

WESTERN CONSTRUCTION

J. Warren Nutt
1711 Lincoln Ave.
San Rafael, Calif. 2A-

MARCH 1952

FEATURED THIS ISSUE

Contractor's methods for
record concrete arch bridge

•
A report on building costs
with breakdown by items

•
Medford doubles capacity
of water supply system

•
Fine aggregate grading for
Pine Flat Dam concrete

Under ANY conditions...with ANY compressor MORE EFFICIENT PERFORMANCE...

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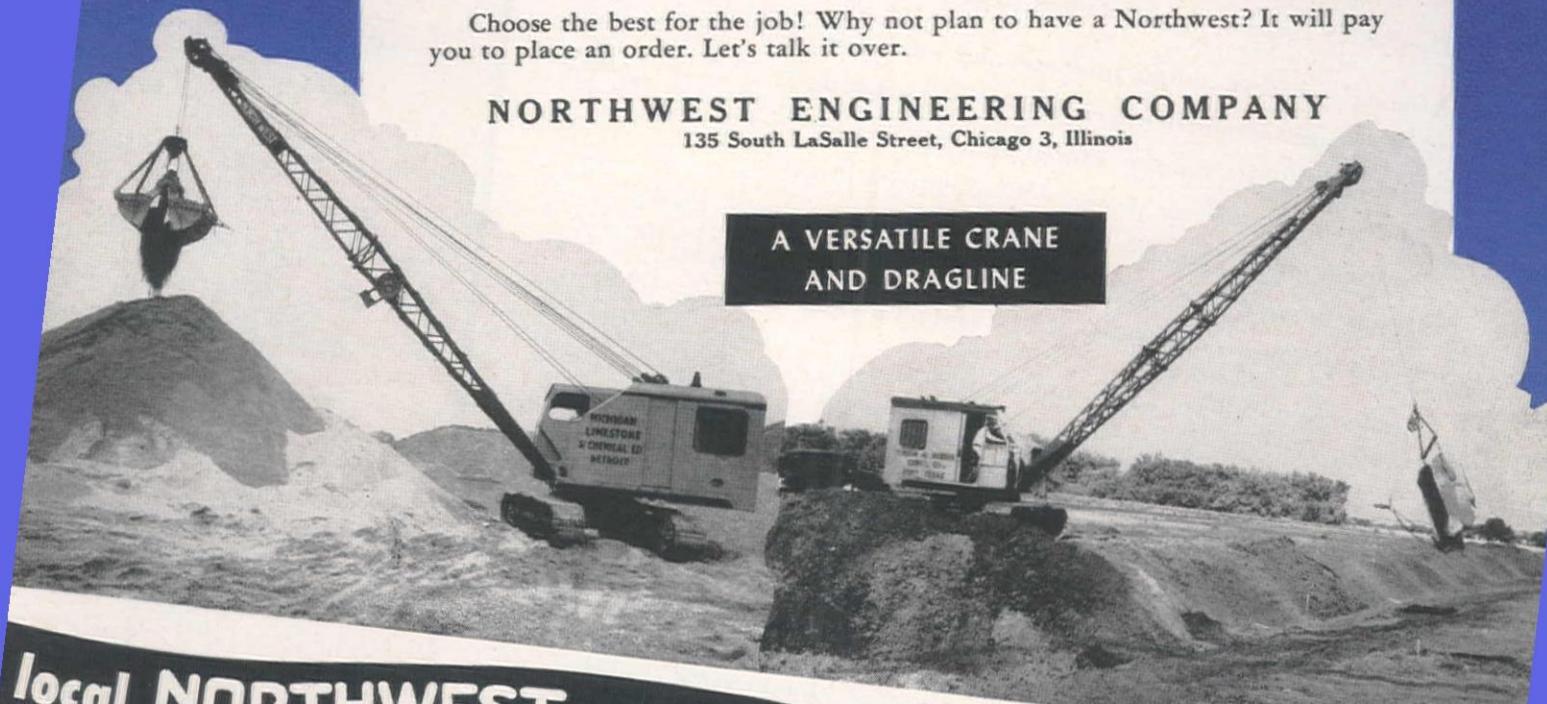
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WESTERN CONSTRUCTION

Volume 27

MARCH 1952

Number 3

ARTICLES

Medford doubles water supply from springs	59
By R. A. DUFF and R. L. LEE	
Building costs—Where do we go from here?	62
By W. F. DREYER, JR. and A. P. STEINFELD	
Methods on the biggest concrete bridge in California	65
Why Oregon is changing from macadam to plant-mix	68
By R. H. BALDOCK	
Fine aggregate grading for Pine Flat Dam concrete	69
By S. D. BURKS	
Building settlement tests on two foundation types	72
By G. W. HOLCOMB and P. P. BROWN	
The Bailey Bridge as a permanent structure	74
By C. F. HAMLIN	
Arizona considers unique underground water law	76
Women engineers in Western highway departments?	77
Driving a 420-ft. highway tunnel on 4.5% grade	79
Confusion in concrete design—What experts think	82
Progress on Los Angeles freeway construction	84
Design preview of the Cherry Valley project	86
Earthfill dam seepage corrected by asphalt membrane	89
By F. E. GRIFFITH	
Road-mix—Where, when and what to use	90
By R. HARSCH	
A report of the AED national convention	168

DEPARTMENTS

Editorial Comment	57	Bids and Contracts	140
How It Was Done	96	Unit Bid Prices	146
News	102	New Literature	156
Engineers On the Move	124	New Equipment	160
Deaths	129	News of Distributors	168
Supervising the Jobs	131	Classified Advertisements	171
Down-time Dopes: Cartoon	131	Advertisers In This Issue	172

FRONT COVER

BIGGEST concrete bridge in California is being built a mile from Pasadena's famous Rose Bowl. To the left, piers and bents and box girder deck members are shown in various stages for the triple-arch structure. At right is an old landmark—the Colorado Street Bridge—which will now be relegated to a position of minor importance. For details, see page 65 of this issue.

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Why contractor chooses BFG tires for traction and long wear

TULLY AND DI NAPOLI, INC., of Corona, New York, is one of the largest general contractors in the New York area. They operate a fleet of 4 tractors, 4 low-bed trailers, 38 dump trucks, 9 scrapers, 17 automobiles and 14 station wagons, in addition to their 18 shovels, 16 truck cranes and other construction vehicles. The tires they use on these vehicles get extra punishment from sharp rocks and slag.

Long a user of BFG tires, they are particularly well pleased with the *all-nylon* Rock Logger truck tires. Since the purchase of their first set of 8, they have found that these *all-nylon* tires

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**For High-Speed, High
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All over the country, profit-minded contractors are using the Big Red Team to complete their contracts days and weeks ahead of schedule. Here's why this matched combination of Bucyrus-Erie B-type scrapers and International TD-24 tractors are today's leaders in high-speed, high output dirt moving.

Both model scrapers are especially designed to take full advantage of the TD-24's unusual power and to effectively develop its maximum working capacity. The scraper loads fast with

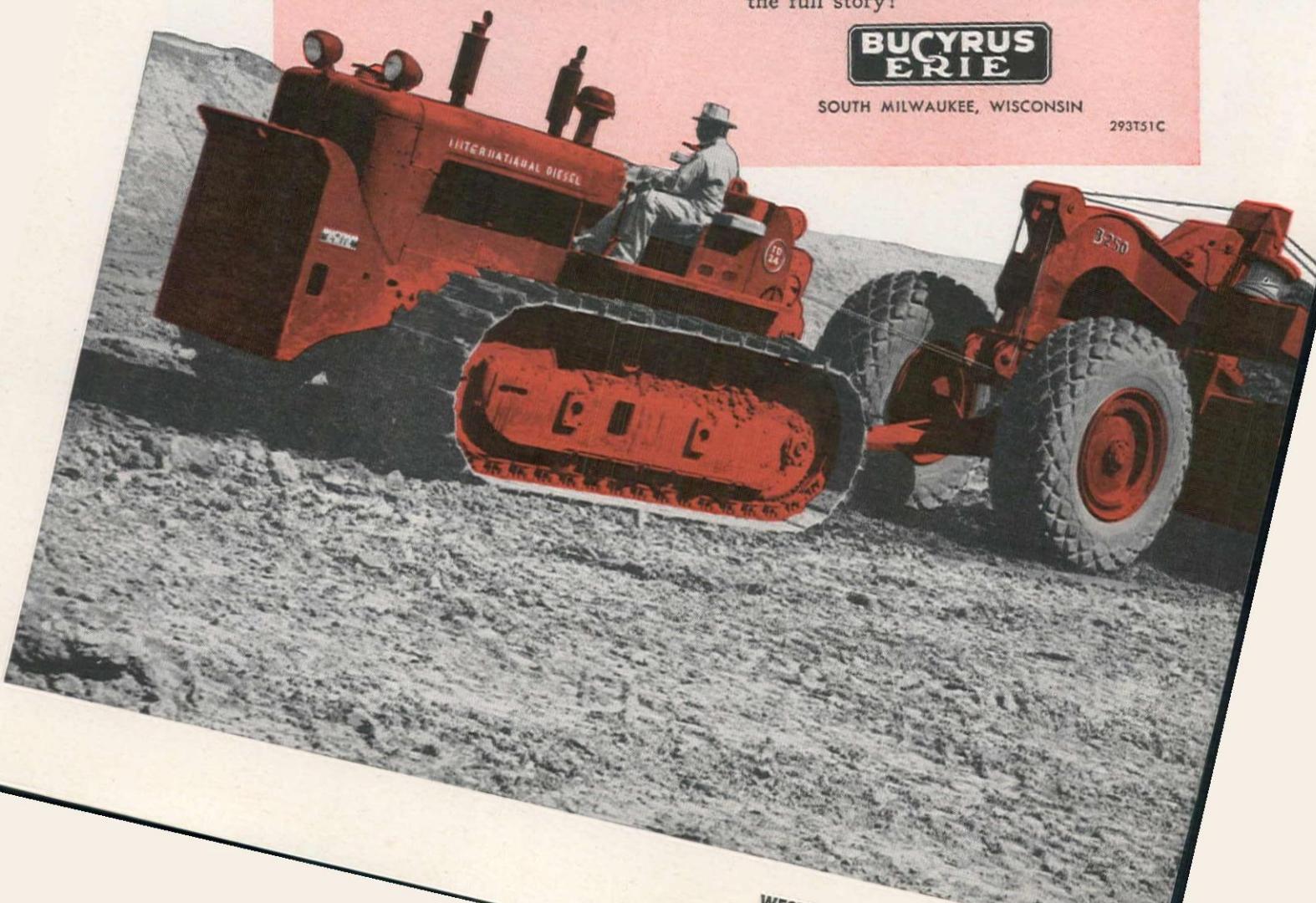
Bucyrus-Erie loading action fountaining dirt through the center of the bowl and spreading evenly on top. The big, heaping loads are hauled with complete stability on big low-pressure tires. Dumping action is quick and clean with accurate placement and smooth spreading for a level, compact fill.

These 16 and 22 cu. yd. (struck capacity) scrapers can make your next job a profit-maker. See your distributor, who has complete job reports of previous Big Red Team projects, for the full story!

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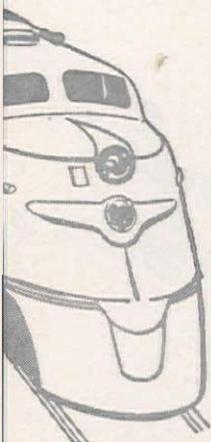
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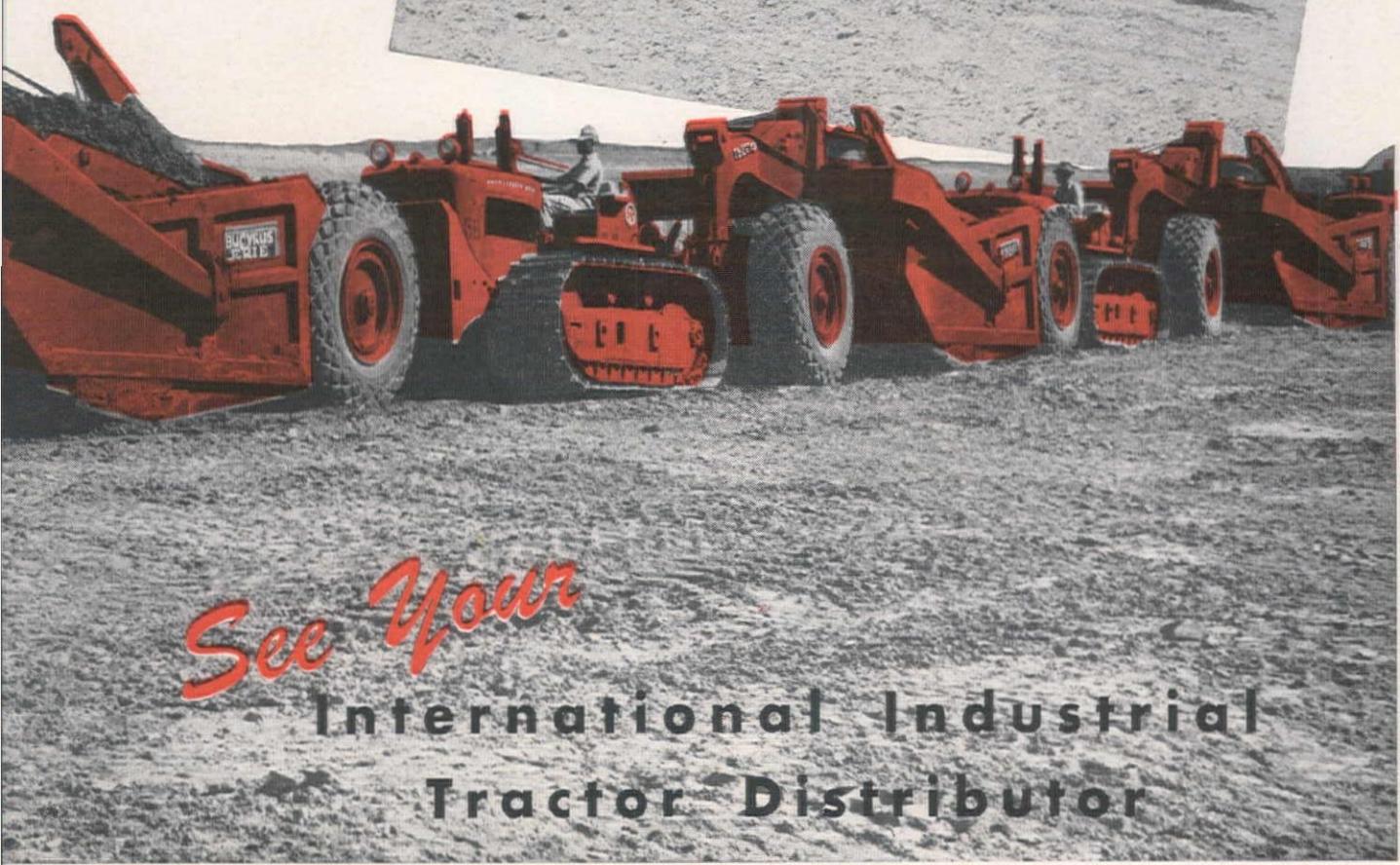
PROFIT TRAIN!



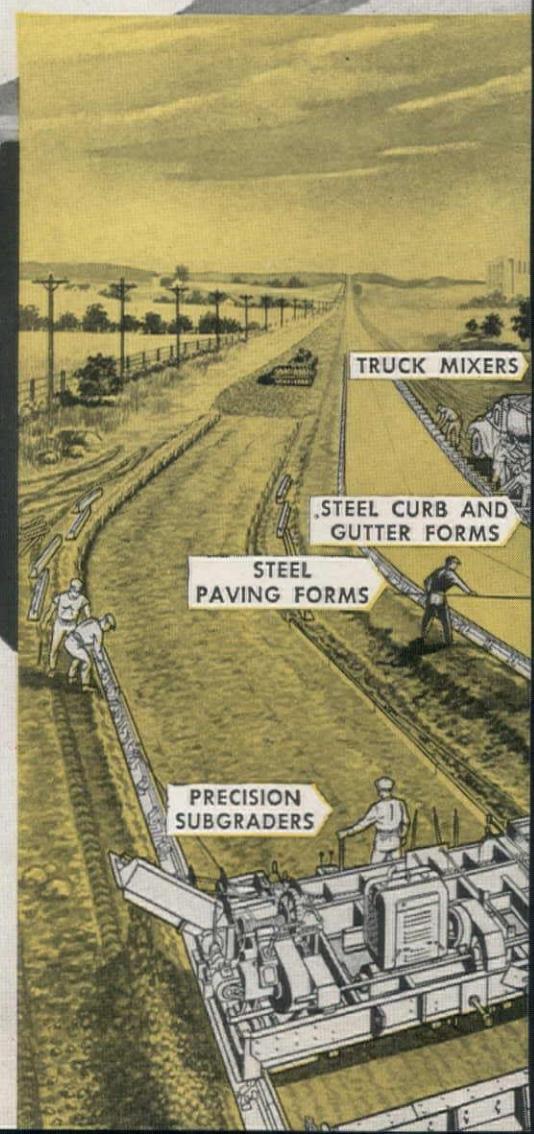
B-250

22-YD. CAPACITY

Three TD-24 and B-250 combinations owned by J. S. Moorman, Muskogee, Oklahoma, work on a flood control project in Ft. Worth, Texas.



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I got
the Contract..."



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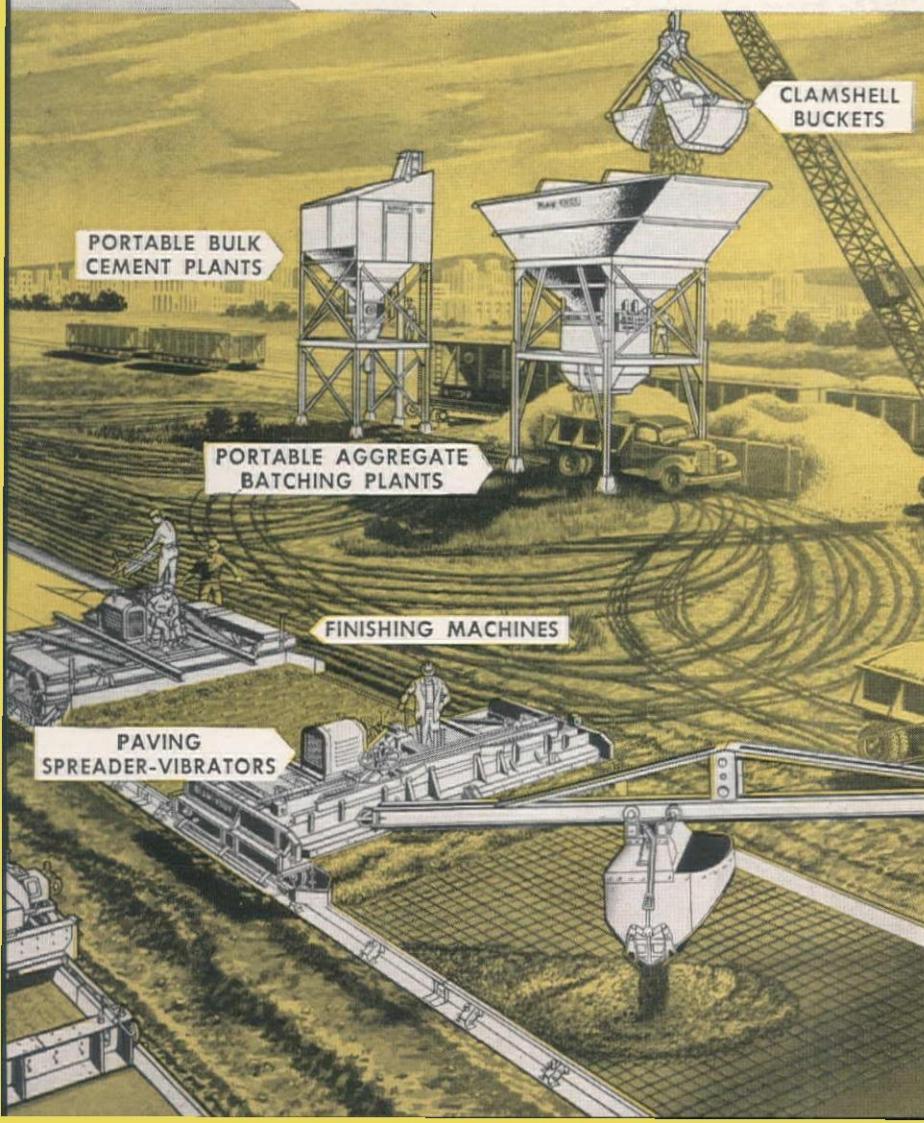
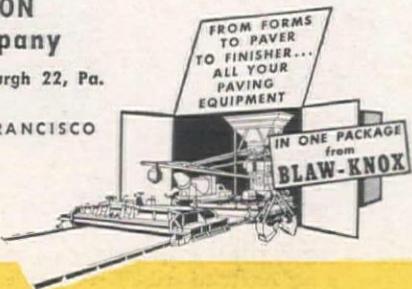
✓ LOWER OPERATING COSTS—The 100% mechanization possible with a "Complete Package" of integrated equipment lets me place more feet per day. The big capacity and economical operation of every unit mean lower costs per mile.

✓ LOWER MAINTENANCE—There's a bare minimum of maintenance headaches. One Blaw-Knox Service Engineer takes care of everything. Each unit is designed by construction-experienced engineers to assure top performance for years of hard usage.

✓ ALL THESE "ONE-SOURCE" ADVANTAGES—Everything that's needed for concrete construction . . . from clamshell bucket to batcher, from forms to finisher . . . on one order, in one shipment, with only one financial arrangement, and backed by one responsible manufacturer. One dependable distributor source for parts and service for all the equipment. With all these "Complete Package" advantages, I can bid lower, yet make more profit, on every job.

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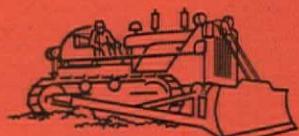
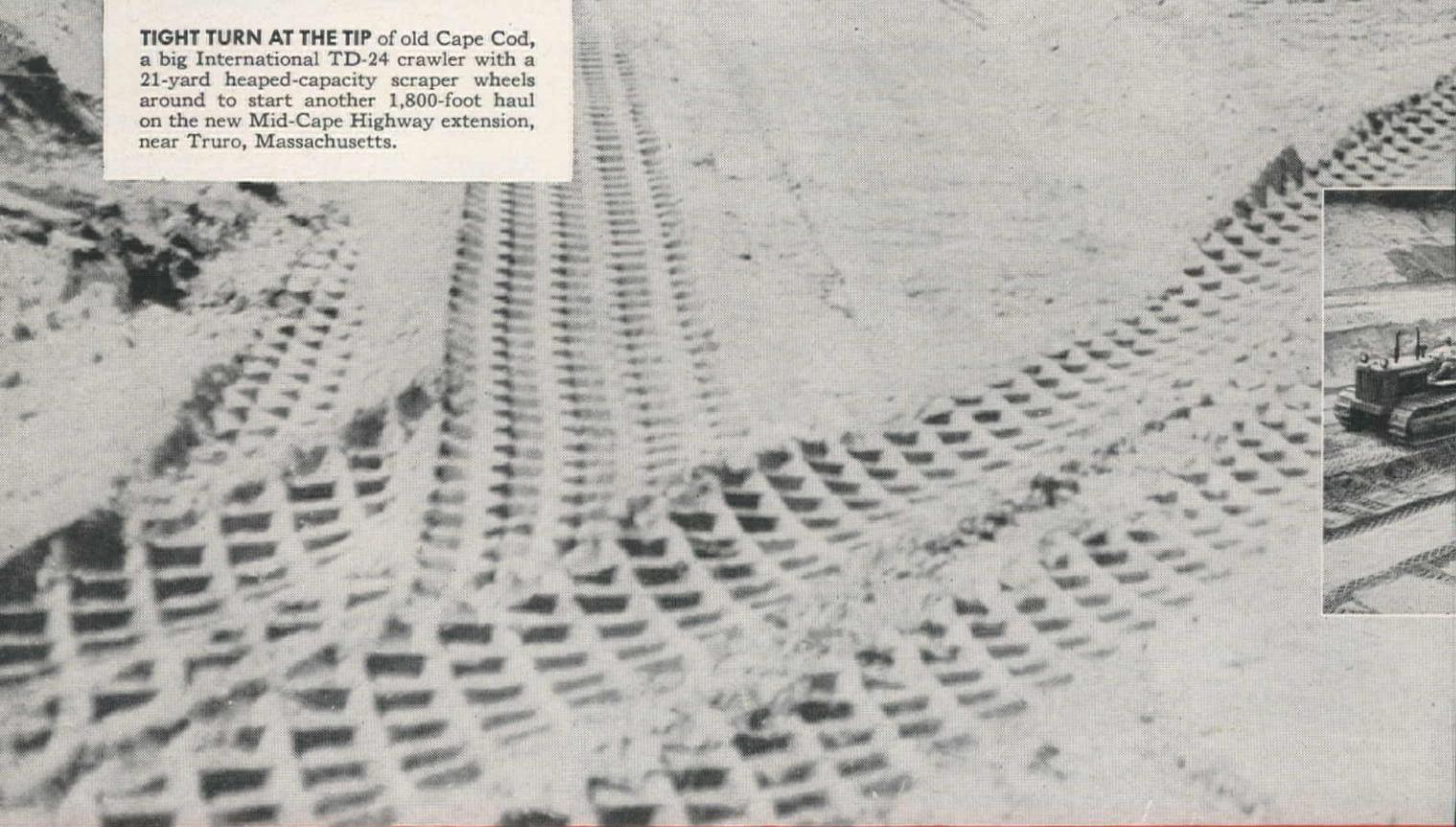
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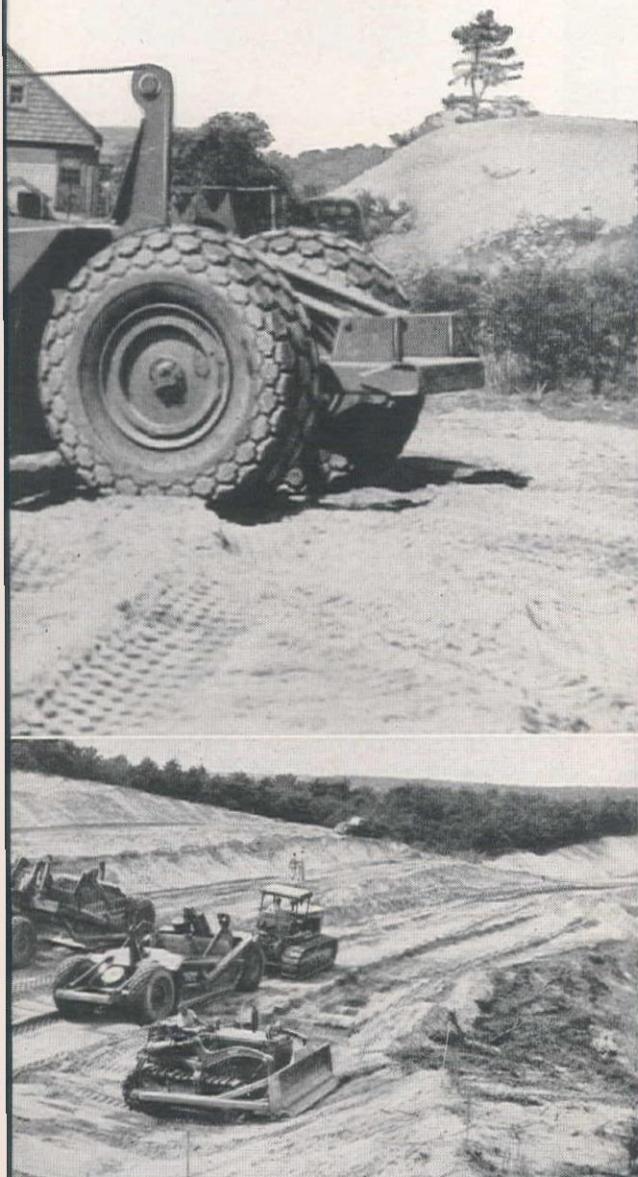
TD
24



TIGHT TURN AT THE TIP of old Cape Cod, a big International TD-24 crawler with a 21-yard heaped-capacity scraper wheels around to start another 1,800-foot haul on the new Mid-Cape Highway extension, near Truro, Massachusetts.



takes the Cape



BIG RED EQUIPMENT. Here are three of the five Internationals on this job, dozing and hauling the loose, shifting Cape Cod sand. In some bogs, peat has to be replaced with sand, and 50-foot piles driven in for stability of the roadway.

Makes tracks near Truro on sand-slowed highway job

Out near the tip of Cape Cod, where the Pilgrims saw their first tracks of redskins in the sand, today's tourists see the tracks of big red Internationals.

They're extending the Mid-Cape Highway, and where the land isn't sand, it's bog and marsh. It's so bad the S & M Construction Company, of Providence, R. I., won't let many of its vehicles venture off the pavement. But the Internationals charge ahead, moving nearly half-a-million cubic yards of sand to build three miles of road.

Pride of the whole show is "Big Red"—the TD-24—pulling bigger loads faster than any other crawler can.

And here's what an S & M operator says about it: "I wasn't on this rig very long before I found out it was mighty nice to handle. I really pull plenty of dirt!"

"Big Red", with 148 maximum drawbar horsepower and up to 7.8 mph, has more power and speed than any other crawler on the market. And it has finger-tip maneuverability to make pivot turns, feathered turns, and turns with power on both tracks.

All this means a faster work-cycle and more paydirt moved per day.

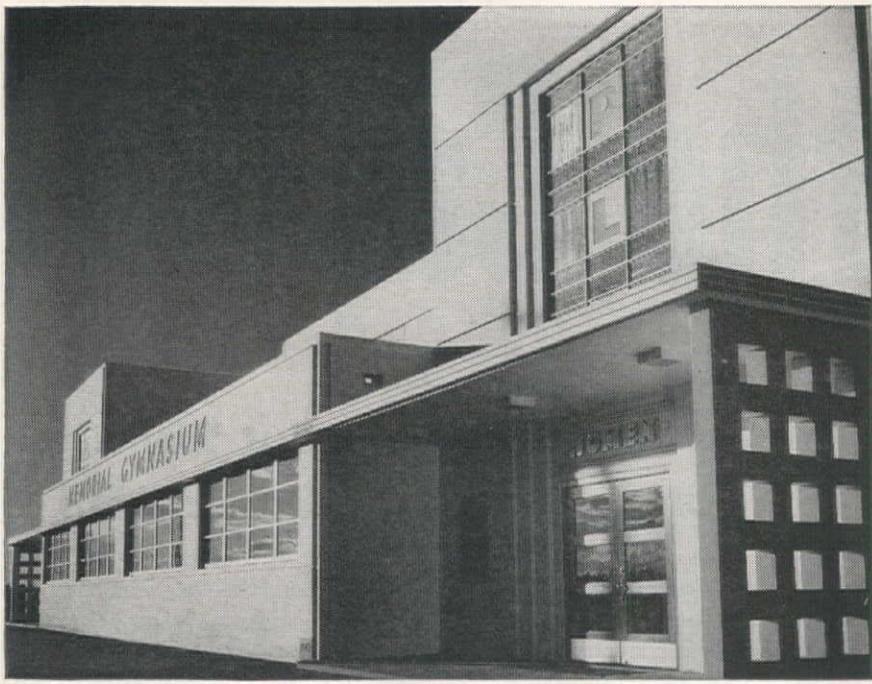
Ask your International Industrial Distributor for details on the TD-24. Ask him, too, about his fast, ready service and speedy parts delivery. Get all the answers . . . and you'll be a TD-24 man from then on in!

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How SMOOTH can concrete be? As smooth as the material against which it's cast. That's why plywood-formed* concrete surfaces are smooth, dense, uniformly attractive. Large panel size automatically reduces fins and joints to an absolute minimum. Exact-size Douglas fir plywood concrete form panels are tough, rigid, dimensionally stable. Stark monolithic surfaces, curved surfaces, rustication lines, fluting and other special architectural design effects are also easily achieved with plywood forms. For free catalog, write Douglas Fir Plywood Association, Tacoma 2, Washington.

Only Plywood Offers All These Advantages

- Plywood forms create smooth, fin-free surfaces
- Economical! Plywood forms can be used over and over
- Plywood forms speed work—save time and labor
- Plywood is strong, rigid—yet light, easy to handle
- Plywood forms are puncture-proof, water and mortar tight
- Plywood has superior nail and tie holding properties
- Plywood is easy to work with hand or power tools
- Plywood provides sheathing and lining in one material

Douglas Fir

Plywood

AMERICA'S BUSIEST BUILDING MATERIAL

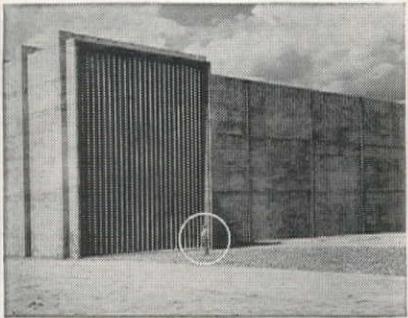
*Several plywood grades are manufactured for concrete form work. Highly moisture-resistant glues in PlyForm® grade permit multiple re-use (up to 10-15 are not unusual). For greatest possible re-use, specify waterproof bond EXT-DFPA Concrete Form grade. For special architectural concrete, requiring finest finish, use Exterior or Interior plywood grades with "A" face veneer—or one of the new plastic-surfaced or hardboard faced plywood panels.

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PANEL DISCUSSION

Plywood Helps Complete Rush Job On Schedule



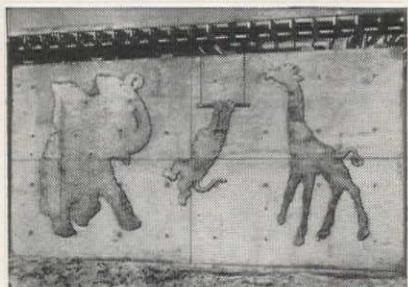
Douglas fir plywood helped speed form-work time by 15 per cent in building the giant reinforced concrete wind tunnel silencer at the Lewis Flight Propulsion Laboratory of the National Committee on Aeronautics at Cleveland, Ohio.

"It was a hurry-up contract with a penalty clause," explains H. F. Hadde, chief engineer for the Hunkin-Conky Construction Company, Cleveland, project contractors. "Plywood forms helped get the job done fast and also formed the smooth concrete required in the design of the structure."

Smooth concrete was a must on the inner walls because roughness would cause a drop in air pressure, requiring more power to pass air through the system of ducts and baffles which curb noise and pressure waves generated by "hot" ram-jet engine tests. Plywood forms were used on outer walls for appearance.

Forms were built by placing standard 4'x8' plywood sheets across 2"x6" studs, backed by 2"x6" walers. After each pour, forms were stripped, re-oiled and crane-erected into position for the next pour. The new acoustical house which is an addition to an existing supersonic wind tunnel is 50 feet high, 33 feet wide and 190 feet long.

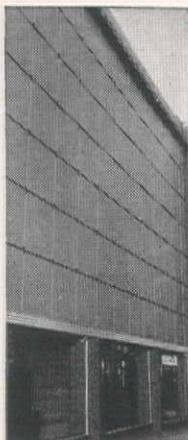
Concrete Intaglio Cast With Plywood



Plywood cut-outs, nailed to the plywood form face, were used to create these whimsical nursery figures on the exterior concrete wall of the kindergarten play yard at the Whitman School, Tacoma, Wash. Architect John G. Richards of Lea, Pearson and Richards developed the idea. Over 7' high, the figures were formed using $\frac{3}{8}$ " plywood cut-outs, secured to $\frac{5}{8}$ " form panels. On the soon-to-be-completed project, plywood forms

are being re-used as roof decking. Contractors: Standard Construction Company, Tacoma, Washington.

Concrete Wall Cast In Novel Block Pattern



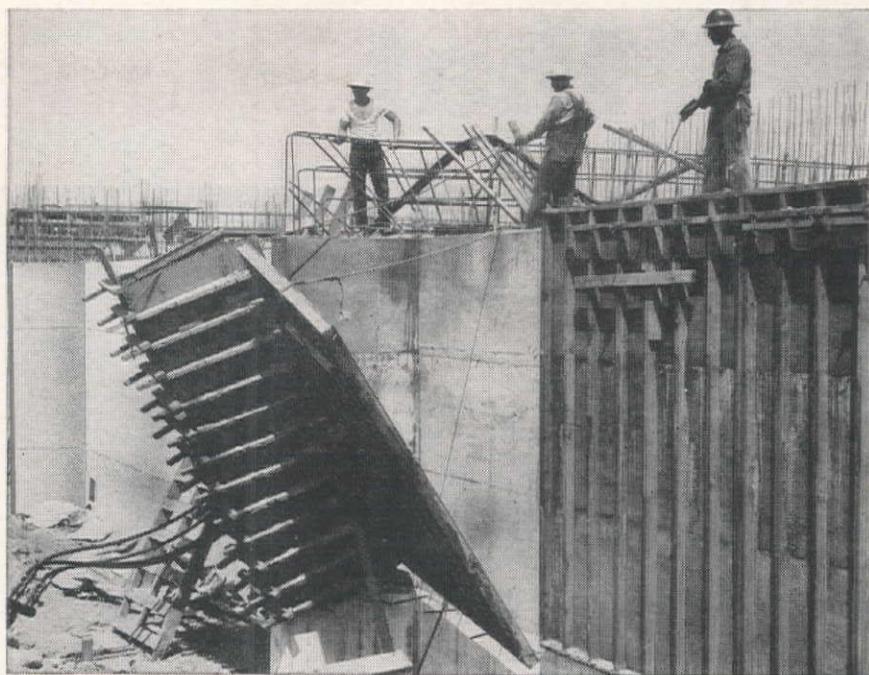
Windowless concrete walls cast in block pattern, painted a cheerful old rose distinguish the Tarlow Furniture Store, Portland, Ore. The structure is from the design board of Richard Sundeleaf of Portland and was built by the George H. Buckler contracting firm with A. L. Funk, general superintendent. Plywood forms were specified to assure that the desired effect would be achieved.

The novel block pattern was formed by nailing vee-moldings, 2"-wide, 1 1/8"-deep to the plywood form face. To create additional interest with varying shadow lines, the inset diamond-shaped blocks are slightly deeper than the moldings as shown in the accompanying detail.

Plywood Forms Shape Modern Church



Because they offer the simplest method of obtaining the smooth, curved walls, Architect Paul Thiry specified plywood form panels for all concrete work on the Church of Christ the King, Seattle, Wash. Built by the Austin Co., Seattle, the curved walls were formed by nailing 4'x8' sheets, 5/8"-thick, horizontally across double 2"x12" waler, bandsawed to the desired radius. In no place were the 2x12s sawn to less than 3 inches. The waler were backed by 2"x4" studding. One-quarter inch thick plywood was used to form the concrete band above and below the windows. Entrance canopy and tall tower were also formed against 5/8" plywood with conventional framing.



When Re-Use Counts—Specify Plywood Forms

MEASURED in terms of cost per use, Douglas fir plywood ranks as one of the most economical of all form materials. On apartments, office or factory buildings, plywood form sections can be used to job completion—eliminating the problem of form reconstruction once the job is under way. Plywood deserves ordinary care in handling, but it does not require extreme caution at every step and is far more rugged than other panel type materials. The exact number of re-uses obtained vary with grade and the care it receives on the job. Builders report up to 10 or 15 re-uses with PlyForm (see grade data below) panels . . . twice as many with Exterior-type and plastic faced plywoods.

Only Plywood Offers All These Advantages

- Plywood forms create smooth, finish-free surfaces
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*Several plywood grades are manufactured for concrete form work. Highly moisture-resistant glues in PlyForm® grade permit multiple re-use (up to 10-15 are not unusual). For greatest possible re-use, specify waterproof bond EXT-DFPA Concrete Form grade. For special architectural concrete, requiring finest finish, use Exterior or Interior plywood grades with "A" face veneer—or one of the new plastic-surfaced or hardboard faced plywood panels.

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When the going's rugged...

that **Pioneer Edge**



Contractor Praises Pioneer Equipment

It wasn't by accident that Winston Bros. chose a Pioneer plant to handle this rough, tough "Ridge Route" job. The firm is well acquainted with the advantages of Pioneer equipment.

Just recently they told us, "We have three of your

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BOTH!**

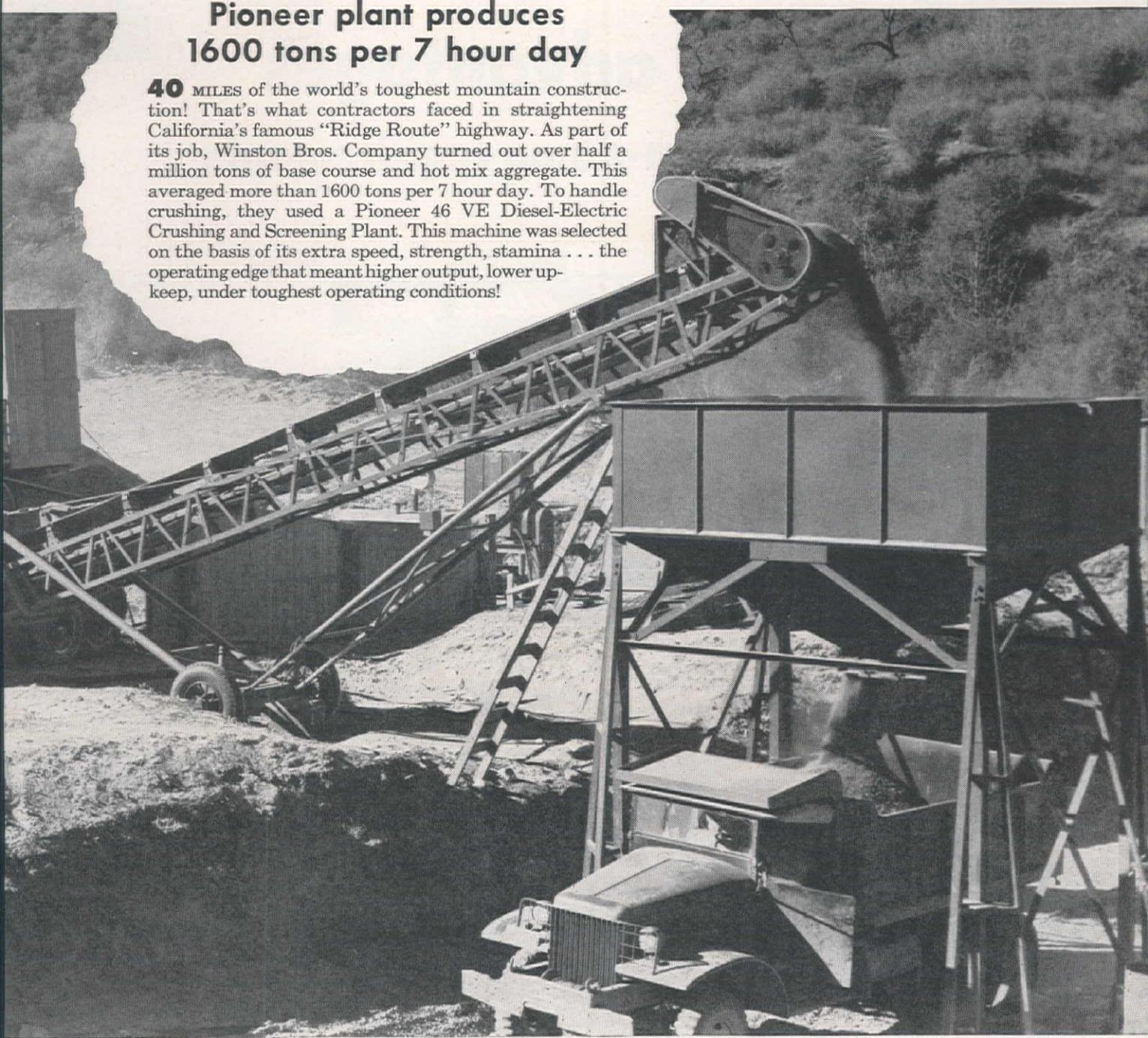
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sees you through

**Pioneer plant produces
1600 tons per 7 hour day**

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CHECK these **8** TOURNAHOPPER advantages

against your bottom-dump requirements



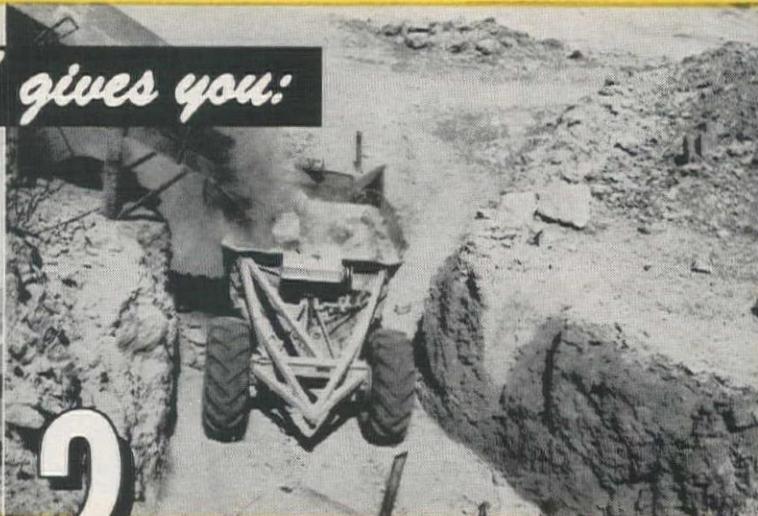
New 18-yd., 18-ton "C" gives you:

1



FASTER LOADING — Short, wide 9'x11' top opening requires minimum movement, minimum time to "top out" under belt loader. Shovel or dragline operator has easy target, low 8'9" loading height that speeds swing, reduces spillage.

2



LESS JOCKEYING IN TIGHT QUARTERS — 90° turn within 15'8" radius, together with positive power steer, get 186 h.p. Tournahopper to and from loader in a hurry. Also gives fast maneuvering on winding pit roads, along narrow levee tops.

5



FAST TURNS OFF FILL — 25" clearance (with gates open) and 15'8" turn radius permit fast dump and quick turn over windrows even when turning down steep side slopes. You can also back up and swing 90° to clear up to 42" boulders.

6



FAST DUMPING — NO GATE DAMAGE — Clamshell-type gate action clears load, eliminates gate damage when dumping rock. Independent electric power opening allows rig to stop over hopper, dump without having to be in motion.

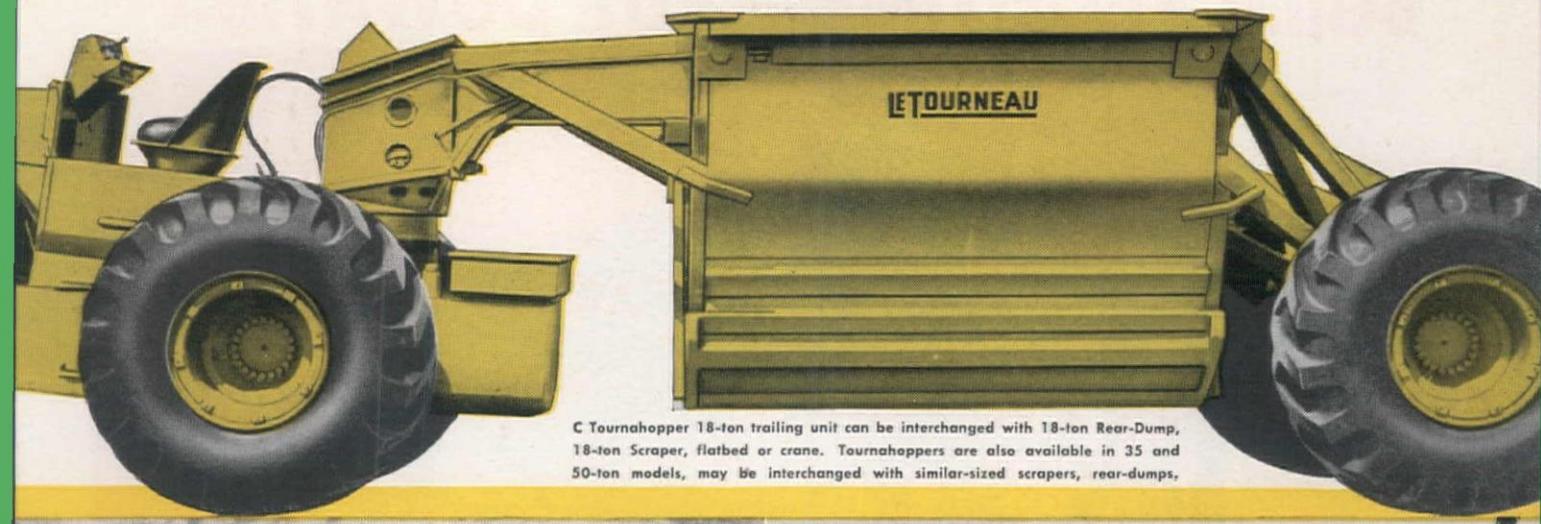


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California — Los Angeles, Bakersfield
CROOK COMPANY

Montana — Helena, Billings
MONTANA POWDER & EQUIP. CO.



C Tournahopper 18-ton trailing unit can be interchanged with 18-ton Rear-Dump, 18-ton Scraper, flatbed or crane. Tournahoppers are also available in 35 and 50-ton models, may be interchanged with similar-sized scrapers, rear-dumps,



3

KEEPS GOING IN SOFT FOOTING — Power-proportioning differential, 5½ h.p. per ton of gross weight, and flotation of 21.00 x 25 low-pressure tires help rig go through spongy, wet going that frequently stops conventional bottom-dumps.



7

NO HAUL-BACK OF STICKY MATERIAL — Gates swing aside and up across full width of bottom, wipe clean, eliminate haul-back of gummed-in material. Whatever can be loaded in the big top opening dumps clean.

