

Personnel

The Cachuma project is being carried out by the Bureau of Reclamation under the general direction of E. R. Crocker, project manager, with headquarters at Goleta. L. N. McClellan is Chief Engineer for the Bureau at Denver. Richard E. Burnett is construction engineer on the project and Max T. Hedges is field engineer in charge of tunnel work.

Operations of Halvorson Contractors (combination of Carl M. Halvorson, Inc., Portland, and H. Halvorson, Inc., Spokane) are under the direction of G. G. Bawden, project engineer. Other members of the contractor's field forces include: Carl Nelson, general superintendent; Earl Crawley, Joe Ivy, William Hoestetter and Harry Ward, walkers; Robert Eyre, purchasing agent and Carl Post, paymaster.

Concrete insulation

. . . Continued from page 66

lem, for he ordered 15 additional mats, these to be 1 ft. wider to give better coverage at the edges.

Supporting data

Performance of the insulating mats in the field is indicated in the accompanying table of comparative concrete and air temperatures. For insulation of a thin concrete slab to be successful to this degree, not only must the earth subgrade be frost-free when the concrete is placed, but the material below the surface must be several degrees above freezing. The table of earth temperatures also reproduced shows that there is enough heat in the ground to aid insulation in conserving heat of hydration of concrete to keep it at favorable temperatures.

NEW LITERATURE

Continued from page 141

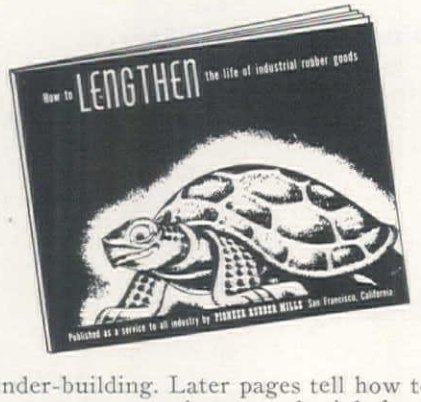
For your convenience, use the coupon on page 141 to request the items which interest you.

★★★★★★★★★★★★★★★★★★★★★★★★★★

930

How to get long life from rubber belting and hose

A "must" for maintenance libraries is a free booklet published by **Pioneer Rubber Mills.** The illustrated booklet outlines a maintenance schedule that, if followed, can double, triple or even further lengthen the useful life of conveyors, belting, hose and other rubber products. First pages tell what elements to consider in choosing the right product to do the right job, and how to prevent the waste of over-building or



under-building. Later pages tell how to protect your products on the job from the natural enemies of rubber (oils and greases, acids, sunlight, etc.). Remainder of the booklet is divided into sections containing maintenance tips for the different types of rubber products. Each section gives some general do's and don'ts, then tells how to install the product to reduce later maintenance and other costs, continues with pointers for best operation and concludes with a trouble shooting guide. Humorous drawings in three colors make the booklet easier to read and the more important maintenance factors easier to remember.

931

32 pages provide chain maintenance know-how

To all who design, install, maintain or operate chain drives and conveyors, this bulletin shows how to get the most service from your sprocket chains. **Chain Belt Co.** has put brief, to-the-point advice in this two-color, 36-page pocket-sized guide. Graphic illustrations clearly show the correct and incorrect ways of solving chain installation, operation and maintenance problems. Published on the theory that chain life can be greatly lengthened by proper installation and operation, the booklet is a must for chain owners who want service and economy from their chain drives and conveyors. Five sections compose the compact little book, covering: installation and operation, care of sprockets, lubrication, inspection and storage, and adjustment and repair.

932

Complete information on this wall-form construction system

Symons Clamp & Manufacturing Co. announces release of a new 34-page catalog on its system of wall-form construction. Incorporated in this catalog is all of the latest information on improvements in the Symons forming system with illustrations to show in detail how the system works. On-the-job photos aid the reader to see the form in use as well as completed foundations. Blueprint illustrations and complete specifications are given along with reference to the material and equipment necessary, time required, and cost figures on representative jobs. Symons announces that by sending in plans and specifications, you will be furnished a free form layout of your job without charge or obligation. Write for this informative booklet by using the coupon on this page.