4

SAFETY PLUS, EVERYWHERE — With 4-wheel, multiple-disc air brakes (3763 sq. in., total braking surface), and instant-acting electric controls, operator can drive loaded Tournahopper up and down steep grades with complete safety.



8

OPERATOR COMFORT — MORE PRODUCTION — Fingertip electric controls, foam-rubber seat, full visibility lessen operator fatigue. Low-pressure tires cushion load and road shocks, help operator work fast, all day long!

Colorado — Denver
COLORADO BUILDERS' SUPPLY CO.

Nevada — Reno
SIERRA MACHINERY CO., INC.

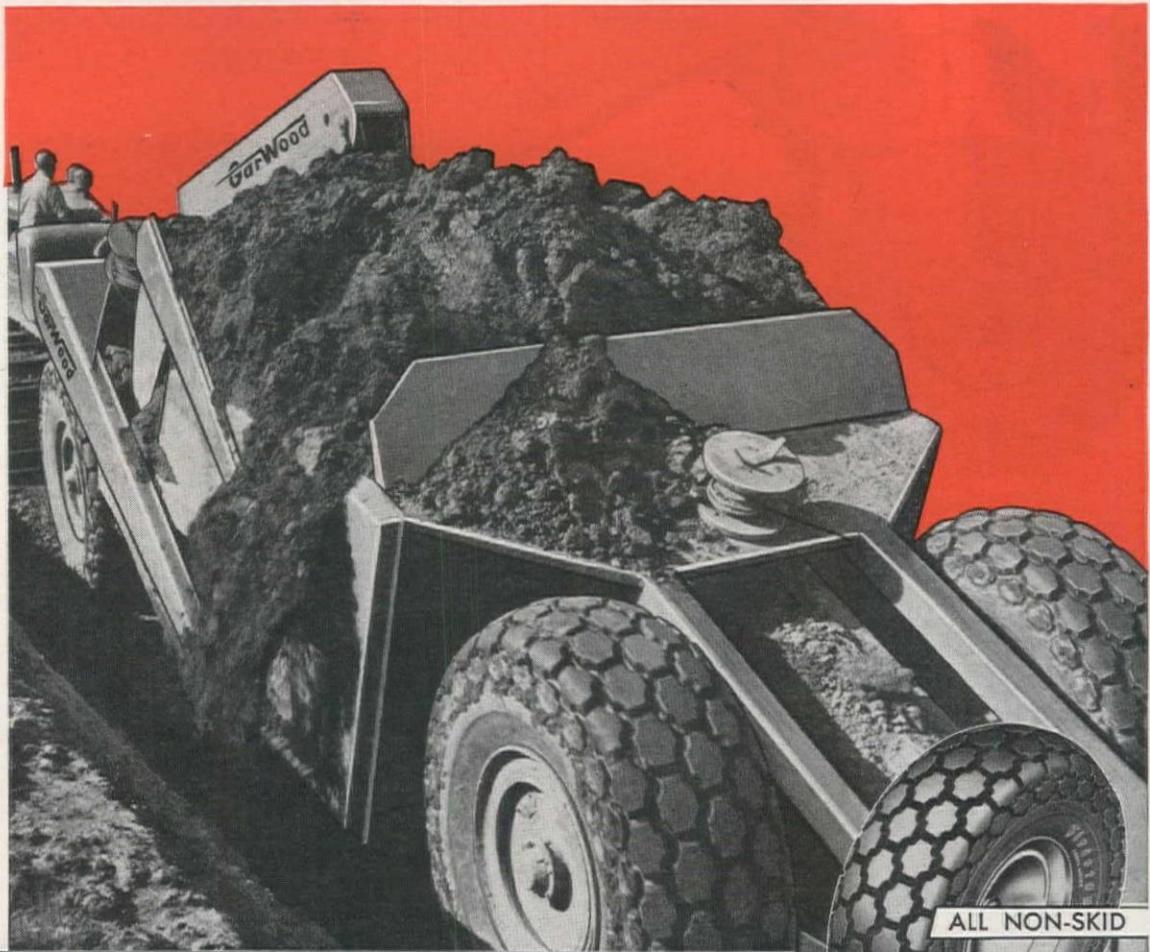
Washington — Spokane, Seattle
MODERN MACHINERY CO., INC.

New Mexico — Albuquerque
CONTRACTORS EQUIP. & SUPPLY CO.

Oregon — Portland, Eugene
LOGGERS & CONTRACTORS MACHY COMPANY

Wyoming — Casper
COLORADO BUILDERS' SUPPLY CO.

BUILD PROFITIME...CUT DOWNTIME-



with
Firestone
OFF-THE-HIGHWAY TIRES

THAT's right! You increase yardage and profits and reduce operating cost when your equipment rolls on Firestone. That's just what the Firestone Earth Mover All Non-Skid tires are doing in the illustration above. This tire is engineered and built for free-rolling wheels—for scrapers, wagons, and buggies—equipment on which maximum flotation, frictional traction, and low rolling resistance are essential. And it holds on slopes without side-slipping.

Firestone Tires stand up longer because they are *built for the job and they are built to take it*. Extra tough, heavy treads give more traction under all conditions. Gum-Dipped rayon cord bodies are reinforced with four extra impact plies and can be retreaded again and again. Tough sidewalls are double-thick and snag-resistant.

Whether it's earth moving, strip mining or rock work, Firestone has the tires and the service that will cut downtime and keep men and equipment on the job. Try them and see for yourself.

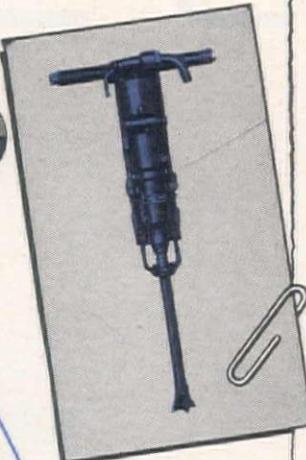


WHEN YOU BUY NEW EQUIPMENT OR REPLACEMENT TIRES, SPECIFY FIRESTONE

Enjoy the Voice of Firestone on radio or television every Monday evening over NBC

Copyright, 1952, The Firestone Tire & Rubber Co.

HERE'S WHAT WE PUT *INTO* A ROCK DRILL ...SO YOU CAN GET MORE *OUT* OF IT!



Worthington *BLUE BRUTES*

Have Everything You
Need For Hard, Fast,
Money-Saving Drilling

With every detail designed to make air do more work, Blue Brute Rock Drills combine the ruggedest construction with the easy handling that goes over big with operators. The WS-55, illustrated, is right for average jobs. For lighter work, use the WS-45 — for heavy duty, the WS-30.

3 More Reasons Why There's More Worth In A *BLUE BRUTE*!

WB-34 Paving Breaker

Hardest-hitting, easiest handling breaker in the 35-lb. class. Ideal where the operator has to lift the tool frequently in guiding its work.



W-14 Clay Digger

Developed in the field by men with practical experience in clay, and thoroughly proved by long, rigorous job-testing.

W-8 Backfill Tamper

Medium weight, with simple horse-shoe valve and ample oil reservoir. A good "walker" that does a finished backfill job, ready for immediate paving.

Worthington Pump and Machinery Corporation
Construction Equipment Sales Department
Dunellen, New Jersey

Distributors In All Principal Cities

WORTHINGTON



Immediate deliveries from your nearby Worthington Distributor
See him, or write us direct

Buy WORTHINGTON *BLUE BRUTES*

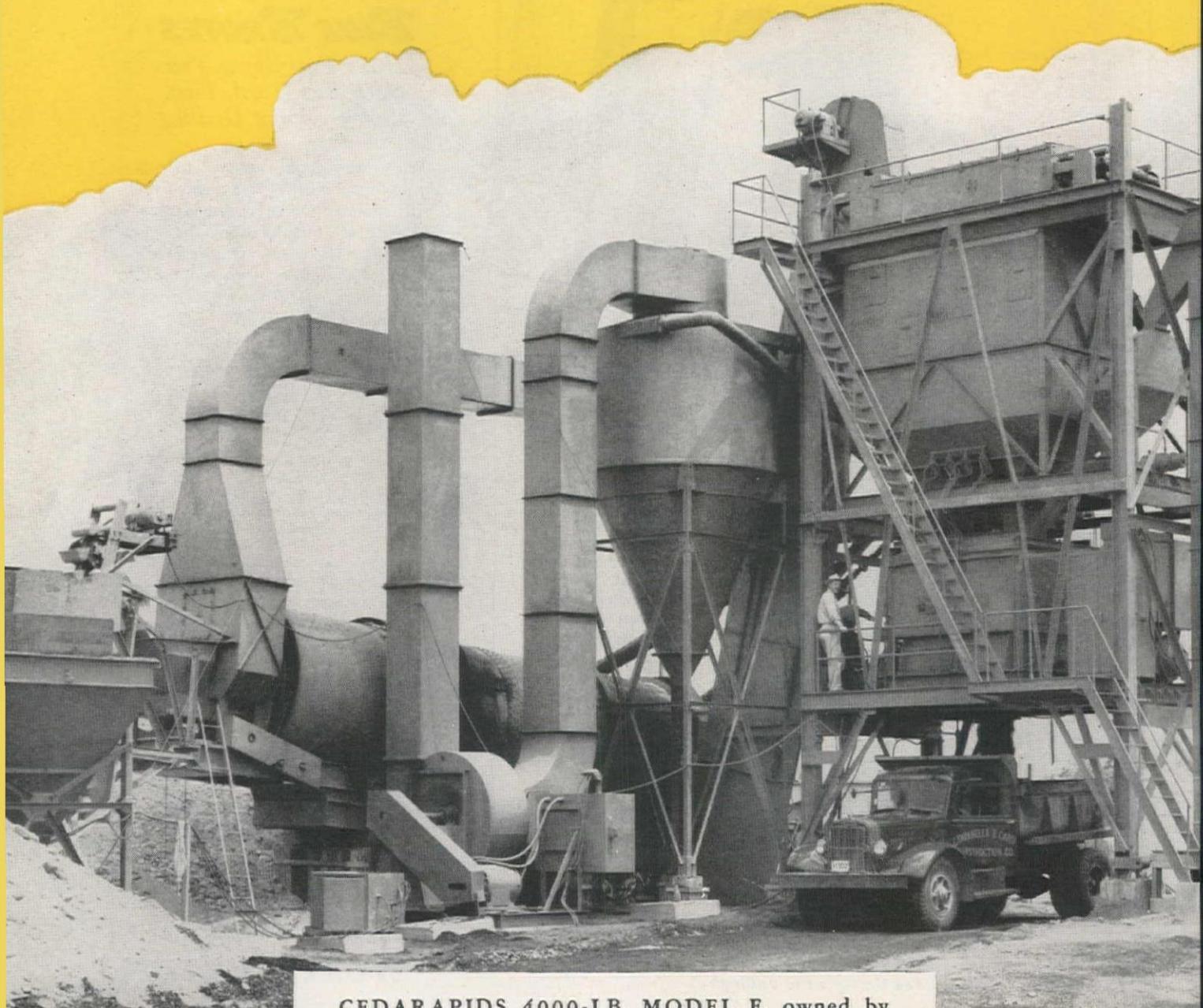
H1-1



IF IT'S A CONSTRUCTION JOB, IT'S A *BLUE BRUTE* JOB

"WE CAN

BID LOW ON



CEDARAPIDS 4000-LB. MODEL E, owned by Campanella & Cardi. The plant is complete with a Cedarapids drier, charging hopper and feeder, and a 10' cyclone type dust collector with dust scavenger and dust elevator.

THE IOWA LINE of Material Handling Equipment Includes: ROCK AND GRAVEL CRUSHERS •

BELT CONVEYORS • STEEL BINS • VIBRATOR AND REVOLVING SCREENS • UNITIZED ROCK AND GRAVEL PLANTS •
• FEEDERS • PORTABLE POWER CONVEYORS • PORTABLE AND STATIONARY STONE, GRAVEL AND SAND PLANTS •
REDUCTION CRUSHERS • BATCH TYPE AND VOLUMETRIC TYPE ASPHALT PLANTS • DRIERS • DUST COLLECTORS
HAMMERMILLS • WASHING PLANTS • VIBRATING SOIL COMPACTION UNITS • DOUBLE IMPELLER IMPACT BREAKERS

AIRPORT SURFACING PROJECTS...

that's why we buy

CEDARAPIDS™

says **Campanella & Cardi**
Construction Company
Hills Grove, Rhode Island

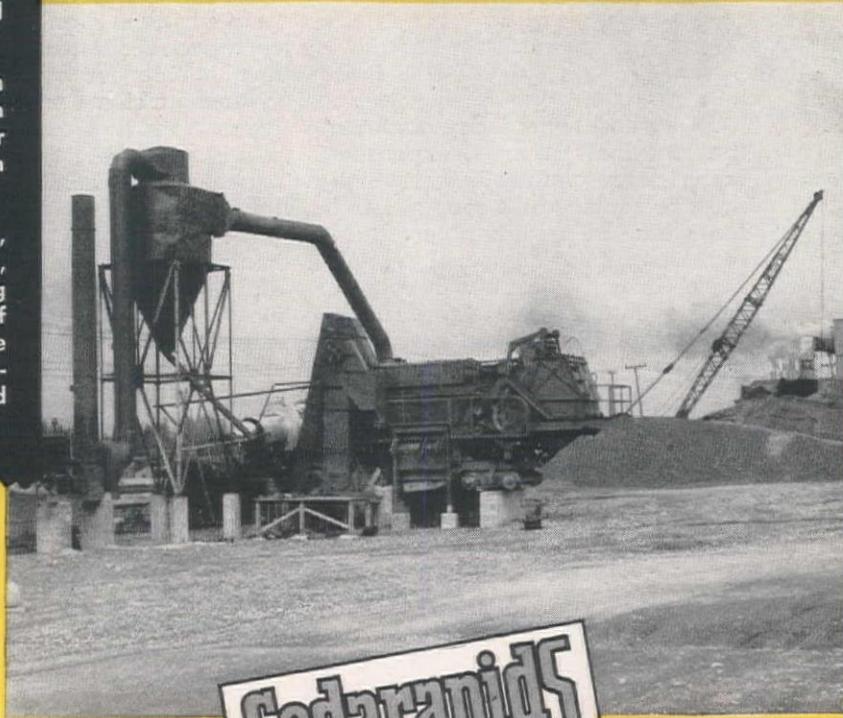
Check these
money-saving features of
CEDARAPIDS
Bituminous Mixing Plants

- ✓ High capacity 88" x 28' drier allows operation at full capacity regardless of whether or not aggregate contains a high percentage of moisture.
- ✓ Use of multiple burner type pressure air atomizers results in extremely low fuel oil consumption.
- ✓ Because all mixing takes place below the center line of the pugmill shafts, a completely coated mix can be obtained in 10 to 15 seconds.
- ✓ Built-in portability, rugged construction and fast operating controls result in less downtime. Combined with a faster mixing cycle, these features mean lower costs per ton.
- ✓ Central operator's panel, air controls, signal lights, interlocking time controls, complete portability, self-erecting tower and rapid set-up are a few of the Cedarapids features that insure ease of operation with absolute accuracy of mix to speed production and make possible **LOW BIDS**.

CEDARAPIDS MODEL FA,
also used on the Limestone job.
In addition, Campanella & Cardi
have a 3000-lb. Model E Plant,
purchased in 1945, which is
still producing.

HERE'S another contractor who is 100% sold on Cedarapids equipment and the Cedarapids advantages that permit low bids on black top surfacing jobs. Campanella & Cardi are supplying bituminous concrete for the Limestone Air Force Base at Limestone, Maine, using two Cedarapids Asphalt Plants...a 4000-lb. Model E and a Model FA. Their two-year contract calls for production of 150,000 tons for the Base, and with their Model E averaging 125 tons per hour under the direction of Joe Papitto, Superintendent, *the job is now half done and ahead of schedule*, with 75,000 tons already produced!

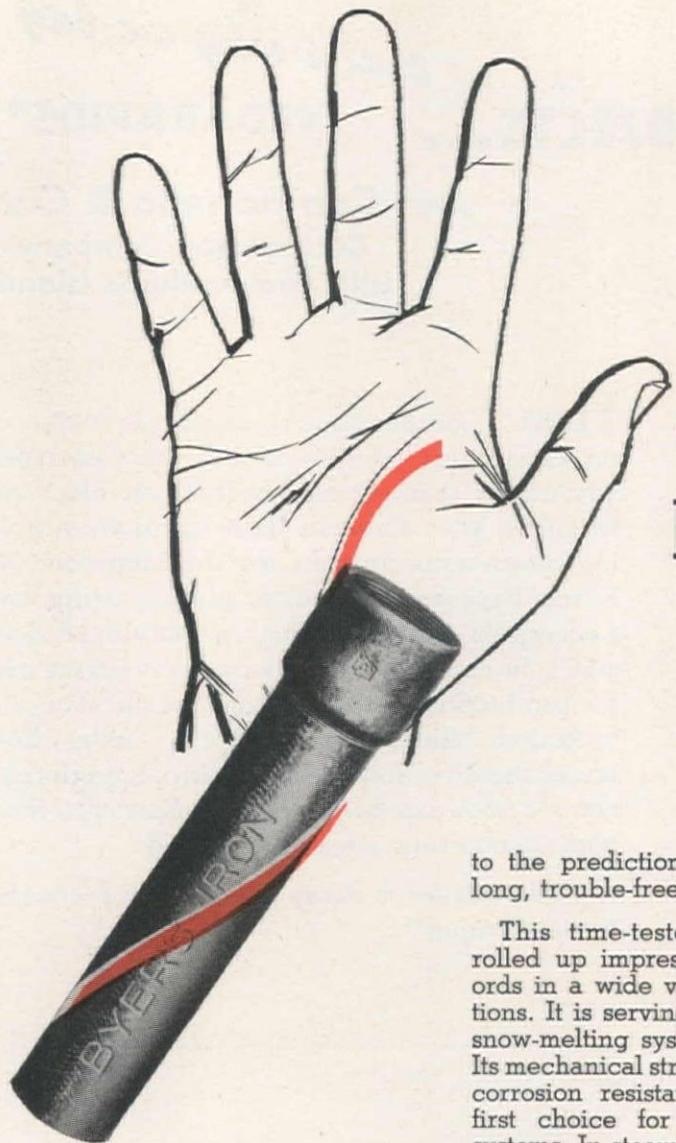
*No wonder so many low-bidding contractors
buy Cedarapids!*



Cedarapids

Built by
IOWA

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa, U.S.A.



THIS
"Life Line"
FORETELLS GOOD FORTUNE
FOR YOUR PIPING

to the prediction and pays-off in long, trouble-free service.

This time-tested material has rolled up impressive service records in a wide variety of applications. It is serving in thousands of snow-melting systems, of all sizes. Its mechanical strength and proved corrosion resistance make it the first choice for radiant heating systems. In steam and return lines, Byers Wrought Iron pipe has been remarkably effective in eliminating excessive repairs. It has successfully combated corrosive hazards in condenser services, air conditioning systems, underground lines, and sewage disposal plants. Many more services could be added to this list . . . but these will serve to suggest genuine wrought iron's many possibilities.

Every cost sheet today confirms the fact that the most expensive material you can use is that which must be replaced too soon . . . and too often. Premature pipe failure digs deep into your profit pocket-book—directly, through repair or replacements; indirectly, through production tie-ups and disrupted routine.

Users by the thousands have found the answer to lower maintenance in Byers Wrought Iron pipe. They have come to recognize its *red spiral stripe* as a dependable "life line" for predicting future service. They know that when corrosion is a threat to durability, Byers Wrought Iron pipe lives up

The next time you approve or specify pipe, investigate the superior performance of genuine wrought iron. You'll find it profitable to do so. For more facts on this time-tested material, write for our bulletin, **THE ABC'S OF WROUGHT IRON**.

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.

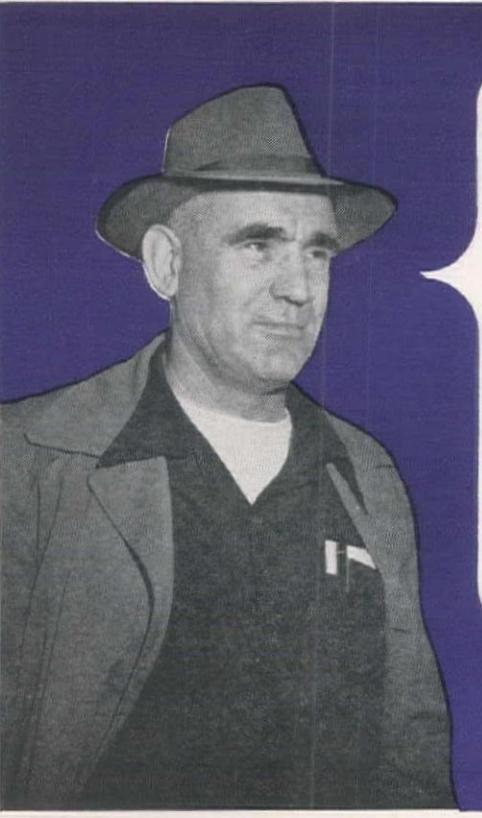


**WHY GENUINE
WROUGHT IRON LASTS**

This notch-fracture test specimen illustrates the unique fibrous structure of genuine wrought iron—which is responsible for the high corrosion resistance of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON
WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS



California contractor reports:

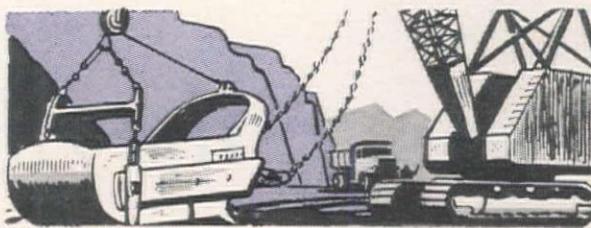
T5X ELIMINATES LARGE NUMBER OF MOTOR OILS



All-purpose superiority of amazing purple motor oil proved in construction fleet

Four years ago, the Cee-Tee Construction Company in Puente, Calif., changed to T5X motor oil for all of its operations. Mr. M. Patritti, one of the executives, says: "Previous to the change, we stocked a number of engine oils and were always fearful that the wrong oil might be placed in one of our units. With T5X motor oil, the fear of substitution has been eliminated completely. Incidentally, we have also effected quite a saving in warehouse space and in inventory stock..."

Construction men everywhere find that T5X motor oil protects *every* type of internal combustion engine under *every* kind of operating condition. This outstanding versatility is possible because T5X is made by blending a 100% pure, paraffin-base stock with a unique combination of additives found in no other motor oil.



Mr. Patritti continues: "In our granite quarrying operations we have a variety of equipment, including Buda and Allis Chalmers gasoline engines and Caterpillar Diesels. We keep a careful check on our oil consumption and maintenance costs. T5X is completely satisfactory for our quarry equipment and for the lubrication of dump trucks, graders, rollers, crushers, clam shells, tractors, etc."



T5X meets and exceeds the rigid Army specifications for a heavy-duty oil. This amazing *purple* oil minimizes ring sticking, sludge, lacquer and gum formation. T5X also reduces oxidation, retards carbon formation, and keeps precision-fitted moving parts covered with a protective film at all times.

Developed by the manufacturers of UNOBA
—the industry's original multi-purpose grease

OFFICES
LOS ANGELES NEW YORK CHICAGO
Union Oil Building 4904 RCA Building 1612 Bankers Building
NEW ORLEANS, 917 National Bank of Commerce Building



**UNION OIL
COMPANY
OF CALIFORNIA**



This "Cat" No. 12 Motor Grader, equipped with DoMor elevating grader, is side burrowing at the rate of between 500 and 600 yards per hour.

They help speed completion of atomic project

Building access road to the Dugway Proving Grounds, south of Tinipie, Utah, the Olof Nelson Construction Company relies heavily on "Caterpillar" equipment.

"We think 'Caterpillar' products are tops," says Mr. F. F. McKinnon, Secretary-Treasurer of Nelson. "Cost of maintenance is low and they've got a long life. We have an old RD8 we were going to scrap four years ago, but it's still going strong. We get good service from our 'Caterpillar' Dealer."

Among the "Caterpillar" units on this job are three No. 12 Motor Graders—one equipped with a DoMor elevating grader. Two "Cat" D13000 Engines power a

Telsmith crusher. The crusher is fed by "Cat" Diesel Tractors with 'Dozers. Nelson's lineup also includes six more D8s, a D7 and a No. 112 Motor Grader.

Concentration on "Caterpillar" equipment pays off three ways—in higher production, lower maintenance costs and simplified service problems. Good care of your units pays off, too—you get *extra* working capacity and longer life. Considering defense demands, that's mighty important today. To get the most out of your "Caterpillar" rigs, treat them right—and keep in touch with your "Caterpillar" Dealer.

CATERPILLAR, SAN LEANDRO, CALIF.; PEORIA, ILL.

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT



**Build Today...
FOR TOMORROW**

with clean
**Penta* -PROTECTED
WOOD**

You build for safety and minimum maintenance in future years when you use PENTA-PROTECTED wood for guard rails, bridges and pilings.

Wood treated with PENTA effectively resists decay and termites—actually lasts *many times longer* than untreated wood! PENTA also leaves wood clean, easy to handle, and paintable when properly treated. PENTA will not leach.

PENTA gives effective, dependable service on any all-weather installations—sign posts, billboards or utility poles. For more information on how PENTA can help you “build for tomorrow”, write to Dow, Dept. PE-80.

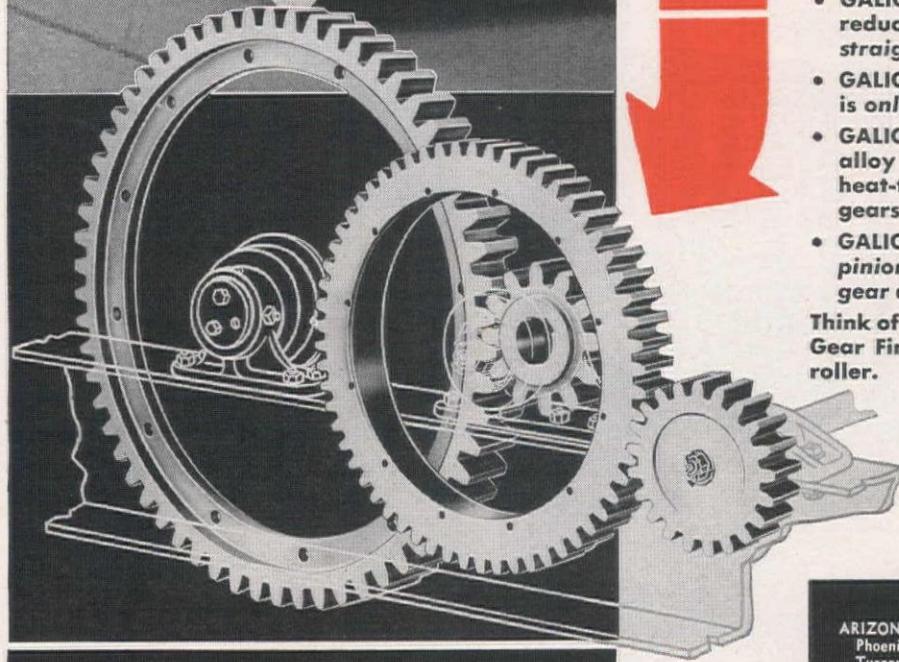
*PENTA is a popular abbreviation of the chemical, PENTACHLOROPHENOL.

Make construction last . . . build with **Penta -PROTECTED wood!**

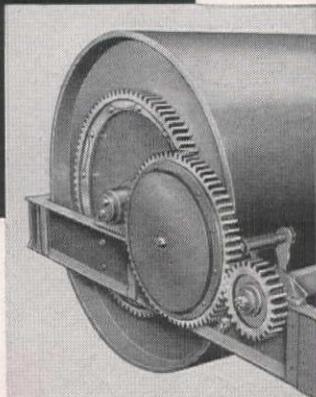
THE DOW CHEMICAL COMPANY • *Midland, Michigan*

DOW

Penta
chlorophenol



REMEMBER!
ROLLER RELIABILITY -
depends largely on its
FINAL DRIVE mechanism



TANDEM ROLLERS

THE GALION IRON WORKS & MFG. COMPANY

General and Export Offices — Galion, Ohio, U. S. A. Cable address: GALIONIRON, Galion, Ohio

IF YOU KNOW GEARS

— you know that gradual reduction and low speeds (each gear with roller bearings) plus a straight-line spur gear train, develop the least friction and consequently cause the least gear wear. That is why Final Drive gears on Galion Tandem Rollers last the longest without adjustment or replacement.

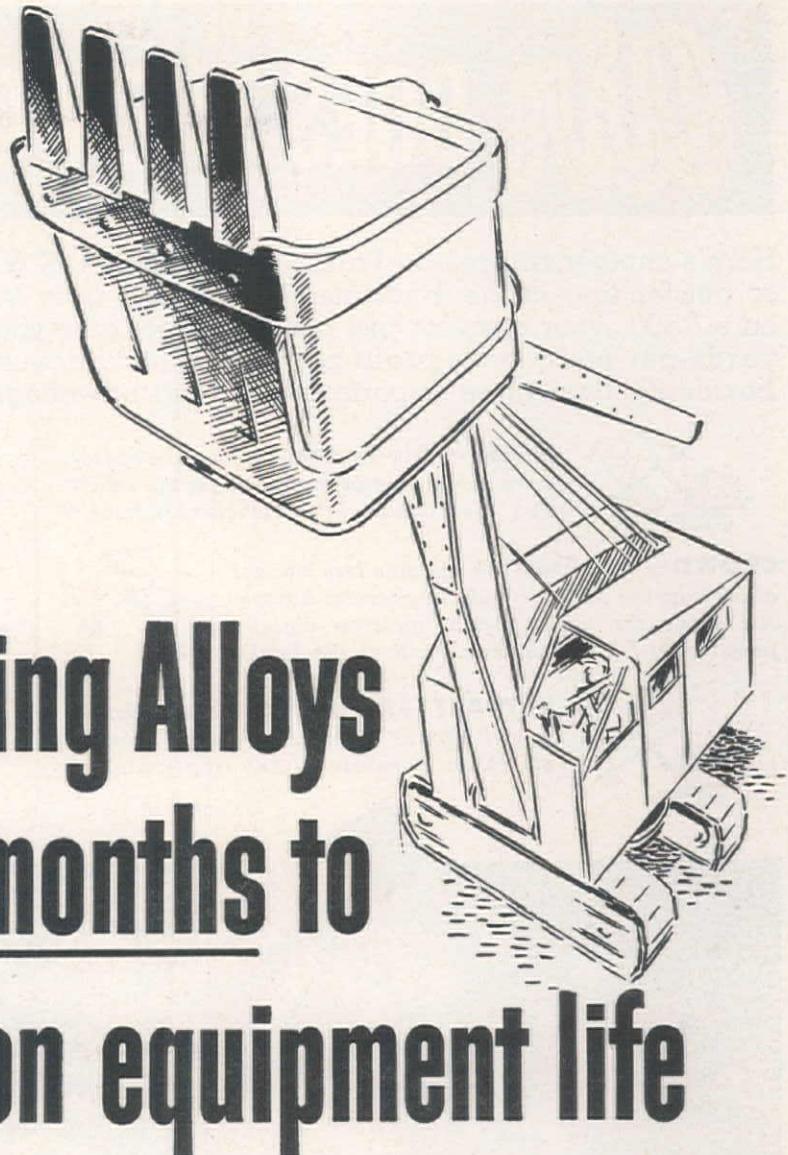
- **GALION FINAL DRIVE GEARS** are all Spur Gears.
- **GALION FINAL DRIVE** is a two step gear reduction train thru four spur gears — a straight line drive.
- **GALION FINAL DRIVE** greatest gear ratio is only 5 to 1.
- **GALION FINAL DRIVE** spur gears are special alloy steel, accurately machine cut and heat-treated. No ordinary, uncut, cast gears are used.
- **GALION FINAL DRIVE** has no small beveled pinion gear driving a large bevel ring gear on the roll.

Think of these advantages of the Galion Spur Gear Final Drive before you buy a tandem roller.

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	Tuscon.....	F. RONSTADT HARDWARE CO.
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**For teeth that
really chew...
two to six
times longer**



Airco Hardfacing Alloys add extra months to construction equipment life

Today worn machinery and equipment mean more than replacement costs. Demands of the present industrial situation may require more priority than you're in a position to give.

Many foresighted construction men are hedging their worn equipment problem by insuring longer life for their present machines through the use of Airco Hardfacing Alloys . . . adding months to equipment life — and in many cases, improving the operating characteristics.

Bucket teeth are a good example. One firm found

hardfacing manganese bucket teeth added two to six months working life to these formerly 'expendable' items.

But this is only one Airco Hardfacing Alloy application you can use to save time, money, and equipment. Your nearest Airco Office will gladly show you how these cost-conscious Airco Alloys will help you with your particular problem. Write today.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND



AIR REDUCTION PACIFIC COMPANY

A Division of Air Reduction Company, Incorporated

SAN FRANCISCO • LOS ANGELES • PORTLAND • SEATTLE
Bakersfield • Fresno • Emeryville • Sacramento • Tacoma

Western Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding and Cutting Machines, Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

Air DOES THE WORK

Here's another big reason Lorain-50's, models I, K & S, are so outstanding in the 1-yd. class! When Air goes to work on a "50", your operator just can't help but give you more yards-per-hour; more profit-per-day. Why? Because he's benefiting from these important operating advantages . . .



HOIST — Air-Assist — allows the operator to retain that important finger-tip, sensitive "feel" of just what his machine is doing.*

CROWD — Air-Assist — requires less manual effort from the operator; reduces operator fatigue; Air keeps the crowd clutch applying digging power until the dipper breaks out of the bank.*



RETRACT — Air-Assist — levers must be moved shorter distances — with reduced effort, to maintain clutch application.*



ON THE
LORAIN
50
I-K-S MODELS

CRAWLER STEERING AND TREAD-LOCK OPERATION —

Air-Controls — Air makes it faster and easier to steer the Crawler—or set the Tread Locking Pawls — from the operator's station, regardless of the Turntable swing position.

STAND-BY CONTROLS — All Air Controls are equipped for quick switch-over to straight, manual, mechanical operation in cases of emergencies. Immediate take-over; no adjustment; no loss of time.

* All these features apply to the Air-Assist control of Hoist, Crowd, Drag-in and Retract.

PLUS HYDRAULIC COUPLING

In addition to this improved operation, Lorain "50's" give you the Hydraulic Coupling with its no-engine stall, shock-proof performance. The "50" is your combination for "easiest" and "smoothest".



LORAIN
50

THE THEW SHOVEL CO.
LORAIN, OHIO

ANDREWS EQUIPMENT SERVICE
OF WASHINGTON, INC.
Spokane, Wash.

CATE EQUIPMENT CO.
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CENTRAL MACHINERY CO.
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SOUTHERN IDAHO EQUIPMENT CO.
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TRACTOR & EQUIPMENT CO.
Sidney, Mont. Branches: Miles City, Glasgow, Mont.

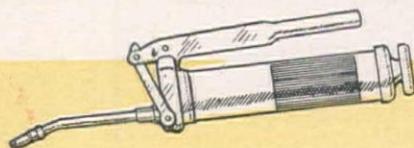
WORTHAM MACHINERY CO.
Cheyenne, Wyo. and Billings, Mont. Branches: Sheridan, Greybull, Casper and Rock Springs, Wyo.

YUKON EQUIPMENT CO. (for Alaska)
Seattle, Wash. Branches at Fairbanks and Anchorage, Alaska

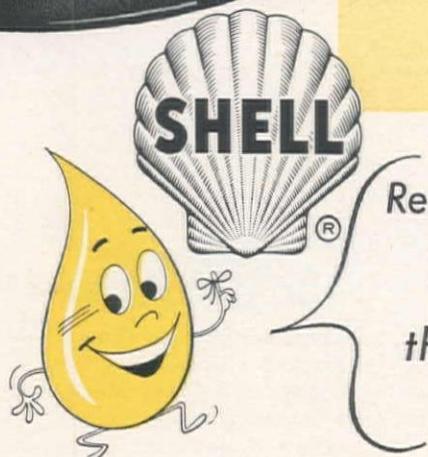
TO CUT YOUR MAINTENANCE COSTS

ON
LUBRICATION
JOBS

Use this
single lubricant for all
your trucks and cars

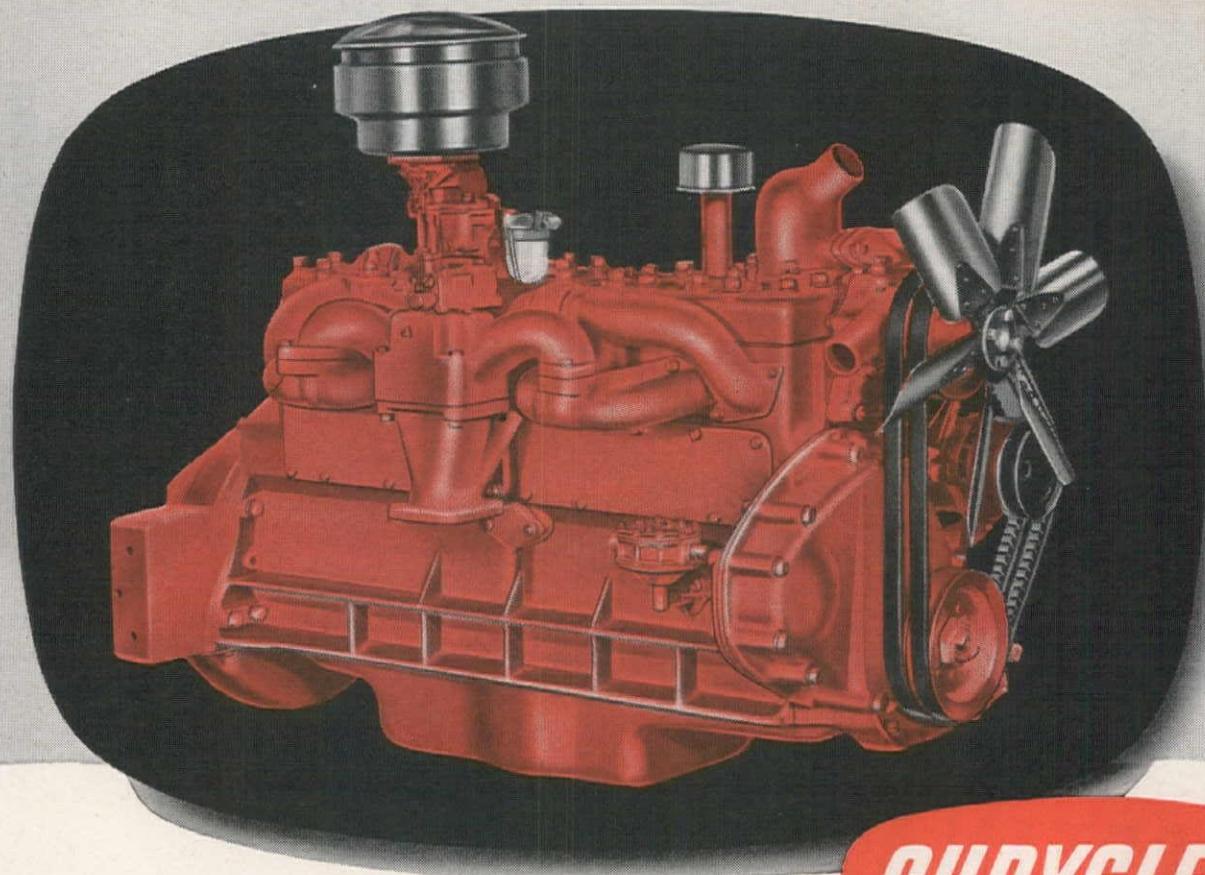


- Lubricates wheel bearings... universal joints... water pumps... all chassis points where grease is needed
- Does a better job than the four or more specialized greases it replaces
- Cuts down your inventory of maintenance supplies. Avoids errors! Saves time and money!



Remember, only Shell offers you
SHELL RETINAX A
(Multi-Purpose Lubricant)
the one lubricant that handles
all your grease lubrication

BUILT FOR INDUSTRIAL POWER NEEDS EVERYWHERE!



Day-in, day-out! . . . developing maximum horsepower with a minimum of down time and at minimum operating cost! That's the outstanding record of Chrysler Industrial Engines on the job!

For Chrysler Industrial Engines are built *solely for industrial use!* They are designed and engineered to meet the specific working re-

quirements of each type of equipment they power. Chrysler Industrial Engines can also be adapted to special regional operating conditions.

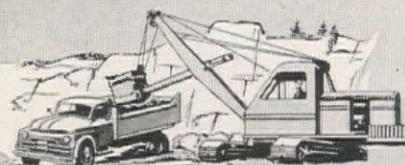
A letter of inquiry will bring an engineer well qualified to discuss your particular application. Address: **Industrial Engine Division, Chrysler Corporation, Detroit 31, Mich.**

CHRYSLER



HORSEPOWER WITH A PEDIGREE

CONSTRUCTION



Chrysler Engines Power:
Ditching Machines • Cranes
• Truck Mixers • Shovels •
Loaders • Yarders • Road
Pavers • Concrete Mixers
• Crane Carriers • Scoop
Tractors

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Chrysler Engines Power:
Air Compressors • Pumps •
Hoists • Derricks • Tractors •
Generators • Arc Welders •
Baling Machines • Winches
• Conveyors • Tackle Blocks

FARMING



Chrysler Engines Power:
Tractors • Combines • Hay
Choppers • Gang Mowers
• Spreaders • Pumps • Feed
Mills • Irrigation Equipment
• Orchard Sprayers •
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OTHER FIELDS



Chrysler Engines Power:
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• Snow Plows • Oil Well
Pumps and Drillers • Street
Flushers • Air Conditioning
Equipment

GENERALS

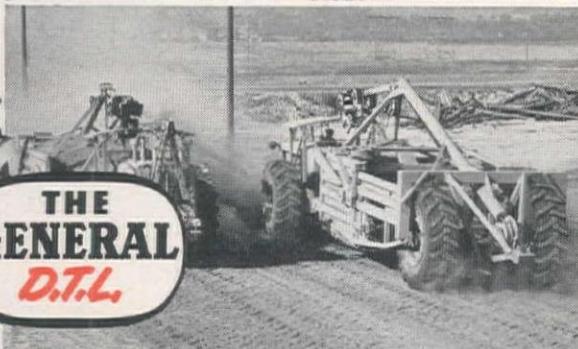
do any job, anywhere—
**FASTER! EASIER!
AT LOWER COST!**



THE
GENERAL
L.C.M.



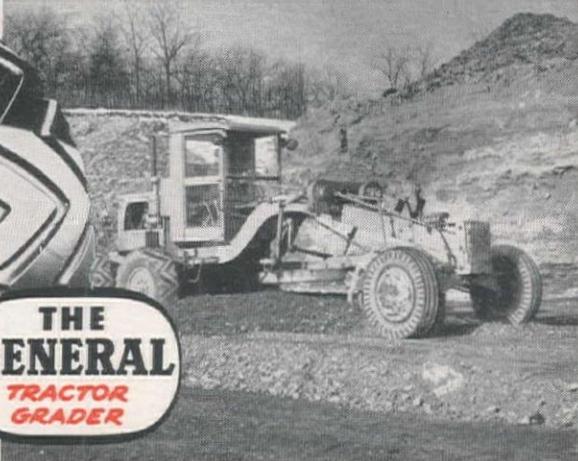
THE
GENERAL
H.C.T.



THE
GENERAL
D.T.L.



THE
GENERAL
*TRACTOR
GRADER*



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.

GENERAL TRACTOR GRADER TIRE

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

P&H GIVES YOU ALL 3

1. GREATER STABILITY

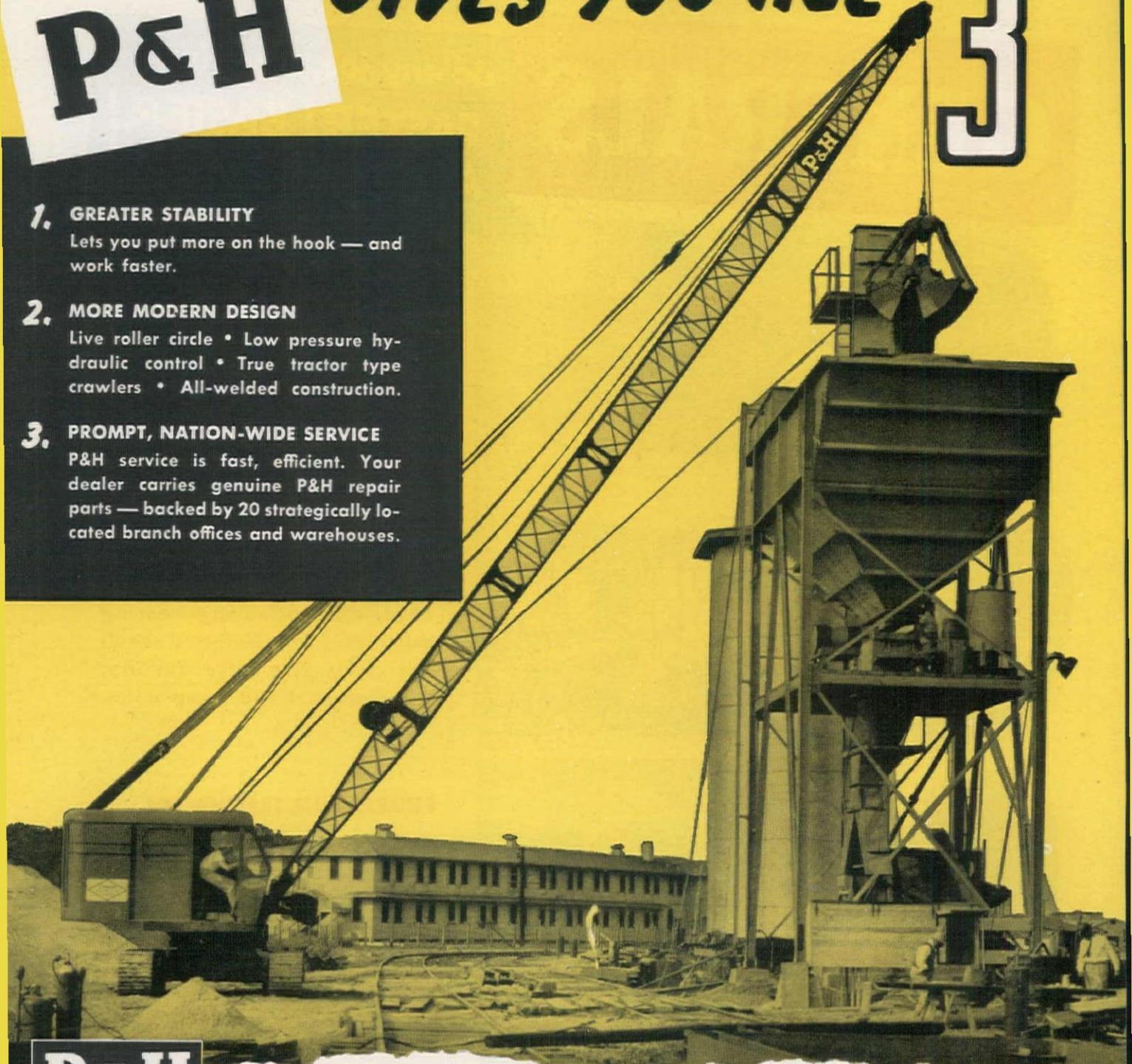
Lets you put more on the hook — and work faster.

2. MORE MODERN DESIGN

Live roller circle • Low pressure hydraulic control • True tractor type crawlers • All-welded construction.

3. PROMPT, NATION-WIDE SERVICE

P&H service is fast, efficient. Your dealer carries genuine P&H repair parts — backed by 20 strategically located branch offices and warehouses.



P&H

POWER SHOVELS AND CRANES
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NOW P&H
services the West
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The new P&H Pacific Division inaugurates local manufacture and assembly of many famous P&H products — provides bigger parts stocks — better service than ever. Headquarters in Los Angeles.

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EL CENTRO, California	Purdy-Holmquist Co., 1275 Main Street
ESCONDIDO, California	Southern Equipment & Supply Co., 301 W. Grand
EUREKA, California	Riley Logging Supply Co., 1034 Broadway
FRESNO, California	Allied Equipment Company, 1824 Santa Clara Street
LOS ANGELES 21, California	Lee & Thatch Equipment Co., Inc., 820 Santa Fe Ave.
MADERA, California	Allied Equipment Company, Highway 99 South
REEDLEY, California	Allied Equipment Company, 1230 "G" Street
SACRAMENTO, California	Sacramento Valley Tractor Co., 1901 Broadway
SAN DIEGO 13, California	Southern Equipment & Supply Co., 2025 East Harbor Drive
RENO, Nevada	Jenkins & Albright Mack Truck Sales, 1131 W. 4th Street
EUGENE, Oregon	Loggers & Contractors Machinery Co., 540 Filmore Street
PORTLAND 14, Oregon	Loggers & Contractors Machinery Co., 240 S. E. Clay 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

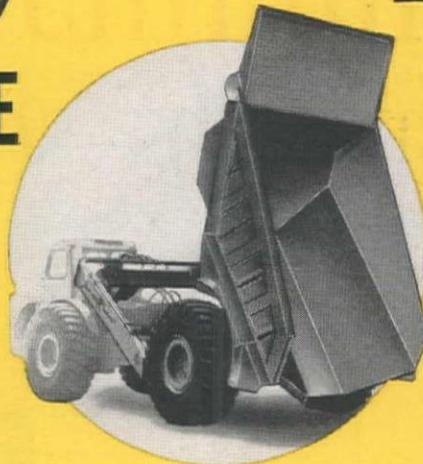
HARNISCHFEGER CORPORATION—Pacific Division: LOS ANGELES 59, Calif., 2400 East Imperial Highway. Branch Offices: SAN FRANCISCO, Calif., 100 Bush Street, DENVER, Colorado, Rm. 415, Central Bank Bldg., 1108 15th Street, SEATTLE 4, Washington, 2909 First Avenue, South

NEW!
THE TR 200
REAR DUMP
MOTOR WAGON



Here's your **NEW**
LaPLANT-CHOATE
ROCK WAGON

HERE'S a new addition to the well-known LaPlant-Choate line of Motor Wagons and Earthmovers. The 18-ton TR 200 is a hydraulically-controlled rear dump wagon flexibly joined to the same big rubber-tired tractor so successfully used on the LaPlant-Choate TS 200 Motor Scraper. It combines rugged power, big capacity and high speed with a host of other features to make this unit outstanding in its field.



**FEATURES YOU'VE BEEN LOOKING FOR
IN A REAR DUMP WAGON**

- ★ Stable wheel base assures absolute safety when dumping over edge.
- ★ Rock Lug tires.
- ★ Protected cab.
- ★ Your choice of two diesel engines in the T 200 Tractor . . . a 176 HP Buda or a 165 HP Cummins.
- ★ No obstructions in the wagon body.
- ★ Tilts to 70° from horizontal.
- ★ Full hydraulic control.
- ★ Rear dump advantages.
- ★ Available with heated body for use in cold climate to prevent freezing of material in load.

**TR 200 MOTOR WAGON
SPECIFICATIONS**

GENERAL

CAPACITY	
Struck, cu. yds.	11
Heaped, cu. yds.	15
Tons	18

OVERALL DIMENSIONS

Length	25'9"
Width	10'7"
Height	10'0"

WHEEL BASE

Tractor	6'8"
Wagon	8'8"

TIRES 4-21:00 x 25-24 ply rock lug

WHEEL TREAD

4-wheel air Timken-Detroit	18" x 7"
----------------------------	----------

TURNING

Width required 180° turn	31'3"
Degree of turn each way	60°

HYDRAULIC SYSTEM .LPC Fluid Power Unit

Steering	25 GPM
Wagon operation	40 GPM

MODEL Model HU25

SHIPPING WEIGHT (Approx. in lbs.) 40,000

T 200 TRACTOR

ENGINE	Buda Diesel Model 6-DA-779	176 HP
or		

Cummins Diesel Model HRB-600	165 HP
------------------------------	--------

ENGINE CLUTCH	17" Lipe Railway
TRANSMISSION	Fuller 5A1120

SPEDS	(at 1800 RPM—MPH)	From 2.46 to 21.63
-------	-------------------	--------------------

STARTING METHOD	Electric	24 V
-----------------	----------	------

AIR COMPRESSOR	Bendix-Westinghouse	.71/4 cu. ft. capacity
----------------	---------------------	------------------------

ELECTRIC SYSTEM	12 V
-----------------	------

FUEL TANK CAPACITY	U. S. gallons
--------------------	---------------

R 200 WAGON

MISCELLANEOUS DIMENSIONS

Loading height, rear	5'6"
Loading height, side	8'3"
Bowl width	8'0"
Bowl depth, maximum	4'8"
Bowl length	11'3"

OPERATING METHOD

Type of ejection	Rear dump, hyd. lift
------------------	----------------------

Number of jacks (double acting)	2
---------------------------------	---

Size of jacks	8" x 31"
---------------	----------

DUMPING ANGLE	70°
---------------	-----

LAPLANT  **CHOATE**
MANUFACTURING CO., INC. CEDAR RAPIDS, IOWA, U.S.A.

Get the facts from your nearest LPC distributor

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custom-built
to fit the job!



Work boats, pleasure craft



Buses and highway trucks



Drilling rigs, centrifugal pumps, generator sets



Off-highway trucks, crawler tractors



Earthmovers, logging yarders and loaders



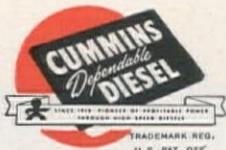
Shovels, cranes, yard locomotives

Lightweight, high-speed Diesels (50-550 hp) for these and many other uses

Cummins® Diesels

do so many jobs—so much better

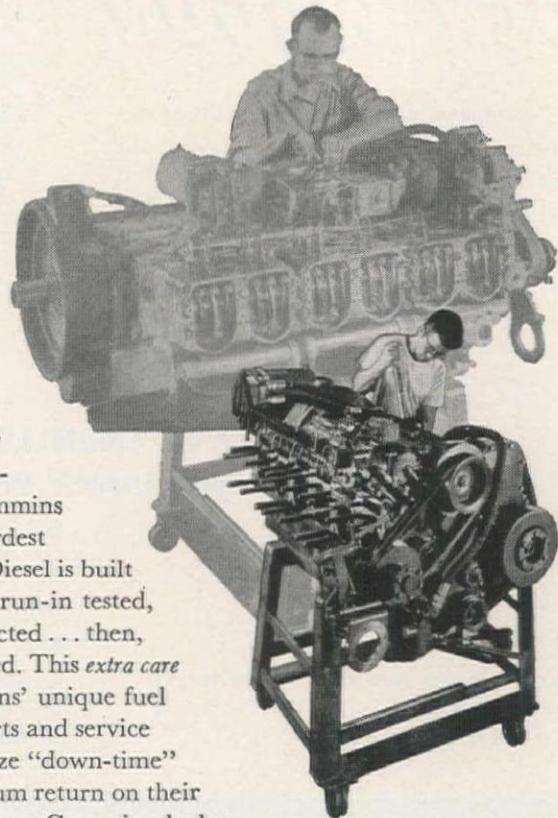
they're
**BUILT
NOT
ONCE
BUT
TWICE**



TRADEMARK REG.
U.S. PAT. OFF.

**Diesel power by
CUMMINS**

Wherever performance requirements are really rough, you'll find lightweight, high-speed Cummins Diesels assigned the hardest jobs. Every Cummins Diesel is built *TWICE*—assembled, run-in tested, disassembled and inspected... then, reassembled and retested. This *extra care* combines with Cummins' unique fuel system and efficient parts and service organization to minimize "down-time" . . . give users a maximum return on their diesel investment. See your Cummins dealer.

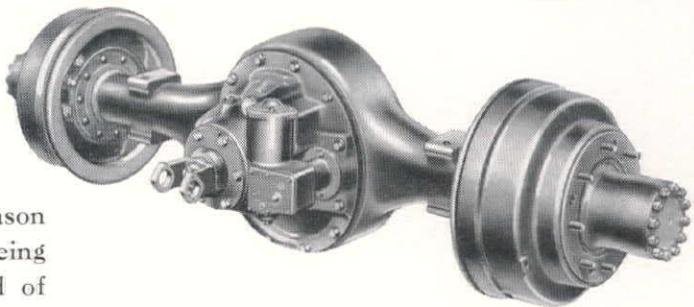
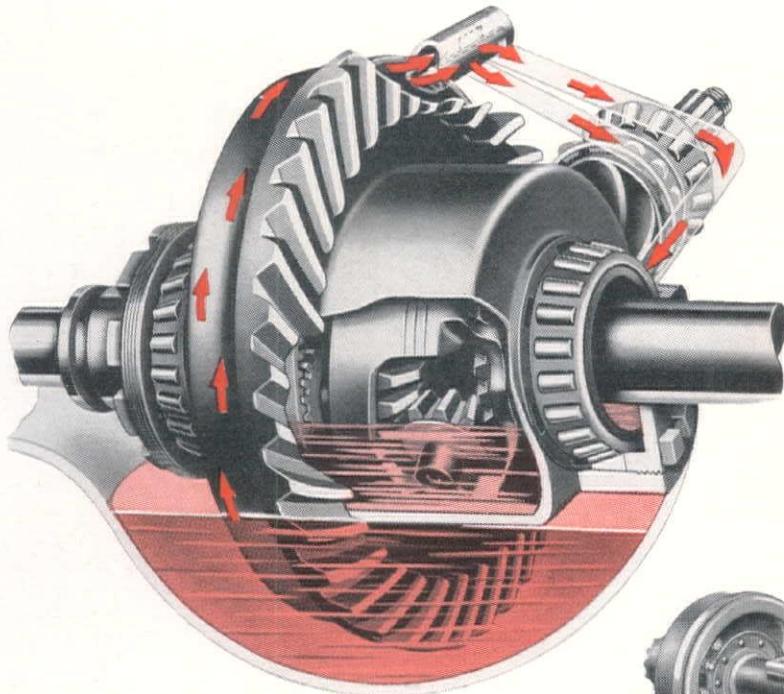


CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA
Export: Cummins Diesel Export Corporation • Columbus, Indiana, U.S.A. • Cable: Cumdix

SEATTLE, Cummins Diesel Sales of Washington, Inc.: 2520 Airport Way, Seattle 4, Wash., Tel. Main 7160. Authorized Sales & Service: Kenny's Cummins Diesel Service, Aberdeen, Wash.; Yakima Commercial Co., Yakima, Wash. . . . **SPOKANE**, Cummins Diesel Sales, Inc.: 5. 155 Sherman St., Box 2185, Spokane 5, Wash., Tel. Madison 0101 . . . **BOISE**, Cummins Diesel Sales of Idaho, Inc.: 1204 Front St., Boise, Idaho, Tel. 3783 . . . **PORTLAND**, Cummins Diesel Sales of Oregon, Inc.: 1225-1235 S. E. Grand Ave., Portland 14, Ore., Tel. East 7146. Branch: 731 Garfield St., P.O. Box 367, Eugene, Ore. Authorized Sales & Service: Diesel Sales & Service, Inc., Grants Pass, Ore. . . . **SAN FRANCISCO**, Watson & Meehan: 1960 Folsom St., San Francisco 3, Cal., Tel. Market 1-8930. Branch: 248 Palm Ave., Fresno 3, Cal. Authorized Sales & Service: Connell Motor Truck Co. of Redding, Redding, Cal.; Fred E. Barnett Co., Eureka, Cal.; Nevada Transit Co., Reno, Nev. . . . **LOS ANGELES**, Cummins Service & Sales: 1661 McGarry St., Los Angeles 21, Cal., Tel. Prospect 1021. Branch: 401 Golden State Highway, Bakersfield, Cal. Authorized Sales & Service: Leo's Diesel Service, Blythe, Cal.; Smith's Diesel Sales, Colton, Cal.; Rhynes' Automotive Service, El Centro, Cal.; San Luis Truck Service, San Luis Obispo, Cal.; F. R. Laux Diesel Service, San Diego, Cal.; Hanson Equipment Co., Santa Maria, Cal.; Newton Automotive Service, Baker, Cal. . . . **PHOENIX**, Cummins & Moran: 1350 N. 22nd Ave., Phoenix, Ariz., Tel. 8-2668. Branch: 1921 N. Broadway, Albuquerque, N. M. Authorized Sales & Service: Cooper Tractor Service, Yuma, Ariz.; Stirling Diesel Service, Las Vegas, Nev.; Willis Diesel Engine Service, El Paso, Texas . . . **SALT LAKE CITY**, Cummins Intermountain Diesel Sales Co.: 1030 Gale St., Salt Lake City, Utah, Tel. 9-3768. Authorized Sales & Service: Wally's Chevron Truck Service, Cedar City, Utah; Automotive Body and Machine, Inc., Idaho Falls, Id.; Jim Macy's, Blue Bell Truckatorium, Rock Springs, Wyoming . . . **DENVER**, Cummins Diesel Sales of Colorado, Inc.: 2450 Curtis St., P.O. Box 507, Denver 5, Colorado, Tel. Acoma 5933. Branch: 119 N. Colorado Ave., Casper, Wyo. Authorized Sales & Service: La Plata Repair Shop, Durango, Col.; Hallam & Boggs, Grand Junction, Col.; Cortez Diesel Sales, Cortez, Col.; Western Motor Truck, Inc., Scottsbluff, Neb.; Century White Truck Co., Casper, Wyo. . . . **BILLINGS**, Cummins Diesel Sales of Montana, Inc.: 4322 State St., Billings, Mont., Tel. 8904 and 9-8800. Branch: Fifth and Omaha, Rapid City, S. D.

(I-11-52)

exclusive forced-flow lubrication keeps Eaton 2-speeds on the job, makes them last longer



PLenty of lubrication—always! That's one reason for the outstanding life and performance records being set by Eaton 2-Speed truck axles in every field of heavy-duty hauling! Eaton's exclusive forced-flow oiling system provides abundant lubrication even at lowest vehicle speeds. The instant gears turn over—even one revolution—oil is started on its way to all moving parts; the rate of flow is governed to meet the demands of various operating speeds. This unique lubricating system and Eaton's exclusive planetary construction are important factors in the ability of Eaton 2-Speeds to stay on the job, to deliver maximum performance with minimum upkeep. Ask your dealer to explain how Eaton 2-Speeds reduce stress and wear on engine and power-transmitting parts—how they will help *your* trucks haul more, faster, longer, at lower cost.

EATON 2-Speed Truck AXLES

Axle Division

EATON MANUFACTURING COMPANY
CLEVELAND, OHIO



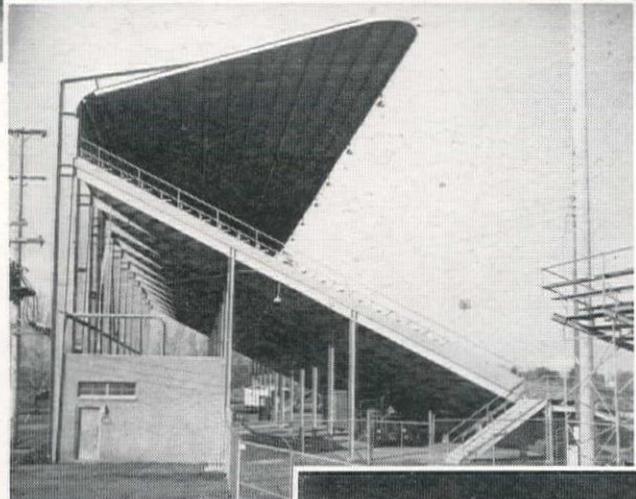
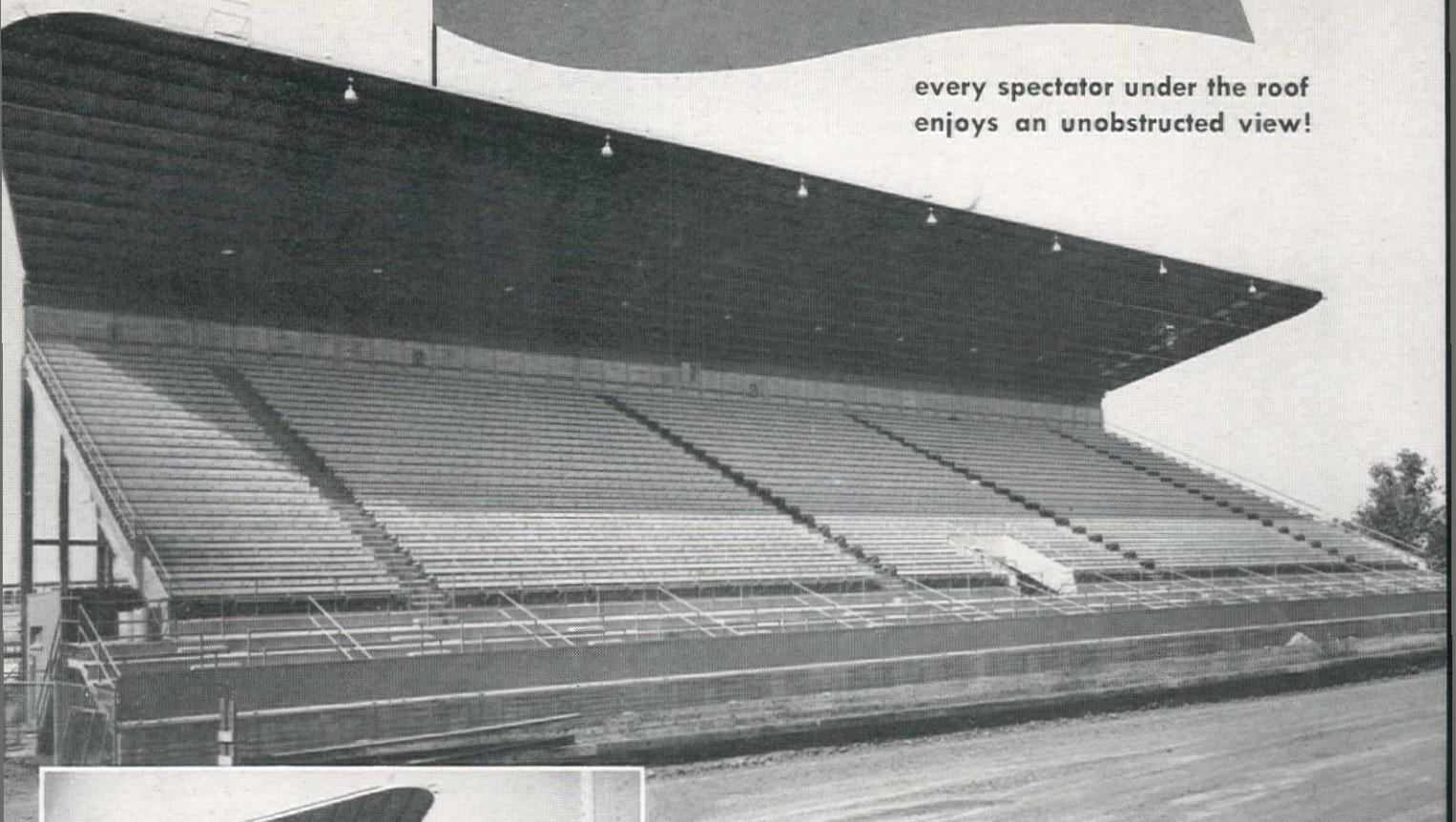
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AT THE

Merced County Fair

(CALIFORNIA)

every spectator under the roof
enjoys an unobstructed view!



PITTSBURGH • DES MOINES

Steel Deck
GRANDSTANDS

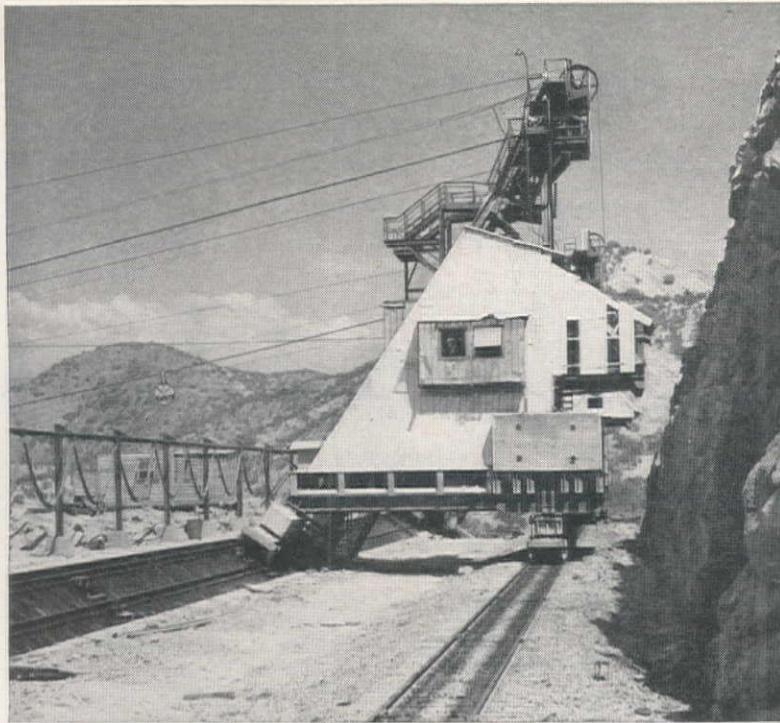
This modern PDM Steel Deck Grandstand features a roof supported solely by beams cantilevered from rear columns—permitting a clear view for every spectator, without interference from "pillars and posts" of any kind. • With four rows of box seats and 23 rows of grandstand seats, the stand has a seating capacity of 2600, is 198' long, and 83'9" deep. • Write for our comprehensive Grandstand Brochure.

PITTSBURGH • DES MOINES STEEL CO.

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Cableway head tower, and tail tower across the canyon, are both driven on straight parallel tracks by G-E drives. Another set of towers for the service rig operates on the same tracks. Main cableway was built by Willamette Iron and Steel Co.

Cableway towers kept in line . . . electrically!

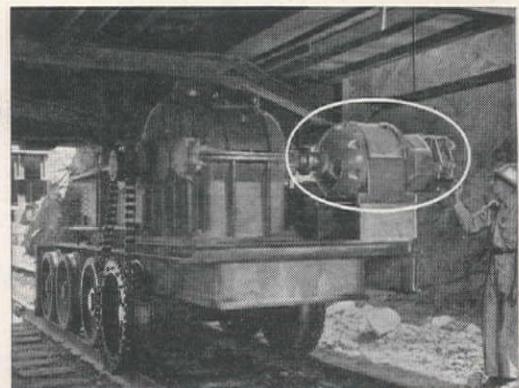
At Pine Flat Dam, G-E drives for movable head and tail towers prevent skewing, help keep pouring operations continuous!

Here's an example of the versatility of electricity on construction jobs—a co-ordinated electric-drive system that helps keep an important project ahead of schedule. It's at Pine Flat Dam on Kings River in California, where a modern, high-speed G-E powered cableway—together with another rig for service functions—has set a pouring record of 4000 yards in one day.

All motors and control for the main cableway tower-drives on this Corps of Engineers dam, being built by Pine Flat Contractors Associated Companies, have been supplied by General Electric. In addition, the electric devices to keep the two cableways on the track, safely apart, and correctly aligned across the 2420-foot canyon, were all co-ordinated for the job by G-E application engineers.

This kind of engineering help—in application, installation, and service—regularly supplements G-E drives and power distribution systems, helps you get the most from your electrified construction equipment. *General Electric Co., Schenectady 5, N. Y.*

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.



Under the head tower, this G-E 75-hp wound-rotor induction motor is one of two that drive the tower. Motors for head and tail towers are controlled by a single master switch in the operator's station.



Tower alignment is maintained automatically. This selsyn generator, connected to a head-tower wheel, and another on the tail tower, feed signals to a differential selsyn which controls speed of the tower-drive motors.

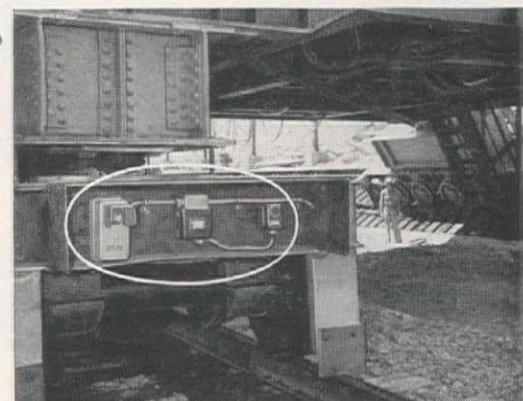


Photo-electric relays on each head tower automatically prevent the two rigs from colliding, and G-E limit switches keep towers from hitting stops at ends of the track. Thus operator can concentrate on spotting buckets.

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.

GENERAL ELECTRIC

664-21

WANTED:

Hauling heavy construction equipment separates "the men from the boys" so far as truck performance is concerned. Wherever the job demands pulling power and stand-up ability beyond the ordinary—you'll find White.

Heavy Hauling Jobs—



Southwest Paving Company of Sun Valley, California, uses White Trucks for moving giant road rollers from job to job.

WHITE SUPER POWER

Whites are "first choice of the Pros" because they save money through greater payloads, better performance and lower maintenance costs. Get the facts of White for yourself! Learn how this

finer motor truck meets your hauling needs more economically! See the proof—in terms of your own business. Your local White Representative is ready to demonstrate.

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THE WHITE MOTOR COMPANY

CLEVELAND 1, OHIO

Factory Branches, Distributors and Dealers Everywhere



KEEP YOUR WHITES IN
BEST WORKING CONDITION

FOR MORE THAN 50 YEARS THE GREATEST NAME IN TRUCKS

NEW CASE MOWER

Masters
Every
Mowing
Condition



DOUBLES

with Bucket or Broom...
Use Tractor Year Round

With the Case "VAI-5" Highway and Airport Mower you can mow side slopes from 45 degrees down to straight up, with full cutting efficiency at all angles. Touch one of the hydraulic controls and the inner shoe raises up to 14 inches for mowing over curbs. The other hydraulic control sets and holds the cutterbar at any angle. Besides its working speed and convenience, it's a mighty well-built mower with plenty of anti-friction bearings, adjustments to take up wear, and provision for renewals after long service. Let your Case industrial dealer show you this great mower. J. I. Case Co., Racine, Wis.



Same man, same "VAI" Case Tractor does mowing or sweeping without waste of time between jobs. Snow plows, blades, scrapers also can be used.

Hydraulically operated loader is mounted and used without interference from mower. It's like having two tractors for the same modest investment.



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Service

WHEN YOU NEED IT



CASE

ENGINEERED TYING DEVICES, ANCHORAGES and ACCESSORIES for CONCRETE CONSTRUCTION

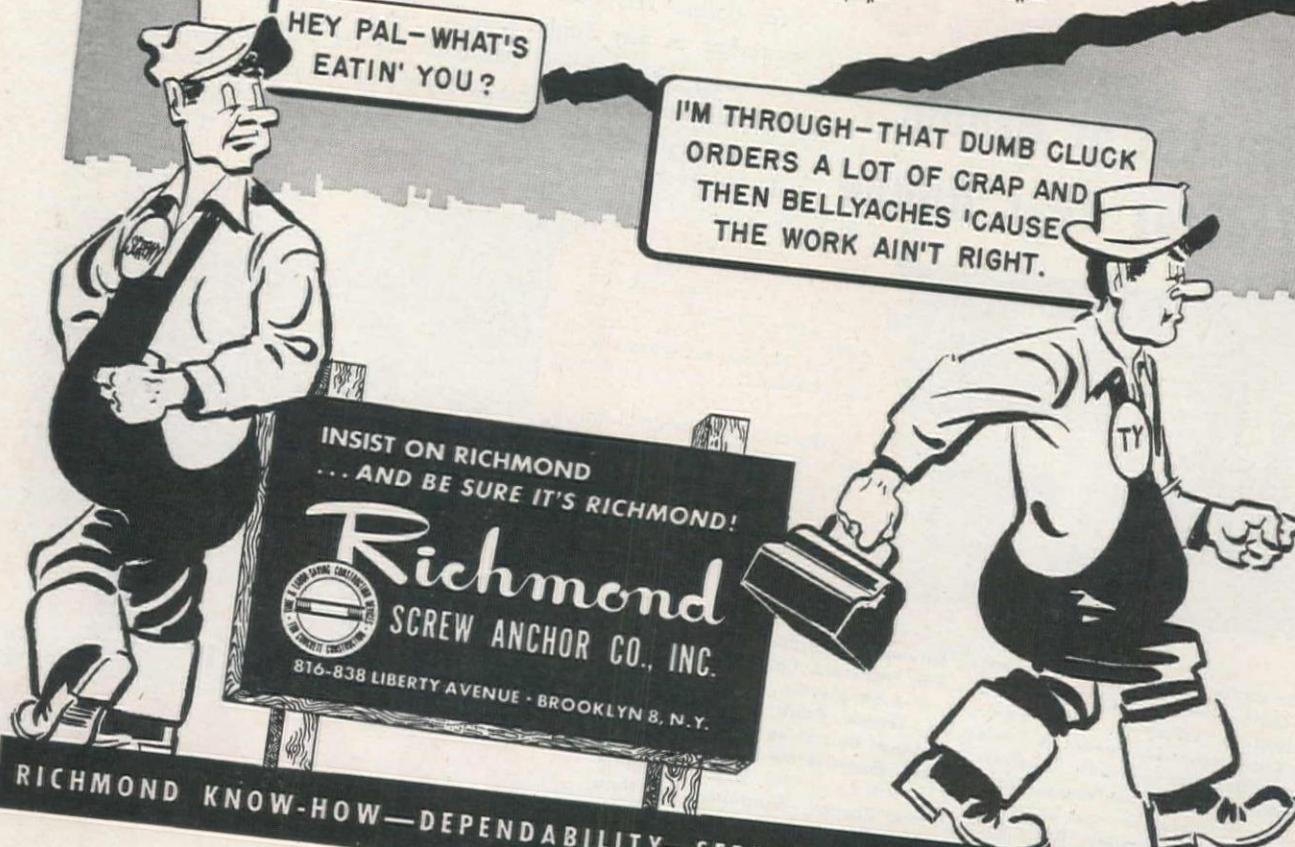
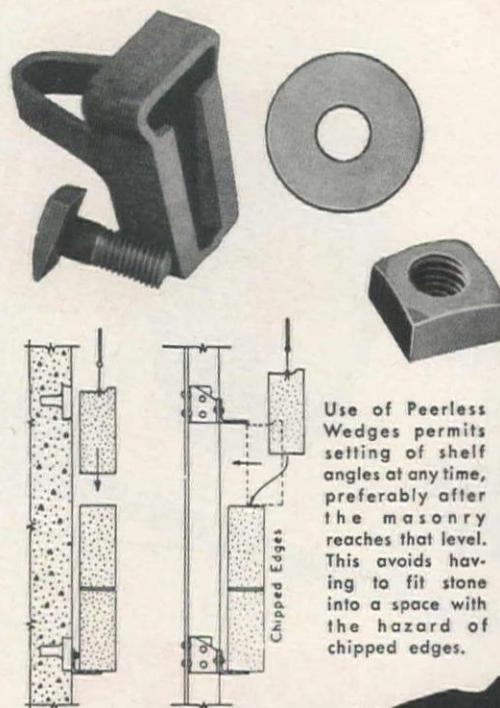
FEWER chipped stones...LESS costly masonry fitting...when you use

RICHMOND PEERLESS WEDGE INSERTS

The Richmond Peerless Wedge Insert provides for quickly, accurately positioning shelf angles used to support ornamental stone, brick or metal facings on building walls.

This powerful insert is a malleable casting with a wedge-shaped holding face working in conjunction with a special askew head bolt. Tightening the nut holds the load at precisely the required elevation without the slightest chance of twisting or slippage.

Three holes are provided for nailing insert in position inside the form. Inserts may be placed along bottom of spandrels or in columns. Two sizes: for $\frac{5}{8}$ " or $\frac{3}{4}$ " Bolts from $1\frac{1}{2}$ " to 3" long.

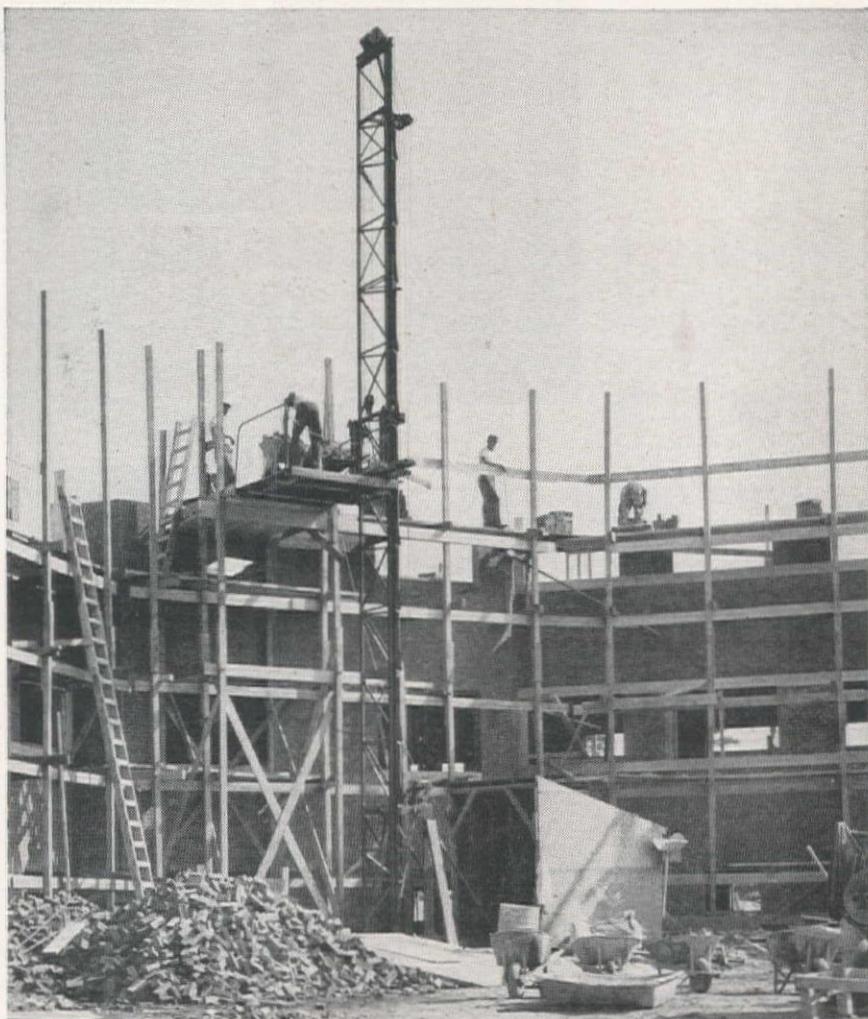
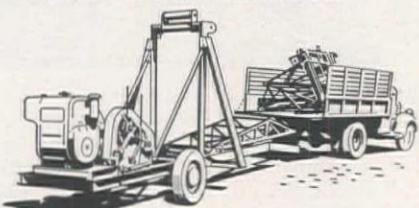


30 trips an hour

Two full concrete buggies up, two empties down, in two minutes? Absolutely—if you can wheel 'em on and off fast enough. And your American Portable Material Elevator will go at that speed as long as you need it.

This is one elevator that doesn't need a lot of tuning and tinkering to get it going. You take it off the truck at 8 a.m., assemble the tower on the ground, raise it by its own hoist power, and start moving material by 11 o'clock. Everything is perfectly aligned, smooth running, and safe.

The PME carries 2500 lb. loads, 90 feet per minute. Stands 46' to 96' high. Switches from big 6' x 6' platform to $\frac{1}{2}$ yard automatic-dumping concrete bucket in minutes. Other extras include swing boom attachment, safety device, and transport wheels. To rent or buy, see your American Hoist distributor.



Modernize...economize...with

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& Derrick Company
ST. PAUL 1, MINNESOTA

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COMPANY _____

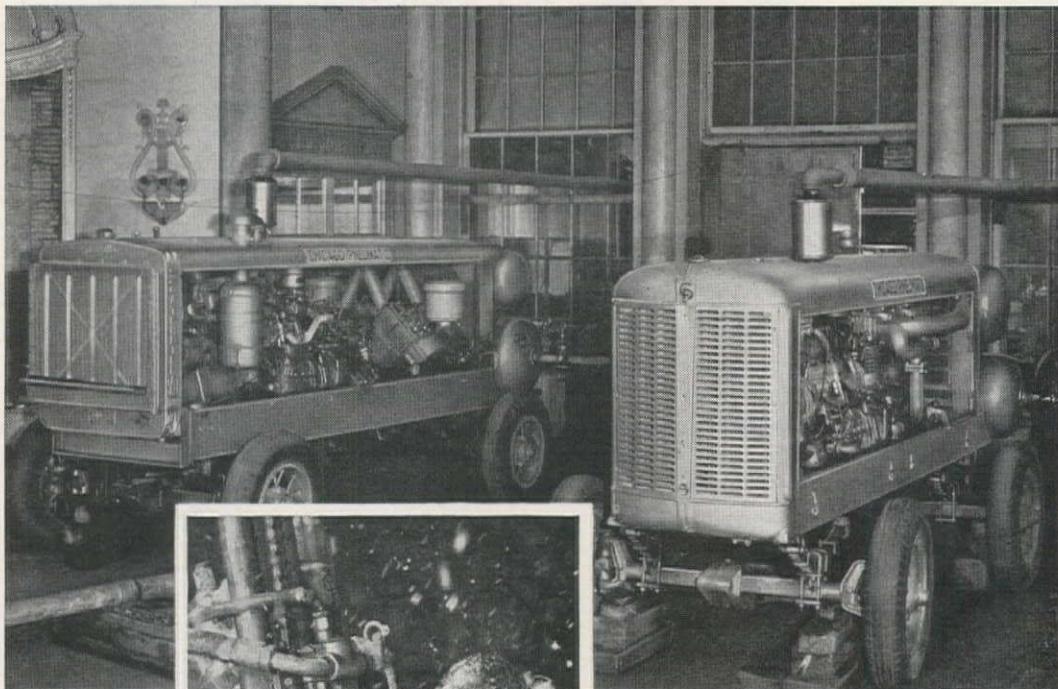
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FROM COAST TO COAST

on all types of jobs

The dining room of a famous hostelry may seem an odd place for compressors, but all air for the demolition work in the year-long job of razing the former Ritz-Carlton Hotel, of New York, was supplied by these two CP Diesel-driven PORTABLE COMPRESSORS, of 600 cfm and 315 cfm capacity.



CP reversible PNEUMATIC ROTARY WOOD BORERS are great time-savers on this coffer dam job. Furnished in 1", 2" and 4" sizes.



For fast drilling under any conditions, at any angle, the G-300 WAGON DRILL handles the heavier drifters, 4-inch cylinder bore—even in a northern blizzard.



Wherever concrete is being compacted—Hungry Horse Dam, in this instance—just the right vibrator for the job can be selected from the seven different models of CP PNEUMATIC and ELECTRIC VIBRATORS.

Write for detailed information



PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

SIX MORE SECO 83%ERS



***83% OF ALL SECO VIBRATING SCREENS
BUILT IN 1951 WERE PURCHASED BY
FIRMS OWNING ONE OR MORE SECO'S**

ISN'T THIS PROOF OF SECO ON-THE-JOB PERFORMANCE

While the six Seco vibrating screens in the above photo are just on their way out of the busy Seco factory, there's a *real performance story* behind them.

Every one of these screens are on their way to operators who already know from experience that these smooth operating Seco vibrating screens will give them years of dependable service. They know that Seco vibrating screens are virtually trouble-free through the years.

After all, it's performance that counts. That's why 83% of the hundreds of Seco vibrating screens built in 1951 went to join other Seco vibrating screens for operators who have had Seco's on their job for as many as fifteen years.

If you're planning to install vibrating screens in your plant for any screening job, from Ag-lime to rip-rap, you'll want to get the facts about Seco "Performance Proven" vibrating screens. Send for Catalog #203 today.

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TRUE CIRCULAR ACTION
VIBRATING SCREENS

Why Take Less Than Seco
"Performance Proven"
Dependability

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One of America's Leading Makers of
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HEAD LOSS CUT



...as much as 65% to 80%

BY

CHAPMAN

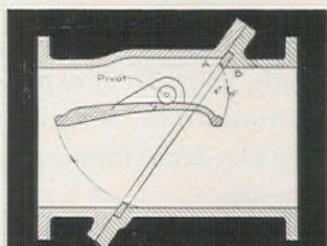
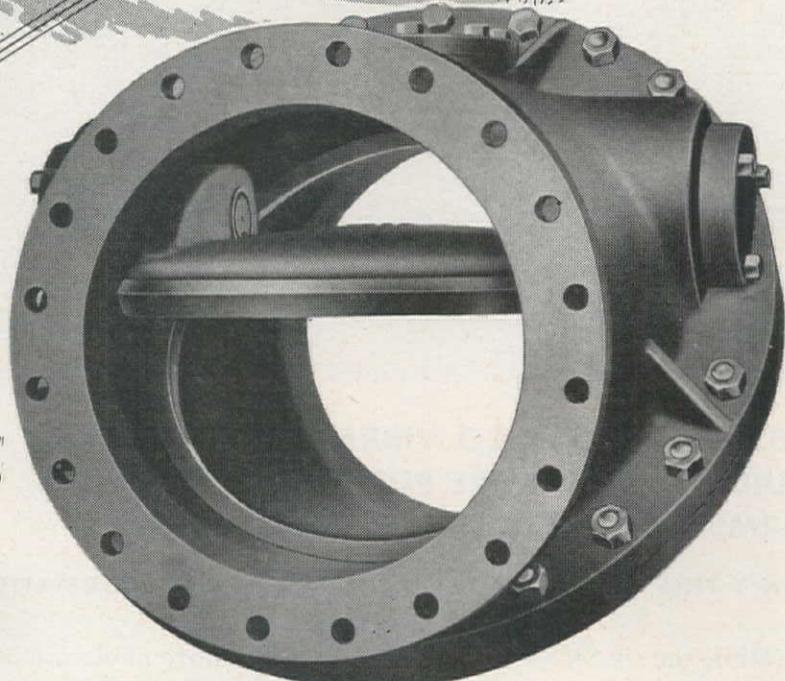
Tilting Disc CHECK VALVES

Typical test on a 22-inch Chapman Tilting Disc Check Valve under 450 pounds gas pressure . . . carrying 3,200,000 feet of gas per hour . . . showed a drop in pressure of less than 7 inches of water.

The average reduction of head loss . . . as against conventional check valves . . . is 65% to 80%.

That's because the balanced hinge-pinned disc, of special aerofoil design, has exceptional lifting qualities, lightness in unbalanced weight, and minimum resistance to flow in open position. And valve body is streamlined, with through-way always equal to the area of the pipe.

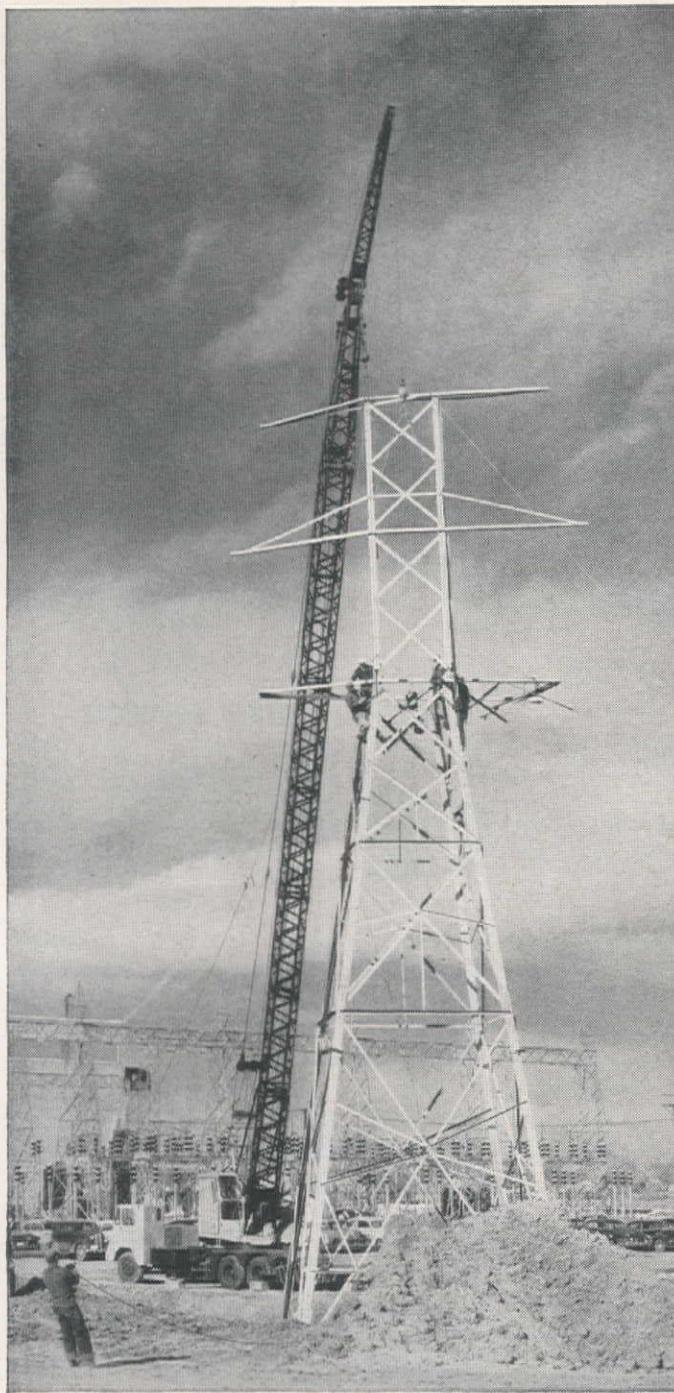
This means that *disc won't slam* under usual piping arrangements . . . and that it seats drop-tight. It means, too, that many new lines can be designed in smaller size. Send for Catalog No. 30, giving complete data and test-curves on Chapman Tilting Disc Check Valves.



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.

THE CHAPMAN VALVE MFG. CO.

INDIAN ORCHARD, MASSACHUSETTS



All lifts are
easier with a
CRANE MOBILE

**top section of a 90 foot
tower goes up quickly**

Maybe you won't be placing steel 90 feet up . . . or handling 25 ton loads . . . but somewhere between these extremes you will find that all lifts are easier with a CraneMobile. With it you have flexible performance to handle long booms for high reach or short booms for heavy lifts.

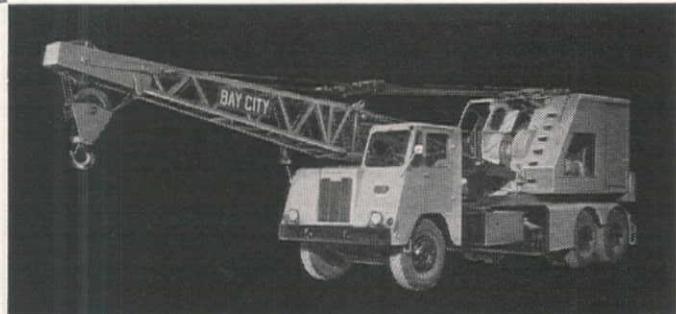
The CraneMobile is made in several sizes having crane ratings from 10 to 25 tons . . . will speed to scattered jobs . . . and is packed with refinements and operating advantages. Consider the independent worm boom hoist which raises or lowers boom by power only. Then there is the power load-lowering device for precision handling of heavy loads. And, in checking the many BAY CITY features don't overlook the hi-collapsible gantry which reduces overall height to 11' 9" or less when traveling. That's only part of the story. Why not get complete information from your nearest BAY CITY dealer or write today for the CraneMobile catalog.

BAY CITY SHOVELS, INC.
BAY CITY, MICHIGAN

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- ✓ Precision Power Load Lowering
- ✓ Hi-Collapsible Gantry
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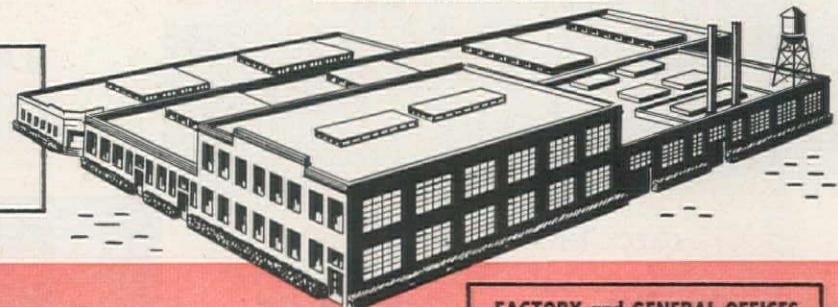
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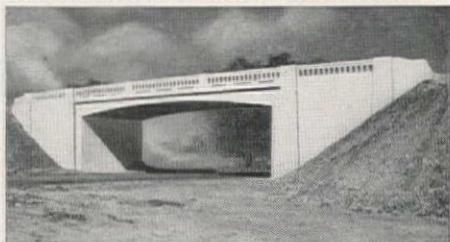
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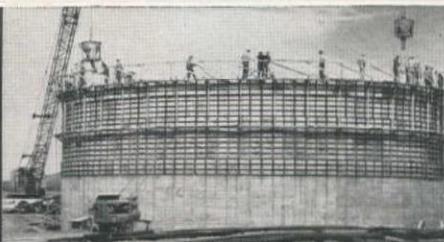
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2 FULL AUTOMATIC
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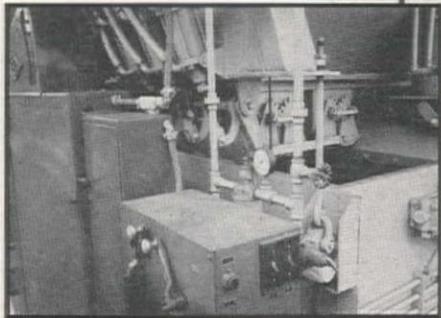
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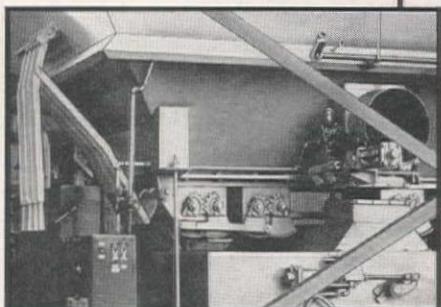
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For further details, wire, write or call NOBLE NOW.
Our engineers will gladly analyze your job and help
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View of double gates, air rams, control panel and indicator of NOBLE clamshell gate full automatic batcher.



NOBLE semi-automatic batcher also uses double clamshell gates, but manually operated.