933

Important study offered on high-strength bolt development

The latest issue of *Fasteners,* publication of the **Industrial Fasteners Institute,** offers the story of the high tensile-strength structural bolt and an approved specification for its use. Information is given on the research and development behind introduction of these high-strength bolts, which offer a new method to the structural engineer. The complete story is compiled here along with specifications for assembly of structural joints using high tensile steel bolts. This is a chance to add an important and different piece of literature to your reference library.

934

Plenty of pointers in this atomic defense booklet

A 32-page illustrated booklet in two colors is now offered by **Walter Kidde & Co., Inc.,** in the interests of national defense. "How to Prepare Your Plant For Atomic Attack" contains a study of the effects of the atomic bomb compared to the block-busters and other high explosives used during the course of World War II. Sections are devoted to the effect of blast wave striking a structure, radiation—its immediate and after effects, plant defense organization programs, shelter and building construction, fire—types of fire and agents used to extinguish them, and a bibliography offering further information and reference material for the reader who wishes to examine a specific phase of the subject.

935

Latest in welding series

For those who are collecting the series on arc welding being released by **Lincoln Electric Co.,** there is a new issue available. Plate No. 122 continues from No.

121 in describing a modern steel deck girder highway bridge with illustrations, diagrams and specifications to point up the text. Like other releases in the series, this issue is punched for filing in a loose-leaf notebook.

936

Hoisting tower specs revised

Wilson-Albrecht Co., Inc., is offering revised specification and illustration sheets on the Waco Portable Elevator and Waco Material Hoisting Tower. The improvements and additional features of the equipment are fully described. The sheets are two-color, 8½ x 11-in. catalog inserts.

937

Down masonry drilling costs fast

A handy, pocket-sized booklet which tells its story quickly and well is available through **New England Carbide Tool Co., Inc.** The booklet features the Thunderbolt Carbide Tipped Hammer Bit and explains how the tool can help cut drilling costs. Tables of standard lengths, specifications and prices are included in the 8-page bulletin along with an order blank for the convenience of the reader.

938

Rubber-line pipe joint system

This new catalog and engineering manual for the GACO Rubber-Lined Pipe Joint System illustrates the way in which the system can eliminate the cost and time consuming methods of pre-engineering and pre-fabricating sections of rubber-lined pipe. The manual contains a complete list of fittings and specifications for your rubber-lined pipe stock piles, plus a list of corrosives to which **Gates Engineering Co.** gaskets and linings are resistant.

939

GMC truck owner's guide

"GMC's Tips to Truckers in the Emergency" is a new release from **General Motors Corp.** The booklet is an effort to acquaint truck owners with preventive maintenance, which pays off in economy and service for years. Included in the booklet are engineers' recommendations for timely inspection of trucks undergoing severe service and a detailed check list for preventive maintenance for GMC owner convenience in keeping his truck in best possible running order.

940

Cummins diesel pictorial

This 8-page, 2-color booklet is loaded with pictures of Cummins diesel power in action on producing crushed stone, agricultural lime, and sand and gravel. On-the-job photographs of hauling and loading operations and of crushing and pulverizing projects help make this booklet a compact survey of Cummins versatility and power. The text in this booklet is limited to caption form and produces quick reading and easy understanding. Specifications for hauling, loading and industrial power equipment manufactured by **Cummins Engine Co., Inc.,** are included in a complete table.

942

Economical transformer system

In its new 2-color booklet entitled "Type 400 Control Unit for Banked Secondary Transformer Systems," **Heinemann Electric Co.** offers a summary of the improvements on its system to give improved voltage regulation, reduction of flicker, construction economy and fewer service calls. The bulletin describes how the unit can be used on construction jobs to protect "lead-in" wires. Bulletin No. 2015 fully describes the rugged qualities of the system which make it very adaptable to construction field uses.

941

32 pages of excavator action

"Marion All-Purpose Excavators" starts off with a 4-color cover showing the Marion 93-M dragline and continues to working views of all Marion machines in the rest of its pages. The magazine-size booklet lists condensed specifications and types of service to which the machines can be converted for use. Bulletin No. 403 is a complete profile of this **Marion Power Shovel Co.** equipment.