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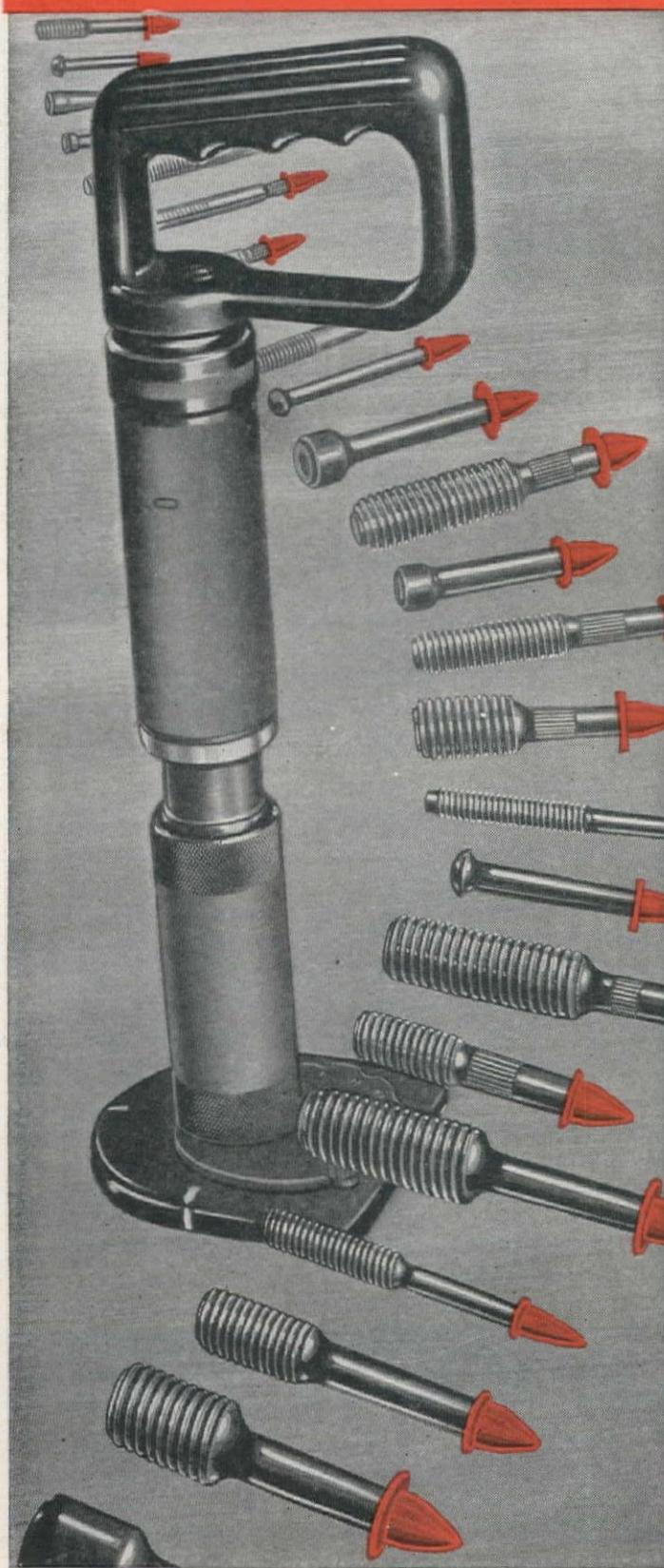
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"Red-Tip Pilot" Line, at reduced prices, leads the way to still greater economies in steel and concrete fastenings . . .

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You beat the time by 15 to 1 for most fastening jobs by using RAMSET SYSTEM instead of old-fashioned methods. If you are not already profiting from these time-saving, money-saving advantages, ask for demonstration. Our nationwide network of capable dealers provides fast, on-the-job service and suggestions. Take a moment now, to ask for details.

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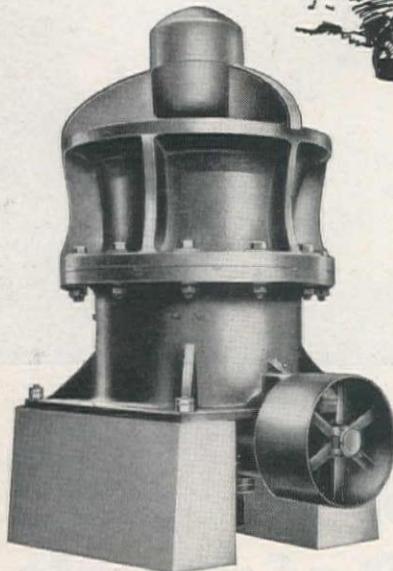


LOOK FOR
THE YELLOW TRIANGLE
ON THE REEL

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PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
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there's nothing new...

about producing aggregate on the job. In the 19th century, road builders regularly employed old men and boys to do this laborious work by hand.

The Traylor TY Reduction Crusher is an example of how experience contributes to building superior machinery. All the details are in Traylor Bulletin 6112.

Like the road builders of another day, modern contractors are finding it more economical and efficient to produce aggregate on the job. Traylor has been one of the main suppliers of rock crushing machinery for 50 years. In that time we have observed many revolutionary changes in aggregate production. And always, Traylor has been foremost in building the equipment to meet these changing conditions. It takes experience to build good rock crushing machinery. Traylor has experience . . . half a century of it.

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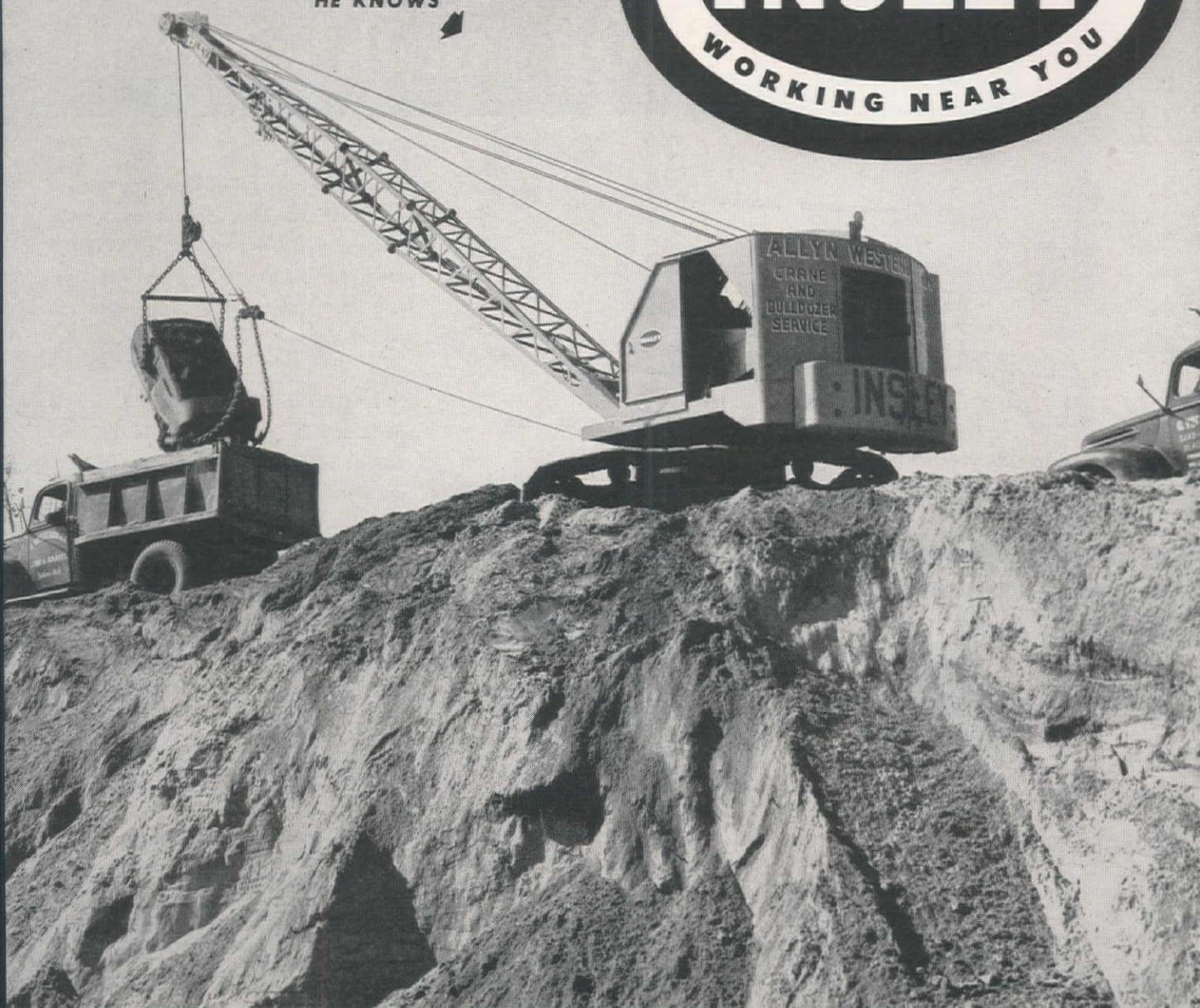
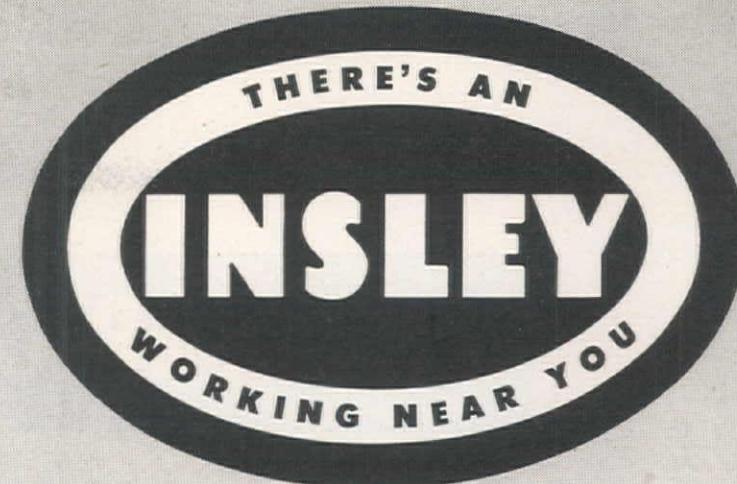
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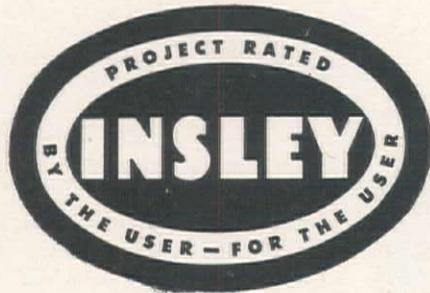
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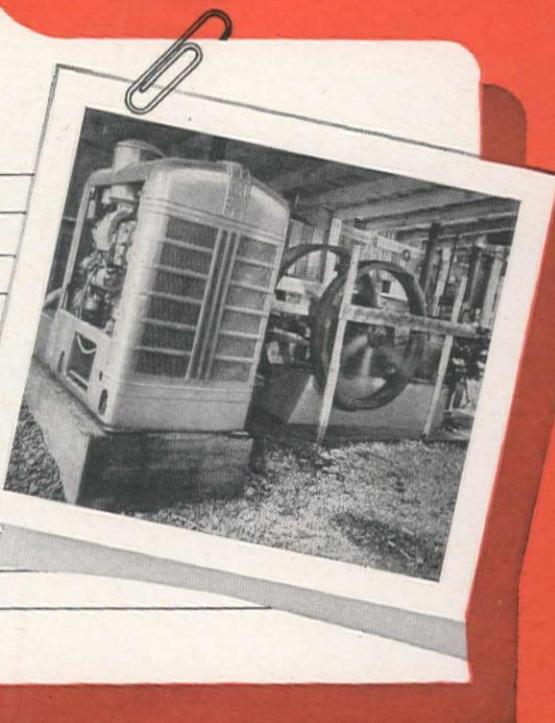
General Motors Diesel
Case History 5012-12

USER: United Feldspar Minerals Corp.

Spruce Pine, N. C.

INSTALLATION: 5-year-old GM 4-71 Diesel (used previously on sawmill) replaces steam engine on Ingersoll-Rand FR-1 compressor.

PERFORMANCE: Does as much work as 2 portable compressors with 4-cylinder gasoline engines and supplies more air. Maintains 100 lb. pressure for drilling. Cuts fuel costs 50%.



THIS DIESEL does the work of two engines

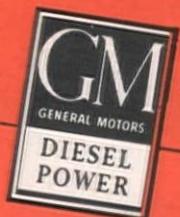
Cuts fuel costs 50%—Supplies more air

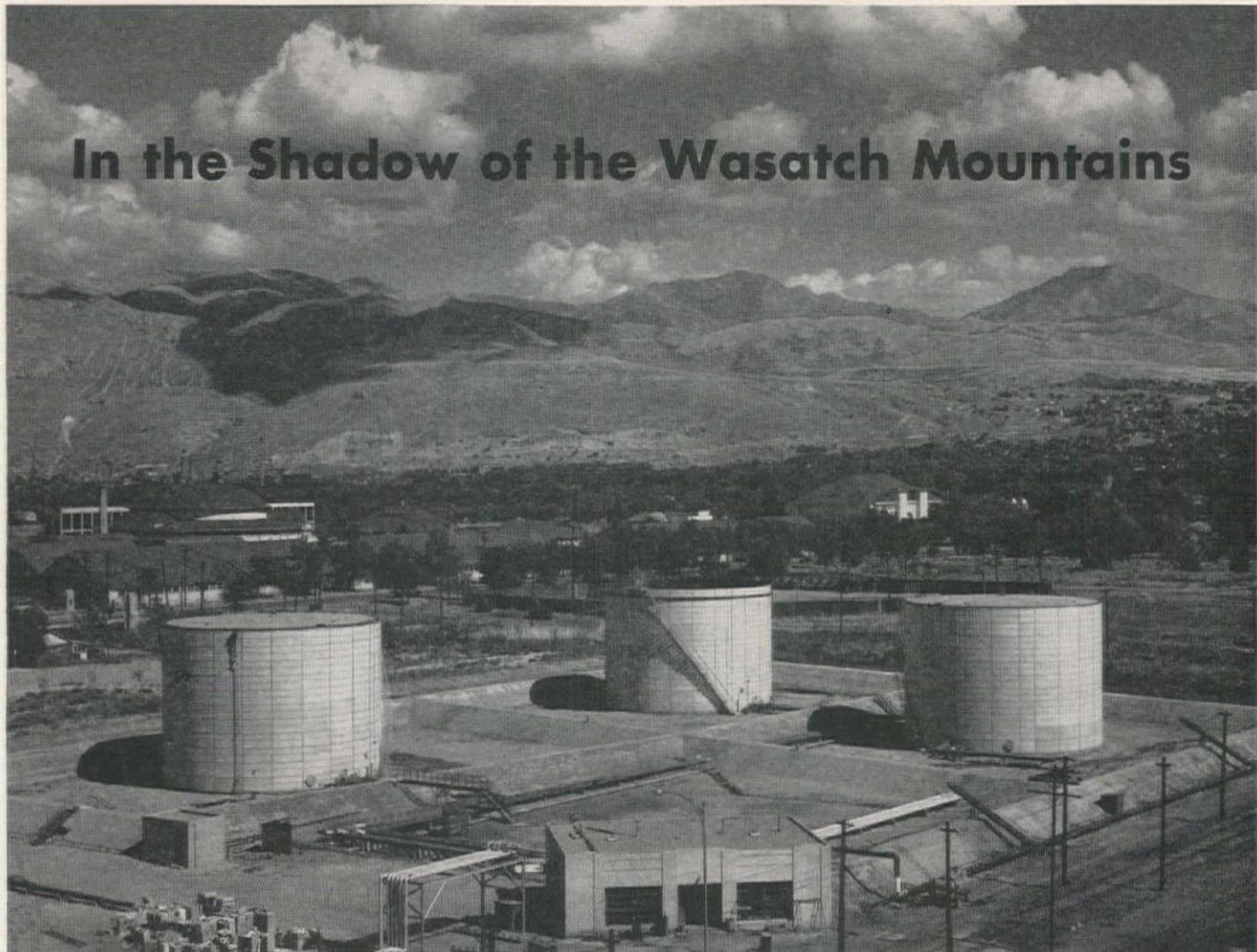
Here's another typical case of how General Motors Diesels take over any job—stick to it month after month—and do it better than either gasoline or steam. After four years on a sawmill—and with one minor overhaul—this 4-71 is now outperforming two 4-cylinder gasoline engines and cutting fuel costs in half. Whatever your need for power—in air compressors, trucks, trac-

tors, cranes or crushers—why not learn firsthand how much more profitably and dependably the GM 2-cycle Diesel can deliver it? There's a GM Diesel distributor in your vicinity who'll gladly give you all the facts.

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GENERAL MOTORS, DETROIT 28, MICHIGAN
SINGLE ENGINES...32 to 275 H.P. MULTIPLE UNITS...Up to 800 H.P.

It pays to Standardize on





In the Shadow of the Wasatch Mountains

Horton Tanks Store Fuel Oil and Pitch for Utah Power & Light Co.

Twin Horton 21,000-bbl. cone roof tanks and a 21,000-bbl. tank with a Horton Double-Deck Floating Roof have recently been installed at Salt Lake City for the Utah Power & Light Company. Bechtel Corp. was the contractor.

The cone roof tanks store pitch burned in boiler furnaces which actuates a steam generator to produce electrical power. Maximum consumption is 2400 bbls. per day. The tank equipped with the Horton Double-Deck Floating Roof stores No. 6 fuel oil. This fuel serves as a standby for the pitch.

Both the fuel oil and pitch are piped to these tanks from the Salt Lake Refining Company. The pitch is heated and circulated through connecting lines to the power plant. In the winter-time, the fuel oil is also heated. This made it desireable to install a Horton Floating Roof with bats of insulation in each pontoon to reduce the amount of heat that is dissipated during storage.

Insulation on the three tank shells consists of 2-in. asbestos bats supported by Nelson studs and covered by 3/16-in. transite sheets secured by steel bands.

These installations prove the adaptability of Horton tanks to many different types of services. Write for complete information.

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Detroit 26.....	Lafayette Building	Tulsa 3.....Hunt Building
Houston 2.....	C & I Life Building	Washington 6, D. C.....1103 Cafritz Building

WESTERN CONSTRUCTION

March 1952

Vol. 27, No. 3

JAMES I. BALLARD Editorial Director
JOHN J. TIMMER Managing Editor
RALPH WHITAKER, Jr. Assistant Editor

Competitive designs

Time and experience would be necessary to provide proper appraisal of the Corps of Engineers' proposal that contractors submit competing designs on defense building projects. Immediate reactions tend to be definitely prejudiced and based on personal factors rather than on sound analysis. Preliminary results are rather negative, but any idea as strange to established American engineering and construction practice would naturally require considerable trial and evolution. Opinions are inclined to consider the basic idea as either all good or all bad—no middle ground—and it is not that simple.

Experience on the part of the awarding officials must be developed to present a call for bids that will make proper comparison possible. It is not enough to ask for competitive designs on, say, a warehouse based only on ground dimensions, for such factors as first cost, annual upkeep, life expectancy, availability of materials and the speed of construction make the selection of the final design a matter of opinion and can end only in argument. On the other hand, the more detailed the official design, the more the tendency to defeat the purpose of the plan. Proper compromise between these two would provide enough detail to make plans properly comparable and still not cramp real ingenuity.

Finally, there must be open-mindedness on the part of the awarding authorities, and not a mere curiosity to see some unusual designs, with the mental reservation that the lowest bid submitted on the official design will be the one that gets the award. Such a tendency—and it has been apparent on at least one Western project—is not only unfair to contractors who have employed engineers to prepare competitive designs but also tends to nullify any possible advantages.

The economics of the general proposal can be, and are, argued violently. The contractor who is progressive and interested in trying new ideas may contend that with his job know-how, combined with his available equipment, he could turn out a structure at a distinct reduction in total cost for the project. The design engineer will say that if a well qualified engineer is selected and provided with proper information on the purpose of the structure and existing field conditions he will turn out the most suitable design without duplication in the cost of engineering effort.

The final answer is not simple. Any means of stimulating design ingenuity is proper, particularly during the present materials shortage. However, first efforts have not produced desired results, and further study is needed.

Foundation study on small jobs

Adequate foundation information for small jobs is a serious problem. On large projects the high total cost makes it relatively easy to allocate a sufficient amount for foundation exploration and study. As the size of the job gets progressively smaller, and particularly in the private building field, the problem increases as essential exploration begins to bulk large in comparison to total cost.

It is a well accepted axiom of civil engineering that adequate foundation information not only saves money in the design, but also assures closer bidding as a result of reduced risk. These produce a saving that will exceed the cost of the study. As a result it would appear logical for the owner contemplating such work to agree to additional cost for such an item. But, what if the engineer in charge requests permission to employ a soil specialist for an additional fee. The owner may take the position that the engineer was hired to answer these problems, and should not require the services of an expert. It is a distinct parallel to the general doctor who tells the patient that he would like to call in a specialist, and what patient balks at an extra charge that directly affects life or health. Engineering has arrived at that degree of specialization, but its acceptance by those who spend money for small private construction jobs has not kept up with this advance in building technique. There is ground for joint work on this problem to the mutual advantage of both engineers and contractors.

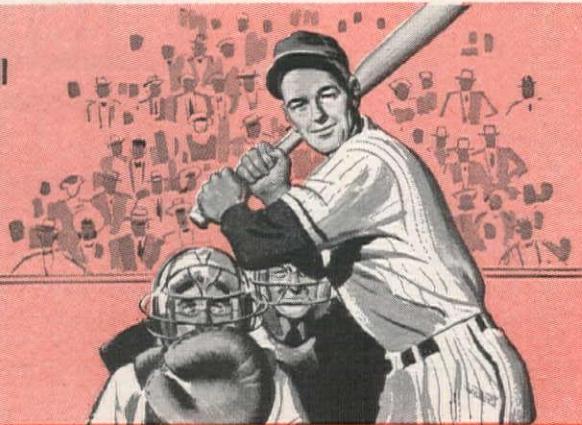
Equipment speeds an engineering cycle

Evolution of equipment has played a major part in the evolution of surfacing for highways in Oregon. In the changes described briefly by R. H. Baldock in this issue the initial adaptation of spreaders to hot mix, and the more recent development of portable paving plants have been essential. The cycle started with hot paving in 1914, switched to light-oil macadam for speed of construction and lower cost, and has more recently reversed. The rapid advance in the portable hot-mix plants with expanding output had cut costs to near the level of macadam, and this completed the cycle in a return to hot-plant mix which was the original surface type of 38 years ago. In this evolution there has been an interplay between the engineering advance in paving design and improvements made in equipment. The combination always results in construction progress.

WESTERN CONSTRUCTION was founded in January 1926 as *Western Construction News*. *Western Highway Builder*, founded in 1919, was consolidated with *Western Construction News* in April 1932 and subsequently became *Western Construction News and Highways Builder*, which title was later changed in April 1934 to *Western Construction News* and finally in July 1950 to *Western Construction*. All rights to the above titles are reserved.

Like Spring and Baseball

they Go Together



ALL-WHEEL DRIVE



and ALL-WHEEL STEER

CONTROLLED TRACTION—product of exclusive All-Wheel Drive and All-Wheel Steer—makes it easy for an A-W Power Grader to deepen ditches and widen roads. The powerful front drivers ride the shoulder; the rear drivers follow the ditch line, and a beautiful "job of work" is turned out. Yes, All-Wheel Drive and All-Wheel Steer *go together . . . work together* on every job. Why be satisfied with less in your next grader?

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MORE WATER for MORE PEOPLE... at Medford, Oregon

LIKE MOST TOWNS and cities in the West, Medford, Ore. has experienced a considerable increase in population during the past 10 years accompanied by a demand for more and more domestic water. Since 1940, the population served by the Medford water system has risen from 13,000 to 23,000 and the peak load from 7 mgd. to 12.5 mgd. This city has always been proud of its water supply, which originates from a series of mountain springs located about 22 mi. to the northeast. The spring water is soft, bacteriologically pure and has a constant temperature of 42 deg. summer and winter. No water treatment is necessary.

In 1948 it was apparent that the existing 11 mgd. capacity of the system must be increased. Growth studies showed that the population served could be expected to be 50,000 in the next 50 years, at which time the water demand would be 24 mgd., or 13 mgd. more than the existing capacity. Subsequent designs were all based on increasing the supply 13 mgd. or approximately 20 cfs.

Storage required

One of the problems to be overcome was the infringement on the water rights of others. The springs have a minimum flow of 45 cfs., but due to conflicting water rights the City of Medford's share is only 17 cfs. in a dry year. In order to satisfy other water rights it became necessary to store 7,500 ac. ft. of water which could be released in the summer months in exchange for spring water taken by Medford.

Preliminary estimates showed the cost to be around \$2,800,000 and in May, 1950 a 30 year bond issue for this amount was voted on and approved by the people of Medford.



The pipe line from the springs to Medford was designed for 20 cfs., with the flow by gravity, and a total head loss of 1,027 ft. in 30.5 mi. The route chosen is somewhat L-shaped due to an intervening mountain range. A tunnel route through this mountain was investigated and abandoned because of the high cost. Several pipe sizes ranging from 20 to 30



A population increase of 77% in ten years compels an enlargement of supply facilities including a 30.5-mi. steel pipe line and a storage reservoir provided by an earthfill dam — Water originates from springs

By

ROBERT
A. DUFF

Superintendent
and
Chief Engineer

and

ROBERT
L. LEE

Assistant
Superintendent
and Engineer
Water Commission
Medford, Oregon

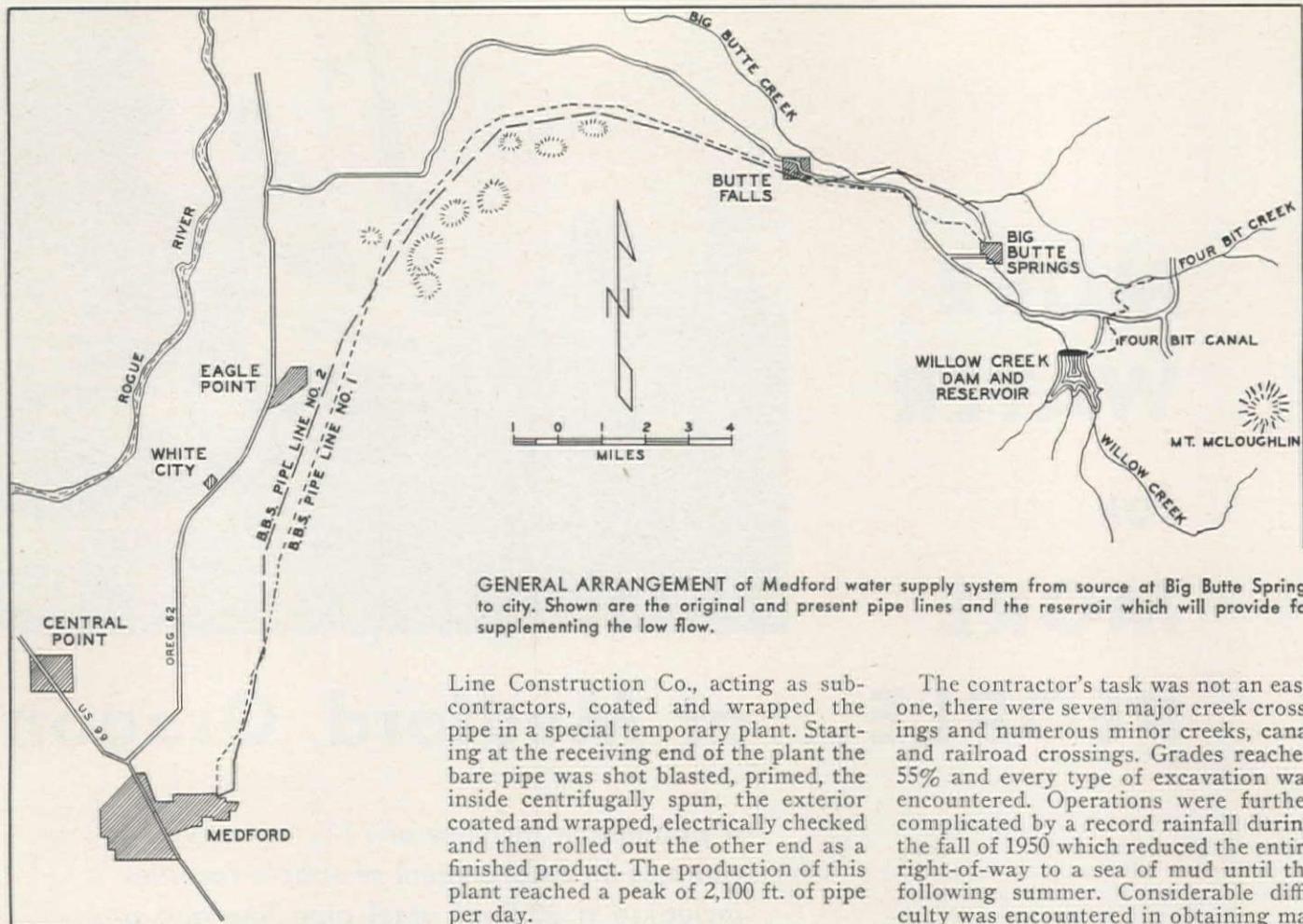
in. and in thickness from 3/16 to 5/16 in. were selected for the line. The first 17 mi. of the line runs through mountainous terrain and the pipe sizes were designed to carry the water from ridge to ridge. Operating head on the pipe ranges from 0 to 690 ft.

Pipe single-wrapped

Expected life of the line is 50 years, the steel pipe being protected from corrosion by coal tar enamel and asbestos felt applied according to A.W.W.A. Specifications. Original designs called for double wrapping the pipe through approximately 20 mi. of corrosive soil. This plan was later changed to single wrapped pipe, combined with the installation of cathodic protection at a considerable savings. The additional wrap on the pipe would have cost nearly \$75,000 initially, with an annual operating cost of about \$500 per year. Cathodic protection is to be accomplished by the operation of two 25-amp., 20-v. rectifiers located at the quarter points of the line.

Fabricating and coating pipe

The first contract was awarded to the Consolidated Western Steel Co. for fabrication and coating the pipe. The company elected to fabricate the pipe in its South San Francisco plant and ship it bare to Medford where the Pacific Pipe



GENERAL ARRANGEMENT of Medford water supply system from source at Big Butte Springs to city. Shown are the original and present pipe lines and the reservoir which will provide for supplementing the low flow.

Line Construction Co., acting as subcontractors, coated and wrapped the pipe in a special temporary plant. Starting at the receiving end of the plant the bare pipe was shot blasted, primed, the inside centrifugally spun, the exterior coated and wrapped, electrically checked and then rolled out the other end as a finished product. The production of this plant reached a peak of 2,100 ft. of pipe per day.

Contractors' problems

The installation contract was awarded to Morrison-Knudsen Co. late in the summer of 1950. This contract called for the construction of 19 mi. of road and 10 bridges in addition to laying the pipe, and installing valves and fittings. The 30, 24 and 22 in. sizes of pipe had bell-and-spigot ends and were joined by welding. The 20-in. pipe had plain ends and was joined with Dresser couplings. Some difficulty in coating the interior welded joints of the 22-in. pipe was anticipated, but subsequent operations proved that it can be done quite satisfactorily.

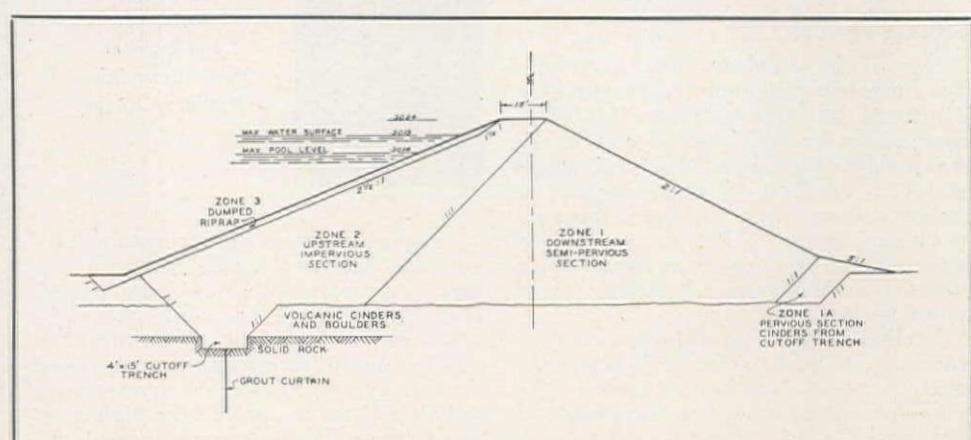
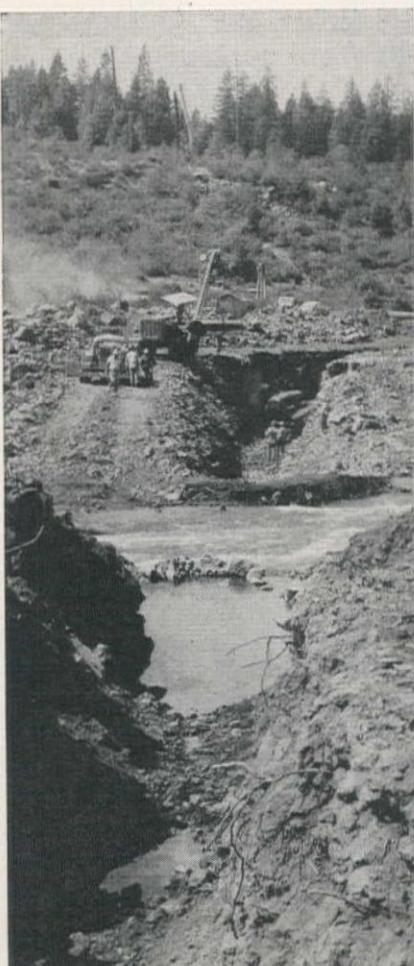
The contractor's task was not an easy one, there were seven major creek crossings and numerous minor creeks, canal and railroad crossings. Grades reached 55% and every type of excavation was encountered. Operations were further complicated by a record rainfall during the fall of 1950 which reduced the entire right-of-way to a sea of mud until the following summer. Considerable difficulty was encountered in obtaining material suitable for backfilling under and around the coal tar enamelled pipe. It was necessary to haul in earth free from rocks from borrow pits located along the right-of-way.

The entire length of the pipe line was electrically detected for damage to the coating inside and out before it was backfilled. Field welded joints and Dresser couplings were coated according to A.W.A. Specifications.

Harold L. Gourlie was project manager for Morrison-Knudsen Co. J. A. Hoffbuhr was field engineer for the Medford Water Commission and N. K. Senatoroff, Pasadena, Calif., is consult-

LEFT—Seven major creek crossings had to be made on the 30 mi. of line, including this intersection of Big Butte Creek.

BELOW—Maximum section of Willow Creek Dam, showing distribution of material and the 10-ft. layer of volcanic cinders over solid basalt rock.



ing engineer for the protective coating and cathodic protection installations.

Willow Creek Dam

The reservoir to provide the required stored water is located on Willow Creek about 3 mi. upstream from Big Butte Springs. Topographically, it is not a good reservoir site, but is the only practical site in the whole area. An earth fill dam 2,300 ft. in length, 54 ft. in height and containing about 682,000 cu. yd. of earth is required to store 7,500 ac. ft. of water. In dry years water must be brought in from Four Bit Creek to help fill the reservoir.

The reservoir area was originally a beaver marsh and it was necessary to drain it by blasting drainage ditches before extensive testing of the available earth could be accomplished. Test pits dug along the dam axis showed foundation rock to be about 10 ft. below ground surface. However, when diamond drilling was done, it was found that a 10-ft. layer of volcanic cinders and boulders overlaid the solid basalt rock. The whole general area is of recent volcanic origin, most of the lava flows and pumice coming from Mt. McLaughlin located about 5 mi. east of the reservoir.

The low specific gravity of the material in the borrow areas is caused generally by the pressure of pumice. Results of the tests on the available earth showed it to be excellent material for an earthfill dam and that a stable impervious

structure with an upstream slope of $2\frac{1}{2}$ to 1 and a downstream slope of 2 to 1 could be built.

Designed with two earth zones or sections (Zone 1 the downstream semi-pervious sections and Zone 2 the upstream impervious section) the dam actually has little difference in the materials, although the semi-pervious material does contain more rock fragments and gravel. Field classification can be made very easily by color, the Zone 1 material being grey or black and the Zone 2 material being quite red. The layer of cinders and boulders proved to be well compacted and no difficulty from settlement is anticipated. However, it was necessary to go on down through this layer and into the solid basalt to obtain an impervious cut-off. The cut-off trench will be backfilled with compacted Zone 2 material after the foundation is drilled and grouted.

Outlet works consists of a reinforced concrete intake tower, a 36-in. steel conduit encased in concrete and an outlet works at the downstream toe of the dam to control and measure the discharge of water from the reservoir.

Near the west end of the dam there is a lava extrusion creating a rock knoll which divides the structure into two parts. In addition to reducing the size and length of the dam, the blasting of a trench through this will provide a spillway for the reservoir. The rock removed will be used for rip-rap on the upstream face of the dam.

Contract for construction of the dam was let to the Fred H. Slate Co. in the summer of 1951. At present the construction is about 25% completed with completion anticipated for about November 1952. The specifications contemplated drainage and drying of the borrow areas; however, it was found that by breaking up the material with a rooter and disc optimum moisture could be secured with no great difficulty. The problem is to time operations so that the material is placed on the dam just before optimum moisture is reached. If the timing is not just right, it becomes necessary to wet the material on the fill.

Elton Slate is project superintendent for the Fred H. Slate Co. Wilbur Warren is field engineer for the Medford Water Commission. Hydes Forbes, Palo Alto, Calif. is consulting geologist and A. Kempkey, San Francisco, Calif. is consulting engineer on the project.

Four Bit Creek Canal

Preliminary design for the Four Bit Creek Canal has been started. This canal, with a capacity of 60 cfs., will bring the winter and spring run-off water to the Willow Creek Reservoir. Preliminary investigations indicate that it must be a lined canal since the area through which it passes is composed of volcanic soil and cinders and very porous. Present plans call for the construction of this canal during the summer of 1952.

UP plans big line change in Wyoming

PLANS for the biggest line change on Union Pacific since the driving of the Golden Spike 82 years ago were outlined at the railroad's headquarters in Omaha last month.

The new line, 42 mi. in length, will be constructed between Cheyenne and Dale Creek in southeastern Wyoming. Grading on the \$16,000,000 project is beginning immediately with completion expected by the close of 1952.

The new line will run to the south of Union Pacific's double main line track west out of Cheyenne over 8,014-ft. Sherman Hill, highest point on U.P. The new track will carry westbound traffic; the present line will continue to be used by eastbound trains.

Purpose of the new route is to eliminate the heavy upward pull out of Cheyenne to the summit of Sherman Hill. The present westbound track has a maximum grade of 1.55% as against a maximum grade of 0.82% for the proposed line.

The reduction of the 1.55% grade will eliminate the last grade between Omaha and Ogden which is in excess of the ruling grade of 0.82%, will increase the utilization of locomotive power and will effect a considerable economy in the railroad operations.

Although the proposed westbound

route is 9 mi. longer than the existing line, the train running time will be up to 15 min. less because of the reduced grade.

Contract for the grading on the new line has been awarded to the Morri-

son-Knudsen Co., Inc. of Boise, Idaho. Union Pacific workers will construct the track and install signal and communication lines.

Highlight of the project will be the construction of two 150-ft. high fills.

PROFILE (top) shows that reduction in grade along 42-mi. route more than offsets additional mileage traversed by the new line (plan at bottom).

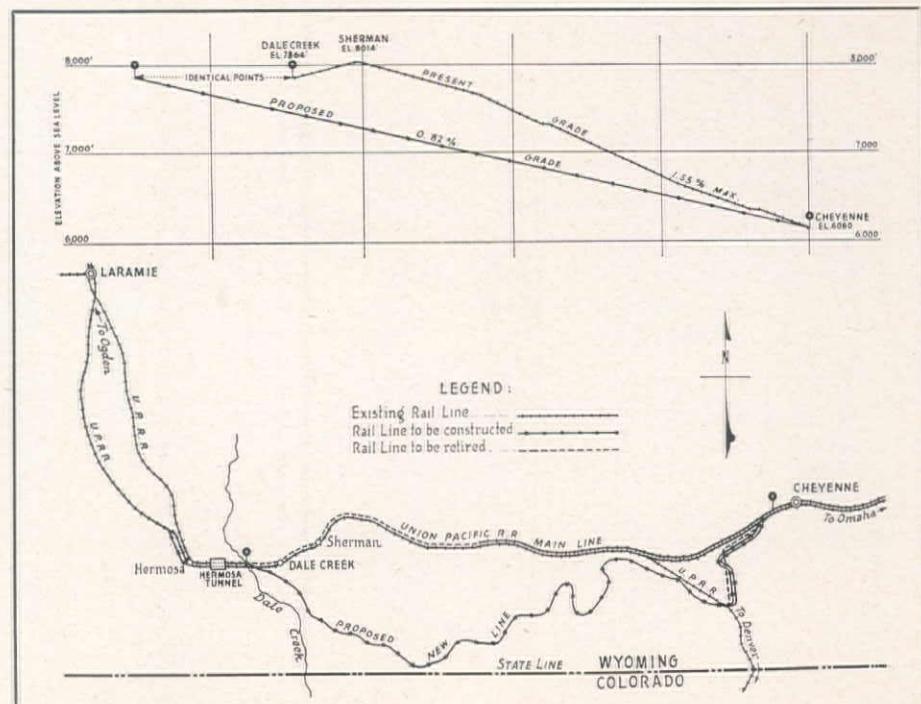


Figure 1

THE CONSTRUCTION COST DOLLAR

NORMAL ECONOMIC CONDITIONS

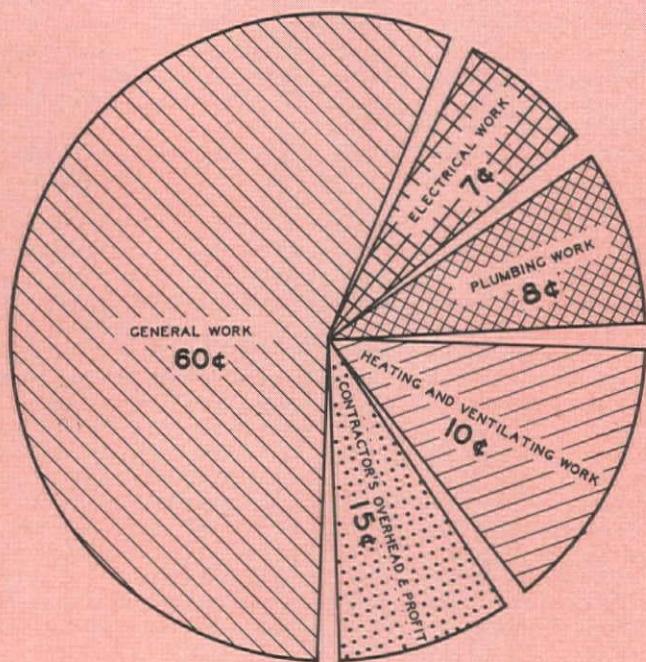
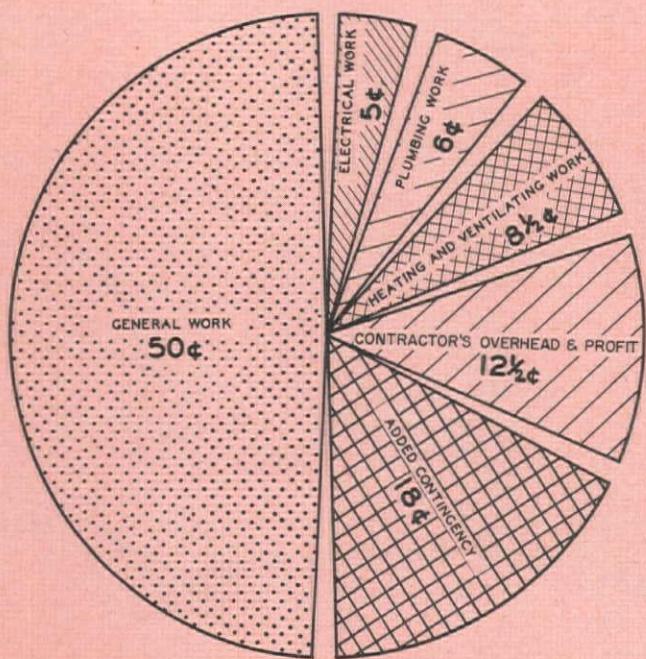


Figure 2

THE CONSTRUCTION COST DOLLAR

ABNORMAL ECONOMIC CONDITIONS



BUILDING

Where do we go

Cost data, based on definable items like labor and materials, show uniform trends; but bids have fluctuated since Korea as contractors include a variable "added contingency" in the building cost dollar

CONSTRUCTION MEN have realized for many years that hindsight is better than foresight. The logic in this adage is certainly realized when reviews are made of building construction costs incurred by the State Division of Architecture in California. The year 1951 revealed that "conditions of the times" have substantially altered the form of any prognostication in building cost trends.

California embarked during the post-World War II years on the largest building construction program in the state's history. Now, with this program not fully completed, we wonder what the year 1952 will bring with respect to building costs. Probably the most fervent desire of men who deal with these costs would be to have available the services of a genie. But in this modern age the best that can be hoped for is a utilization of historical facts and their proper application to answer the question, "Where do we go from here?"

Reason for cost analysis

The State Division of Architecture has the full responsibility for design and construction of all state buildings, including office buildings, prisons, mental hospitals, colleges, agricultural exhibit buildings, armories, agricultural inspection stations, etc. The Division must necessarily supply cost information to other state agencies in order that these agencies may obtain construction funds by legislative appropriation. Thus, background material and other data become the yardstick by which building costs are developed.

In setting forth project cost data for 1951, it is interesting to note the several factors which prompted sharp rises over costs of similar projects in the preceding year. The year 1951 witnessed and felt the full impact of the Korean war. The controlled materials plans of NPA came into full swing. Material shortages, particularly acute shortages of steel, copper and aluminum, upset construction timetables and thereby impaired productivity. This general condition introduced

COSTS

from here?

By WALTER F. DREYER, JR.

Supervising Estimator of
Building Construction

and
ALEX P. STEINFELD
Associate Estimator of
Building Construction
Division of Architecture
State of California



DREYER

STEINFELD

new costs that are intangible and thereby upset normal cost considerations. These intangibles, or "invisible costs," due to lower productivity, unpredictable materials delivery, gray and black markets, etc.—all make for an unstable bidding market and have no doubt been instrumental in increasing bid prices received by the Division of Architecture.

Added costs creep into bids

The pronounced switch in types of construction, from ordinary private to public defense and industrial work, has resulted in a geographical dislocation of potential labor supply markets. Recruiting of job labor for one area from other areas where labor is available has become a decided factor in job costs. The reintegration of this new labor into smooth construction crews has required higher supervisory costs, all of which is reflected in higher bid prices.

In several instances the Division has used almost identical drawings and construction for institutions having a significant difference only of location. Proximity to metropolitan or critical defense areas has produced definite "pattern" characteristics. The pattern has in some cases been detrimental to economical construction in that mobilization cost-rise influences are reflected in high unit building costs. Thus, in calculating or estimating trends, it becomes very difficult from our yardstick to analyze future needs accurately in relation to current costs. The question naturally

Figure 3

INDEX COSTS VERSUS BID COSTS

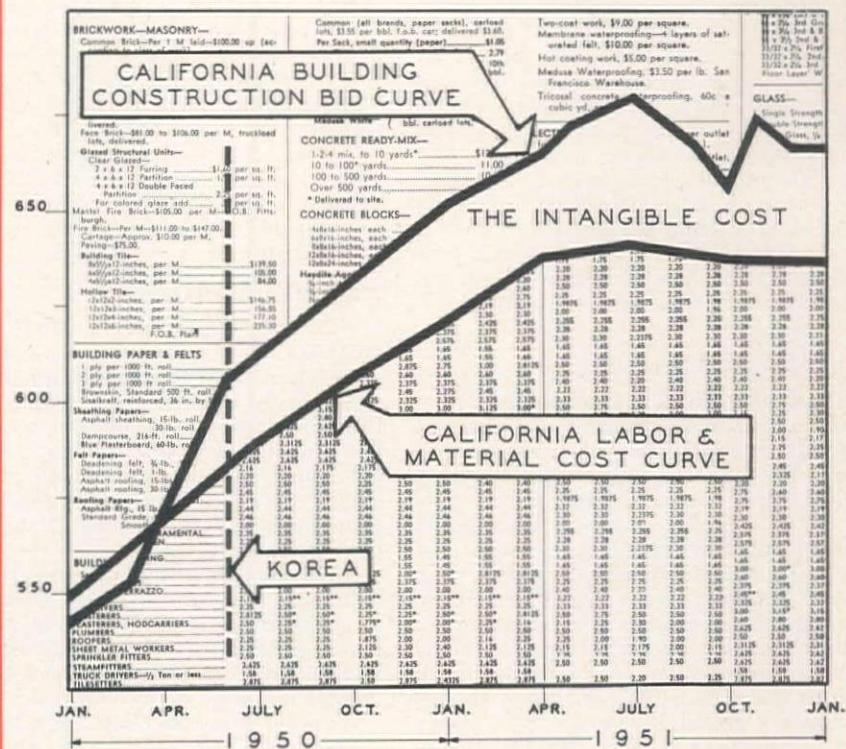
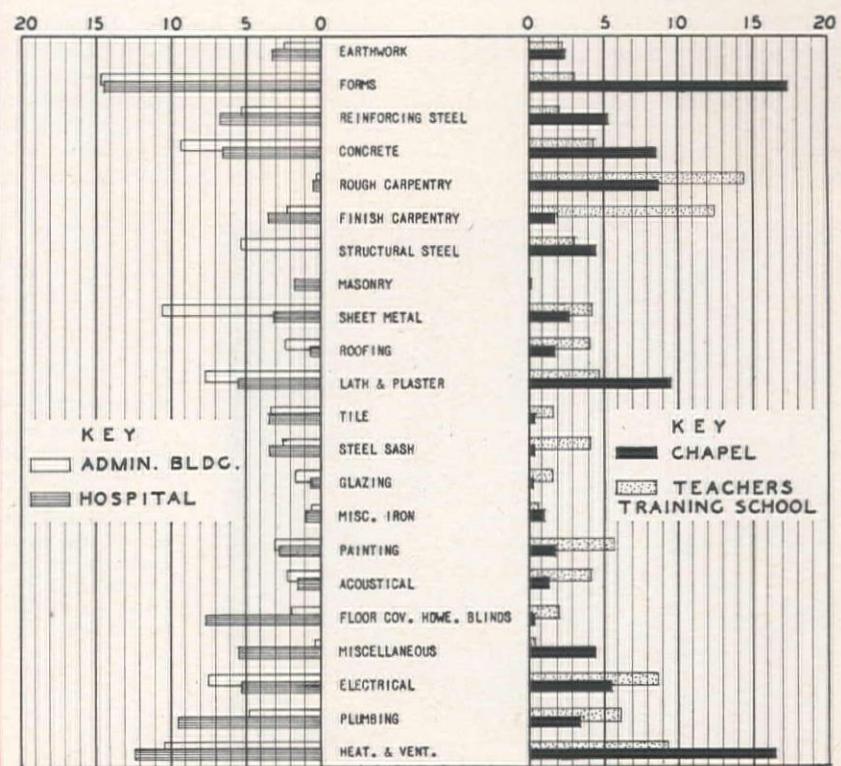


Figure 4

PERCENTAGE BREAKDOWN OF CONSTRUCTION COSTS



follows, then, "What is happening to our construction dollar?"

We venture the opinion that the layman, not being familiar with construction cost transitions, is prone to consider building costs in terms of pre-War or pre-Korea levels. Significantly, however, our cost studies reflect startling upward spirals, something which in all probability has no rational explanation. Now, informed of these currently high cost levels, but assuming normal changes henceforth, the layman again would predict future costs at lower levels. His assumptions would be reflected in an apportionment of the building construction cost dollar as shown in Fig. 1. As can be seen from the illustration, costs are in fact well distributed in fair proportions; they are in line with normal practices under normal industry conditions.

The pie cuts differently now

Now note Fig. 2, an analogous apportionment made for a time of abnormal economic conditions. The same dollar buys less general, electrical, plumbing, and heating and ventilating work. This is to be expected because all affected trades suffer from the same uncertainties of such abnormal conditions. The usual industry mark-up, interestingly enough, also becomes less valuable. We might suspect that this item alone is subject to challenge, the first thought being that abnormal conditions should prompt a greater diversion to it. However, it must be realized that the ills as-

sociated with abnormal times require the setting aside and earmarking of special funds for added contingencies. This "insurance" against any eventuality is utilized, and in good stead.

A more enlightening demonstration of this ill-defined trend in evaluation of contingencies is shown in Fig. 3. The State of California, using a cost index developed from prevailing labor and materials prices, has projected a curve that rises fairly uniformly over a two-year span. A portion of this curve is shown in the figure, followed by a "point of stress." At this point, indicative of a severe curtailment in construction resulting from ceilings and controls, the rise in index disappears and apparent stability in cost is evidenced.

Bids reflect uncertainty

From the upper curve, which is calculated on the basis of actual bids received (and they normally bear a definite relationship to costs), one can see that the uniform rise and subsequent apparent plateau of costs is misleading. In particular, the plateau is supplanted by abrupt rises, brief constant periods, and even sharp reversals in bid prices. The obvious conclusion is that intangible costs are represented by the area between the two curves. These intangibles are sometimes ominous in magnitude and at other times of small significance. Woe to the estimator who tries to predict them.

An interesting and revealing analysis is indicated also in a study of charts

representing the costs of component parts of several dissimilar structures. Figs. 3 and 4 are in themselves self-explanatory and serve to illustrate in more detail the contents of Figs. 1 and 2. The intangible costs, profits, overhead, contingencies, etc., are included in each of the component items, indicated as percentages of the whole.

We in California expect some critical times in the coming year insofar as costs are concerned. Defense and all its ramifications mean manpower problems for the construction industry. California, essentially a critical defense area, expects to feel the pinch to the extent that competitive bidding for labor results in an upward trend in costs.

Conversely, rigid and more drastic controls on materials will tend to "dry up" the potential total civilian construction, thereby leading to spirited and competitive bidding for the remaining jobs. This, weighed against the upward spiral in labor alone and the gray market in material, might act as a leveling influence. The intangible added contingency in building construction could, in part, disappear.

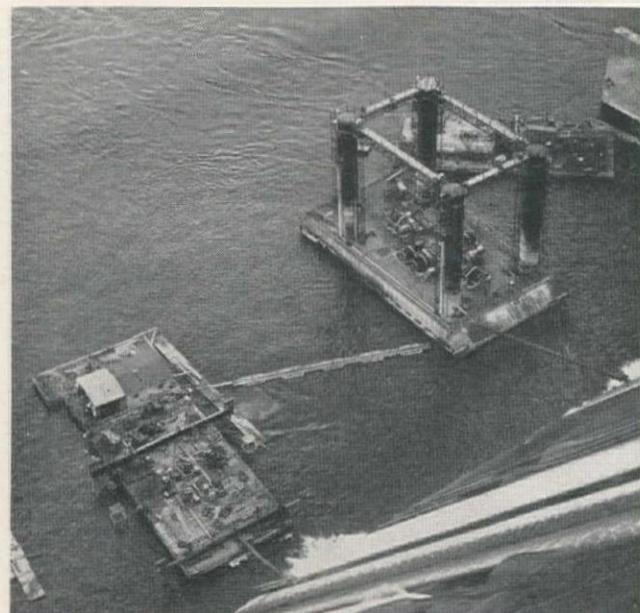
Costs are on the "up and up"

Generally speaking, however, we feel that a fairly uniform and well pronounced over-all rise is in the offing. With the advent of 1952 and 1953, the bar graphs may well be entirely different. Our hope is that construction and the buying public can absorb the impact as it develops.

Spillway bucket repairs at Coulee Dam completed two years ahead of schedule

SPILLWAY BUCKET repairs at Coulee Dam, Washington, are being completed nearly two years ahead of schedule by Pacific Bridge Co., and the major item of equipment used in the work, a specially designed floating caisson, has been laid up in drydock until needed in

the distant future. Pacific Bridge Co. has held two contracts for repair work on the dam spillway, utilizing in its operations both this unique caisson and other special equipment designed by the Bureau of Reclamation. Conduct of the recent work and a description of this



FLOATING CAISSON (right) being accurately positioned over spillway bucket. Four towers provided access for men, materials and air. Contour of the bucket was duplicated by the shape of the caisson. Seat frame is sunk into position at left.

equipment appeared in *Western Construction* for August 1951, pages 69-71.

For work 70 ft. below surface

Proposed by John L. Savage, the designer of Coulee Dam, the floating caisson was built to fit the curved surface of the spillway bucket and give access at atmospheric pressure for work 70 ft. below tailwater surface. Displacing 1,300 tons, the caisson measures 50 x 135 ft. and is fitted with four steel towers 7½ ft. in diameter that extend above the water surface at all times. Through these towers men and materials are transported to the work scene and furnished air and power.

Good for half a century

Carrying sand, gravel, and even boulders, spillway eddies had eroded the concrete bucket surface as much as 8 ft. before the rehabilitation program got under way in 1949. After removal of the riverbed material by dredging, the repair contracts covered work in 18 of the 33 spillway blocks. Generally, the eroded concrete was chipped and cleaned, then fitted with new reinforcing steel and rebuilt with new concrete. Eleven settings of the floating caisson were made in the course of three low-water work seasons. Seven blocks were repaired using other equipment and methods. Engineers of the Bureau of Reclamation estimate that no further repair to the spillway bucket concrete should be necessary for 50 years.



For the biggest concrete bridge in California—

Three arches to span 780 feet

A center arch of 319-ft. span is flanked by spans of 230 ft. to carry a 6-lane freeway over the Arroyo Seco about a mile from Pasadena's famous Rose Bowl — Guy F. Atkinson Co. carrying out \$3,389,650 contract

THE COLORADO FREEWAY bridge, under construction over the Arroyo Seco about a mile downstream from Pasadena's famed Rose Bowl, will be in many ways a notable structure. It will take over the functions of carrying through traffic on a busy boulevard, relegating an old landmark—the Colorado Street bridge—to a place of minor importance. It will have the distinction not only of being the largest concrete bridge so far built by the California Division of Highways, but also of representing the largest dollar value—\$3,389,650—in any single contract so far awarded in the Division's vast program of highway and bridge construction. Background planning, general design features and construction preliminaries are reviewed in this article.

Layout and plan

The old bridge, long inadequate for the traffic on this busy artery, is a narrow structure providing one lane in each direction. Built in 1913, it consists of nine concrete arch spans with a concrete viaduct approach at either end, the entire structure having a length of about 1,260 ft. In the new scheme of things, this old bridge will extend a frontage road lying south of the freeway on the westerly end of the project into outlets at Grand Ave. and Green St. on the easterly end. Connection of the main business section of Colorado St. to the freeway will be made by an overpass and on- and off-ramps, also at the easterly

end of the project. The new bridge will have a 6-lane divided roadway, and will flare to greatly increased width to accommodate the Colorado St. ramps entering from the east.

Design studies

The freeway bridge design was the result of extensive study, it being necessary to produce an economical and functional bridge structure, and also one in harmony both with its surroundings and with architectural features of the existing bridge. Although the old bridge had great beauty of line and form, its details were much too ornate for present-day construction. A simpler and less expensive type was chosen, with sufficient features of contrast and of similarity to produce a harmonious result.

The final design for the new bridge provides for three arch spans—a central span of 319 ft. flanked by spans of 230 ft. Numbering from the west abutment, these are spans 6, 7 and 8 of the structure. Spans 1 through 5 on the west and 9 through 11 on the east approaches are all of box girder type. Box girder longitudinal deck members are also used in

the arch spans; though selected primarily on the basis of design requirements, they provide a similarity in deck construction that will aid in securing the desired architectural harmony. Approach spans average about 70 ft. in length, and the total length of the bridge is 1,364 ft.

Among the many factors which complicated the design problem was the widening, or flare, for the easterly ramps. While the width at the west abutment is 94 ft., at the east abutment it is about 171 ft. The bridge is built on a grade of about 1% and all arches are unsymmetrical. The westerly position of the bridge is laid out on a curve of 2,000-ft. radius, which extends easterly beyond the first of the three arch spans. These conditions, with increased rib width and deck load in wider easterly spans aggravated the inequalities in column loads.

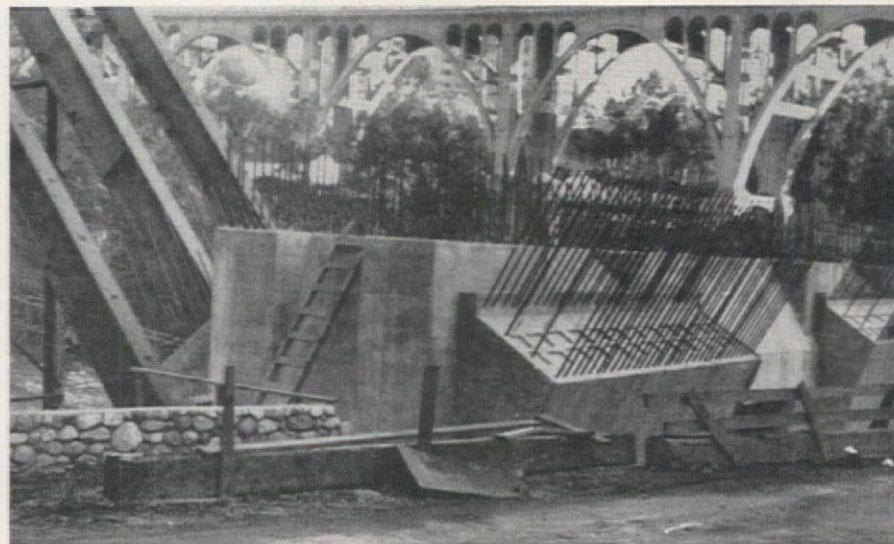
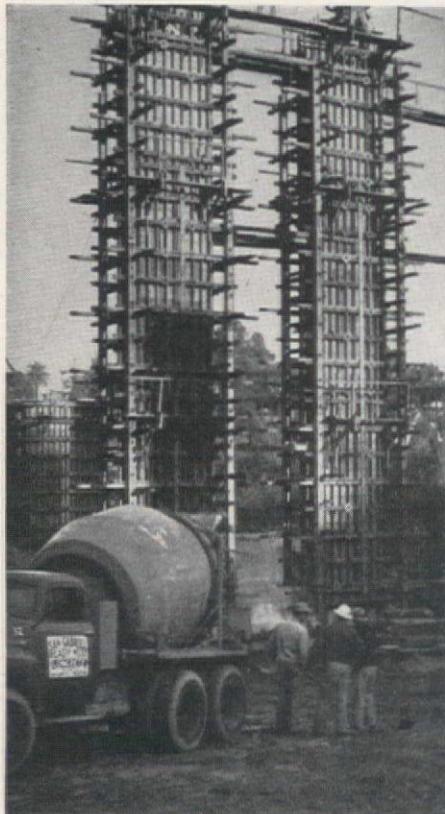
Arch spans

Since the arch spans hold major interest as features of the project, they will be described more fully. Foundations consist of heavy dual concrete pier bases with footings founded on rock. Northwesterly and southerly blocks of each pier foundation are connected by heavy tie beams. Dimensions of the blocks are variable, but the largest, dual bases for pier 8, will extend 58 ft. above the pier footing. The four shafts for each pair of base blocks rise from the pier bases to deck soffit elevation. Pier 8 has the highest shafts—88 ft.—and the shaft section is 10 ft. 6 in. wide by 3 ft. 8 in. thick. These shafts, or wide columns, are flexible as compared with the solid piers. They have the advantage of allowing temperature movement without developing critical stresses and also of permitting construction without the provision of expansion devices.

The design adopted provides for two wide ribs in each arch span, with a cantilevered deck. In general, the width of the ribs is 24 ft., increasing to 32 ft. in

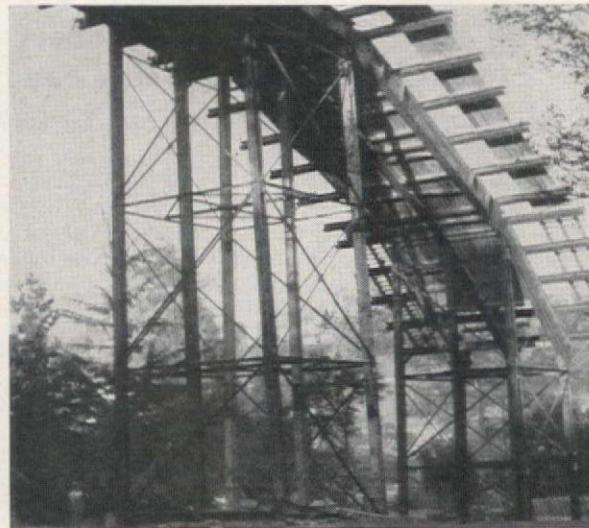
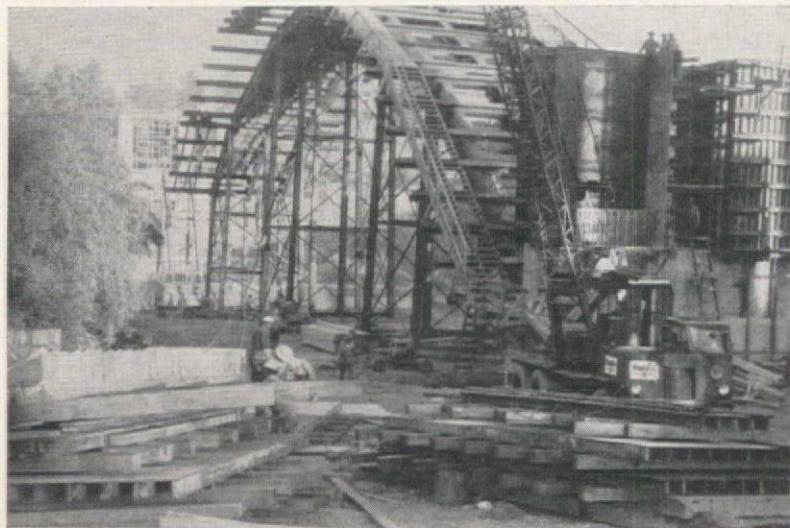
VIEW AT TOP OF PAGE—

Steel centering erection under way (foreground) for one of the 230-ft. side spans on the new bridge. The six-lane structure will take through traffic from the old bridge in the background.



LEFT—Columns for approach spans are about 7 x 3 ft. in section. These columns carry box girders of about 70-ft. average spans. ABOVE—Base blocks for arches are dual concrete piers. They are connected by heavy tie beams to the blocks for the parallel arch. Continuous pours of more than 1,000 cu. yd. of concrete in less than 24 hr. featured work on these blocks. Note arch centering rising at left.

BETWEEN (two views): Arch supporting system for each side span rests on three structural steel towers made up of six columns. These towers will carry a steel girder and joist system supporting the plywood form for the soffit of the rib.



the flared easterly portion. Ribs have crown thicknesses of $2\frac{1}{2}$ ft. to 3 ft. and skew-back thicknesses varying from 4 ft. 3 in. to 5 ft. 4 in. In the design, a time-saving procedure employed was a grid system for computation of quarter-points for axes of different crown positions and rise ratios, and interpolation to determine an axis conforming to the dead load force polygon.

As noted, variables complicated the design problem. No two springing points are at the same elevation, and the flaring deck width causes a variation, not only in width of rib, but also in space between ribs and in length of outer cantilever.

The deck structure is carried on the pier shafts and a series of wide, slim columns which rise from the ribs to the deck soffit. The long arch of span 7 will have 52 such spandrel columns, while spans 6 and 8 each require 40 of them.

They vary from very short columns near the crown to heights as great as 62 ft.

Approaches to the arch spans are carried on bents of two types. Bents 10 and 11 on the easterly end have five columns each, 7 ft. wide and 3 ft. thick, built on separate footings. Bents of the westerly approach spans each have four similar columns rising from continuous base walls and footings.

The main wall of the east abutment is about 30 ft. high and 178 ft. wide, varying in thickness up to 3 ft. 8 in. and carried on a wide footing which rests on rock. A smaller abutment will be built at the westerly end of the structure.

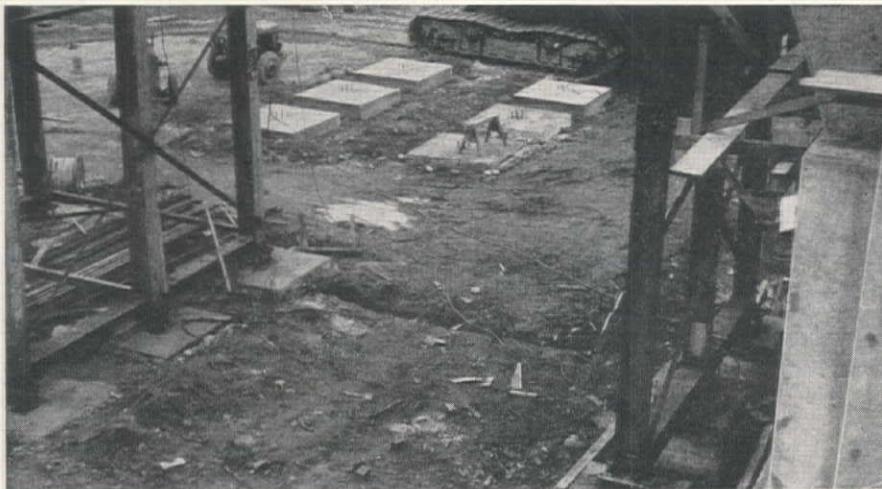
Work done—through '51

At year's end, construction was completed or well advanced on most of the substructure except the westerly abutment and adjacent bents. The box girder

deck of spans 10 and 11 at the easterly end, involving more simple shoring of moderate height, will be completed early to utilize it as a working platform.

With a major portion of the substructure concrete already placed (12,000 cu. yd.), the total project volume of 39,000 cu. yd. has been substantially reduced. These operations have had interesting features. In the building of the piers in the arch portion of the bridge, a record has been set by the placement of as much as 1,010 cu. yd. of concrete in less than 24 hr. on two occasions. These are the largest single continuous pours ever made in Southern California in structural work of the Division of Highways.

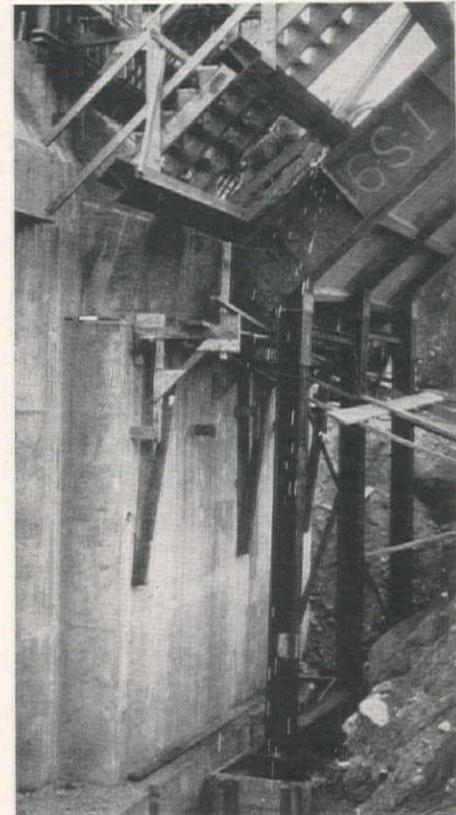
Conditions at the site so restricted space for operations that the contractor purchased land adjoining the right-of-way for construction yard use. Also it was found necessary to establish an off-



ABOVE—In background, six temporary piers to support the steel tower when it is moved laterally after the pouring of the first arch.

RIGHT—Steel ribs for arch centering at the connection with the base block where arch width is 24 ft., and thickness is about 5 ft.

BELOW—Tower columns for steel supports rest on temporary foundations and are designed for lowering after arch is poured so centering can be skidded or rolled sideways to second arch.



site concrete plant, so the contractor's own batching plant was set up at the yard of San Gabriel Valley Ready-Mix Concrete Co. The latter company operates the plant and furnishes the necessary fleet of truck-mixers. The Noble batching plant used has a rated capacity of 100 cu. yd. per hr., and operating conditions permitted an output of about 60 cu. yd. per hr. On the day of the record pour, the fleet consisted of three 6-yd. and four 4-yd. units. The haul distance is about $2\frac{1}{2}$ mi.

In the substructure work, concrete was placed at consistencies represented by 2-in. slump for heavy sections and up to $3\frac{1}{2}$ -in. slump for thinner sections, suitable for consolidation by vibration. Much of the concrete was placed from considerable height of form, commonly using buckets handled by crane. Tremies of steel sections or of rubber were employed. In a heavy pier base, as many as eleven tremies were used to facilitate even distribution in layers over a large area.

Arch form structures

The most interesting and unusual feature of the work involves the preparations under way for supporting and forming the arch ribs. Steel structures are being erected for each of the north halves of the three arch spans. Each of the two shorter spans will have three towers, while the longer central span will have four. Of the ten towers, the highest will rise 110 ft. above the arroyo bottom. These towers will carry a girder and joist system. The final contact form surface for the rib soffits will be of $\frac{5}{8}$ -in. plywood.

The contractor's plan is to utilize each complete arch rib form assembly for two concreting operations. Each of the three assemblies is being set for first use in a manner designed to provide for striking and moving laterally without dismantling, from the completed north portion into position for building the south portion. In order to do this, each of the six columns in each tower rests on four "jacks" embedded in concrete pad supports. This will permit adjustment of form elevations and also lowering of the forms for lateral movement after the concrete has gained sufficient strength. Moving will be accomplished by skidding or rolling the assembly on concrete

grade beams installed for the purpose.

First concreting of arch ribs will probably take place this month, flood conditions having set back the original schedule. At a later date, form striking—lowering on the jacks—and the operation of moving the form assemblies will perhaps be the most striking feature of the work.

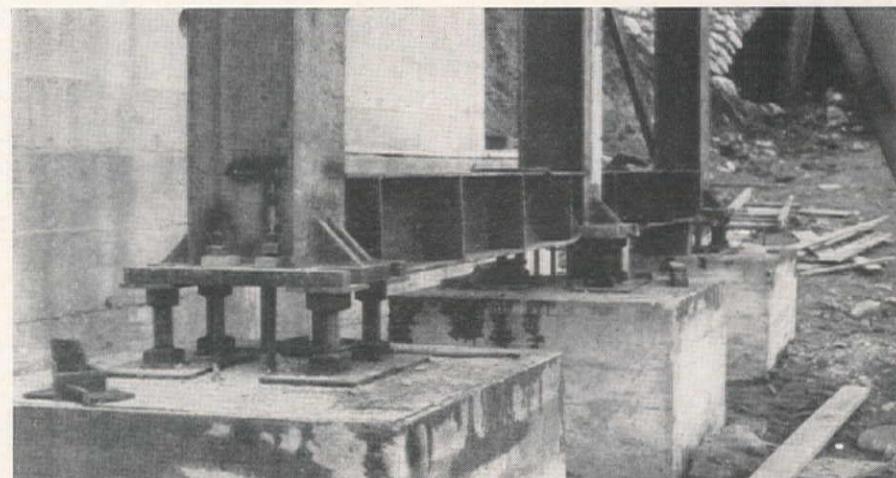
The three pairs of arch ribs will have a total concrete volume of about 6,000 cu. yd., so that the average placement for each use of a form assembly will involve a little more or less than 1,000 cu. yd. The placing of concrete in each arch form will be limited to three pours.

Following the construction of the arch ribs, there will be additional features of interest. The forming and placing of the spandrel columns and the deck structure are no small job and offer problems in economical construction procedure. A variety of work remains—overpass, ramps, west abutment and piers, approach decks and incidental construction—to complete this important and complicated concrete construction project.

Personnel

Chief personnel charged with construction of the Colorado Freeway bridge are Frank B. Cressey, Assistant District Engineer; resident engineers H. R. Lendecke and Louis Steele for the Bridge Department and Division of Highways, respectively; and J. W. Green, southern representative of the bridge department. F. W. Panhorst is state bridge engineer.

Project manager for the contractor, Guy F. Atkinson Co., is Bob Boyd. Project engineer is Brick Marsh. Construction superintendent is Paul Paulson. D. E. Root is vice president and district manager of Guy F. Atkinson Co. The work is scheduled for completion about June 30, 1953.



Why Oregon is changing from macadam to plant-mix

BECAUSE OREGON was recognized for years as a leader in the building of macadam highways in both the elements of design and construction, the fairly recent trend to plant-mix surfacing appeared worthy of explanation. R. H. Baldoock, who is the West's outstanding authority on asphaltic highway work, was requested to review briefly this transition. This short article is of more than passing significance since it points to an increasing trend which is important to highway and street engineers, contractors and suppliers of equipment.—Editor.

By
R. H. BALDOOCK
State Highway
Engineer
of Oregon



which time 532 mi. of asphaltic concrete were placed.

The plants of that day were rather small and put out from 100 to 300 tons of hot mix per day. The mixture was spread between wood headers which were installed by hand labor, and the black stuff was raked in place by hand. The amount of hand labor used in the placing of asphaltic concrete pavement made it relatively expensive and limited the mileage of this type of pavement materially.

When I was division engineer, located at La Grande, and in charge of the eastern portion of the state, the need for some intermediate-type pavement, affording an all-weather, dustless surface, was evident, and as a result experiments were conducted in that division in the building of light oil macadams, which culminated in a very successful practice. The experiments began in 1923 and were completed in 1925.

Macadam gave service and economy

With the increase in traffic, need was evident that a still further intermediary type be developed between the rather cheap light oils and the rather expensive pavements. I then made rather extensive trips over various parts of the United States and found that very high-type penetration macadams were being built in Massachusetts and Rhode Island. These pavements were rather expensive because of hand methods, all the rock being spread and placed by hand. We developed in Oregon machine methods of spreading the rock with stone spreaders and graders, and evolved a quite economical type of penetration macadam which has given excellent service.

Based upon the experience of adapting

the machine methods to penetration macadam, the state highway department tried at various times to spread hot mix by machine, but inasmuch as the asphalt used in those days was a 50-60 penetration, the mixture was so stiff that it was rather difficult to do so. Finally, an adaptation was made on one of the rock spreaders which performed a successful job in 1929. This experiment caused a great deal of interest and from that (and, very probably, other experiments) the modern pavers were devised.

In the meantime, a change was made to use 90-100 penetration asphalt in the hot mix, a softer asphalt which permits the spreading of the material by motor graders. We use this method extensively in patching jobs.

Better plants lower costs

The elimination of the wood headers, the use of the pavement spreaders, and the development of large plants with more efficient driers and better screens materially increased the plant production and speeded up street operations so that a modern paving plant can now place from 1,000 to 1,500 tons a day in comparison to the 100 to 300 tons of thirty years ago. Thus the cost of asphaltic concrete pavements is relatively less than during early years and relatively more comparable with the cost of oils and bituminous macadams.

In strength, asphaltic concrete is and always has been superior to the oils and bituminous macadams. On roads not subjected to too heavy concentrations of heavy truck traffic, the oils and bituminous macadams have rendered and are still rendering acceptable service. It has been proved, however, that for highways carrying large numbers of the larger and heavier trucks, the greater strength and permanence of plant-mixed asphaltic concrete are needed, and are worth the greater cost.

Greater strengths needed

With the rapid increase in traffic, particularly heavy traffic, that has taken place during recent years, more and more roads and highways have moved into the category requiring surfacing of greater strengths than those afforded by the oils and bituminous macadams. This fact, together with the lowered cost of asphaltic concrete, has been the cause of the Oregon State Highway Department's swingback to hot-mix pavement as the predominating type in the surfacing being constructed on main highways in the State of Oregon today.

Street opening rules under fire at Great Falls

A SET OF RULES and regulations controlling how street openings can be made and replaced at Great Falls, Mont., has been attacked by the Great Falls Contractors Association and the Great Falls Master Plumbers Association. The regulations were placed in effect last November by the city commission after recommendation by the commission's street committee.

In a letter to the council, the two contractors' organizations stated that they would not follow the new regulations, but would continue to observe two previous city ordinances, based on the reasoning that the regulations presented "some proclamation of lesser dignity" and that the two ordinances cover adequately the opening and replacement of public ways.

Field tests at Pine Flat Dam determine effect of—

Sand grading for lean concrete

By S. D. BURKS

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Tests in 1,000,000 cu. yd. of 2-bag interior mass concrete determine optimum fine aggregate grading — Heat control and structural quality found suitable by Corps of Engineers; mixing and placing found satisfactory to economy-minded contractor — Data used to establish specs for similar lean mixes at Folsom Dam

BECAUSE OF THE MASSIVE dimensions of Pine Flat Dam—it is approximately 350 ft. thick at the base—the problem of controlling the heat within the structure resulting from chemical hydration of the cement becomes a major one. Unless the temperature behavior of the dam is such that excessively high interior concrete temperatures do not occur, later cooling of the mass to its ultimate stable temperature may develop highly undesirable tensile stresses not contemplated in the design. For the extraordinarily lean concrete used at Pine Flat to avoid such high temperatures, control of structural quality lies largely in the aggregate grading. This article, the third in *Western Construction* to report in detail on various aspects of Pine Flat construction, describes field tests undertaken to determine the effects of sand grading on the character of 2- to 2½-bag interior mass concrete. The data gathered have been used to establish specifications for fine aggregates in similar lean mixes to be used at Folsom Dam.

Pine Flat Dam is a concrete gravity structure located on the Kings River above Piedra, about 35 mi. east of Fresno, California. When completed in 1953, this Corps of Engineers project will contain 2,400,00 cu. yd. of mass concrete and will be about 440 ft. high.

One of the several measures which pre-construction studies indicated would be of benefit in limiting interior concrete temperatures was the design and placement of a mass concrete of minimum cement content. Basically, this meant that such interior concrete should contain only enough cement to (1) permit economical and satisfactory placement with conventional concreting equipment; (2) yield the desired properties of durability, impermeability, and strength commensurate with a structure of this type situated in a relatively mild climate; and (3) produce a mass concrete of sufficient unit weight to allow the design of an economical section.

Laboratory tests

Extensive investigations conducted prior to the start of construction at the Corps of Engineers testing laboratories at Jackson, Miss., and Sausalito, Calif., indicated that—with the proper selec-



INTERIOR MASS CONCRETE at Pine Flat, a 2-bag mix, looks like this when discharged from 8-yd. dual compartment controlled-dump bucket.

AFTER VIBRATION, the 2-bag concrete looks like this. It is so dry that workmen can stand on it without sinking in.



tion and control of fine aggregate and the right amount of entrained air—coble rock mixtures with only 2 bags of cement per cu. yd. of concrete would possess the properties listed in the foregoing paragraph. These laboratory investigations also disclosed two other features which were later confirmed by on-the-job experience. These were (1) the ratio of sand to total aggregate should be about 0.18 to 0.20 for optimum plastic qualities and minimum water-cement ratio, and (2) the permissible variation in the gradation and fineness modulus of fine aggregate must be rigidly controlled to insure the manufacture and placement of a satisfactory mass concrete. In recognition of these two factors, project specifications for fine aggregate included a stipulation that the fineness modulus of sand should not vary more than 0.10 (plus or minus) from the average fineness modulus of the previous 30-day period, and should not be less than 2.20 or more than 2.70. These specifications also required that the sand be graded as shown in Table I.

Job experience

Large-scale placement of mass concrete began in the base of the dam during the first stage diversion in January 1951. Concreting operations had actually started 2 months prior to that date but high water floods in November and December 1950 had caused considerable delay. A detailed description of the processing plant with which the contractor responded to the requirements of the specifications has been related in a recent article in *Western Construction* (September 1951, pp. 71-75).

For the first several weeks of concreting, the mass interior mixture contained 3 bags of cement per cu. yd. Although this cement content was more than desired from the standpoint of temperature control, it was recognized by project personnel that it would be overly optimistic to attempt the 2-bag concrete until most of the operational "bugs" had been corrected in all plants. During this shake-down period, the major improvements to mechanical operation of plant included (1) development of proper charging sequence of the four 4-yd. mixers; (2) suitable control of aggregate handling to minimize variations in moisture content, and (3) refinements in the operation of the sand plant to the extent that the requirements of the specifications for sand gradation could be improved upon.

This shake-down period also served to demonstrate quite clearly the absolute necessity for material control—particularly of gradation and moisture content—which had been indicated by laboratory tests. This was true even for the 3-bag mix. Accordingly, there was no effort made to reduce the cement content until the major deficiencies—common to all newly erected plants—were fairly well eliminated. After these major deficiencies were corrected, there followed a period of gradual reduction of cement content that went hand in hand with further refinements in material production and control, concrete mixing, and placement. The result of these ef-

TABLE I
Project Specifications for Fine Aggregate at Pine Flat Dam

U. S. Sieve Series

Passing	Retained	Minimum	Designed	Maximum
	No. 4	0	0	5
No. 4	No. 8	5	8	15
No. 8	No. 16	10	14	20
No. 16	No. 30	20	25	30
No. 30	No. 50	20	28	30
No. 50	No. 100	12	17	22
No. 100	No. 200	3	5	7
No. 200	Pan	1	3	5

forts—supplied mainly through the exceptional cooperation of the contractor—was the adoption of the 2-bag interior concrete in the late spring of 1951. In considering the approach of the hot summer months and their influence on concrete temperature control, it was particularly gratifying to achieve this goal.

Influence of sand gradation

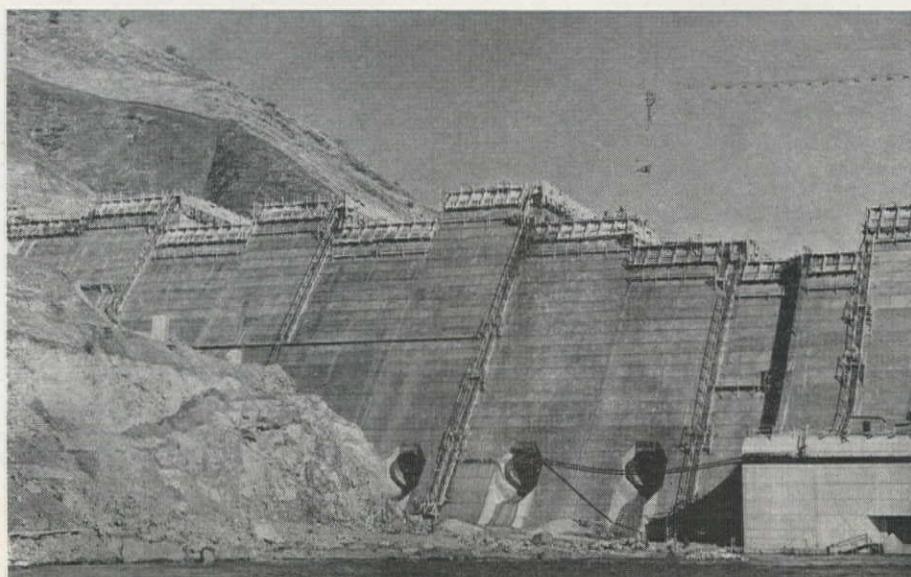
Concurrently with the placement of the 2- and 2½-bag concrete at Pine Flat Dam, plans and specifications were being drafted for Folsom Dam, on the American River near Sacramento, Calif. Inasmuch as it was intended to pattern the concrete temperature control for the latter project along the same lines as Pine Flat (which would include the low cement content), it was considered desirable to investigate the possibility of improving the qualities of the lean interior concrete through a beneficial change in sand gradation. Since the aggregates for both projects are natural sands and gravels and have a similar particle shape, it was decided to conduct large-scale field trials at Pine Flat to observe the effects of radical changes in gradation. The following paragraphs (1) briefly describe the modifications which were made to existing aggregate facilities to produce the changes in sand grading, (2) list the various combinations of sand gradings and cement content which were studied, (3) relate the field effect of the different sand gradings on the mass mixes, and (4) summarize the conclusions which were indicated by the experiments.

In the processing of concrete aggregates at Pine Flat Dam, finished aggregates are stockpiled approximately $\frac{1}{2}$ mi. downstream from the axis of the dam. Sand and rough-proportioned gravels are drawn from these stockpiles onto a conveyor belt which carries them to the storage bins situated in the top of the batching-mixing plant. The sand is directed by chute into storage, and the rough-proportioned gravels are classified into conventional sizes by vibrating screens equipped with rinsing sprays.

In order to produce a sand gradation with a greater percentage of minus No. 100 fines than the regular project sand, a supply of very fine blending sand was stockpiled adjacent to the lower end of the main reclaim belt leading to the mixing plant. A 12-cu. yd. hopper was placed over the belt in a fashion so as to discharge directly onto the belt. An air-activated paddle wheel in the bottom of the hopper insured an even discharge of blending sand. By trial and error runs, the gate settings on the blending sand hopper and underneath the main stockpile of project sand were calibrated so as to produce the desired finished blend. During the operation, the hopper was maintained full by charging with a small truck loader from the blending sand stockpile.

The blending sand discharged direct on the belt carrying the regular sand and then passed through several belt transfer stations before being deposited in the sand storage bin over the mixing plant. Tests indicated that the mixing resulting from these transfer points was sufficient to result in complete blending.

PROGRESS AT PINE FLAT. In January 1952, with 1,000,000 cu. yd. in place,



The foregoing method for adding the blending sand was quite satisfactory from the standpoint of permitting considerable latitude in producing synthetic blends of sand in amounts commensurate with routine concrete production. The method did not interfere with or disrupt the contractor's operation at any time.

Sand grading

Table II shows the gradation of the regular project sand, the fine blending sand, and the two synthetic blends produced by adding 10% and 15% respectively, of the blending sand to the project sand.

At the time these field trials were conducted, the regular interior mass concrete mix being placed in the dam contained 2 1/4 bags of type II cement per cu. yd. In order to broaden the scope of the tests, it was considered worth while to observe the effect of sand gradation on that cement content and also on 2- and 2 1/2-bag concrete. The basic design data for the three mixes are shown in Table III.

TABLE II
Grading of Project Sand and Blends Tested at Pine Flat Dam

Sieve size	Project sand	Blending sand	10% blend	15% blend
No. 4	1.9	0.0	1.7	1.6
No. 4 - No. 8	9.4	0.3	8.5	8.0
No. 8 - No. 16	12.0	0.6	10.9	10.3
No. 16 - No. 30	23.3	2.1	21.2	20.2
No. 30 - No. 50	29.8	11.2	27.9	27.0
No. 50 - No. 100	16.8	39.3	19.0	20.2
No. 100 - No. 200	5.2	30.7	7.8	9.0
No. 200 - Pan	1.6	15.8	3.0	3.7
Fineness modulus		2.53	0.72	2.35
				2.26

ing sand of different fineness moduli. The capacity of the blending hopper and the size of stockpiled blending sand were sufficient to permit sustained concrete operations on any one combination of cement factor and sand grading, thereby permitting ample time to observe the behavior of that mix combination until the inspecting party agreed to a change to the next mix combination. Because it required about 2 hr. to clean out the aggregate system completely when changing from one sand grading to another, it was necessary to begin a run of one sand fineness modulus and then vary the cement factor on that run until observations and tests were completed. It would have been more effective to maintain a constant cement content and vary the fineness modulus, but such an operation would have consumed too much time cleaning out the sand storage bin to be sure that there was no carry-over from one sand grading to the next. In the record runs, approximately 2 hr. of concrete operations were devoted to each mix, or about 350 cu. yd. During the course of these record runs, seven mix combinations were observed. In the order that they were placed in the dam, these were:

Project sand, C/F 2.25 bags/cu. yd.
Project sand, C/F 2.50 bags/cu. yd.
Project sand, C/F 2.00 bags/cu. yd.
10% blend, C/F 2.25 bags/cu. yd.
10% blend, C/F 2.00 bags/cu. yd.
15% blend, C/F 2.25 bags/cu. yd.
15% blend, C/F 2.00 bags/cu. yd.

In evaluating the effect of sand grad-

ation on any cement-factor mix, individuals in the inspecting party observed and noted the following features: water demand, plasticity and cohesiveness, tendency to segregate, degree of mortar coating on coarse aggregate, response to vibration, and relative consistency required for satisfactory placement by conventional means.

In general, the field trials described in this article indicated—for natural aggregates such as are being used at Pine Flat Dam—that 7 - 8% minus No. 100 fines, as shown in Table II ("Project sand"), is about optimum for mass concrete in the 2.0- and 2.5-bag range. The tests showed that as the sand becomes finer, the plastic characteristics of the concrete are adversely affected by increased stickiness, reduced plasticity and response to vibration. Sand composed of the 15% blend was definitely unsatisfactory in the concrete.

Conclusions

The manufacture and placement of 2- and 2 1/2-bag interior mass concrete at Pine Flat Dam in general has been a satisfactory operation, both from the standpoint of producing a product suitable to the Corps of Engineers and from the standpoint of economy to the contractor. Much of the success in accomplishing this type of concrete is creditable to the proper selection of fine aggregate gradation and materials control. In the latter instance, experience in placing over 1,000,000 cu. yd. of this type of concrete has shown that (1) fluctuations in moisture control must be kept to the very minimum practicable for an operation of such magnitude, (2) minus No. 100 fines should not exceed 7 - 10% for optimum qualities of the plastic and hardened concrete, and (3) the percentage of purposefully entrained air must be maintained within a somewhat narrow bracket.

Personnel

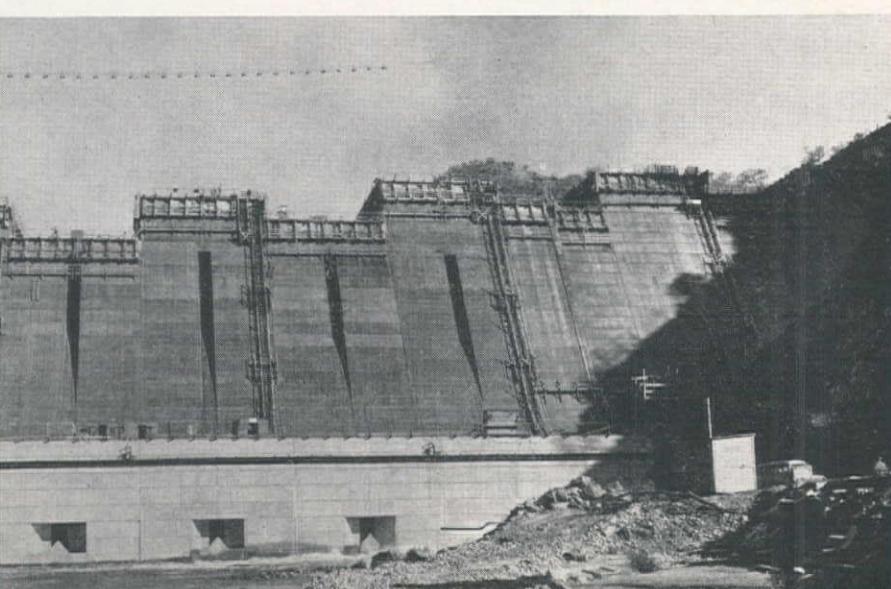
The construction of Pine Flat Dam is under the supervision of the Sacramento District, Corps of Engineers. Colonel C. C. Haug is District Engineer, R. B. Jenkinson is project engineer, C. F. Beattie is assistant project engineer, and W. G. Mitchell is concrete engineer.

Pine Flat Contractors has the main dam contract, with Earl Jennett as project manager, George Archibald as project superintendent, and R. G. Rofelty, engineer.

Note: Air content for all series of mixes was 6.0 to 6.5%. (Minus 1 1/2-in. portion.)

Including the preliminary runs for mix adjustment, approximately 8,000 cu. yd. of mass concrete was produced contain-

the dam was already an effective barrier on the Kings River in California.



Building settlement tests on two foundation types

Comparison of laboratory and field testing for structures at Oregon State College supported on spread footings and piles — Program provides information which will lower building costs

ENGINEERS seldom have the opportunity for direct comparisons in studying building settlements resulting from different foundation designs. Last summer a program of observing the settlement of two buildings—one on spread footings and the other supported on piles—was initiated at Oregon State College, Corvallis, Oregon. Originally intended to provide data for future design on this campus, this program of settlement observations, borings, laboratory and field testing is believed to represent a compromise between the old approach of design wholly on the basis of previous experience and the newer extreme of a design based entirely on laboratory shear strength and consolidation test data. Total program costs, less than \$3,000, are within reach of most institutions and private agencies concerned with building foundation problems. Benefits received lie in lower engineering and construction costs and in information valuable to all foundation engineers.

Low bearing values recommended

Coordinated settlement observations and soil testing program at Oregon State College grew out of a controversy over safe bearing values for two new buildings, Food Technology Building and Animal Industries Building (see illustration). Recommendations by a firm of soils engineers, based on laboratory tests, showed unit bearing in excess of 1,250 lb. per sq. ft. in the silty-clay soil to be unsafe, and pointed up the necessity for piles. Large differential settlements due to consolidation were also predicted if a spread footing were used. These recommendations seemed overly conservative since all other buildings on the campus are on spread footings, some with design bearing values as high as 4,000 lb. per sq. ft. There is little evidence of damage due to differential settlement in any of these buildings, but settlement records were completely lacking.

As a result of these recommendations, and the discussions which followed, it was decided to build the Food Technology Building on spread footings using unit loads up to 3,000 lb. per sq. ft. and the Animal Industries building on piles of 25 and 50-ft. lengths. This afforded an excellent opportunity for comparison of the action of the two foundations on

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similar soil profiles, and the authors suggested that a program of settlement observations be undertaken. Guy H. Taylor, Structural Engineer for the Food Technology Building, suggested that these observations be coordinated with a complete foundation investigation of the entire campus, thus providing a rational basis for design in an extended building program.

Settlement readings

Whenever building settlement records are undertaken, some compromise must be made with the desire to obtain readings of great precision and, at the same time, not to interfere materially with the construction. In addition, bench marks must be laid out so that readings can be continued conveniently after plaster and paint have been applied, and the building is in use. If these factors are not considered, the difficulties and inconveniences encountered by those

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using the structure as well as those conducting the study will defeat the program before it is completed.

Markers used in this program were quite simple, and consisted of a 1-in. square brass plug with threaded hole bolted to the forms and cast into the concrete members. For elevation readings, a short rod was screwed into the open end to support the levelling rod. When not in use, a screw plug was inserted to keep the threads clean.

For level circuits, a Lietz tilting axis level with 14-sec. bubble was used. Readings were made to thousands of a foot by estimating the fraction of 1/100th mark. With this method, circuits were run and closed within a .005-ft. error of closure consistently. After several check runs were made, it was estimated that readings were accurate within .002 ft., plus or minus. This precision was considered entirely satisfactory because it represents the magnitude of movement that might be expected from thermal movements in concrete.

Approximately 30 bench marks were placed in the columns and walls of both buildings after footings and pile caps had been placed and construction had reached above ground level. In most cases, this meant that the markers were

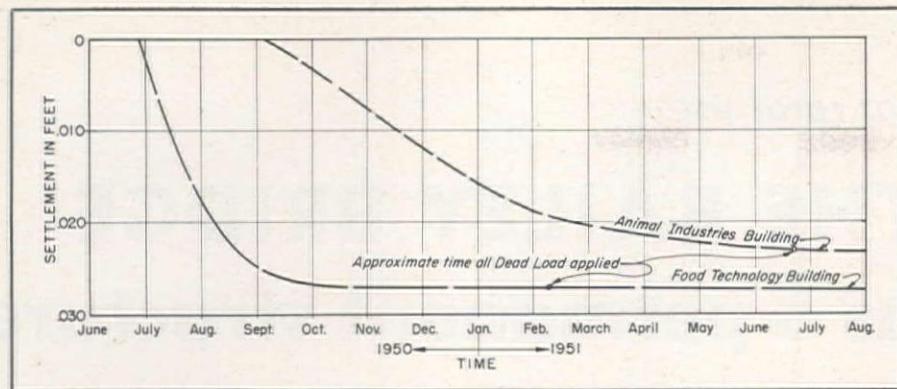
COMPARISON OF MEASURED SETTLEMENTS

	Spread Footings (Food Tech. Bldg.)	Timber Piles (Animal Sci. Bldg.)
Maximum Settlement . . .	0.027	0.023
Maximum Differential Settlement . . .	0.025	0.020
Average Settlement . . .	0.019	0.013

approximately 5 to 7 ft. above the base of footings. Also, in most cases, this weight of concrete was not in excess of the weight of soil removed during excavation. Markers in exterior walls were kept below any brick facing or architectural concrete. On interior columns, they were placed above first floor grade so that circuits could be run conveniently through main corridors or storage areas.