943

Bitumuls reference library

Stancal Asphalt and Bitumuls Co. is offering six booklets on the use of Bitumuls. The booklets, designed for reference libraries, concern "Bitumuls Penetration Macadam", "Bitumuls for Maintenance", "Bitumuls Handbook", "Hydropel" admix for concrete, and "Fibrecoat," roof and metal coating.

944

Ordering wire rope?

"How to Order Wire Rope" is the title of a booklet published by **Macwhyte Company.** Designed to give the buyer a guide to sizes and construction features of Plow Steel Monarch Whyte Strand Wire Rope, the booklet also contains general advice on wire rope buying that could serve the purchaser.

945

56-page stud guide

Superior Concrete Accessories, Inc., offers a 56-page catalog which gives complete specifications and a valuable table for spacing studs, wales, and form ties. Cost-cutting is the key note of the booklet.

946

Plenty of pile hammers

Sixteen sizes of pile hammers manufactured by **McKiernan-Terry** are described in a catalog offered by the firm. In addition the bulletin gives technical information on two sizes of pile extractors. On the job data is included.

947

A glance at highway guards

The different types of highway guard rails, their installation and specifications, are included in a folder offered by **United States Spring & Bumper Co.** The flush type mounting bracket, designed for use with U. S. Metal Plate Guard Rail where space is limited, is described in the folder.

Literature Briefs

948

The Cooper-Bessemer Corp. offers a new bulletin giving complete engineering data, specifications and power ratings for its type FV diesel engines. The 6-, 8-, 12- and 16-cylinder types are described.

949

Mack Trucks, Inc. announces publication of an eight-page, 2-color booklet entitled "National Security Rides On Trucks." The booklet points up the importance of the trucking industry to the economy of the country.

950

Standard Steel Corp. has published two new 4-page bulletins (conveniently bound for reference in a loose-leaf manila file cover) on its recently developed S. M. Series Asphalt Paving Plant line. One bulletin discusses operators' experience in the field and the second deals with construction details of the plants.

951

Baldwin-Hill Co. announces publication of a new folder on Powerhouse Cement, a finishing cement that insulates.

952

International Harvester Co. announces publication of four 2-page bulletins presenting operating and construction features of International diesel engines. Titles are as follows: "Fast All-Weather Starts," CR-130-A; "Long-Life Lubrication," CR-131-A; "Combustion Control for Economical Power," CR-132-A; "Pull Through Overloads," CR-133-A.

953

Caterpillar Tractor Co. announces publication of a new 16-page pamphlet entitled "Work Horse Power," which features illustrations and information on "Cat" diesel engines on a variety of jobs.

954

Twin Disc Clutch Co. announces publication of a 32-page booklet called "Production Road," which features many on-the-job photographs of equipment utilizing twin disc clutches for a variety of interesting jobs.

955

The Galion Iron Works & Manufacturing Co. announces release of a new catalog devoted to the model 3-5 Ton Variable Weight Tandem Roller. New features are explained and illustrated.

956

Ingersoll-Rand Co. announces publication of an 8-page catalog which describes the Class APH-APK line of vertical, turbine-type pumps.

957

The Chem Industrial Co. announces publication of a new product information and application bulletin on H2-O-NO, silicone base liquid water repellant for masonry. The bulletin contains complete instructions for the use of the material, technical data, coverage facts, etc.

958

United Laboratories, Inc., announces publication of a new 8-page booklet containing information on how and where to apply Plastic Rock flooring. Technical data on the product and illustrations of typical applications are included.

959

American Tubular Elevator Company announces publication of a descriptive folder on its new lightweight, low-cost material-handling elevating tower, Model III Type PT.

960

Federal Motor Truck Co. announces publication of a bulletin showing the Federal line of heavy duty motor trucks. Six-wheel models are discussed in the bulletin along with other types.

961

Mines Engineering & Equipment Co. announces publication of a booklet on its Dual Portable Plants offering greater capacity for crushing, screening and loading. Bulletin No. 276.