TWO BUILDINGS, Food Technology (below) and Animal Industries (opposite page), were studied for comparable settlement for spread footings and pile foundations.





TIME CURVES for maximum measured settlement points in the two buildings. Curves indicate equilibrium has about been reached, but observations will be continued. Dates when dead loads were completed are indicated.

Settlement readings were taken four times during the construction period and are being continued at approximately four month intervals. Maximum settlement and average settlement for each building are shown in the accompanying table. Time settlement curves for points showing maximum settlement in each building are also shown. These curves do not show final settlements, but it will be noted that both curves have levelled off considerably. The action of piles in reducing settlement is not appreciable. Piles for the Animal Industries Building were driven completely through the yellow silty clay layer (see illustration on which footings of the Food Technology Building were placed.) Part of the pile load can be considered as being transferred to this same soil, but a large part is undoubtedly transferred to lower soil strata. Differential settlements in both buildings are not strikingly different. It is possible that greater differential might have occurred in the Food Technology Building if footing unit pressure values had not been distributed purposely to equalize settlement. A similar design procedure was used for the piles of the Animal Industries Building by varying lengths of some of the piles.

The foundation exploration of the campus carried out in conjunction with settlement observations was primarily for determining the uniformity of the soil profile, and establishing reasonable allowable bearing pressures. Eighteen borings were made—mostly to shallow depths. Three holes were extended to 60 ft. These with previous soil bearings combined to give a good coverage of the area. Two distinct upper profiles were apparent—the one illustrated being predominant.

Undisturbed samples were obtained from the deeper holes for shear testing and consolidation testing. These were obtained by means of 3-in. thin walled samplers. Shear testing was accomplished mainly through unconfined compression tests, although direct shear and triaxial shear were performed for check purposes.

One field bearing test was performed in the upper yellow silty clay by means of a loading truss. Test data compared well with the results of previous bearing tests on similar campus soils.

Ultimate and allowable bearing values on the yellow silty clay computed from bearing tests and from laboratory shear tests are:

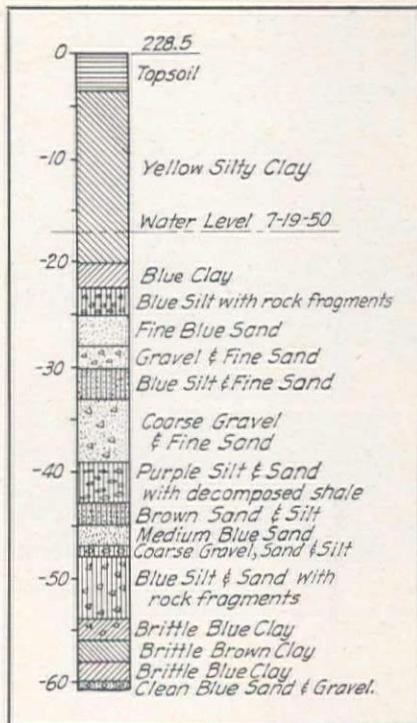
For continuous footings*

From unconfined compression tests—	
Factor of Safety = 2.0.....	3300 lb./sq.ft.
From field bearing tests—	
yield point values.....	3330 lb./sq.ft.
From field bearing tests—	
ultimate load divided by Factor of Safety = 2.0.....	3100 lb./sq.ft.

Good agreement was obtained by the two approaches. It will be noted that two interpretations of the field bearing test data are made, i.e. Factor of safety = 2.0, and yield point values. Both methods are accepted and used and in this case, show good agreement.

A few consolidation tests were performed and rough settlement estimates made on the data indicated a maximum settlement for the Food Technology Building of approximately 1 in. These figures were obtained by assuming Bous-

* Relation between continuous footing and isolated footing values used is factor of 1.3.



TYPICAL TEST HOLE indicating the general soil conditions at the building sites. Spread footings of the food technology building were established in the yellow silty clay.

sinesq distribution, and considering consolidation of the upper yellow silty clay only. No attempt was made to estimate settlements from field bearing test data.

Costs vs. value

This complete program of settlement observations, foundation exploration, field and laboratory testing was performed for less than \$3,000. This figure includes funds for continued settlement observations required. It is a realistic cost figure and includes very few "gratuitous" services available only to educational institutions. All soil boring, sampling, laboratory and field testing and initial installation of markers was performed by two staff members during a three month summer period. Shallow drill holes were made with a 1½-in. diameter hand auger; deeper holes were drilled with a 8-in. diameter power auger rented with crew from the Oregon State Highway Department. Necessary samplers and other minor equipment were fabricated in college shops and charged to project funds.

Three thousand dollars for information on which foundation design for the entire campus building program may be based is not an unreasonable price to pay. Considerable time and money will be saved on future building designs. Contractors have information at hand which eliminates much guesswork in the way of possible excavation difficulties. Records of foundation action are available at any time during construction to point up any corrective action required. Finally, a complete record of foundation action stands with pertinent soil property data for study by other engineers at other sites with building foundation problems.

Concluded on page 139





PRE-CUT PANELS of open-mesh decking were laid from truck rolling over earlier work.

CIVIL ADAPTATION of the military Bailey bridge as a permanent structure is typified in a recent bridge replacement job undertaken in Plumas County, California. When it was discovered that the old timber bridge across the Feather River at Rich Bar had become seriously weakened by decay, its replacement in the shortest possible time became imperative. It was a vital link in the county road connecting Rich Bar to the Oroville-Quincy highway.

The old and the new

The old bridge consisted of an 85-ft. timber pony truss with a 17-ft. stringer span at each end. The lower chords of the trusses had decayed badly and failed by crushing at the end posts. In order to prevent collapse, a pair of heavy cables had been rigged in the manner of a suspension bridge to support each of the floorbeams. Although this expedient had prolonged the life of the structure, its replacement nevertheless became necessary.

The Bailey Bridge Equipment Co. was called upon to design and furnish an all-steel prefabricated superstructure able to carry H-20 loading or better and to fit the existing stone masonry piers and

ORIGINAL 85-ft. timber span, in danger of collapse, had been reinforced by cable suspension to relieve lower chords of truss.



For rural use—

THE BAILEY BRIDGE as a permanent structure

Five days for erection, ten days for the entire job, including removal of old bridge, is the accomplishment of an inexperienced 6-man crew

By C. F. HAMLIN

Civil Engineer

Bailey Bridge Equipment Co.
San Luis Obispo, Calif.

abutments. Emphasis was placed upon complete prefabrication because of the remote location and difficulties of working at the bridge site.

Design

To make the 85-ft. span, a modified "double-single" Bailey bridge was selected. Each girder of this type is composed of two lines of trusses in single-story height (see illustration). Roadway width is 12 ft., 4 in. between girders, which extend 3 ft., 5 in. above the deck. The Army's safe capacity rating for this structure is in excess of 45 tons per vehicle. However, this military working stress is considerably higher than that used in civilian practice. For the approach spans, conventional 12-in. I-beams, spaced to suit the H-20 loading, were used.

Fabrication

Because Bailey bridges normally come in lengths which are multiples of 10 ft.

(the length of one truss panel), the 85-ft. span posed a special problem. To solve it, the four 10-ft. panels for one end were cut in half at the shop and their middle vertical members reinforced to act as end posts. Special sway braces were also designed and fabricated to fit the new half-panels thus created.

Non-standard techniques

Since the new structure was to be a permanent installation, several other changes from standard Bailey construction were introduced. Instead of "drop-in-place" stringers, ten lines of 5-in. I-beams were welded to the floorbeams. In order to reduce maintenance, steel open-mesh decking was used instead of timber planking on the entire bridge. To permit free movement due to temperature changes, roller-type expansion bearings and rocker-type fixed bearings were installed. Instead of standard Bailey end posts, truss end verticals were reinforced by welding on additional channels. Corrugated steel beam-type guard rails on steel posts and sills were placed along the full 120-ft. length of the deck to guide traffic through the bridge and protect the trusses. The small amount of concrete which would otherwise have

"DOUBLE-SINGLE" Bailey truss was assembled on river bank. Erection crew here lays floor beams as welder secures I-beam stringers in one bay.



been required was eliminated by use of 12-gauge corrugated steel for backwalls over the ends of stringers and by use of prefabricated steel pedestal bearings to support stringers of the approach spans at the old grade.

Make-ready

To dispense with falsework in the stream, which was 85 ft. wide and 10 ft. deep, the cantilever launching method was chosen. Taking the weight of the 60-ft. skeleton launching nose (see illustration) as 180 lb. per lin. ft., and that of the 85-ft. double-single Bailey span (less deck and guard rails) as 455 lb. per lin. ft., the computed "reach" of the cantilever was 86.75 ft. before tipping would occur. Although this was 21 in. more than the span length, two sections of decking, weighing almost a ton each, were laid on the tail of the bridge to act as a counterweight and provide an additional safety factor.

Following standard Bailey erection procedure, two rocking rollers were installed on the nearest bridge pier, and three pairs of plain rollers were placed at 25-ft. intervals on the launching bank. Two plain rollers were also placed on top of the far pier to receive the leading end of the nose. The 60-ft. launching nose and the 85-ft. main span were then assembled as a unit on top of the rollers. The two leading bays of the nose were tilted upward by means of links inserted in the lower chords between the second and third panels. This was to compensate for anticipated sag in the cantilever before the nose reached the far pier, and also to provide an inclined runner for the initial contact with the rollers there.

Launching

This 145-ft. assembly, weighing 27 tons, was then rolled forward until the 85-ft. span was in position directly over its bearings. The launching nose was removed and the span jacked down onto these bearings. Actual launching, as a matter of fact, was commenced before assembly was quite completed. At first, several men using pinch bars were able to move the growing structure forward on its rollers. Later, as the weight increased, launching power was provided by a winch truck.

Placing of the deck and guard rails

LAUNCHING NOSE, six 10-ft. single-single bays, spanned river first to give terminal support for rolling rest of bridge into position.



THE PRESENT Bailey bridge, familiar in name to nearly everyone, is an evolution from the design by Donald Coleman Bailey of England. Conceived originally for military use as a single-lane fixed bridge, its principal feature is simplicity and ease of construction. This is achieved through modular design, whereby a basic unit may be utilized in a variety of combinations to produce the desired structure for given conditions.

The basic Bailey unit is a steel truss panel 5 ft. high and 10 ft. long, provided with numerous holes and slots for pin connection to other panels. In so-called "single-single" construction the two side girders of a bridge are composed of Bailey truss panels connected end-to-end. "Double-single" construction finds two parallel lines of such panels interconnected for each girder. This process of addition can be carried to any desired extent. It is also possible to stack the girders so constructed to form multiple "stories" of panels. In this manner,

the foregoing examples would become single-double and double-double Bailey spans.

In its military use, the Bailey bridge is fitted with transverse floorbeams, or transoms, at 5-ft. intervals, and these are overlaid successively by longitudinal steel stringers and timber "drop-in-place" decking. The civil adaptation generally introduces a permanent design for the floor system.

Though the Bailey bridge can be assembled on pontoons as a floating structure, or erected in suspension fashion, standard procedure calls for its use as a simple beam. Assembled in entirety on one bank of the stream to be bridged, it is then "launched" on rollers as a cantilever. A skeleton falsework, or nose, fixed to the leading end is used to establish first contact on the far shore and bear part of the structure's weight as it is further pushed to final position on prepared bearing pads. This is the procedure followed in the accompanying article.—Editor.

followed immediately after the launching. Decking had been pre-cut into 15 sections about 12 ft., 3 in. wide and 8 ft. long. These were picked up singly by the truck crane and positioned on the stringers, beginning at the near end and proceeding across the span, the truck driving on the newly placed sections as the operation progressed. The entire 120-ft. deck was installed in less than 2 hr. A welder tacked the sections into position as they were placed and completed his work later.

Completion time

Because every part of the structure was completely prefabricated, and since the heaviest section handled weighed less than 600 lb., and especially because of the cantilever launching method, erection was accomplished in a very short time. Using only a 1½-ton truck equipped with a winch and a light crane, the contractor's 6-man crew placed and completed the 85-ft. Bailey span and the two 17-ft. I-beam approach spans in only

5 days. None of these men had had previous experience with Bailey bridging, but they quickly mastered the techniques. Altogether, unloading incoming material, removing the old timber structure, building the new 120-ft. all-steel bridge, cleaning up and loading out required only 10½ days. In reviewing the work, it was concluded that operations might have been more efficiently handled by a crew enlarged to about 10 men.

Personnel

All materials entering into the new superstructure were furnished and delivered to the site by the Bailey Bridge Equipment Co., San Luis Obispo. The contract for erection was held by the Lew Jones Construction Co. of San Jose. Ed Mason was superintendent for the contractor; Frank J. Brown was inspector for Francis L. O'Rourke, Plumas County Road Commissioner; and the author was project engineer representing Bailey Bridge Equipment Co.

TO MAKE 85-ft. span using 10-ft. Bailey units, this end bay was cut in half and middle vertical members reinforced to serve as end posts.



Arizona groundwater law gets realistic rewrite

PROPER CODIFICATION of Arizona's underground water law has been made possible by a state supreme court decision handed down January 12 in a case involving agricultural water users and a dairy in the Salt River Valley. In its decision the court set a precedent by (1) enunciating for Arizona the doctrine of public ownership of percolating waters underground and (2) declaring that appropriative rights thereto are valid according to the chronological priority of their establishment.

By its action the court rejected the implicit doctrine that had governed Arizona's groundwater use practices until now. Lacking specific legislation or judicial precedent to the contrary, groundwater users had pumped from wells in accordance with an extension of English common law whereby each land owner might pump as much as he pleased. This concept is based in riparian law, which governs rights to water flowing in defined surface stream channels. It is totally inapplicable to underground water and has for years been a source of legal confusion in many Western states.

Ground water supply

Underground water is not present strictly in streams; rather, it occurs throughout an entire valley, or basin, as a reservoir of water entrapped in subsurface gravel and sand strata known as aquifers. Riparian law permits establishment of water rights by land owners abutting a stream according to their respective positions upstream, one above the other. Application of this law to a groundwater basin permits no such realistic control of water use: a late comer may join with earlier owners in pumping from a basin until it virtually goes dry. Indications of such an overdraft are rapidly declining water table levels that necessitate deeper wells, longer pump columns, and increasingly expensive pumping lifts.

A groundwater basin is recharged annually to some extent by percolation, or sinking, of natural rainfall. The magnitude varies from year to year. However, the application of hydrologic procedures to historical records of water supply and use permits a determination of the average annual volume of recharge. Depending upon the number of years of record, this average figure may be applicable to a protracted period spanning several wet and dry "cycles."

In Arizona, a 10-year period of near drought has seen a rapid decline of water levels in four groundwater basins. Measured against even normal, or average, annual recharge, the volume of pumping is thought by some to have been excessive, brought on by an expansion of agriculture in a time of high crop prices. Measured against historical recharge during this recent period, however, the pumping volume has definitely caused a

Priority of appropriative rights to groundwater supplies established by state supreme court decision — Governor's water code revision committee action allays "prophets of doom" who fear resultant ruin of Arizona agriculture

grave depletion of groundwater supplies, leading to the Salt River Valley case recently decided.

Workable legislation governing groundwater use had to be predicated on declaration of the principle of appropriative rights. The instant case gave opportunity to Arizona's supreme court and was thereby responsible for a rapid series of developments that culminated in the early February completion of a revised groundwater code for submission to the legislature.

Governor Fyle's groundwater code revision committee, appointed last October, has successfully steered a middle course in both preparing the proposed legislation and incorporating late changes to conform with the supreme court ruling. The new code declares percolating waters to be public in character and subject to appropriation in accordance with chronological priority; thus, the oldest users possess the best established rights.

Code provisions

Beyond its appurtenant procedural provisions, the code names 13 groundwater basins within the state and assigns a classification to each in accordance with the gravity of its overdraft. Four of the basins are hereby "closed," meaning that overdraft is gross and that annual withdrawals from the groundwater must be reduced. To this end, none but replacement wells may be drilled, and 1951 pumpage volume may be reduced in 1952 by as much as 25%. Even in the event of a "good" water year, unit groundwater allotments may not exceed a defined maximum determined as the average required for raising various prevailing crops under sound water management. This maximum is 4.5 acre-feet per acre in the Salt River Valley basin, and 4.0 acre-feet in Eloy, Coolidge-Florence, and Maricopa-Stanfield basins.

All other basins in the state are classified as "restricted," meaning that no more water is available for new appropriation and pumping. The third classification, "open," may eventually be applied to certain of these basins after a proper evaluation of their condition is made. Open basins are those in which groundwater levels are stable—that is, their fluctuation is strictly in accordance with expectations based on estimates of annual recharge. In such basins, no controls are imposed; water may still be appropriated. Changes in classification,

either up or down, may be initiated only by petition of agricultural water users as prescribed in the code.

Economic yield determination is to be made for each basin, a measure of average annual recharge. In the meantime, in an effort to lessen the decline in groundwater levels, the code permits an enforceable reduction in 1952 of as much as 25% of prior pumpage—across the board for all users in a critical area. In subsequent years, such a cut is limited to 10% of the previous year's pumpage. Conversely, increases granted in good years may not exceed 25%.

Estimates of water available for pumping each year are to be made on a calendar-year basis, and made public by January 1. Means of appeal and amendment of such estimates are provided. Of the total water proclaimed to be available in a given year, 60% shall be apportioned equally among all irrigated lands of a basin. This is the "equalization allotment." The remaining 40% shall be apportioned among the lands in accordance with the priority of land owners' appropriative rights. This is the "priority allotment" and is somewhat more complicated in its determination.

As a basis for such determination, it first becomes necessary to establish the year in which annual pumping volume within a basin first commenced to cause overdraft or, roughly, to exceed average annual recharge. In the case of the Salt River Valley, 1937 is the governing, or "breaking point," year. All appropriative rights established prior to that year will be honored to the fullest extent: they will receive a priority allotment equal to the entire difference between their equalization allotment and the maximum allotment set for the basin (4.5 acre-feet per acre in the Salt River Valley). Lands so receiving water are to be known as Class I lands.

Class II lands are those having appurtenant appropriative rights established within the three years immediately following the breaking point year. Such lands, as their priority allotment, shall receive 80% of the difference between their equalization allotment and the maximum allotment. Class III lands, their rights established from four to six years after the breaking point, shall receive 60% of the difference cited. Class IV lands, their rights dated seven to nine years after the breaking point, shall receive 40%. And Class V lands, their rights dated more than ten years after, shall receive 20% of the difference.

Water "savings account"

There are further provisions in the code for allocation of unprecedented surpluses or shortages of water. Also under the code, by limiting withdrawals in one or more years, an appropriator may accumulate a limited reserve credit for later use.

Administration of the code is to be directed by an appointive Groundwater Resources Board of seven members, no more than two from a given basin, each serving staggered terms of six years. The Board shall in turn appoint a salaried Commissioner to serve a six-year term in administration of the code.

WOMEN ENGINEERS

in Western highway departments

**A survey of Western States provides
information on present employment and
the attitude of state organizations**

LESS THAN ten years ago, the Colorado Highway Department hired its first woman in an engineering classification. Today, there are only three such employees on the payroll—all draftswomen.

To find out how other state highway departments handled the "woman question," I queried the other ten Western States. These questions were asked:

Are women, if qualified, acceptable for engineering jobs?

Do you have any women engineers on your payroll?

Other engineering jobs filled by women? If so, what are they?

Other comments.

Answers were received from all states queried. In the box on this page is a summary of the data contained in the questionnaires returned combined with similar Colorado information:

Although California employs more women in engineering classifications than any other Western State, they say: "... we agree that highway engineering

still is a man's world. All our women employees in engineering classifications have office assignments. Their work is of a standard equal to that performed by the average man employee ...

"None of our women employees... has been given field assignments recently. We did have several such assignments during World War II. Field assignments (for women) involve problems in connection with transportation, accommodations and, of course, conventions."

"It was a short flyer"

Montana was least receptive to the idea of employing women and their comments were emphatic. "It is strictly a man's field. Our department does not have any women on engineering staffs. During the war for a few months one of the fairer sex was at a drafting table but she didn't last long. She married one of



By HAROLD N. KINDRED

Administrative Assistant
Colorado Highway Department



FOR EIGHT YEARS Gladys Nicholson has been employed as a draftswoman in the Planning and Research Division of the Colorado Highway Department.

the returned soldiers, hied him off to college and an engineering degree.

"This couple then took a short flyer of highway engineering together, he as an instrument man and she as the loving wife of the oft moved engineer from small town to tourist camp. They gave it up.

"We do not have any limitations toward women in hiring for any engineering capacity. None have applied however; a situation we find pleasant. We have enough troubles keeping engineers and near engineers satisfied without thinking of the complications of furnishing powder rooms in the field instead of Chick Sales."

"Women are . . . handicapped"

Oregon said: "We have really never had enough experience with women in engineering classifications to give a great deal of first-hand information. Women are considerably handicapped for any kind of field work. Occasionally a woman does work out satisfactorily in office work such as computing or tracing but most of them do not wish to work long enough to really get good at it."

Washington employs two women engineers, both apparently assigned to office jobs. However, one bears the title of Junior Highway Engineer and, according to the sample qualification sheet sent by them, she is capable of performing these duties in the field: "Serve as instrumentman and chief of survey party engaged in making reconnaissance, preliminary and location surveys... Directs the work of engineering aides engaged in the computation of survey field notes and the preparation of topographic and contour maps, plans, profiles . . ."

In Wyoming, the first State in the

Employment of Women in Engineering Classifications

Eleven Western State Highway Departments

Acceptable If Qualified	Women Engineers On Payroll		Women In Sub-Professional Classification		Other Infor- mation
	Field	Office	Field	Office	
Arizona	Yes	Yes	0	0	a few
California	Yes	Yes	0	8	47
Colorado	Yes	Yes	0	0	3
Idaho	No	Yes	0	0	a few
Montana	Yes	Yes	0	0	0
Nevada	Yes	Yes	0	0	a few
New Mexico	Yes	Yes	0	0	a few
Oregon	—	Yes	0	0	a few
Utah	No	Yes	0	0	1
Washington	Yes	Yes	0	2	a few
Wyoming	—	Yes	0	1	a few

*Other Information consisted of comments given below:

Union to admit women to political equality, are "several" women employed in office engineering jobs and their report is: "We have had excellent results from the hiring of women engineers in the office. Their work has equaled and often excelled that done by male employees."

Here in Colorado, our experiences have been similar to those in most of the other ten Western States. Our first draftswoman was hired in 1944 but we never had a woman engineer on the payroll.

Sunburned and weary

A few years ago, during another such period as the present one when fieldmen were hard to find, two of our office women volunteered to help in an Origin and Destination Study being conducted in the vicinity of Colorado Springs. After about ten days the girls returned to Denver sunburned and weary. They never again offered to perform field duties and it was the only time that the department has ever employed women outside the office.

Our women employees, like Wyoming's, turn out drafting work comparable to that by the men. However, very few ever apply for engineering work. All recruiting for the department is carried out by the personnel division and hiring, of either sex, is almost at a standstill due to the draining off of skilled workers in the area to defense plants and war projects.

A few years ago, we were able to obtain promising males from college engineering classes but now those too are beyond our reach due to the higher pay offered elsewhere. And women are mostly among those absent from civil engineering classes.

At Denver University, there have

been no female students in highway engineering classes since that department was accredited in 1949. In the Denver Opportunity School class now being taught the fundamentals of highway drafting, only three out of fifteen students are women.

According to facts brought out at a recent meeting of an Engineering Manpower Convocation in Pittsburgh, only 20,000 graduates will be at hand to meet the Nation's need of 80,000 engineers in 1952. It was stated that the reason for this goes back to a widely publicized report of the Department of Labor which claimed that the engineering field was overcrowded. At the meeting it was stated that "... drafting, computing and clerical work can often be handled by specialists leaving the young engineer free to gain experience in his chosen field."

Every highway engineer will probably agree that specialists could profitably be employed in the manner suggested—if! But first we must find or create the specialists. Second, in many highway departments, the "young engineer" must also be found.

The manpower problem in highway departments is becoming more acute as workers are literally forced into defense work. By making a change, they, in some cases, double their present salaries. The labor turnover in Colorado, for example, is climbing steadily. In 1950, the rate was 16.1% for highway department employees of all classifications. The figures for 1951 show a turnover of more than 20%.

The department in Colorado cannot act independently to increase the rates of pay. Increases must be enacted by the state legislature and this is often difficult to accomplish because of aggressive opposition of some politicians who may have failed in obtaining what

they thought should be their fair share of roads or road funds.

We are further restricted in recruitment of personnel by regulations of the Colorado State Civil Service system. Employees are of three types; certified, provisional and seasonal or temporary laborers. To reach the goal of certification, an employee or applicant must pass an examination given by the civil service commission. After passing with a satisfactory grade, he is placed in a job or his name is included on an eligible list from which he will later be selected for a position when his name reaches the top.

Too many days off?

Should there be no established list, as sometimes happens due to a lack of applicants for examinations, then the highway department is allowed to go into the open market and hire men on a provisional basis. Those hired are then required to take the examination at a later date when more applications have been received. Laborers may be hired during the busy construction season for a limited time without examination.

Again we cast our eyes in the direction of the ladies. Aside from the unsuitability of women for field work, the question of attendance arises. According to a study made by the writer a few years ago, women lay off due to illness three times more than do the men. The average number of days lost each month by women over the period of a year was 13.0 as against only 3.8 days for men.

Regardless of poor attendance, we might be ahead if qualified women could be obtained for certain jobs thereby releasing the male occupants for more active duties. However, this article is designed to pose the problem—not to give the answer.

USBR announces approximate bid call dates through June of this year

DURING FEBRUARY the Bureau of Reclamation issued bid calls on several major Western projects and an additional tabulation of calls that will be issued during the remainder of the fiscal year ending June 30, 1952.

February 14 marked a call for bids on Lost River Channel improvements on the Klamath Project in Oregon and California. The work is located about 50 mi. from Klamath Falls, Ore., and consists of channel enlargement and excavation of 6 mi. of new channel.

Colorado-Big Thompson canal

St. Vrain Supply Canal construction bid calls were expected February 21. The work, part of the Colorado-Big Thompson project, is located south from Carter Lake Reservoir to the St. Vrain River at Lyons. The canal is to be about 10 mi. long. Included are 4 mi. of unlined canal, 4 mi. of concrete-lined canal, two 8.5-ft. diameter horseshoe-shape tunnels total-

ing .8 mi., a 1,700-ft. long 8.5-ft. circular siphon under the Little Thompson River, additional siphons, etc.

Calls were expected the latter part of the month for the Mohawk Canal and Dike on the Gila Project, Arizona. Construction of about 8 mi. of unreinforced concrete-lined canal of 135- to 30-cfs. capacity is included.

Folsom power plant

Folsom Power Plant, part of the Central Valley Project in Calif., was the subject of bid calls issued by the Bureau February 13.

Calls also were issued during the month for construction of three bridges on the Hungry Horse Project, Mont., and construction of the 26-mi., 115-kv. Eklutna-Anchorage transmission line for the Eklutna Project, Alaska.

Palisades dam

In March, calls will be issued for Palisades Dam and power plant and road relocation on the Palisades Project in Idaho. Calls will also go out for construction of the Davis Dam Switchyard addition in Arizona.

Eklutna Power Plant bid calls are expected in April. The plant will be located near Palmer, Alaska. The Nimbus Power Plant of the Central Valley Project in California will be advertised for bids in April along with the project's Madera distribution system.

Canals and a reservoir

Calls for construction of the Cachuma Project's Ortega Regulating Reservoir, near Summerland, Calif., will be issued in May. Central Valley Project's Friant-Kern Canal distribution system calls are also scheduled for May. Calls for construction of the East Low Canal and Scooteney Wasteway on the Columbia Basin Project and the Franklin Canal, first section, on the Missouri River Basin Project will also have May release.

June calls will include work on unit one and unit two of the Friant-Kern canal distribution system, Delano-Earlimart section and the Eltopia Branch of the Potholes East Canal on the Columbia Project.



Preserving a natural gorge (and landmark) —

History puts highway into a tunnel

To provide two more lanes on U. S. 101 along rugged California coast line, economics of location and an historical landmark dictated a 420-ft. tunnel on 4.5% grade and a curve

COMBINED FACTORS of a better location and the preservation of an historic landmark resulted in using a 420-ft. two-lane tunnel as part of a four-laning project on U. S. 101 where it passes through Gaviota Gorge about 30 mi. north of Santa Barbara, Calif. Construction of the tunnel is being carried out by Rhoades-Shofner Construction Co. under a \$780,000 contract awarded June 18 by the California Division of Highways.

Location problems

At the narrow gorge the existing 2-lane highway passes between two almost vertical walls of rock, which rise directly from the edges of the road bed. The eastern wall of this gorge, through which

the tunnel is being driven, is a narrow offshoot from the Santa Ynez Range. Adding two lanes posed a combination construction and "historic" problem. From a historical standpoint cutting away the east side of the gorge would destroy a landmark prominent in California's history (see box). From a construction point of view cutting the gorge would not only entail moving a large quantity of material for the initial cut and finding an area for the disposal of this waste, but due to the nature of this material (primarily sandstone with numerous seams of putty-like clay) a relatively flat slope would have to be established. Faced with these two problems the California Division of Highways decided that a tunnel through the narrow arm would preserve the natural gorge and be more economical.

This design will handle northbound traffic through the tunnel, with southbound vehicles remaining on the present highway. The median south of the tunnel will be about 85 ft. wide and will be made into a parking area, with existing trees preserved for future landscaping.

Tunnel design

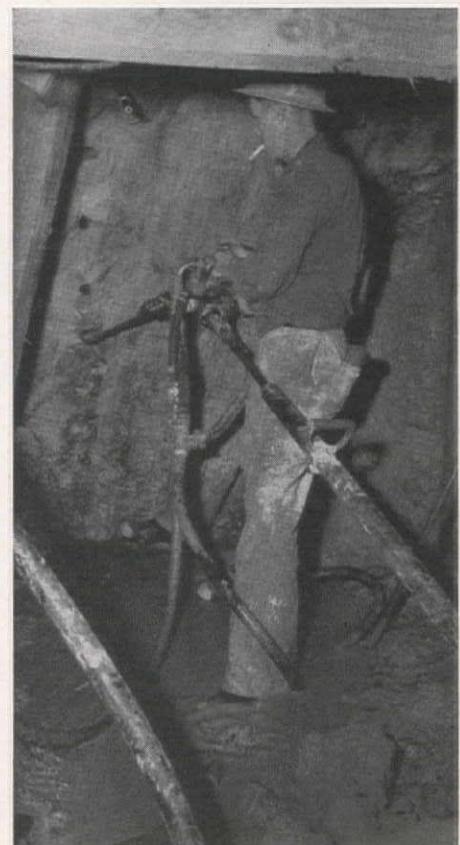
As laid out, the tunnel will be 420 ft. portal to portal on a 1,200-ft. radius curve. It will rise on a 4.5% grade from south to north and have a 10% super-elevation. The finished tunnel will be lined with 18 in. of concrete and be 35 ft. 3 in. wide at the springline and 22 ft. high to provide two 12-ft. traffic lanes and sidewalks. To secure these finish dimensions the contractor is driving a tunnel about 40 ft. wide at the invert level. Provisions are made under the present

contract for lighting facilities which will be installed on the next contract.

Preliminary operations

At the south end of the rock wall through which the tunnel was to be driven, a small valley was available for a large portion of the construction plant and working area. However, it was not entirely satisfactory and did not provide an adequate area for wasting the muck removed from the tunnel. About 500 yd. farther south of this valley the moun-

DRIFTS are advanced in 5-ft. rounds using "Swede" drills. Wall plates are set ahead of core excavation.

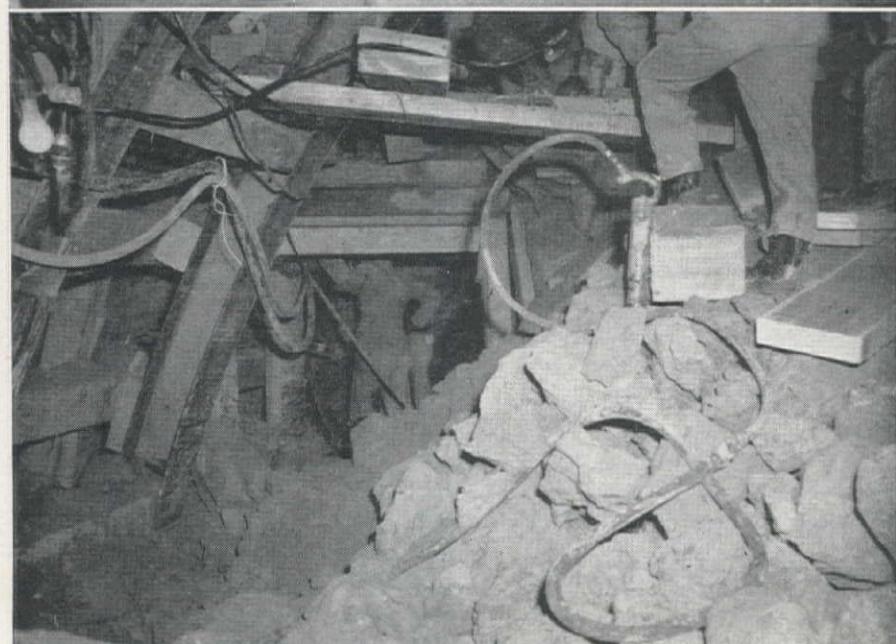
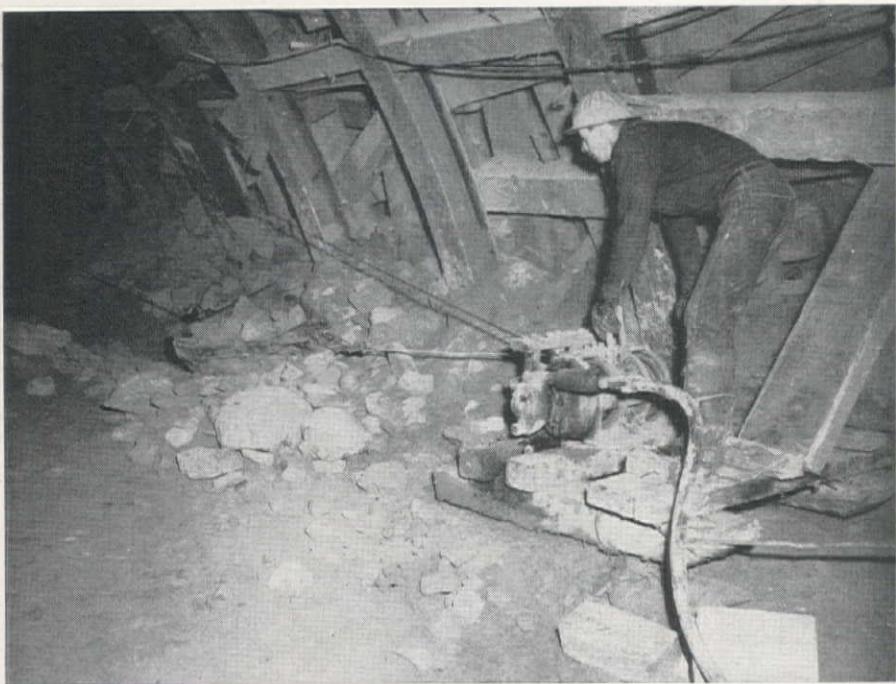


History at Gaviota Gorge

Monument at the site carries this statement:

"Here on Christmas Day in 1846 natives and soldiers from the Presidio of Santa Barbara lay in ambush for Lt. Col. John C. Fremont, U. S. A., and his battalion. Advised of the plot, Fremont was guided over the San Marcos Pass by Benjamin Foxen and his son, William, and captured Santa Barbara without bloodshed."

This historical monument will be moved into the new parking area which will be properly landscaped.



tain widened to provide a much larger area. However, between the two valleys a rock cliff, making almost another gorge, rose from the eastern edge of the existing highway. In order to prevent construction traffic conflicting with highway traffic, the contract provided for the building of a haul road between the traveled way and the face of the cut adjacent to the existing highway. After the haul road was established work began on facing up the cliff for the tunnel portal. In addition to stripping, this work entailed removing an overhang of some 8,000 cu. yd. of material.

Establishing the portal

A study of the portal face indicated that for the first 30 ft. of the tunnel supports would be required, and that troublesome conditions might be encountered during the remainder of the driving. As a result, plans were made to install supports for the first 30 ft. with hope that conditions would permit driving the rest of the tunnel without supports. However, as driving has proceeded conditions dictated the use of more timbering and it is now expected that supports will be required for the remainder of the tunnel.

Working north from the south portal two wall plate drifts, about 6 ft. in size, were driven into the cliff to a depth of

VIEWS INSIDE THE TUNNEL—

TOP—Slusher operated by air motor removes muck from drifts to where it can be reached by loader.

CENTER—Core material handled by Eimco Rock Loader is dumped directly into Euclids for removal to dump.

BOTTOM—From the core muck pile the wall plate drift is shown advancing under temporary support.

30 ft. These small tunnels, which were 33 to 35 ft. apart, center to center, were at the lower corners of the main tunnel (see photo). As driving proceeded, the wall plates of 12 x 12-in. timbers were laid where the wall and invert meet, and the first segments of the arch timbering were placed. Necessary temporary timbering consisting of another wall plate, vertical members and cross pieces at the top were placed as driving advanced.

Reaching the 30-ft. depth from the portal the crews stopped from each wall plate drift up the line of the arch until they met. When the arch, 30 ft. in from the portal, had been opened, an entire supporting ring was placed. With this ring established the excavation along the arch was carried back to the portal and timbering installed as it progressed until the entire arch was completed leaving a core in the center of the tunnel. The core was then removed.

Driving tunnel

The general method of driving being used is to keep the side drifts 20 ft. ahead of the core, set the wall plates, and



WITH MODELS of tunnel supporting systems are John Witte, resident engineer for the Division of Highways (left), with assistant engineers W. W. Evans, Dean Felton and W. D. Altus.

then pull the core between the wall plate drifts. However, unlike the method used to drive the first 30 ft. the arch is not being cut prior to pulling the core. The work on the side drifts alternates keeping them relatively the same distance ahead of the main core operations.

The side drifts are being drilled with Swede drills and the normal round consists of 18 holes about 5 ft. deep. About 6 lb. of 45% gelatin dynamite was used for each cubic yard of rock removed from the wall plate drifts.

A truck-mounted jumbo is used to drill the core. The setup includes 5 drills and the average round includes 100 holes about 5 feet deep. About 3.25 lb. of 45% dynamite per cubic yard were used in the core section.

Material is mucked from the side drifts by a slusher powered by a small air hoist. Due to the light weight of this piece of equipment it can be moved from one drift to the other quite easily eliminating the necessity for two units. Material brought to the end of the side drift and that from the core is handled by Eimco loader into trucks for hauling from the tunnel.

Supports

Both timber and steel supports have been used. When operations began timber rings were being used but as it became apparent that supports would be required throughout the tunnel and steel became available the change over was made at the 120-ft. mark.

Timber supports consisted of 12 x 12-in. wall plates joined together with a half-lap scarf joint, with 9-segment rings of 12 x 12-in. timbers set at 4-ft. centers. Collar braces were made from 4 x 6-in. timbers and the rings were joined longitudinally by 3/4-in. tie-rods.

The steel ribs now being used are fabricated from 10 x 10-in. H-beams weighing 42 lb. per lin. ft. Wall plates are 10-ft. in length and are joined by butting the ends and attaching two splice plates. Rings are in two sections, and are set at 5-ft. centers, bolted to the wall plates and at the top of the arch. Collar braces are set at 5-ft. centers and sixteen 3.4-in. tie-rods are spaced around the arch, tying the rings together.

As the material at the heading changes

frequently and strata of softer material cross the tunnel face no set plan or system is used for supplementary shoring other than what is necessary to transfer the load to the rings and provide a safety factor against falling material. Supplemental timbering is done with various size pieces ranging from 2 x 4-in. wedges up to lengths of 12 x 12-in. material. Generally various lengths of 4 x 8-in. and 6 x 8-in. material is used in this work.

When the timber sets were being used, the practice was to place the first segment on the wall plate with the remaining segments built up to the crown of the set, using the drill jumbo as a working platform. The steel sets require considerably less time to install as they consist of only two sections whereas the timber sets consisted of nine segments. The steel sets are raised into position by means of block and tackle and placed into final position by taking advantage of the drill carriages and jibs mounted on the drill jumbo. The blocking of the steel sets requires about the same time as the timber sets.

Work is being carried out on a three-

shift, 6-day week basis with crews changing the shift they work each week. Generally 15 men comprise the tunnel crew on all three shifts with an additional 10 to 15 men carrying out exterior work during the day shift.

Equipment being used on the job includes: Eimco mucker, three 12-yd. Euclid end dumps, Caterpillar D-8 tractor, Caterpillar motor patrol, 2 Ingersoll-Rand 500 cfm. compressors, Gardner-Denver 500 cfm. compressor, LeRoi powered 25,000 cfm. air plant, White truck for jumbo.

Personnel

John E. Witte is resident engineer for the California Division of Highways with W. W. Evans, W. D. Altus, L. D. Kraatz, Dean R. Felton and Ken Taylor as assistant engineers. E. J. L. Peterson is district engineer at San Luis Obispo.

Paul Lemaster is project manager for Rhoades-Shofner Construction Co., Inc. H. N. Allinder is tunnel superintendent and W. A. Ripley is project engineer. Walkers are Frank Clary, Roy Walthrip and Lloyd Oelschlaegel. Shifters are E. J. McEnroe, Bob Lee and H. Schmeling.

New Mexico highway department will be reorganized

A REVISION of the New Mexico State Highway Department organization has been recommended by the Public Service Administration, a private agency. The agency was paid \$10,000 by the state highway commission to make the study, which was aimed at providing more efficiency in the state highway department operations.

Five divisions were recommended in the agency's report. These would be planning, maintenance, technical and administrative branches and a tourist bureau. All divisions would be directly responsible to the chief highway engineer. The technical division would be headed by a chief technical engineer. This division would handle location, design of roads and bridges, construction and materials testing. The maintenance division would be headed by a chief maintenance engineer and would control operations

of district maintenance offices. The administrative branch would be headed by a director responsible to the chief engineer. Under the administrative director would be legal, personnel, budget, accounting and secondary road activities.

Present set-up of the New Mexico highway department consists of a chief engineer responsible to the state highway commission, and an assistant engineer with supervision over the department's five district offices and nine divisions — administration, accounting, road design, bridge design, construction, testing, maintenance, secondary roads, and planning.

Public Service Administration has also been commissioned to make a study on which will be based a plan for a personnel system covering New Mexico state highway personnel. The study will be made at a cost of \$6,000.

Irrigation engineering courses at Colorado A & M

COLORADO A & M College will feature "Hydraulics of Sediment Bearing Channels and Rivers" and "Ground Water Hydraulics" in the annual graduate summer program in hydraulic and irrigation engineering during the first term of the 1952 Summer Session, June 16 to July 11.

"Hydraulics of Sediment Bearing Channels" will be taught by Prof. T. Blench, Assoc. Prof. of Civil Engineering at the University of Alberta. Professor Blench was formerly Director of Research for the Punjab Irrigation District and is widely recognized as an authority on the hydraulics of channels in erodible materials, and is the author of numerous technical articles.

C. E. Jacob, head of the Department of Geophysics, University of Utah will teach the course in "Ground Water Hydraulics." Prof. Jacob was formerly Chief of the Section of Ground Water Hydraulics for the U. S. Geological Survey and is author of numerous articles on ground water flow.

Other graduate courses will be taught by regular staff members both during the first term and during the second term July 14 to August 8.

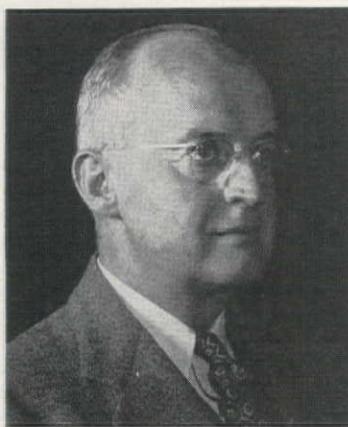
A limited number of fellowships are available for students interested in regular graduate work. Further information may be obtained by writing to the Dean of Engineering, Colorado A & M College, Fort Collins, Colorado.

Comments on the article that talked about...

CONFUSION in CONCRETE

Two concrete authorities discuss an article in the December issue of Western Construction which outlined the problems in correlating the demands of the laboratory technicians and the desires of the man on the job

How wet does structural concrete need to be?



J. W. KELLY

Sir:

I was most interested in Mr. Conahey's article on "Confusion in Concrete" . . . , and feel that attention directed toward improving field practice in concrete construction would be well repaid in improved quality.

His statement that "...relatively wet concrete is needed for most structural purposes" bears on one of the major causes of poor concrete today. Just how wet does structural concrete need to be? Tests and experience tell us that, within limits, stiffer consistencies are desirable because they result either in greater yield (for concrete of fixed water-cement ratio) or in greater strength (for concrete of fixed mix proportions). Yet, we recognize that the consistency must be wet enough for proper placing. I submit that it should be **no wetter** than necessary, not only for theoretical reasons stated above, but also because excessively wet concrete results in segregation, water gain, delayed finishing of slabs, and other practical difficulties such as surface cracking.

The practice of adding excess water to increase the yield of a fixed mix, often

observed on small jobs, should never be permitted; it takes a shocking toll of quality.

Some construction men maintain that wet mixes are necessary for economical placing. However, let's be realistic. How much, if any, **does** the building contractor save in handling costs by using, say, a 7-in. slump instead of a 4-in. slump? The costs of mixing and of transportation to the site are the same. Good modern practice does not approve chuting concrete for more than short distances, and never permits sluicing it along the forms. To fill the carts or wheelbarrows, the workman tilts a mixer chute or opens a hopper gate—no difference there. It takes just as much labor to wheel and dump a cartful of 7-in. slump concrete as one of 4-in. slump concrete. The vibrator man will compact either mix with equal effort and speed, in contrast to the old days when hand tamping was the practice. The floor finishers can start on the 4-in.-slump concrete long before they could start on the 7-in.-slump concrete. Draw your own conclusions.

Further, some construction men assume that an excessively wet mix has a 4-in. slump, because they judge the consistency by eye and are used to the appearance of wet mixes; either they don't bother to make the slump test at all or—if a properly made test shows the consistency to be too wet—they feel that there is something wrong with the particular sample or test. I have seen concrete specified as 4- to 6-in. slump but delivered as 6- to 8-in. slump because the construction superintendent wouldn't accept it any drier.

As Mr. Conahey points out, there are many ways in which concrete making can be simplified and improved. The one which could most easily and profitably be accomplished is to make the concrete **no wetter than is absolutely necessary to avoid honeycombing**.

J. W. KELLY

Professor of Civil Engineering
University of California

Concrete ships standard for placing procedure



ROBERT F. BLANKS

Sir:

Mr. Conahey's "Confusion in Concrete," I believe, is due in a large measure to one major misconception with, of course, all its attendant ramifications. This misconception is typified by his statement, "It should be recognized by all that relatively wet concrete is needed for most structural purposes."

It is suggested that Mr. Conahey and all who read his article also read and carefully study Mr. L. H. Tuthill's article, "Concrete Operations in the Concrete Ship Program," which appeared in the January 1945 *Journal of the American Concrete Institute*, page 137. I firmly believe that this will remove all of the so-called "confusion" and the "mystery" from anyone's conception of what constitutes good concreting practices in structural concrete work. The concrete ship program was probably the toughest structural concrete work ever accomplished. It simply had to be done right in order to meet the rigid specifications and tough acceptance test requirements. The fact that the program did turn out so successfully testifies to the fact that

when all concerned recognize that the correct practices have to be followed, no concrete job is too tough. Furthermore, I think when it was all through everyone was agreed that in the end the correct methods were the cheapest.

In his article, Mr. Tuthill says, "There were many special problems in placing hull concrete that had to be recognized, but their solution was largely a matter of application of basic principles of concrete placing." He also says, "However, with the influence of the . . . contractor, who fully understood and appreciated the importance of well-placed medium-low-slump concrete, and who did not increase his slump . . . , and with gradual improvement of concrete control and experience in the other yards, slumps were brought down gradually until practical minimum medium slumps were generally in use throughout the program." Of course, these two quotations could be expanded to form a book, but they very neatly sum up in a nutshell all that is needed to remove any mystery and confusion from good concreting operations.

The disadvantages of using "relatively wet" concrete are obvious:

1. It increases the water content and is wasteful of cement.
2. It lowers the quality and weathering resistance of the concrete.
3. It increases drying shrinkage.
4. It fosters improper placing methods.
5. It encourages laxness in compacting the concrete in its final position.

The necessity for using "relatively wet" concrete went out the window with the advent of efficient concrete vibrators, both the internal and external form types. Concrete of the proper consistency cannot be over-vibrated, and all that is needed to compact the mass thoroughly under any conditions is vibration and more vibration. This presupposes, of course, that the concrete is placed and distributed properly and that the vibrators are not used as a means of transportation.

To sum up, the following basic factors are all that are required to "un-confuse" good concreting practice, whether it be structural or otherwise:

1. Proper selection of the ingredient materials, with particular attention to aggregates graded within proper limits which are, with present knowledge, clearly delineated.

2. Proportioning these ingredient materials in accordance with known concepts and laws so that the resulting concrete mix has a minimum practical water content, no more cement than is necessary, and the minimum practical slump.

3. Deposition of the concrete in the forms, in accordance with the principles which Mr. Tuthill has carefully outlined in his article; i.e., distributed without segregation throughout the placement area as uniformly and evenly as possible.

4. Thorough and complete consolidation by the application of internal vibration, supplemented when necessary by external form vibration.

Letters were prompted by such statements as . . .



GEORGE CONAHEY

"IT SHOULD be recognized by all that relatively wet concrete is needed for most structural purposes. Relatively dry concrete can be used for mass construction."

"Concrete made and used for structural purposes containing five or more sacks of cement per cu. yd. and made with reasonably well-graded aggregates, having a slump of not more than 7 in., has an excellent record for weather resistance, fire protection, structural strength and architectural appearance. Many laboratory technicians raise their hands in holy horror when concrete mixes with 6- or 7-in. slumps are mentioned, let alone used."

The author expressed these personal views in the article in the December 1951 issue of *Western Construction*, page 57. At present he is training specialist, U. S. Navy Civil Engineering Corps, Officers School, Port Hueneme, California.

5. Sufficient curing for the service conditions to be encountered.

I sincerely hope that [the foregoing] will help to take some of the "confusion" out of concrete.

ROBERT F. BLANKS

Vice President & General Manager
Great Western Aggregates, Inc.
Denver, Colorado

How the job foreman can "stump the experts"

Sir:

"Confusion in Concrete" may exist in the minds of the technicians and experts, but on a recent building job in San Francisco it was direct action that solved the concrete problems confronting the placing crew.

On a reinforced concrete garage structure, on this particular morning of observation, the truck-mixers were lined up ready to start the day's pour. The lead truck was back in position at the hopper. The foreman of the concreting crew took over control of the mix at this point. His first peek into the slowly revolving mixer showed him quickly that the strengths planned by the structural designer, the mix ordered by the testing laboratory and such control as was exercised at the batching plant were in error and must be ignored in the light of his superior knowledge of concrete and how it is used on the job. He immediately grabbed the convenient water hose, turned it on full force and stuck the end in the mixer, while engaging the truck driver in small talk.

While I watched amazed, the seconds ticked by. A quick glance into the mixer by this foreman provided a further technical check on the water-cement ratio, slump, strength, etc. More water. Another visual check (quick peek in the mixer). Finally, after what might have been 25 to 30 seconds of adding a full stream of water, the foreman had adjusted the expert's inferior knowledge of concrete, the hose was removed and discharge started.

The gruel-like mix which appeared

seemed to be most satisfactory to the "expert."

Thus, at least on this particular job and day, the work and worry of the designer, the long hours of research and the mix analysis were completely nullified.

Further comment is unnecessary.

Anonymous Sidewalk Superintendent

(Definite information on this actual observation is available on request.)

Try to make two batches of concrete exactly alike

Sir:

I and my colleagues were very much interested in the paper on "Confusion in Concrete" by George Conahey. I have known George personally for many years, and his writings were always stimulating.

I have always wanted to have some one write an article on how to make two batches of concrete exactly alike when everything was different; that is, different cement, different aggregates, different gradings of aggregate, and different methods of mixing and handling. As a matter of fact, it is not possible to make two batches of concrete alike when there is any substantial change in the proportions or ingredients.

I certainly agree with Mr. Conahey that making of concrete is an art, not a science.

C. H. SCHOLER, Head,
Dept. of Applied Mechanics,
Kansas State College

MORE ON CONCRETE, IN THIS ISSUE . . .

READERS interested in problems of concrete design will find a valuable contribution on this subject starting on page 69 of this issue. The author discusses the "Effect of Sand Grading on Lean Concrete."



PROGRESS REPORT—

Los Angeles Freeway System

Contract awarded for last 1.4 mi. in the 10-mi. expressway leading directly to Los Angeles Civic Center—Here's a look at the freeway program as it stands today

LAST LINK in the 10-mi. Hollywood Freeway is now under contract and will complete this major unit in the long-range program of the California Division of Highways to relieve the ever increasing traffic problem in the Los Angeles metropolitan area. Since the war this program has involved funds totaling \$150,000,000—spent and obligated. As an example of the costs for this type of modern freeway construction the final section of the Hollywood Freeway just awarded to Bongiovanni Construction Co. was bid at \$2,274,366 for 1.4 mi. of six-lane paving, three bridges and minor structures. Completion of this contract late in 1953 will open this express route from Vineland Ave. in San Fernando Valley to the Los Angeles Civic Center.

To continue this freeway program the Division of Highways has budgeted \$28,000,000 for the fiscal year 1952-53, divided into \$13,000,000 for the purchase of rights-of-way and related expense and the remainder for construction.

Present status and contemplated work on the individual freeways are as follows:

Hollywood Freeway

Now completely financed the last construction unit to connect the Hollywood Freeway from the Los Angeles Civic Center to the existing freeway in Cahuenga Pass has just been placed under contract. By the end of 1952 it is expected that this freeway will be so far completed that traffic can move over the 6½ mi. section from Hollywood Boulevard to the Los Angeles Civic Center without interruption.

Construction work on bridges and overpasses in the section between Hollywood Boulevard and Cahuenga Pass is under way and scheduled for completion before the end of 1952.

Santa Ana Freeway

By the end of 1952 construction on the Santa Ana Freeway should be completed for the entire 10 mi. between Aliso Street and Lakewood Boulevard. During 1952 construction contracts are expected to be let for a grade separation that will eliminate the last intersection at the northwest end of the freeway and grading, paving and construction of structures on a 4.7-mi. section between Lakewood Boulevard and Pioneer Boulevard. The separation structure is expected to cost \$400,000 and the 4.7-mi. length of freeway is estimated to cost \$3,381,000. The number of contracts to be awarded has not been determined.

Arroyo Seco Parkway

On the Arroyo Seco Parkway the remaining ½-mi. length will be completed in 1952, connecting this 8-mi. freeway with the 4-level grade separation structure near the

Civic Center and linking it to the Harbor and Hollywood Freeways.

Harbor Freeway

During 1952 the section of the Harbor Freeway extending southerly ½ mi. from the 4-level grade separation structure will be completed and open to traffic. This will provide, along with the portion of the Arroyo Seco Parkway, a complete interchange for traffic between Hollywood, Arroyo Seco, and Harbor Freeways. Work will continue on the section between Third Street and Olympic Boulevard and contracts will be let for several structures between Olympic and Washington Street. The amount budgeted for Harbor Freeway work and linking Arroyo Seco Parkway to the 4-level grade separation is \$5,160,000.

Ramona Freeway

Construction is expected to be completed on the Ramona Freeway for the 5-mi. section between Aliso Street near the Civic Center and Hellman Ave. in Alhambra. Contracts, aggregating \$1,625,000, will be let for construction work and seven structures on a 7.2-mi. portion of this freeway.

Los Angeles River Parkway

Construction work on a 2.5-mi. portion of the Los Angeles River Parkway between Pacific Coast Highway and 223rd St. in Long Beach is scheduled for completion this summer. Contracts amounting to \$3,305,000 will be let during the fiscal year 1952-53 for grading, paving and constructing structures on a 4.6-mi. portion between 223rd St. and the south junction of Atlantic Ave.

Colorado Freeway

The first unit of the Colorado Freeway, the Arroyo Seco Bridge, is presently being constructed by Guy F. Atkinson Co. under a \$3,389,650 contract. This is the largest single contract ever awarded by the Division of Highways. When completed the bridge will link Pasadena and the Eagle Rock section of Los Angeles. Work started in May 1951 and the date of completion is scheduled for June 1953. During the coming fiscal year contracts aggregating \$1,472,000 will be let for roadwork at each end of the bridge and additional structures necessary to connect the bridge with existing street systems. These units will ultimately become a part of the Colorado Freeway.

The Los Angeles Freeway work is being carried out under the direction of G. T. McCoy, State Highway Engineer. Paul O. Harding is assistant state highway engineer in charge of the Los Angeles area, assisted by W. L. Fahey in charge of administration and operations and Mark E. Cessna in charge of planning.

MAJOR GOING CONTRACTS ON LOS ANGELES FREEWAYS

HOLLYWOOD FREEWAY

Contractor	Job	Amount	Complete
Winston Bros.	Pave, 5 bridges, Cahuenga-Gower	\$1,740,600	Feb. '53
Geo. W. Peterson			
Jack W. Baker	Holly Drive U-Xing	303,700	Jan. '52
Fredericksen & Kasler	Hollywood Blvd. O-Xing	349,400	May '52
Oberg Bros.	Cahuenga Blvd. O-Xing	294,100	Apr. '52
Peterson & Baker	Two rail crossings	965,000	Dec. '52
Webb & White	Hill St. relocation	230,100	Jan. '52

SANTA ANA FREEWAY

Winston Bros.	1.1 mi. Fwy. and structs.	1,184,300	July '52
United Concrete Pipe Corp. & Ralph A. Bell	2.3 mi. Fwy. and structs.	1,742,100	Mar. '52
"	1.5 mi. Fwy. and structs.	1,546,200	Oct. '52
"	2 mi. Fwy. and structs.	2,701,200	Jan. '53
Winston Bros.	Grd. and surf., Fwy. and structs.	2,656,300	Feb. '53

RAMONA FREEWAY

J. E. Haddock, Ltd.	1.5 mi., expressway and bridges	1,957,300	Nov. '52
Griffith Co.	.9 mi., Fwy. and 3 bridges	1,422,100	Mar. '53
Griffith Co.	1.7 mi., Fwy. and structs.	2,598,000	July '53
J. E. Haddock, Ltd.	Pave and construct bridge	207,400	May '52

LOS ANGELES RIVER FREEWAY

Griffith Co.	2.5 mi. Fwy. and gr. sep.	1,507,300	Aug. '52
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HARBOR FREEWAY

Webb & White	.6 mi. grd. and pave	710,200	
W. J. Distelli	Fourth St. bridge	545,500	Feb. '52
Winston Bros.	Two bridges	1,010,800	Nov. '52
Webb & White	Wilshire Blvd. O-Xing	382,800	Sept. '52
Oberg Bros.	Three bridges	1,227,600	Apr. '53

COLORADO FREEWAY

Guy F. Atkinson Co.	Arroyo Seco Bridges	3,599,900	July '53
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ABOVE—Path of the freeway making its way through the congested Hollywood area to the foothills and routes to the northern part of the state.



LEFT—Four-level grade separation on the route allows motorists access to adjacent residential districts. Work in foreground shows the pattern of right-of-way from which houses were removed.



MAPPING THE PROGRESS of LOS ANGELES FREEWAYS

WITH LOS ANGELES (circle) AS THE HUB, the mammoth freeway system is seen radiating in all directions to alleviate urban traffic congestion. Bold line at top left indicates the Hollywood Freeway. Proceeding clockwise, the Arroyo Seco, Ramona, Santa Ana, Los Angeles and Harbor freeways appear.

LEGEND:

Solid line—completed

Broken line—completed by 1953

Dotted line—in design stage

DESIGN PREVIEW of the Cherry Valley Project

FURTHER EXPANSION of San Francisco's municipal water and power supply in the Tuolumne River watershed of California is currently marked by progress of three contracts for damsite access road construction and award of a fourth for diversion tunnel excavation to commence this spring. The new dam and reservoir site is located on Cherry Creek (see map), a tributary of Cherry River, which flows into the Tuolumne just downstream from San Francisco's existing Hetch Hetchy aqueduct power tunnel intake. Cherry Valley Dam will be a 7,000,000-cu. yd. earth and rock-fill structure.

Existing rail and vehicle routes to the site are inadequate; hence, the road contracts recently completed and now in force. Totaling \$1,178,800, they will pay for 25 mi. of two-lane asphalt pavement 18 ft. wide. The first section of this road, from State Highway 120 at South Fork (Tuolumne River) to Jones Point (above Early Intake powerhouse) was completed by KleinSmid Construction Co. of Bakersfield, California, last June at a cost of \$102,500. A portion of the present work, under contract to T. E. Connolly, Inc., of San Francisco, on a bid of \$226,500, includes surfacing of the section constructed by KleinSmid. The same Connolly contract also includes reconstruction of the present road from Early Intake to Mather, a recreational community maintained by San Francisco.

A second contract held by Connolly, for \$361,800, covers new construction of a road from Early Intake northward 2.7 mi. to Cherry River. A bridge crossing at this terminal is included in the work, steel for the bridge being provided by the City through a separate contract with Bethlehem Pacific Coast Steel Corp. The final stretch of new construction extends 11.8 mi. from Cherry River to the damsite on Cherry Creek. For this work, a \$448,000 contract is held by KleinSmid.

All three of these contracts in progress were commenced last summer and were scheduled for completion early this year. However, early and continued rains slowed the work, and the advent of winter brought operations virtually to a standstill. Even so, the contractors are continuing as they are able and, with extensions of time granted by San Francisco, will finish the road construction by next June.

Diversion tunnel contract

At the damsite, Ralph A. Bell of Monrovia, California, has a \$747,800 contract for the diversion tunnel, first feature of the ultimate \$30,000,000 project to get under way. Contract time is 300 calendar days, beginning May 1, 1952. Prior work on the scene has consisted, apart from topographic surveys, only of an exten-

Site exploration completed and access highway and diversion work active on program to add storage to San Francisco's Hetch Hetchy system

sive program of core drilling and sinking of auger test holes.

This exploration, conducted between October 1950 and September of last year (with five months layoff during the winter), was handled by two contractors. Diamond Drillers, Inc., of San Francisco, investigated the rock structure in the abutment and spillway areas and along the prospective axis of the dam, drilling holes up to 100 ft. deep over the diversion tunnel alignment. Core recovery from the program was excellent; the detailed drilling information has already paid for itself in the exceptionally low and close bidding for diversion tunnel excavation.

Dam site exploration

Borrow pit and quarry sites for the dam were probed by J. N. Pitcher Co. of Daly City, California, who sank more than 500 12-in. holes ranging to 30 ft. in depth. In addition, exploratory trenches were bulldozed as required. Again, the information gained was of excellent quality, even at the relatively shallow depths for which good data were of the best value. As a result of this work, two principal borrow areas were selected, one on each side of the valley downstream from the damsite. These will be stripped mainly for earthfill; most of the rock to be dumped and placed in the dam will come from abutment excavation.

Cherry Valley Dam will stand 320 ft. high, spanning its site with a crest length of 2,600 ft. A side channel spillway having a capacity of 25,000 cfs. (with 6 ft. of reservoir freeboard) will be cut into the right abutment. The reservoir will impound 268,000 acre feet and cover 1,700 acres. Designs for presently contemplated construction are nearly complete, except for the spillway itself. Hydraulic models of this feature are under study, and the entire project will be reviewed by a board of engineering consultants.

The next contract to be let, probably in July or August of 1952, will be for stripping of the site and cutoff grouting. Foundation conditions appear satisfactory in the canyon, with a minimum of bedrock jointing. Dam construction and spillway excavation, as one contract, will commence next fall if possible, and will continue for about a year and a half. The inner portion of the dam will be impervious rolled fill (3,500,000 cu. yd.) having slopes of 0.9:1 upstream and 0.8:1 downstream. Its downstream toe

will be underlain by a crushed rock drain blanket. Two transitional filter blankets will separate the inner mass from the outer dumped rock. The inner blanket, 8 ft. in thickness, will be crushed rock, none larger than 1½ in. The outer one, 12 ft. thick, will consist of quarry spalls, 1½ to 12 in.

The outer mass of the dam will be dumped quarry rock (3,500,000 cu. yd.), deposited to achieve an average slope both upstream and downstream of 2:1. Repose for this material is estimated as 1.33:1; the design slope will result from a series of berms, each nominally 20 ft. wide and 30 ft. high. Toe rock is specified as follows: not less than 50% weighing a minimum of 2 tons, and not less than 75% weighing a minimum of 1 ton.

Other variations from the general specification outlined above occur in the top 45 ft. of the structure. Here, fine and coarse filter blankets each taper to a thickness of 3 ft. Also, the upstream face of the dam will receive a placed layer of riprap about 10 ft. thick as protection against wave action in a 40-ft. range of reservoir level.

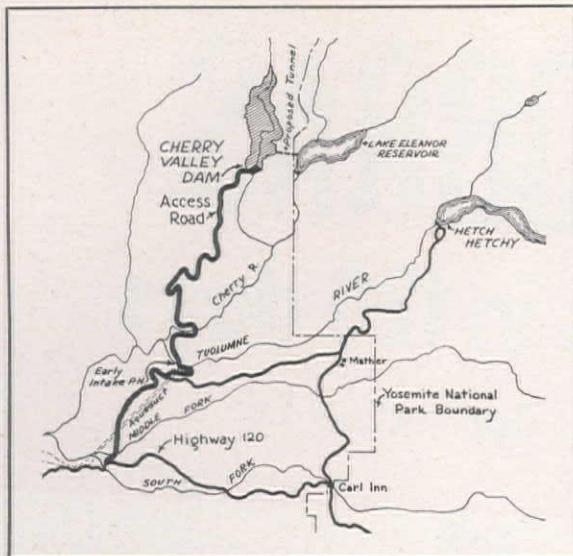
Except for the diversion tunnel, appurtenant reservoir features will follow the main dam construction. The diversion tunnel itself, a 16-ft. circular bore 1,320 ft. long, will have a capacity of 6,700 cfs. before the inlet is submerged. Its capacity for diversion purposes, under maximum head, will be 7,100 cfs. For operation of the reservoir in the future, the tunnel is to receive a steel liner and serve as a permanent outlet. The outlet structure necessary to this use will be built under a later contract, to be awarded in the summer of 1953. Spillway construction will come to contract then also.

The final major item presently planned is a 6,300-ft. tunnel connecting Cherry Valley reservoir to Lake Eleanor, an existing 27,000-acre foot reservoir owned by the City in the adjacent watershed to the east. Its construction is expected to begin in the winter of 1953. The tentative design is for a horseshoe section about 9 ft. wide and 11 ft. high, to pass about 1,800 cfs.

The final project

Eventually the Hetch Hetchy project will provide 400 mgd. for San Francisco. The immediately authorized work on Cherry River (\$13,000,000) will bring the project past the halfway point toward this goal. In addition it will firm hydroelectric power production in the existing Early Intake and Moccasin powerhouses. Early Intake is actually located below the Hetch Hetchy power tunnel portal on the Tuolumne; it also is above the Cherry River confluence with the Tuolumne. Water for its turbines (200 cfs.) is diverted from Cherry River upstream from the latter point and conveyed in a 3.2-mi. conduit to the powerhouse. A water supply connection is also made from the powerhouse to the tunnel diversion dam just upstream. Cherry Valley reservoir operation, utilizing the connecting tunnel to Lake Eleanor, will augment the powerhouse water supply.

Cherry River power facilities, to cost an estimated \$18,000,000, will come later.



LOCATION MAP of Hetch Hetchy Storage

They will amount initially to 60,000 kw. of firm power, to be generated in a new powerhouse on Cherry River about 6 mi. downstream from Cherry Valley Dam, where a so-called power tunnel stub is to be provided at the downstream end of the diversion and outlet tunnel. Tentative designs call for a diversion of about 600 cfs. through this connecting stub for transport to the powerhouse. A head of 2,000 ft. will be available for turbine operation.

Although the scope of the ultimate project comprehends principally the features of water conservation and power generation here described, it also includes a flood control provision for which federal financing will provide. The federal flood control contribution is presently set at \$9,000,000. (An already approved municipal bond issue accounts for the remaining \$4,000,000 immediately needed.) Under the agreement governing this provision, a flood control reservation has been established in the City's Hetch Hetchy reservoir and in the Don Pedro reservoir owned by the Turlock and Modesto irrigation districts. Cherry Valley reservoir will be operated partially for flood control also. In the distant future, this entire reservation will be transferred to a new Don Pedro reservoir, flooding out the present one, and additional federal payment will be made at that time based upon evaluation of the flood control benefits effected by the entire system in the Tuolumne and lower San Joaquin rivers.

Early engineering plans

Engineering studies as early as 1882 indicated the future course of San Francisco's municipal water supply development in the Tuolumne watershed. First filings on the water were obtained in 1901, and in the same year an application was made to the Secretary of the Interior for certain rights of way and reservoir sites. This application, necessary since the desired land lies in Yosemite National Park and Stanislaus National Forest, was denied. Thus was San Francisco's battle begun. After many subsequent years of hearings, applications,

bond elections, surveys, minor construction, and other preliminary steps, the permissive federal legislation, known as the Raker Act, was passed in 1913, granting the rights of way sought by the City and setting specific limitations upon the character and use of its contemplated works.

To supply electric power for subsequent work, Lake Eleanor was first developed as a water supply source for Early Intake powerhouse. The buttressed arch dam constructed is 70 ft. high and raises the natural lake level 35 ft., giving a total storage of 27,000 acre feet. A creek diversion canal had been built at the site in 1909-10; the dam itself was begun in 1917 and storage commenced in 1918. In the same year Early Intake powerhouse went into operation.

Hetch Hetchy damsite work began in 1915, with clearing and diversion work by contractors. The dam was built by Utah Construction Co. between 1919 and 1923 to a height of 345 ft., permitting storage of 206,000 acre feet of water. It was subsequently raised, in 1938, to a height of 430 ft. and a capacity of 360,000 acre feet.

Moccasin power plant

Moccasin powerhouse was built between 1921 and 1925, its 620-cfs. water supply furnished through the Mountain Division of Hetch Hetchy aqueduct, a 19-mi. length of tunnel (and steel pipe at river crossings). Priest reservoir, capacity 2,350 acre feet, acts as forebay for the powerhouse, regulating flows into the four penstocks that drop 1,300 ft. to the turbine runners.

From the tailrace of Moccasin powerhouse, the Foothill Division of the aqueduct conveys the water 16 mi. through tunnel and pipeline to Oakdale portal, 14 mi. east of that town. The San Joaquin Division consists of 47½ mi. of pipe, terminating at Tesla portal on the east side of the Coast Range. The Coast Range Division, 29 mi. long, is almost wholly tunnel—25 mi. in one bore, the world's longest at the time of its completion in 1934. From Irvington Portal on the west, the Bay Division of the



ABOVE—Typical dam site area looking along site for the spillway.

RIGHT—Drill rig with 12-in. auger testing borrow point.



aqueduct is the final link, terminating at San Francisco's old Crystal Springs reservoir on the peninsula south of the City.

These are the project components to date, together with power transmission facilities roughly paralleling the aqueduct. Intermittent work over the past twenty years has seen the enlargement of Hetch Hetchy reservoir and, more recently, double barreling of the San Joaquin and Bay division pipe lines. Remaining now are the Cherry River project and new Don Pedro Dam, which will complete Tuolumne River development for the benefit not only of San Francisco but also of the Turlock and Modesto irrigation districts.

Personnel

The Bay Division of the aqueduct is operated and maintained by the San Francisco Water Department. Some of the recent work on these facilities was reviewed in *Western Construction* for November 1951, p. 85. All other aqueduct components are built and operated by the Hetch Hetchy Water Supply, a separate bureau of the City and County government. Manager and chief engineer is H. E. Lloyd. For the Cherry River project, Maurice L. Dickinson is construction engineer. The board of engineering consultants retained in preparation of Cherry Valley Dam designs consists of Walter L. Huber, I. C. Steele, and A. Kempkey. Harold Craig was resident engineer for preliminary surveys and drilling exploration. W. K. Bertken is resident engineer for road construction and tunnel excavation.

4 TERRA COBRAS

move 840,000 yds in 120 days

for Wright Contracting Co.



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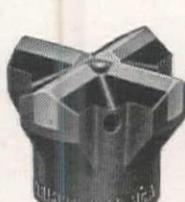
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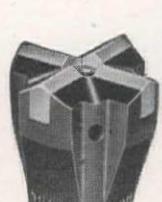
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ROAD-MIX—

Where, when and what to use

BITUMINOUS PAVING by the road-mix method attained its silver anniversary during 1950 or 1951, having originated under the direction of E. Q. Sullivan, district engineer for the California Division of Highways with headquarters at San Bernardino. Despite improvements and new developments in oil spreading, mixing and blading equipment over the 25-year period, the methods used today are not drastically different from those used in the early work. And what is more important, the basic principles of construction, mix composition and thickness design learned during the preliminary developments are still fundamental and essential to successful results.

Unfortunately, time and familiarity seem to have dulled the appreciation of these important principles by many of those continually in contact with road mix oiling. Too often the attitude has been that because road-mix surfacing is low cost, it cannot be considered a high quality pavement, and that any refinements and controls necessary to obtain high quality, will automatically result in high cost.

I shall never forget a remark made by a state highway district engineer to a resident engineer of a road-mix oiling project. He said, "Don't be too particular about how the job turns out. If it ravels or bleeds we can come in next year and rework it under maintenance." It would probably be unnecessary to mention that a large part of today's highway funds are being expended to maintain and reconstruct pavements which were poorly designed or carelessly constructed in the past.

This brings up the question of the life expectancy of road-mix pavements. Although the method is only 25 years old many of the road-mix pavements constructed in the late '20's and early '30's are still giving excellent service and, with an occasional seal coat, will continue to serve another 20 or 30 years. The factors which contribute to failures usually reveal themselves in the first few years of the pavement's life. "Road-Mix Methods—Where, When and What to Use" is intended to throw the spotlight of emphasis on the materials, the design and the construction methods which either prolong or shorten the service of road-mix pavements.

Where

Although road-mix surfacing will provide a durable, waterproof and smooth riding pavement for streets and highways if properly constructed, this latter qualification often restricts the locations suitable for road-mix construction methods. A road suitable for a road-mix surface may briefly be specified as one having a foundation of proper quality and thickness to support the traffic loads expected, and located where the climate is

AN AUTHORITY who has observed and helped to guide the development of road-mix surfacing presents a helpful history of the subject, and answers many common questions.

Ray Harsch made these observations and comments in a paper at the I. T. & T. Highway Conference in Los Angeles, February 6-8.—Editor.

By RAYMOND HARSCH

Manager, Asphalt Department
Shell Oil Company
San Francisco, California

dry and warm for a sufficient period to permit air drying the mineral aggregate and mixing it with liquid asphalt while spread on the road.

While the weight of traffic should not prohibit the use of road-mix surfacing, it should focus attention on the character and thickness of the base course and the subgrade soil which is to support the pavement. No pavement surface can be expected to carry a traffic load which exceeds the structural capacity of the foundation.

The foundation starts with the subgrade soil. Soils differ in their ability to support loads especially when they become wet. Some soils, usually of the granular, sandy type require only a 4- or 6-in. base course to carry the maximum allowable wheel loads. Others, which contain large amounts of silt and/or clay often require 18 in. or more of base to support the same loads. The physical characteristics and load bearing capacities of both soils and base course material play an important part in the success or failure of pavement surfaces and deserve thorough investigation before deciding that a road-mix or other asphalt treatment should be used. There have been developed some relatively simple tests for indicating the performance of foundation materials and their use will often show how to utilize the best available material resulting in large savings in costs as well as contributing to uniformly adequate support.

The success of any asphaltic mix requires the adhesion of the asphalt binder to the particles of mineral aggregate. Surface dryness in the mineral aggregate is one of the primary requirements for such adhesion. For road-mix construction the mineral aggregates are deposited on the road in advance of the introduction of asphaltic binder and are dried by exposure to wind and sun. A geographical location subject to frequent rain is, therefore, not conducive to economical road-mix construction as the mineral aggregate would have to be processed until surface dry by blading and harrowing after any rain before oil is added. This makes road mix most adaptable to semi-arid or arid sections

of the country or where sufficiently long periods of dry, warm weather can be expected.

The speed of mixing the asphaltic binder with the mineral aggregate to obtain uniform coating is influenced by temperature, with faster mixing accomplished at the higher ambient temperatures. Use of road-mix construction in colder climates or at high elevations is often limited to rather short periods during the warmest parts of the summer.

Sometimes it is impossible to either divert or adequately control a large volume of traffic during construction to permit the usual oil spreading, blade mixing and laying operations; however, with the advent of the travel mixers it is now possible to accomplish road-mix construction with a minimum of inconvenience.

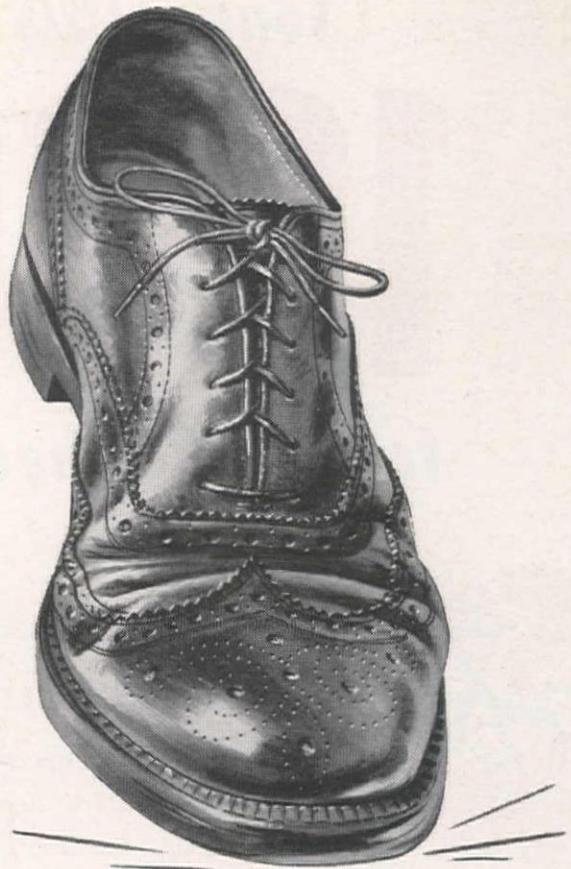
Road-mix surfacing has often been selected as the treatment for roads carrying relatively light traffic in lieu of using surface treatment types. Too often road-mix surfacing is expected to remedy a thin asphaltic surface treatment which failed because of inadequate base support. It should be remembered, however, that road-mix should have a minimum of 2 in. in thickness even for light traffic. Experience has shown that the impact action of traffic on thinner mats tends to loosen the top layer of the untreated base course thus forming a plane of unbonded material which allows the thin mat to be displaced. Sufficient mineral aggregate for a minimum compacted thickness of 2 in. should be available for the surfacing, over and above that required for the base course.

When

During the early development stages of road-mix construction it was almost universally recognized that if the proper drying of mineral aggregates and the warmth necessary for adequate and economical mixing were to be obtained, construction should be limited to the summer months. In later years, there has been a tendency to extend the working season by starting early in the spring or continuing the work late into the fall. This usually results in high labor and equipment costs because of the long mixing period or, what more frequently happens, the introduction of too much asphaltic binder in an effort to get a uniform coating on the mineral aggregate.

Continued on page 94

Best way to find more scrap



Steel scrap—needed to keep the nation's mills rolling—grows scarcer every day.

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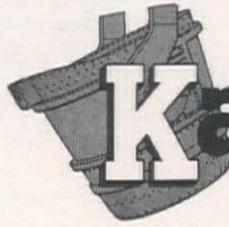
You can do the most to improve the situation. And the best way, the proved way, is this: Use your *shoe leather*. Walk around your plant and property and

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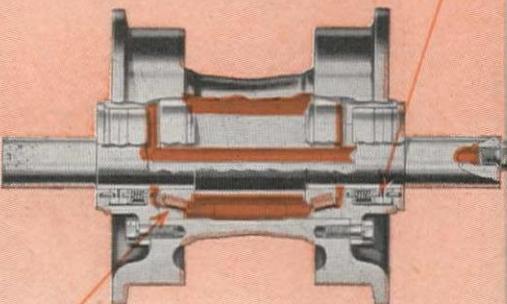
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seula—Mountain Tractor Company; Sidney—Northland Machinery Company; Billings—Seitz Machinery Company, Inc. **NEVADA:** Elko—A-D Machinery Company; Reno—Moore Equipment Company, Inc. **OREGON:** Eugene, Roseburg and North Bend—Farm and Industrial Equipment Company; 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 Company, Inc. **WASHINGTON:** Seattle, Tacoma and Wenatchee—A. H. Cox Company; Spokane—American Machine Company. **WYOMING:** Casper—Studer Tractor & Equipment Company.

ROAD-MIX—

...Continued from page 90

The use of lower viscosity oils to accomplish this purpose results in a less tough and durable mix than would be the case if higher viscosity oils were used during seasonable weather. It is quite probable that the highest percentage of failures, due to excess binder content, which required reworking the following season have been due to early or late season work. It is also difficult to reduce properly the moisture content of the mineral aggregate during spring and fall construction and such moisture plus the asphaltic binder often results in unstable mixes having an excess liquid content. A road-mix pavement has a much greater chance of success when it is completed and subjected to traffic early enough to obtain thorough curing compaction and a traffic sealed surface before cold weather winter rains.

What to use

As the mineral aggregate constitutes approximately 95% of any road-mix surfacing the importance of selecting suitable materials is evident. Fortunately, a wide variety of mineral aggregate types have been successfully used for the purpose.

These have included graded sands, decomposed granites, volcanic cinders, sand-gravels, crushed gravels, graded crushed rock, and similar granular materials. It is customary to limit the maximum size of mineral aggregate to $\frac{3}{4}$ in. (or $\frac{1}{3}$ the thickness of a 2-in. mat) because road mixes are usually spread in layers with a blade grader and larger aggregates have a tendency to be segregated by the blade forming rock pockets.

Stability of an asphalt and mineral-aggregate mixture may be defined as the resistance of the mineral aggregate particles such as rock, gravel, sand grains, etc. to movement when subjected to the loads of traffic. The resistance to the movement of one particle with respect to adjacent particles is influenced by the surface roughness of the particles, the interlocking of particles due to their angularity and the amount of asphaltic binder present.

Smooth surfaced gravel and sand grains, especially when of spherical shape, develop low frictional resistance that may be further lowered by an asphaltic oil film, particularly if that film is too thick. Rough, irregular surfaces usually encountered on crushed gravel, crushed rock, cinders, and decomposed granite sands produce high frictional resistance, which is further augmented by the interlock of angular particles of coarse aggregate if the proportion of fine aggregate is not in excess. These rough surfaced particles permit the use of thicker asphaltic films.

That portion of the mineral aggregate finer than the 200-mesh screen is generally silt and/or clay. These finely divided particles possess extremely high surface areas per unit of weight. A high surface area requires a greater quantity of bituminous binder to coat the individual particles, yet, such binder must be of low viscosity if the film thickness

on the particles is to be maintained at a minimum. Not only does the presence of an appreciable quantity of 200-mesh fines make the mineral aggregate very critical as to oil content but these fines are difficult to waterproof with thin films of oil and are therefore subject to water action. This is particularly detrimental in case the fines are of the clay type which develops plasticity and volume change upon becoming wet. The sand portion in a mineral aggregate for road-mix construction therefore should preferably show no plasticity, or a maximum Plastic Index of 6.

Bituminous binder

Probably one of the biggest obstacles to educational promotion with respect to asphaltic pavement construction is the number of grades and types of asphaltic binders. If the several grades of asphaltic binder differed widely in characteristics and uses it would be much easier for the engineer to become familiar with the several types and grades and make his selection accordingly. This does not mean that the grades and types of asphalts are not logically classified and arranged for easy understanding, but there is not sufficient difference in physical characteristics between adjacent grades of the same type. For example, there are three types of liquid asphalts which can be used in road-mix construction, namely, slow curing (S.C.), medium curing (M.C.), rapid curing (R.C.).

As their names imply, each of these types of liquid asphalt have different curing rates depending upon the volatility of the solvent oils present. The slow curing products contain industrial distillate fractions in addition to asphalt; the medium curing products are composed of asphalt thinned with kerosene, while the rapid curing products consist of asphalt thinned with a gasoline fraction known as naphtha. In each of these types there are six grades ranging from No. 0 to No. 5 which only differ from each other with respect to the proportion of solvent to asphalt. The No. 0 grade has the highest whereas the No. 5 grade has the lowest percentage of solvent. As the amount of solvent usually varies approximately 5% between grades, the consistency or viscosity of the several grades increases by moderate steps and thus permits the engineer to select the proper consistency for the particular mineral aggregate, mixing method, and climate encountered.

In selecting the grade it is desirable, of course, to use the highest viscosity oil which can be economically mixed with the aggregate with the available equipment. Fine grained aggregates, cool weather and blade-and-harrow mixing usually require liquid asphalts not heavier than the No. 2 grade. Coarser aggregates, hot temperatures, and mechanical mixing devices (such as the travel mixers) permit the use of No. 3 and sometimes No. 4 grade. It should be remembered, particularly in the case of the M.C. and R.C. types, that solvent is lost by evaporation during the mixing and spreading operations and that it

only requires a loss of 3 to 5% of solvent to change the liquid asphalt to the next heavier grade.

The toughness of the mix is related to the cohesiveness of the binder, which in turn depends upon the rate of curing of the liquid asphalt. Rapid curing liquid asphalts develop cohesive binders within a day or two and are therefore not considered suitable for blade mixing. They have been successfully incorporated by travel mixers where the mixing is accomplished in a few hours and the resultant mix spread and compacted the same day. Medium curing asphalts provide a longer period of workability. When used with travel mixers, the mix should be further aerated by blading to increase the viscosity of the binder prior to laying and compacting. Slow curing liquid asphalts permit long periods of workability and cannot be expected to develop increased cohesiveness during construction. It is, therefore, essential that the proper viscosity binder of a slow curing type be selected to provide sufficient initial cohesion to bind the mineral aggregate.

The quantity of asphaltic binder required by a given aggregate has been determined by visual observation by construction superintendents of wide experience with reasonably satisfactory results. During the early stages of road-mix development this was the system followed and the results were generally satisfactory, particularly for noncritical aggregates. Because mineral aggregates from different sources varied in surface roughness characteristics, size gradation and absorption, more exact oil content determinations were desirable and several formulas and methods were developed to serve as a guide. For dense graded aggregates the C. K. E. (centrifuge kerosene equivalent) method of the California Division of Highways has proven most satisfactory. Other methods involve the determination of surface area from a screen analysis of the mineral aggregate which, considered with a factor for surface roughness and proper allowance for absorption, also gives a good indication. Allowance should also be made for the amount of solvent present in the M.C. and R.C. liquid asphalts as no binding effect can be expected from the solvent which evaporates.

Mixing equipment

The first road mixing was accomplished by means of disc and spring tooth harrows pulled at medium speed through the mineral aggregate as each increment of liquid asphalt was applied by pressure distributor. After all of the liquid asphalt had been incorporated, final mixing was accomplished by blade graders. This process is still used with excellent results. The only disadvantage is the interference to traffic during the mixing operation. The next improvement consisted of the development of mobile mechanical mixers which speeded up the mixing of the liquid asphalt with mineral aggregates, thus eliminating some of the blade graders used for mixing.

A further logical development consist-

Continued on page 138

Asphaltic membrane to stop seepage from old earth dam

Loss of 20 acre feet per day through fill and abutments corrected by placing buried membrane — Life and usable capacity extended on 50-year old Yorba Dam

SATURATION of the earthfill dam, bringing about slippage of the fill, restricted the use of Yorba Reservoir in Southern California to about one-third its 1,200-acre feet capacity. Economical corrective measures undertaken by the reservoir owner, the Anaheim Union Water Co., are described below.

Yorba Reservoir, situated about 5 mi. from Fullerton, Orange County, is used primarily as a service reservoir for irrigation of citrus and avocado groves. Its water level varies constantly, as operation calls for daily withdrawals followed by nightly replenishment from the owner's canal, diverting from the Santa Ana River several miles upstream in Santa Ana Canyon.

Built 50 years ago

The dam was begun in 1900 and completed in about 1906. About 42 ft. high and 1,000 ft. long, the dam impounds water in a reservoir covering about 80 acres. Lack of engineering data leaves the type of soil used in construction a matter of speculation. The abutments are gravel and quite poor. For some time in recent years there had been a loss of storage estimated at about 20 acre feet per day. Observations at the dam face and a survey disclosed that most of this loss was occurring as seepage through the dam abutments. The resulting saturation had permitted slight slippage, and early action was needed to control

SPRAYING CONTINUES on abutment as dragline starts to cast backfill on completed membrane along toe of dam.



By

FRED E. GRIFFITH

Sales Engineer

American Bitumuls & Asphalt Co.

the situation. As a safety measure, the operating capacity of the reservoir was reduced to about 400 acre feet.

Several methods considered

Many types of lining were considered by the engineers and directors of the water company, including subsealing, asphaltic concrete, gunite, heavy prime coats with cutback asphalt, bentonite, and others. The buried membrane type was finally selected, using catalyzed blown asphalt of the type currently employed by the Bureau of Reclamation. An extensive survey also disclosed that the buried membrane was by far the lowest in cost, and with every evidence of being the most efficient. In addition, it required only a fraction of the construction time estimated for other methods.

Sequence of operations

After draining the reservoir, the sequence of operations and construction details was as follows:

1. A line of steel sheet piling was driven about 20 ft. deep into the bottom of the reservoir, flush with the ground



ASPHALT IS APPLIED in the excavated trench between the sheetpile cutoff and the toe of the dam. This general view shows the two access roads on dam, stockpiled spoil, line of sheet piling and equipment at work.

surface along the upstream toe of the dam.

2. Earth was excavated about 4 ft. below the top of the piling on the dam side to insure a good seal. Soil from this excavation was stockpiled on the dam face to be used for backfilling. (See illustration.)

3. Two access roads were constructed across the upstream face of the dam to permit operation of asphalt spreader trucks, thereby eliminating the use of long hoses in the spraying operation.

4. RC-1, at a rate of $\frac{1}{2}$ gal. per sq. yd., was used as a tack, or prime coat on piling and on all concrete outlet structures.

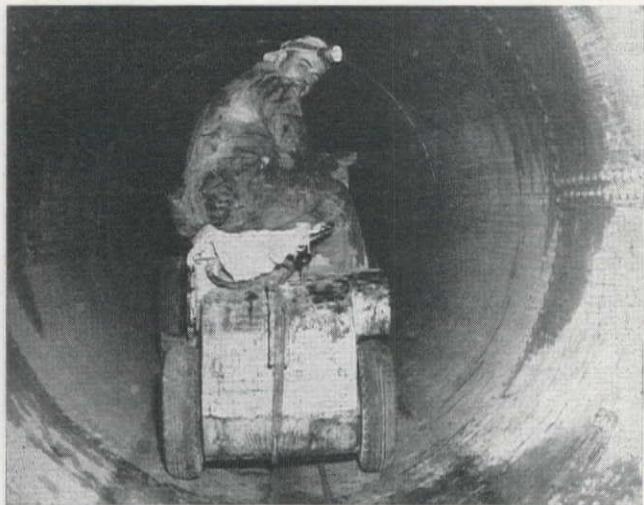
5. Catalytically blown asphalt was sprayed at a rate of about 2 gal. per sq. yd. and a temperature of 400 deg. F. On the 3:1 dam slope no runoff of asphalt was experienced. On the abutments, which have a slope in some places of $1\frac{1}{4}:1$, it was necessary to make two applications to prevent excessive runoff.

6. Backfilling was done, using fine material as a cushion next to the asphalt membrane. This prevented large angular stones from puncturing the mat. A total of about 2 or 3 ft. of backfill was used.

Two weeks required

About two weeks were required for the entire application of asphaltic products listed above. Total quantities were: RC-1, 4 tons; catalyzed asphalts, 242.5 tons.

HOW IT WAS DONE . . .



Converted concrete buggy tackles an "inside job"

A NEW DEVELOPMENT in construction equipment has been devised by forces of Pipe Linings, Inc., a subsidiary of American Pipe & Construction Co., to facilitate cement-mortar lining operations in large diameter pipe. For Centriling 17,000 ft. of 66-in. steel water main in Seattle, Wash., the contractor has converted a conventional motor concrete buggy for "inside" work.

The concrete buggy was originally built by the Gar-Bro Manufacturing Co. of Los Angeles, and driven by a gasoline engine. Because it is impossible to use an internal combustion engine in pipeline work, the buggy had been modified in several ways so as to be effectively used.

First, it was electrified. A 5-hp. fluid drive electric motor was installed on the rear end. For the Seattle job, power from a 220-volt portable generator was transmitted through 1,300 ft. of No. 10 Simplex four wire cable.

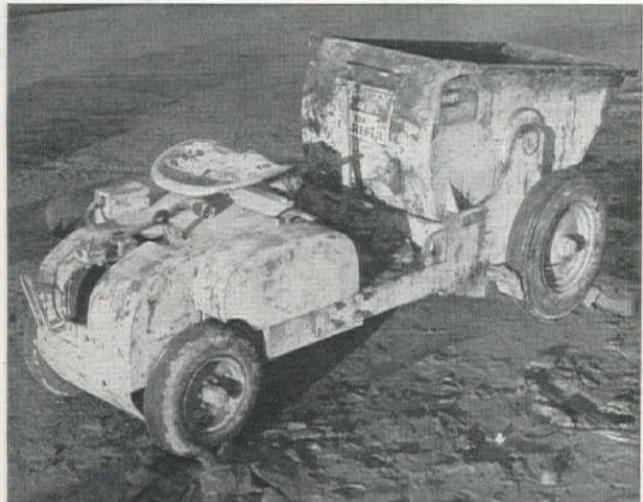
ABOVE—View of the Garlinghouse "Mud Buggy" inside pipe. Buggy had to be electrified since gasoline-driven engines couldn't be used inside the pipe.

BELOW—Overall view of the buggy after it has emerged from its "inside job."

Also, the original rear guide wheel was removed and replaced by a rigid two-wheel axle. Attached to this axle and to the electric motor are sprocket gears, connected by standard $\frac{1}{4}$ -in. drive chain. The drive wheels are fitted with 4 x 8 pneumatic tires. The resulting rig cannot be steered; curvature of the pipe invert suffices to guide the buggy in operation.

In the Seattle water main, access holes for the Centriling were spaced about 1,000 ft. apart. Delivering 1,300 lb. of mortar per load, the buggy at this distance would take $2\frac{1}{2}$ min. for the trip in, and 2 min. to return, traveling about 520 ft. per min.

Keith Boatwright was superintendent for Pipe Linings, Inc.



Scarifier-pulverizer team aids regrading work

PICTURED at right is an International TD-18A tractor and pull-type grader with scarifier and pulverizer. In Fresno, Calif., this combination is helping with regrading work on the oiled streets in lightly traveled residential areas. The scarifier tears up bumpy oiled roads and the pulverizer breaks up the chunks. The material is then reoiled and smoothed to serve as a good light-traffic surface for several years.



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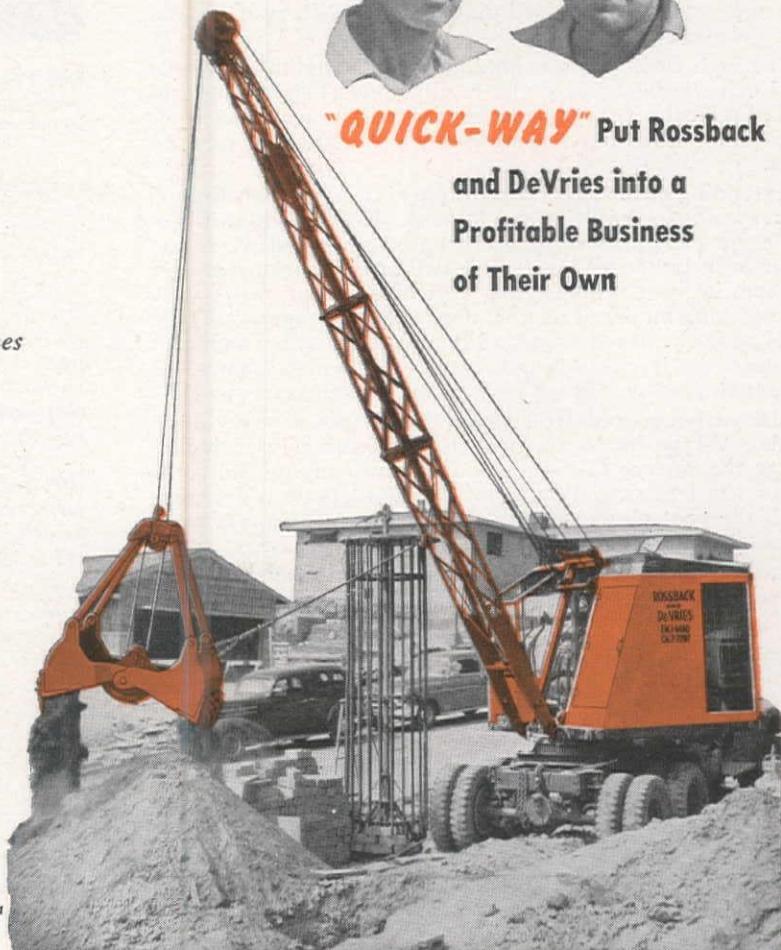
"We've been working for many years with "QUICK-WAY" Truck Shovels and know their worth in Back Hoe, Clamshell and General Crane Work. A typical operation is the job we're doing now for contractors who are building 52 Three Bedroom Houses for *La Canada Homes* on the outskirts of Pasadena.

"We are digging holes for 1100-gallon septic tanks (13' long, 4' wide, and 7' deep), digging two cesspools for each tank 26' deep and 6' in diameter. We're digging the ditch to join the septic tank with the two cesspools. This is all being done on hilly ground, some of it hard pan. Our "QUICK-WAY" really does fast work on jobs like this which mean profit to us. On one job our "QUICK-WAY" handled 698' of ditch in one day, averaging 2½' to 6' deep. We've dug in seven 750-gallon prefabricated septic tanks (9'6" x 3'6" x 7') in a single day. These are typical money-making jobs for us."

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Please send me complete details on "QUICK-WAY" Truck Shovels—
four different models from 3 to 10 ton crane capacity.

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Clearing job speeded with new "Cat" claws

LAND CLEARING EXPERTS rub their eyes when they see the 52-ton machine illustrated on this page cut a 16-ft. swath through dense mesquite and brush, controlling the menace which in recent years has plagued the cattle lands on the King Ranch in Texas.