962

Eutectic Welding Alloys Corp. announces publication of a 6-page, pocket-size folder describing new "Eutectic In-

Space is sold as advertisers' inches. All advertisements in this section are ⅛ in. short of contracted space to allow for borders and composition.

CLASSIFIED SECTION

Rates are $6.50 a column inch. Copy should be sent in by the 10th of preceding month if proofs are required; by the 15th if no proofs are required.

The following listed earth-moving equipment is for immediate sale, all quotations being subject to prior sale or other disposition.

Group "A": Three (3) Caterpillar DW10 Scrapers, s/n 1V713, 1V715, 1V737, approximately 3000 hours service, extended bowls, 12 cu. yd. struck measure, good tires, fine mechanical condition, good clean appearance, located near Denver.

Price: $13,000.00 each, f.o.b. Location.

Also $10,000.00 worth spare parts at inventory price.

Group "B": Four (4) Caterpillar DW10 Scrapers, s/n 1V126, 1V130, 1V176, 1V762. Extended bowls and top extensions, good tires, excellent mechanical condition, located Wyoming. Immediate delivery.

Price: $13,000.00 each, f.o.b. Location.

Group "C": Four (4) Wooldridge Model TC Terra Cobra Scrapers, s/n 34066, 34067, 34068, 34069, powered with Cummins Diesel engines, modernized steering, good mechanical condition, good rubber, location Denver.

Price: $15,000.00 each, f.o.b. Location.

Group "D": One (1) nearly new Wooldridge Model TC-S-14W Terra Cobra Scraper, s/n TC-34063, 21:00 x 24 - 24 ply tires, 1500 hours service, Cummins 200 HP. engine, wonderful mechanical condition, excellent rubber, available immediately, located Western Colorado.

Price: $21,000.00, f.o.b. Location.

Group "E": Wooldridge Model TC Terra Cobra Scraper, s/n TC 34055 powered with Cummins Model HBIS 200 HP. engine, approximately 2000 hours service, excellent condition throughout, located Western Colorado, available now.

Price: $18,000.00, f.o.b. Location.

Group "F": Six (6) Euclid Model 9FDT-58W Bottom Dump units, s/n 1771, 1772, 1773, 1774, 1775, 1776, powered with Cummins HB600 - 150 HP. engine, Fuller 5A920 Transmissions, good rubber, good condition, location West Central Texas, available now.

Price $10,500.00 each, f.o.b. Location.

Group "G": Five (5) Euclid Model 5FD Rear Dump units, s/n 1591, 1592, 1647, 1648, 1650, powered with Cummins HB600 engines, running condition, located Western Wyoming.

Price: $4,500.00 each, f.o.b. Location.

Group "H": Two (2) Wooldridge Model TCH Scrapers, good rubber, excellent condition, tires dual 21:00 x 24 rear, single 21:00 x 24 front, located near Denver.

Price: $7,500.00 each, f.o.b. Location.

Inspections can be arranged at any time and we respectfully request interested parties to get in touch with us immediately by any means of communication.

CONSTRUCTORS EQUIPMENT CO.

3707 Downing Street **Denver 5 Colorado** **Phone ALpine 3474**

For Sale or Rent

STEEL SHEET PILING

Carn. M-116 & Beth. DP-2—
used redrivable

Any part 2844 pcs. 49 to 15 ft.,
mostly 35 to 25 ft.

Prompt Shipment from California

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Capable of location preparation, aggregate plant erection and operation, quarry, open mine, dams, highways, freeways. 25 years experience. Calif. Gen. Eng. Contractors license. Write Box 1081, Western Construction, 609 Mission St., San Francisco 5.

FOR SALE:
20 Foot Drag Scraper
Excellent condition. Price $900.00.
COACHELLA VALLEY FEED YARD
Thermal, California, Phone Main 30

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stant Hardener" for emergency surface hardening with an ordinary welding torch. The folder is fully illustrated.

963

Joseph T. Ryerson & Son, Inc., announces publication of a new bulletin titled "Ryerson Threaded Bar Service," giving data on sizes, lengths, kind of threads, bending, and types of finishes of steel bars that are furnished threaded. Some available accessories are illustrated.

964

Blaw-Knox announces publication of a bulletin containing typical examples of the use of Blaw-Knox steel forms on the job. Bulletin 2035 also points out special design features which might aid special jobs.

965

Mine Safety Appliances Company announces publication of an illustrated booklet which will be given away with every new MSA Skullgard hat. It lists the importance of adequate head protection with cases in point.

967

Wodack Electric Tool Corp. announces publication of a 4-page folder on the Do-All Electric Hammer and Drill. Complete specifications, textural descriptions and illustrations highlight the booklet.

966

Hercules Steel Products Corp. announces release of a new folder on a hydraulically operated lifting gate for trucks.

968

The Chapman Valve Manufacturing Company announces publication of a catalog describing its line of valves and including complete technical information.

STATE RIVERS AND WATER SUPPLY COMMISSION, VICTORIA, AUSTRALIA

GOULBURN IRRIGATION SYSTEM

TENDERS are invited from organizations experienced in the construction of large civil engineering works for the WARANGA WESTERN MAIN CHANNEL ENLARGEMENT (First Stage) between Waranga Reservoir and the Campaspe River, a distance of 41 miles.

The construction includes the following main items:

PART A:

Approximately 10,000,000 cubic yards of earthwork, miscellaneous minor drainage works, road deviations and fencing.

PART B:

Regulating structures, including control equipment, major cross-drainage works and some 50 road and railway bridges. Approximately 30,000 cubic yards of reinforced concrete are involved in these structures.

Tenders may be submitted for the whole of the work or for either Part A or Part B. Tenders for Part A are invited for a "Schedule of Rates" (unit price) contract. Tenders for Part B are to include DETAILED DESIGN and may be either on a "Schedule of Rates" or "Cost Plus Fixed Fee" basis.

EXHIBITION DOCUMENTS comprising CONDITIONS OF TENDERING, GENERAL CONDITIONS OF CONTRACT, AND SPECIFICATIONS AND PLANS, together with general information concerning some prevailing wage rates and employment conditions in Victoria, are available at £A10, per set, and will be forwarded to bona-fide prospective tenderers on receipt of written applications, enclosing cheque, addressed to:

The Secretary,
State Rivers and Water Supply Commission,
100-110 Exhibition Street,
MELBOURNE, C1,
Victoria, Australia.

or

The Agent-General for Victoria,
Melbourne Place,
Strand,
LONDON, W.C.2.

Tenders endorsed:—

"TENDER FOR WARANGA, WESTERN MAIN CHANNEL ENLARGEMENT (FIRST STAGE)"

will be received by the Secretary, State Rivers and Water Supply Commission, at 100 Exhibition Street, Melbourne, until 12 NOON on 18th September, 1951. A preliminary deposit, payable at Melbourne of £A200. for Part A and £A100 for Part B must be lodged with the Tender. Such preliminary deposit will subsequently be refunded to unsuccessful Tenderers.

Lowest or any Tender not necessarily accepted.

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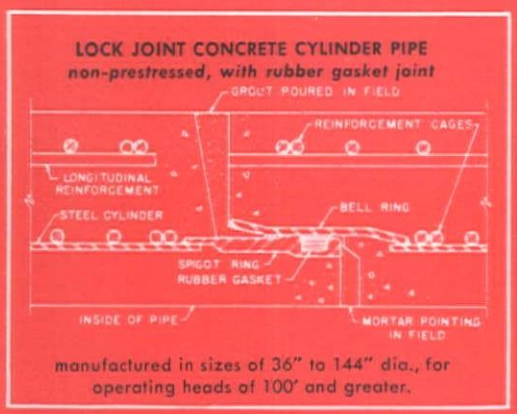
★ IN THIS ISSUE ★

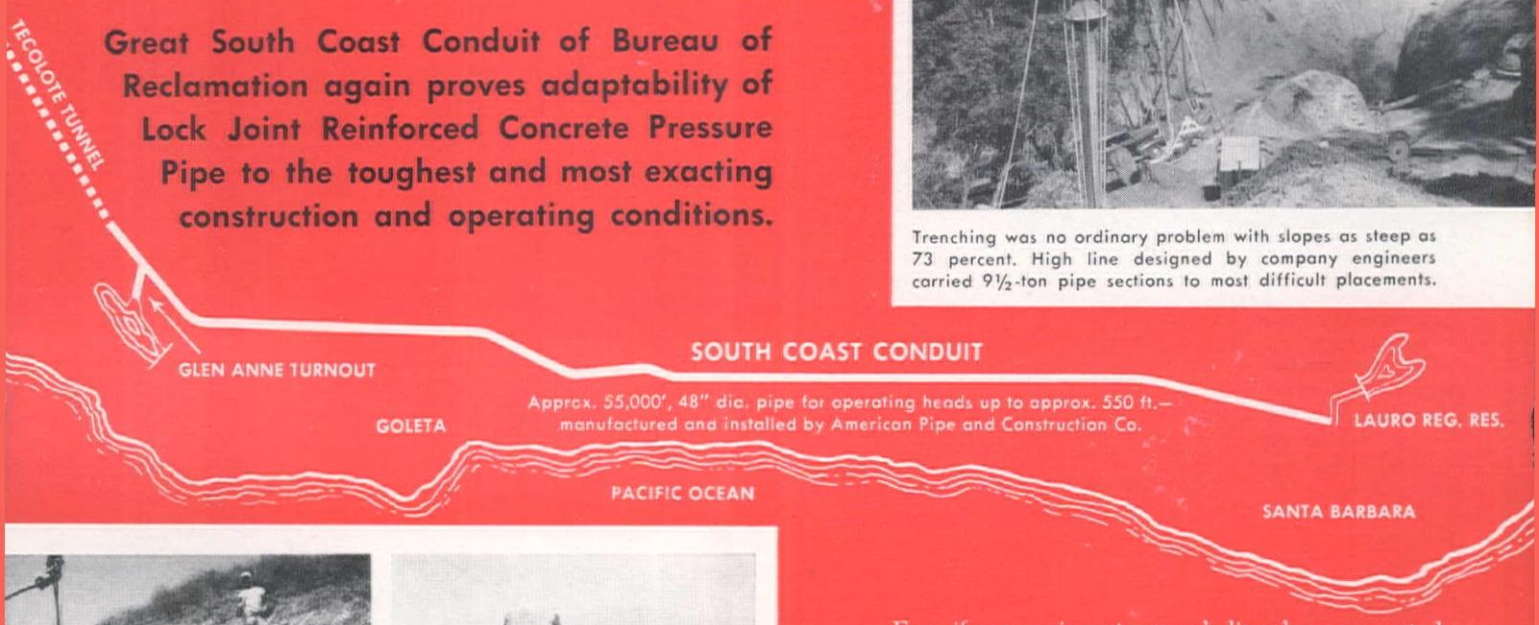
Rough, Tough and Rugged!

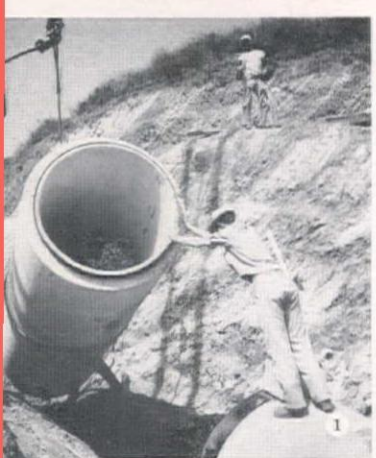


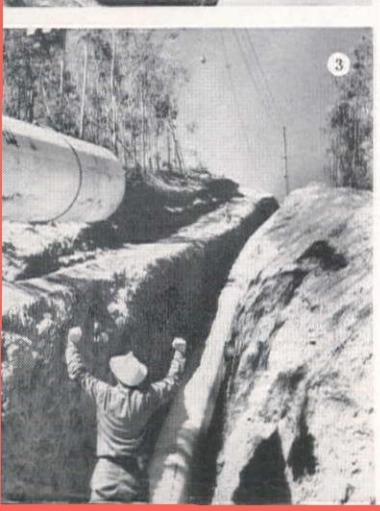
manufactured in sizes of 36" to 144" dia., for operating heads of 100' and greater.

Great South Coast Conduit of Bureau of Reclamation again proves adaptability of Lock Joint Reinforced Concrete Pressure Pipe to the toughest and most exacting construction and operating conditions.

Trenching was no ordinary problem with slopes as steep as 73 percent. High line designed by company engineers carried 9½-ton pipe sections to most difficult placements.







1. Pipe laying was simplified to the maximum extent possible by use of Lock Joint Rubber Gasket Joints.

2. This 80 ft. deep cut was backfilled to a depth of 20 feet over the pipe. Lock Joint Pressure Pipe will sustain enormous external loads.

3. Entire line was engineered to go together piece by piece, including all fittings and specials, a characteristic advantage of Lock Joint Pressure Pipe.

Few, if any, main water supply lines have presented more difficult construction problems than the South Coast Conduit of the Cachuma Water Project. Spanning the mountains and valleys of the precipitous terrain between Tecolote Tunnel and the Santa Barbara area, the line was considered one of the toughest projects of this kind since the construction of the San Diego Aqueduct, which also used Lock Joint Reinforced Concrete Pressure Pipe. Now nearly completed, modern engineering and the superior qualities of Lock Joint Concrete Cylinder Pipe have helped make it practicable. Illustrations indicate some of the ways this versatile pipe met the needs of this rough, tough, rugged job.

This line is a brilliant example of permanent reinforced concrete pipe line construction. It will serve the Santa Barbara area for generations at peak performance and minimum maintenance expense. The same advantages are available to you for your project—advantages that mean reductions in the cost of delivered water.

American
PIPE AND CONSTRUCTION CO.

Concrete Pipe for Main Water Supply Lines, Storm and Sanitary Sewers, Subaqueous Pipe Lines
P.O. Box 3428, Terminal Annex, Los Angeles 54, California
OAKLAND—SAN DIEGO—PORTLAND, OREGON

Raymond

MAKES 5 TYPES OF CONCRETE PILES

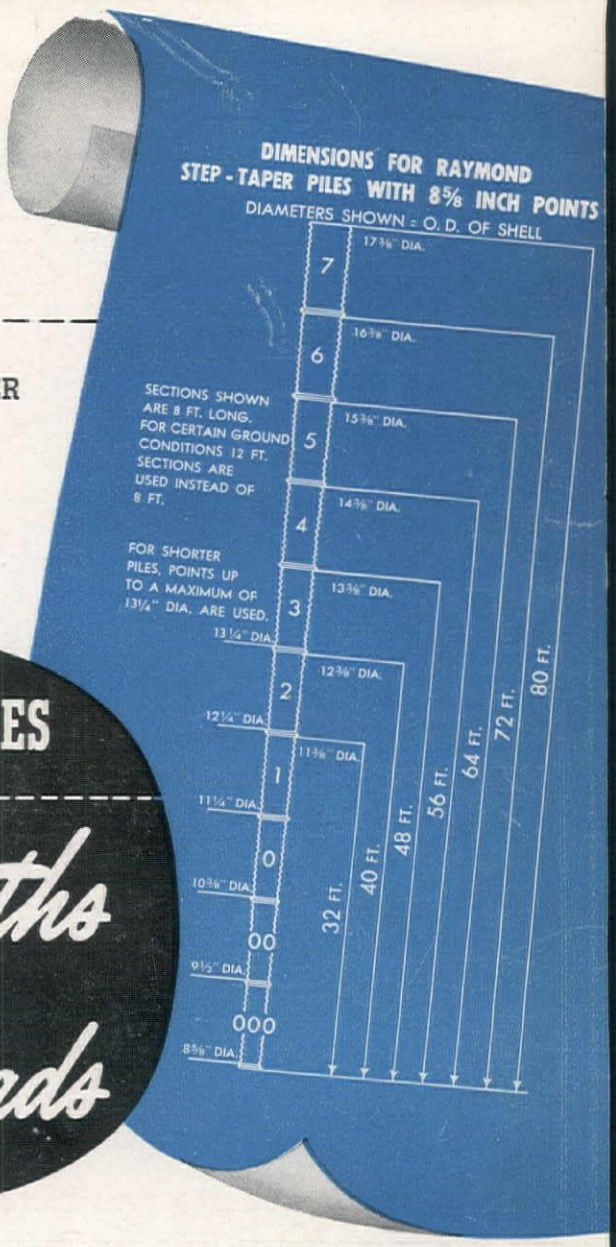
1. STANDARD . . . 2. STEP-TAPER . . . 3. PIPE STEP-TAPER

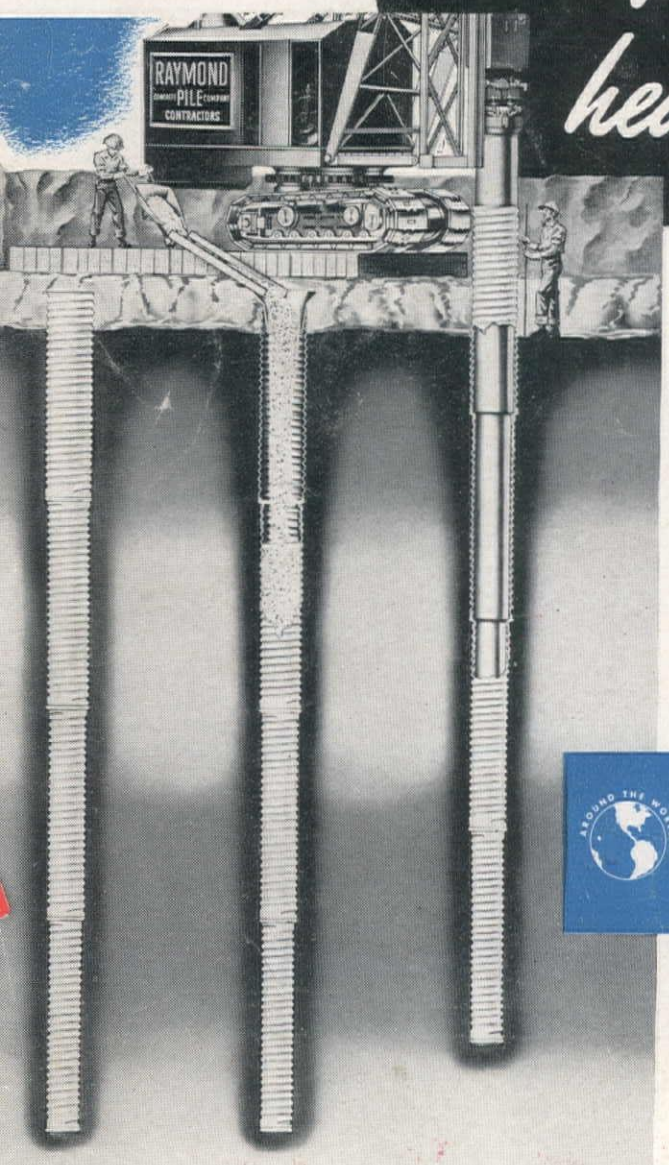
4. COMPOSITE. . . 5. GOW CAISSONS

Raymond installs every type of pile: cast-in-place concrete, precast concrete, steel pipe, wood and H-beam. Raymond operations include underpinning; borings and soil investigations; waterfront construction and harbor and river improvements; shipbuilding facilities; also cement-mortar lining of water, oil, gas and chemical pipelines, 4" to 144" diameters, by Centriline Corporation, a Raymond subsidiary.

At left, completed Step-Taper Pile. Center, filling the permanent steel shell with concrete after internal inspection. Right, driving the pile with rigid core.

2. STEP-TAPER PILES FOR *long lengths* WITH *heavy loads*





Raymond Step-Taper Concrete Piles driven with rigid steel cores and heavy hammers are designed to develop high load-carrying capacities at depths to 80 feet. The permanent steel shell maintains the resistance developed during driving. After the shell is inspected internally, it is filled with concrete and cut off at the specified elevation.

You are invited to discuss with our engineers the efficiencies and savings made possible by Raymond's exclusive, original concrete pile designs.

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