It all started when two Caterpillar dealers—Peterson Tractor & Equipment Co. of San Leandro, Calif., and the Wm. K. Holt Machinery Co. of San Antonio, Texas—announced a new set of claws for the twin "Cat" D8 tractor. The new version is a high clearance unit with 270 hp. and a 65,000-lb. drawbar pull.

Design of the twin tractor arrangement resembles that of its predecessor unveiled last year. However, due to the special application, the revised unit has a 13½-ft. gauge and a 3-ft. ground clearance.

The high clearance was obtained by placing an additional final drive bullgear over the regular one. This change required relocation of the bevel gear and oil pump, plus extension of the final drive housing and installation of new oil lines.

Extending out in front like a funnel is a 7-ton Holt Funnel Dozer manufactured by the Wm. K. Holt Machinery Co. In design, the funnel dozer is composed of a standard, Caterpillar-built bulldozer blade with two large knockdown bars or pipes in front. This angling-type blade is cut in two with the sections mounted at a 45-deg. angle. In operation, the arms push the brush over, and the blade sections conduct it between the tracks. The 3-ft. ground clearance allows the tractor to pass over brush without excessive use of power.

The rear-mounted Holt "Root Plow" has a heavy-duty, double V-type blade that travels approximately 16 inches below the surface of the ground, cutting stumps and roots below the bud ring. Weight of the 16-ft. plow is six tons. Both the root plow and funnel dozer operate from a rear-mounted Caterpillar cable control unit.

Production with the high clearance tractor averages approximately four acres per hour in heavy brush. Diesel fuel



THE TWIN "Cat" D8 tractor knocks down and root-plows 40-ft. trees and underbrush on a tough clearing assignment. Not many things can stand in the way when this 52-ton machine goes into action.

consumption totals 2½ to 3 gallons per acre. King Ranch follows the practice of leaving the brush where it falls without burning, in order to add humus to the soil and protect the good grasses until they can reseed.

Early last year, R. A. Peterson of Peterson Tractor & Equipment Co. amazed the tractor industry by producing the first set of "Siamese Twins." He removed one track and final drive from each of two Caterpillar D8 tractors, which were then joined at the final drive housing. A special plate was installed on the back of the housing, and necessary linkages were made for controls. A rigid, U-shaped bar was devised to tie the tracks together and support the front of the tractor. Not until the advent of the twin D8 did the desired track-type tractor become available for full scale operations in the largest brush on the King Ranch, where many other land clearing machines have been tried in the past.

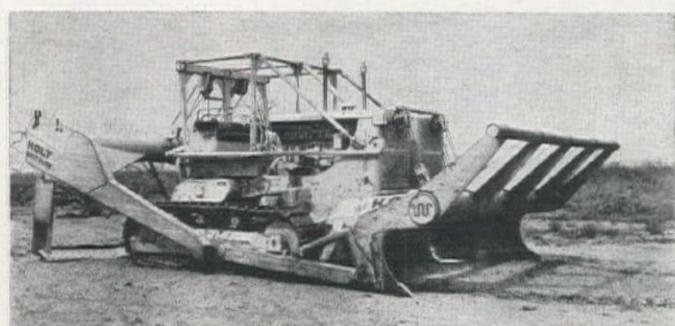
For Wm. K. Holt's organization, the King Ranch's continual battle against the brush menace is not new. Nearly two decades have been spent in close cooperation with King Ranch officials, developing special machines and techniques. In fact, the present funnel dozers and root plows mounted on standard D8 tractors working the vast acreage are tools resulting from these years of practical research.

King Ranch confirmed the success of the first high clearance twin D8 by ordering a second unit from Wm. K. Holt Machinery Co. The first twin had run 1,000 hours and had knocked down and root plowed 3,800 acres of the heaviest mesquite and mixed brush pasture on the ranch—without a single delay for repairs.

SPECIFICATIONS

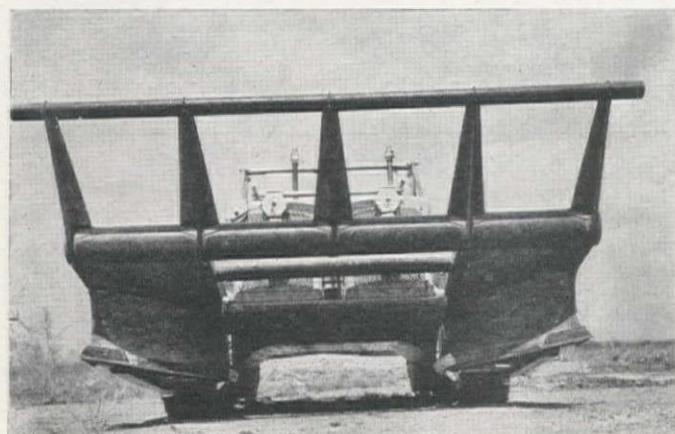
Horsepower.....	270 @ 1,110 r.p.m. (high idle)
Width	15 ft. 6 in.
Weight (tractors).....	72,350 lb
Drawbar pull.....	65,000 lb.
Cable control (No. 25).....	1,800 lb. (rear-double drum)
Funnel dozer	14,210 lb.
Root plow cut	16 ft.
Root plow weight	12,000 lb.
Plow lifting mechanism.....	2,500 lb.
Sheave groups	500 lb.
Total weight	103,360 lb.
Total length	32 ft.
Total height with cab.....	13 ft. 6 in.
Total width with equipment.....	21 ft.
Clearance	3 ft.
Width of funnel	8 ft.

Miscellaneous Information: Standard plow blade is hard surfaced for longer wear in sand and hard top soil. Double "V" found desirable for better cutting and elimination of binding usually experienced with straight plow blade. Foot booster on master clutch gives free use of both hands for shifting gears. Dual throttle offers operator great advantage (quick turning) . . . he rarely uses steering clutches. One master clutch control, two brake pedal controls.



CABLE CONTROLS operate the Holt Funnel dozer and root plow, both of which pivot on trunnions attached to the track roller frames of the twin D8.

HERE IS THE WAY the machine approaches its assignment. When the funnel dozer is lowered brush is gathered for the kill.



Precision Action

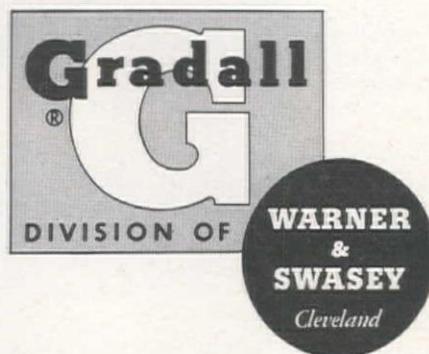
**CLEANS DITCH BOTTOM
WITHOUT DESTROYING
SODDED SLOPES!**

HERE'S HOW a major railroad uses one of its several Gradalls to cut costs on a rather routine—but never ending—job.

With extreme accuracy, the Gradall cleans this 7½ foot drainage ditch without harming sodded slopes or disturbing the surrounding area. Completely replacing the hand labor previously required, the Gradall did the job quicker, more accurately, and at less cost.

Many similar excavating jobs—close to curbs, sidewalks, tree lawns, buildings, or around buried pipe or tanks—ordinarily require hand work in addition to machines. But the Gradall's positive down pressure and arm action insures such accuracy and neatness that hand labor is eliminated on nearly all such jobs.

The Gradall's remarkable precision, versatility, and maneuverability return big profits to construction men—cut costs for railroads and municipalities.



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Portland, Oregon; Boise, Idaho; Seattle, Washington
BROWN-BEVIS EQUIPMENT CO., Los Angeles 58 California
ARIZONA EQUIPMENT SALES, INC., Phoenix, Arizona
CONTRACTORS MACHINERY CO., San Francisco 7, California
WESTERN CONSTRUCTION EQUIPMENT CO., Billings, Montana



1

The 6 ft. wide, ½ cubic yard bucket starts its precision cut.



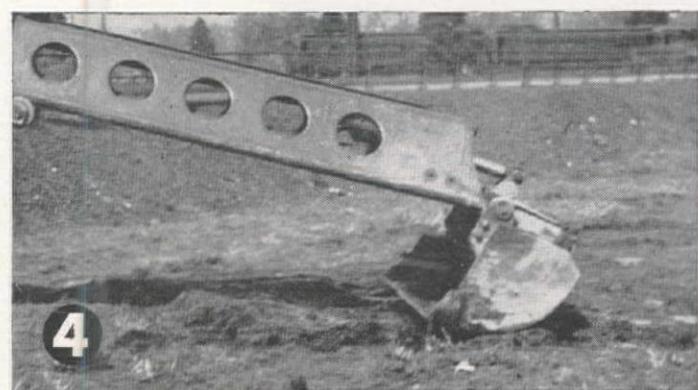
2

The hydraulic boom, working with the skill of a giant arm, takes a skim cut from the bottom of the back slope. The muck is cleaned from the bottom, and a skim cut taken from the lower end of the front slope—lifting it free without disturbing sod.



3

The Gradall swings around and wastes the muck.



4

The arm-action boom levels the waste evenly over the surface before returning for another cut.

GRADALL—THE MULTI-PURPOSE CONSTRUCTION MACHINE with Controlled Down Pressure

New techniques employed in concrete wall construction

TWO INNOVATIONS in concrete wall construction are being used by MacDonald, Young & Nelson, Inc., and Morrison-Knudsen Co., Inc. (a joint venture), in building a warehouse covering nearly seven acres at the Signal Corps Depot in Sacramento, Calif. One of these innovations is a scaffold bracket, called a Clamp Jack, which eliminates extensive scaffolding. The other is an adjustable type of shore that was used as a vertical support on a previous MacDonald, Young & Nelson project and is now being put to work as diagonal bracing for sections of wall forms.

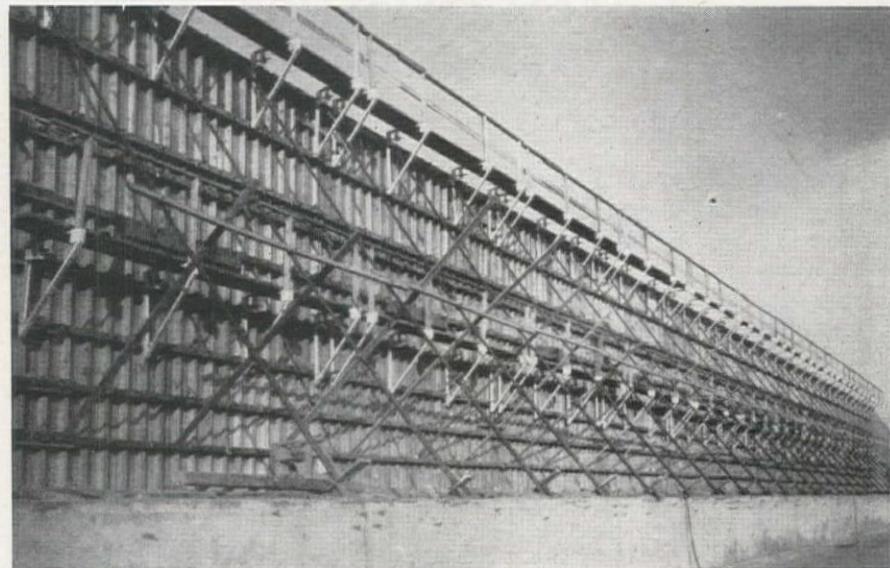
In constructing the 1,440 by 181-ft. warehouse the contractors decided that the most efficient method of erecting the long continuous concrete walls would be to use fabricated 20 by 21-ft. form sections that could be stripped and moved ahead for subsequent pours. In conjunction with the use of these sections it was found that the relatively new Clamp Jacks would be far less costly than the standard type of unattached and erected scaffolding. Also they would remain more solidly attached to the forms during the moving than would fixed scaffolding of timber construction.

Scaffold brackets

Lightweight (22 lb.), the Clamp Jacks are triangular in shape (see illustration) and are attached directly to the form by tie bolts that have a hook on the end to fit over the walers. When attached, they become part of the form. However, they

RIGHT—Close-up of scaffold bracket shows method of attaching to whaler. Lower point of triangular bracket rests against lower whaler.

BELOW—Two rows of Clamp Jack scaffold brackets provided two catwalks for men at work on the 20-ft. high walls. Diagonal bracing by steel shores eliminated timber work to support forms.



M. S. KELLEY, left, is resident engineer for the Corps of Engineers, and Ken Gooding is general superintendent for MacDonald Young & Nelson and Morrison-Knudsen Co., Inc., on this Signal Corps Depot job.

can be removed for use with another form when desired. At the outer end of the horizontal leg is a built-in socket where uprights for a safety railing are inserted.

Each of the 20 x 21-ft. form sections used for the signal depot warehouse have two rows of these brackets spaced across them on about 5-ft. centers. One at each end provides a double bracket for the scaffold walk where the sections are joined. The catwalk supported by the upper row is used for placing steel, and placing and finishing concrete.

The other device being used to speed the operations are Acrow adjustable shores. Originally the shores were used in their normal function as vertical supports during construction of a sludge plant. In stock in the MacDonald, Young & Nelson storage yard when construction of the warehouse was in the preliminary stages, it was decided that they could be used instead of timber bracing for supporting the form sections in a vertical position.

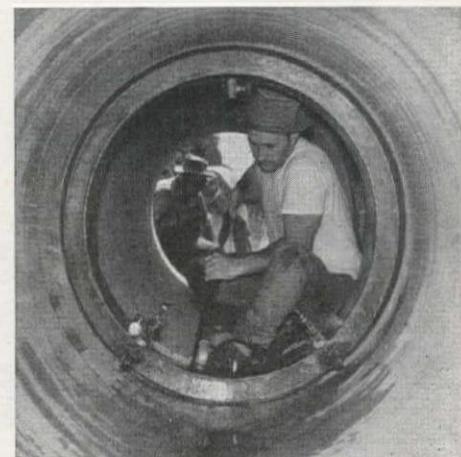
Two adjustable collars

Made from steel pipe, each shore has two adjustable collars that permit a positive pushing or pulling action for obtaining the correct vertical alignment of the forms. Set on 6-ft., 8-in. centers, two shores are used for each form section. To hold the base of the shores special angle plates are attached with double-ended bolts to the previously constructed loading dock.

The Clamp Jacks for the project were supplied by W. J. Burke & Co.

Ken Gooding is general superintendent for the joint venture. Oliver Twig is project engineer with Bill Muetting and Robert Cox as foremen. M. S. Kelley is resident engineer for the Corps of Engineers.

Tire pump takes new role as convenient joint tester



THIS MAN is employing an ordinary tire pump to test joints in 42-in. reinforced concrete pipe on the Bureau of Reclamation's Central Valley Project. The ring is in position with rubber gasket on each side of joint. Space between gaskets is filled with water and subjected to air pressure. If joint is not tight, water will leak to outside of pipe. Defective joints can be discovered before completed laterals are covered and placed under test.

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Its variety of uses keeps it busy every month of the year.

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NEWS OF WESTERN CONSTRUCTION

MARCH 1952

It's full speed ahead on major Northwest dam jobs

THE SPRING THAWS, and in some cases an approving nod from the U. S. Bureau of the Budget and Congress, will introduce a flurry of activity on major dam and hydroelectric projects in the Northwest States. The following is a run-down of the status of some of these projects, the possible moneys that may be appropriated, and the work expected to be carried out this summer.

Corps of Engineers appropriations

In his recent Bureau of the Budget speech, President Truman recommended the following appropriations for major C. of E. Civil Works projects in the Northwest:

WASHINGTON	
Chief Joseph Dam	\$25,300,000
Ice Harbor Lock & Dam	5,000,000
McNary Lock & Dam (Ore. & Wash.)	66,000,000
The Dalles Lock & Dam (Ore. & Wash.)	37,500,000

OREGON	
Detroit Reservoir	10,700,000
Lookout Point Reservoir	17,250,000

IDAHO	
Albeni Falls Reservoir	8,100,000
Lucky Peak Reservoir	6,087,000

Not included in this tabulation is a possible request for funds to start work on the \$380,000,000 Hells Canyon Dam in the Snake River Canyon on the Idaho-Oregon border. President Truman indicated that a supplemental appropriation would be asked of Congress if that body authorizes construction of the dam.

CHIEF JOSEPH DAM—First cofferdam being removed, second being extended

Concreting work within the center section of the second-stage cofferdam on this project was completed in a race against flooding, following the spring thaws. The first-stage cofferdam is being breached to allow the Columbia River to spill over the first completed section of the dam's spillway. Work has started on extending upstream and downstream legs of the second-stage cofferdam, wherein the second section of the spillway will be constructed.

The second-stage cofferdam will be completed about the end of next June, and this will immediately be followed by excavation to bedrock.

A prebid conference was held at Wenatchee last month to allow contractors

and power equipment manufacturers to look over the Chief Joseph intake and powerhouse plans and specifications. Bids for this \$40,000,000 structure will be opened probably on March 12 at the Seattle Corps of Engineers' office.

Chief Joseph Dam, estimated to cost about \$240,000,000, is on the Columbia River near Bridgeport in north-central Washington. Current major work at the

site is under contract to Chief Joseph Builders, a joint-venture firm with L. E. Dixon Co. as sponsor.

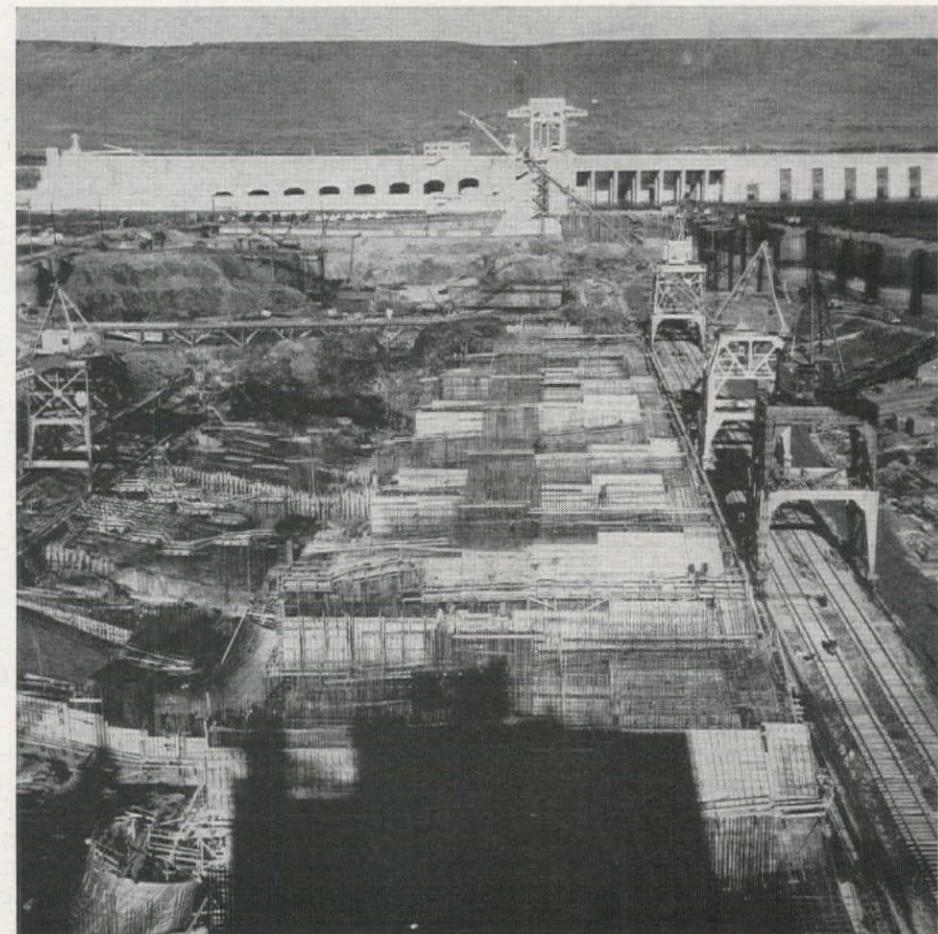
THE DALLES—Work starts on cofferdam and excavation

A milestone was reached on this project last month when work started on the first major contract at The Dalles damsite. A \$4,888,000 contract was awarded early this month by the Corps of Engineers to the White Plains, New York firm of S. A. Healy & Co. Work covered under this contract consists of cofferdam construction, powerhouse excavation, etc. Completion time is 500 days.

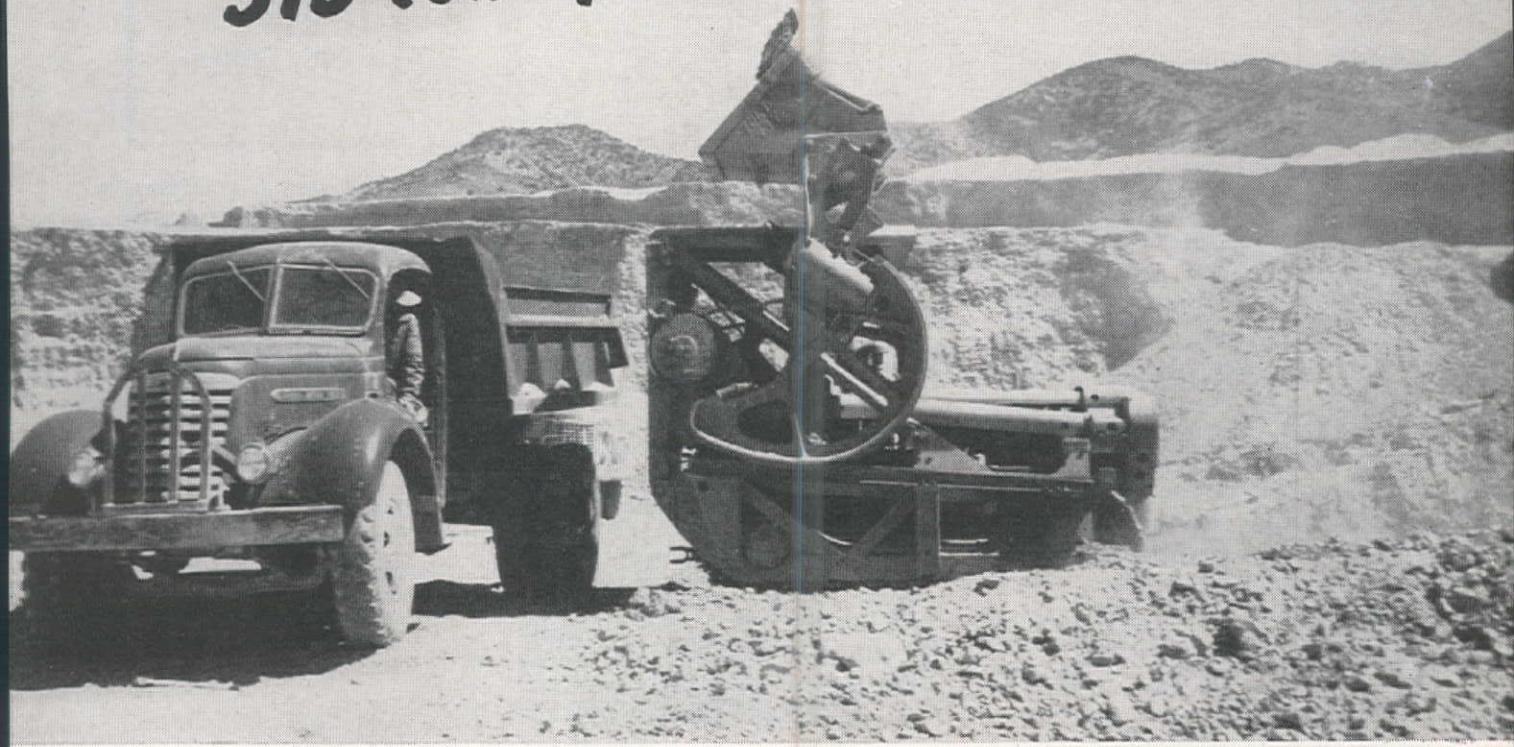
Continued on page 104

ENOUGH STEEL AT McNARY DAM TO BUILD THREE LARGE BATTLESHIPS

THERE'S STEEL EVERYWHERE in this current construction view at McNary Dam on the Columbia River. You're looking down the centerline along the dam's axis, with reinforcing steel in place for substructures of powerhouse. Steel sheetpile cells of main second step cofferdam can be seen at upper left and right, enclosing 43-acre area where work is being pushed on the completion contract awarded last year to Guy F. Atkinson Co. and Ostrander & Jones (McNary Dam Contractors) on a low bid of \$58,416,460. Area in immediate foreground was the main channel of the Columbia River a few months ago and was under 60 to 70 ft. of water. A total of 247,500,000 lb. of steel is being used in all phases of McNary Dam, enough for three large battleships.



315 tons per hour average



JOB STUDY

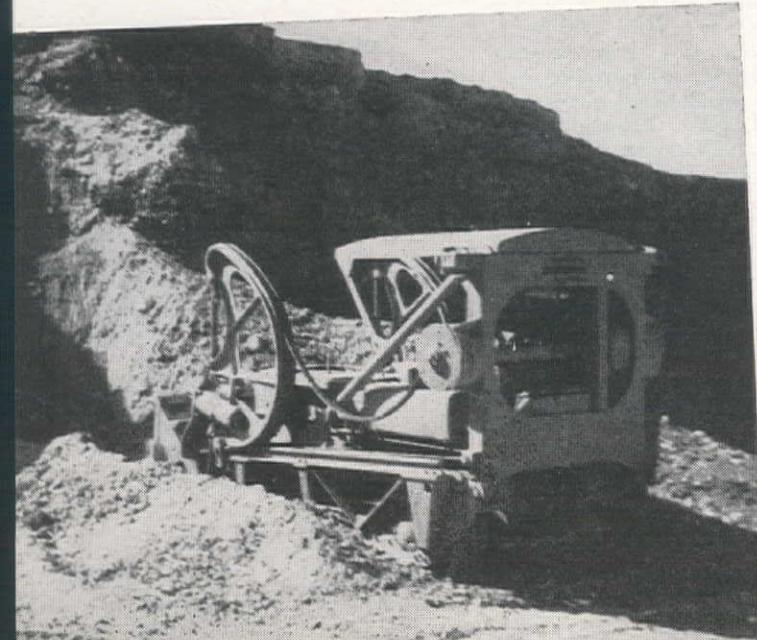
Time—1 hour
Material—compacted gravel and clay sand mixed
Location—Nevada
Actual yardage loaded—212
Total loading time—40 minutes
Lost time and switching—20 min.
Average loading time—61 seconds
Truck rated capacity—5 yards
Weight material—110 lb. cu. ft.
Actual tonnage loaded—315
Haul—1 mile round trip
Trucks—6 working

Loading compacted clay, sand and gravel

A recent case study of loading sand and gravel compacted with clay, with no preliminary shooting, shows the average loading speed of the Eimco 104 RockerShovel to be equal to that of much larger, more expensive equipment.

This operator maintained the average for 27 hours in order to fulfill his contract with the Railroad.

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The \$350,000,000 dam is located on the Columbia River at the head of the Bonneville Dam pool. Upon approval by Congress of appropriations asked, more contracts will be awarded this year. First power is scheduled to be delivered from The Dalles powerhouse in 1957.

CABINET GORGE DAM—Pouring round-the-clock in freezing weather

Below-freezing temperatures have failed to slow appreciably the work by Morrison-Knudsen Co., Inc. on the Washington Water Power Co. Cabinet Gorge hydroelectric development. Major concrete pouring started last November, and about 40,000 cu. yd. have been poured to date. During the cold weather the concrete mix is preheated by steam pipes in enclosed bunkers so that temperature upon delivery is about 50 deg. About 800 men are employed on the \$20,000,000 project. First production of power is scheduled for September of this year. The project will produce about 200,000 kw. and will be Idaho's largest hydroelectric power development.

HUNGRY HORSE DAM—Concrete pouring resumes this month

Concrete placing by General-Shearmorrison, prime contractors for the Bureau of Reclamation's Hungry Horse Dam, is beginning this month, a month earlier than during each of the last two years. The concrete work is chiefly in the powerhouse, with plywood and canvas protection. Installation of the first 71,250-kw. generator in the powerhouse began last month. General Electric Co. has a \$4,641,000 contract to fabricate and install four such generators. First generator will be producing power about next October, with the second generator going on the line probably in December. Graft-Shirley-Lane is continuing turbine installation.

LIBBY DAM—Planning funds provided, exploration starts

A \$125,000 planning fund was approved early this year for this \$240,000,000 power and flood control project on the Kootenai River near Libby, Montana, and a contract has been awarded for foundation exploration. Congress has approved the project but has not yet appropriated money for initial construction. The project must be approved by an international joint commission of United States and Canadian officials, since both countries will be involved in the project.

The concrete dam will rise 400 ft. from bedrock, will be 2,330 ft. long at its crest, and 1,300 ft. long at base. Six power units will be installed with a rating of 98,000 kw. each. The reservoir will impound 4,250,000 acre-feet of usable storage.

COWLITZ RIVER DAMS—Tacoma ordinance gives the go-ahead signal

An ordinance approved by the City of Tacoma has given the go-ahead to the Cowlitz River hydroelectric development. To be built by Tacoma, the \$146,000,000 project includes two dams on the Cowlitz River—Mossyrock and Mayfield. The ordinance detailed heights

of the dams and set locations of powerhouses and transmission lines. Work will begin at an early date on access roads, construction camps, etc.

Mossyrock Dam will be about 500 ft. high, have a crest length of 1,300 ft. and impound a reservoir 21 mi. long. Mayfield Dam, downstream from Mossyrock, will be 240 ft. high.

McPhail is new USBR commissioner

WITH THE TRANSFER of Wesley R. Nelson, assistant commissioner of the Bureau of Reclamation, to the State Department, the Bureau of Reclamation announces the appointment of H. F. McPhail, director of power utilization, to replace Nelson.



Nelson

McPhail

Nelson was the recent recipient of the Department of the Interior's distinguished service award. He joined the Bureau in 1922 as a surveyor and junior engineer on the Grand Valley Project, and with the exception of 4 years, has served with the Bureau since that time.

McPhail joined the Bureau in 1919 as a powerhouse foreman at the Lingle hydroelectric plant in Wyoming on the North Platte Project, and in a considerable degree has supervised the tremendous expansion of the hydroelectric capacity of the Bureau. After service on the Shoshone Project and in the Denver office as chief electrical engineer McPhail became director of the branch of power utilization when the unit was established in 1943.

McPhail will be succeeded by Henry B. Taliaferro, who was formerly regional power manager in charge of production, distribution and marketing of power from the Central Valley Project power plants at Shasta and Keswick dams.

New Mexico squelches specs favoritism

THE NEW MEXICO State Highway Department has moved to squelch any hint of favoritism toward the products it requires with a clarification of its buying policies.

In future bid calls, the department will list the names of three manufacturers of the desired product and leave a space labeled "or equal" which may be filled in. This new policy would make it impossible to specify any one brand as the only acceptable one on a given bid.



Neil B. McGinnis Company, Inc.
Phoenix, Arizona
Casa Grande, Arizona

San Joaquin Tractor Company
Bakersfield, California

Food Machinery and Chemical
Corporation
Fresno, California

Shaw Sales & Service Company
Los Angeles 22, California
San Diego, California
Riverside, California
Santa Barbara, California

J. M. Equipment Company
Modesto, California

Redwine Tractor Company
Mountain View, California

Buran Equipment Company
Oakland, California
Willits, California

Moore Equipment Company, Inc.
North Sacramento, California
Redding, California
Reno, Nevada
Stockton, California

Livingston Brothers Tractor
Company
Salinas, California

Tulare County Tractor Company
Visalia, California

Aikins & Williams Tractor Co.
56 West Fifth Street
Eureka, California

Power Equipment Company
Denver, Colorado

Southern Idaho Equipment
Company
Idaho Falls, Idaho
Boise, Idaho
Twin Falls, Idaho

Ever wonder why you never see a scowling, fagged operator on the Baker, A-C team? Here's why:

They just plain love that "doze-in-your-armchair" ease of control; that positive hold without throttle jockeying; that fraction-of-an-inch accuracy . . . that quick, direct lift; that positive down-pressure which puts almost all the tractor weight on the cutting edge; and the "roll-action" of the blade which leaves more tractor power for push. Because "Easy DOZE It!"

That's why you see the Baker, A-C team more and more wherever dirt has to be moved fast and efficiently. When operators prefer it, you can count on it being the best money-maker.

Specify Baker Bulldozers, Gradebuilders or Root Rippers for your new A-C Tractors . . . Baker makes engine-mounted hydraulic control models and cable-control models for the entire line of Allis-Chalmers crawlers. See your Baker, A-C Dealer. THE BAKER MANUFACTURING COMPANY, Springfield, Illinois.



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Harry Cornelius Company
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Smith Machinery Company, Inc.
Roswell, New Mexico

Diehschneider Equipment
Oregon, Ltd.
The Dalles, Oregon

Farm & Industrial Equipment Co.
Eugene, Oregon

West-Hitchcock Corporation
Klamath Falls, Oregon

Oregon Tractor Company
LeGrande, Oregon

Tractor Sales & Service, Inc.
Medford, Oregon

Wood Tractor Company
Portland, Oregon

Cate Equipment Company, Inc.
Salt Lake City, Utah

A. H. Cox & Company
Seattle, Washington
Wenatchee, Washington
Tacoma, Washington

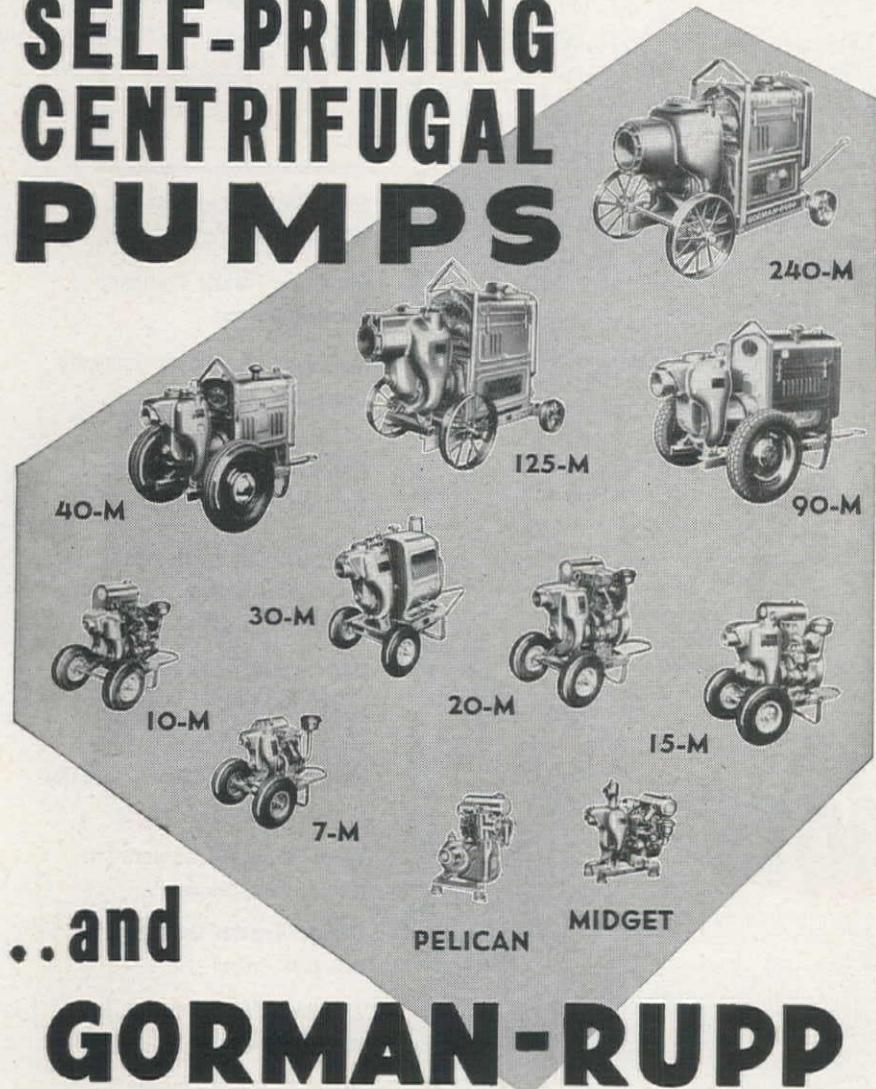
Northern Harris
Walla Walla, Washington

Yukon Equipment, Inc.
Seattle, Washington
Fairbanks, Alaska
Anchorage, Alaska

American Machine Co.
Spokane, Washington

Studer Tractor & Equipment Co.
Casper, Wyoming

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Per-ton-mile tax fought in Colorado

A FIFTEEN-YEAR FIGHT by the Colorado Contractors Association to eliminate a per-ton-mile tax on materials hauled by contractors to and from state and federal construction jobs has received a set-back. A District Judge at Denver has granted a motion by the Colorado Public Utilities Commission to dismiss the contractors' case against the commission.

The fight against the tax began late in 1937 when the Colorado Attorney General ruled that such a tax should be collectable. The contractors then contended that the tax should apply only to the transportation of property for sale or resale in the course of private commerce. The Colorado State Highway Department then asked the Attorney General to reconsider. He did, and the ruling was reversed in 1938. However in 1949, a new Attorney General again ruled that the tax was collectable when public works were involved. The now-dismissed suit by the contractors prevented the tax from ever being collected.

Present view of the state highway department is that the tax bill will increase contractors' contract prices. The department will lose some 60% of the extra charge, since 20% of the tax will go to the public utilities commission and 40% will go to Colorado counties.

The contractors' association has indicated that an appeal will be made to the state's supreme court.

Long runway planned at Salt Lake airport

CONSTRUCTION of a \$2,500,000 north-south runway at the Salt Lake City Municipal Airport in Utah, has been proposed. Cost of the development would be shared by the city, the U. S. National Guard and the Civil Aeronautics Administration. Plans have been prepared and, when financing has been approved, the project will get the go-ahead signal. Constructing the runway of Portland cement concrete was estimated at \$2,770,000; of bituminous paving, at \$2,020,000. The runway would represent only the initial phase of the airport's development.

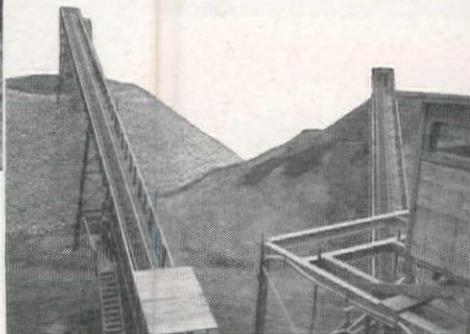
Utah plans longest over-water structure

PLANS are being rushed for the longest over-water structure in the Utah highway system—a \$1,000,000 steel and concrete bridge over the Colorado River north of Moab on U. S. Highway 160. The development of uranium deposits in southeastern Utah with a resultant increase in heavy truck travel on the highway has made the bridge a mandatory project. Present structure at the site is an independent 16-ton capacity steel truss bridge.

What's U. S. Rubber doing at Pine Flat Dam?



View of U. S. Rubber belts ascending the mountain side for approximately three quarters of a mile.



Stockpiling coarse and fine material taken from the gravel pit.

At this great California installation, the finished aggregates and sand are carried by "U.S." conveyor belts from storage all the way to the batching plant high up on the site. The belting is 36" wide, climbs six flights for a total distance of 3700 feet. This 100% "U.S." belt installation is another example of 3-Way Engineering—"U.S." engineers worked with the conveyor equipment manufacturer and the contractor to produce this economical and efficient haulage system.

United States Rubber Company engineers have designed and built conveyor belts for a variety of installations, large and small. Let them advise you on any materials handling problems. Write to address below.



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SERVING THROUGH SCIENCE

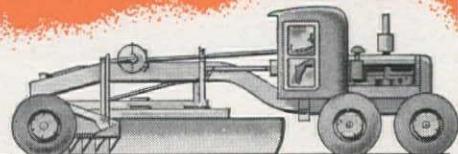
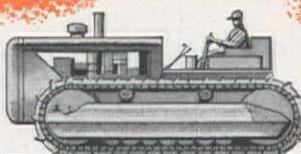
Here conveyors are stockpiling the finished washed-and-screened gravel.

UNITED STATES RUBBER COMPANY

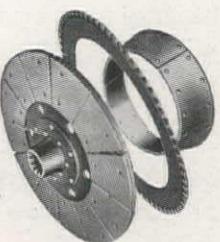
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Velvetouch

Big steam plant in New Mexico

A LOAN totaling \$9,045,000 to the Plains Electric Generation and Transmission Cooperative, Springer, N. Mex., opens the way for construction of the largest steam generating electric plant in the Rural Electrification Administration's history.

Espanola will be the site of the plant itself which will take approximately \$6,000,000 of the loan funds. Main transmission line construction will consume the remainder.

Electric power for 12 distribution cooperatives, eleven of which are in New Mexico and one of which is in Colorado will be provided.

A project of this scope facilitates a

tie-in between the plant at Espanola and the Bureau of Reclamation's Elephant Butte Dam. Projected Bureau plans could include another line running into Colorado which would unite the mountain states in an interchange grid.

With the transmission line to Albuquerque, the new plant will be tied in to the new network being formed in central and southern New Mexico. A network of this scope would mean that any power plant could fill a breach caused by a failure or shortage in a given area within the grid.

Opposition to the plans and proposed difficulties have already been advanced by the Public Service Co. of New Mexico. Other sources claimed that the plant would not be able to derive sufficient gas supplies from present sources to run the gas-fueled electric generating plant.

15-year building plan in So. Calif.

TENTATIVE APPROVAL of a 15-year multimillion-dollar civic center building project in Orange County, Calif., was recently voted by the Board of Supervisors.

Detailed plans were ordered for the first unit of the project, a \$647,000 health center. An eight-block area would ultimately house, in addition to the clinic, a social service and welfare building and a major courthouse structure. In time perhaps other facilities would be erected on the acquired land.

Officials estimated that a year would be required to make necessary tests and acquire plans for the health center project.

Westerners on 12-year irrigation project in jungles of Ceylon

THE GAL OYA Development Board of Ceylon, Morrison-Knudsen International, Caterpillar Tractor, "Tex" Taylor of Yuba City, Calif., and about 1,500 Ceylonese workers have teamed up for construction of the Gal Oya Irrigation and Reclamation Project in Ceylon, a 12-year job encompassing clearing of 250,000 acres of jungle, building of a 154-ft. high earthen dam at Inginiyagala, and construction of 25,000 four-room masonry cottages for settlers.

Begun in 1949, the entire project is moving consistently ahead of schedule, with Gal Oya Dam now nearly completed. Built by M-K International, the dam is 3,600 ft. long, 800 ft. thick through its base, and contains 5,000,000 cu. yd. of embankment material. Its four-turbine power plant will deliver 11,000 kw. of power for the project; and its 770,000

acre-foot capacity, supplied by a 100-in. monsoon season rainfall, will irrigate some 130,000 acres of arid land.

For jungle reclamation of 20,000 acres per year, project supervisor L. "Tex" Taylor has trained over 500 Ceylonese in the operation of Caterpillar equipment. Completely ignorant of the native tongue, Taylor has coupled color codes and charts with unending demonstrations and patience to teach equipment

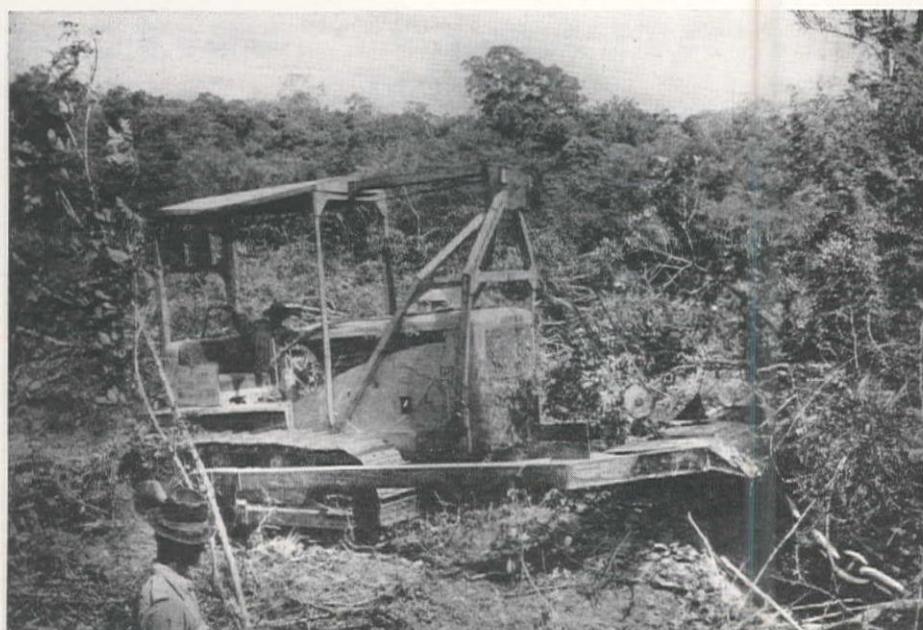
LOOP of 20-ton anchor chain is pulled by four tractors to clear the jungle. This is followed by a Caterpillar D7 tractor (left) equipped with a special dozer for felling large trees and stumps.

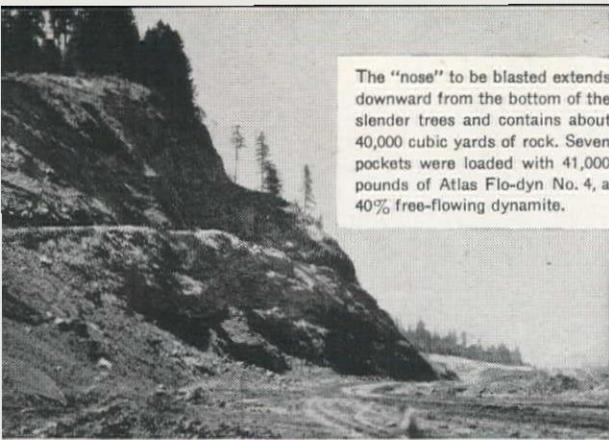
RIGHT — "Tex" Taylor of Yuba City, Calif., shown with native worker, is the man in charge of the jungle clearing operations.

operation and maintenance. To solve the servicing problem, he had grease fittings, containers, and guns painted: red for light lubricant, blue for heavy, etc. And the Ceylonese have caught on fast. Averaging only 100 lb. or so in weight, they now perch on special built-up seats to handle five teams of six D8 "Cats" that clear a total of over 600 acres daily.

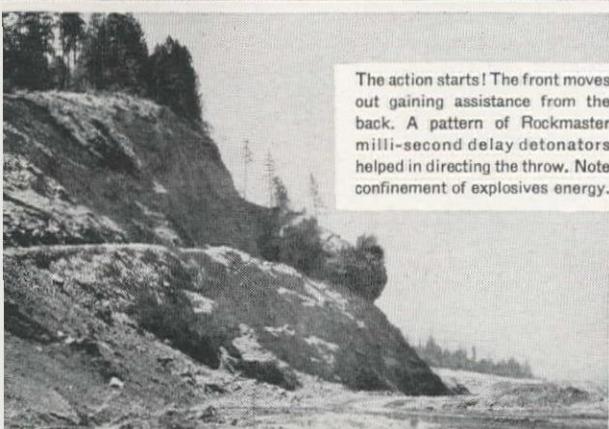
Reclamation areas have been laid out in 3,000 to 4,000-acre blocks, with parallel clearing trails bulldozed out by advance equipment. The heavy work is done by four D8's pulling a 20-ton, 300-ft. length of anchor chain. With two tractors in tandem at each end, the team clears everything in its path. Obstinate stumps and snags are nudged loose by a pair of job-built "treedozers" that follow immediately behind the big loop of anchor chain.

Taylor's crews began in August 1950 and cleared 18,000 acres in the first nine months—a rate of 24,000 per year. As a result, one 1,200-acre section has already yielded a rice crop, averaging 25 bushels per acre, that paid the entire cost of clearing the land.

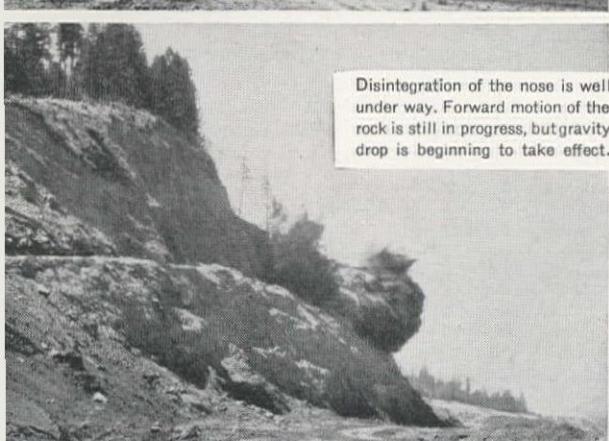




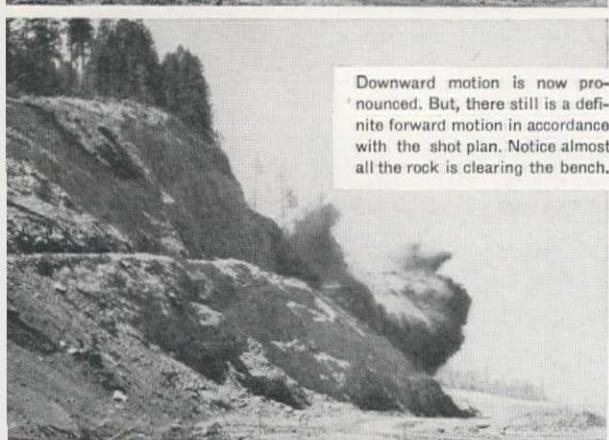
The "nose" to be blasted extends downward from the bottom of the slender trees and contains about 40,000 cubic yards of rock. Seven pockets were loaded with 41,000 pounds of Atlas Flo-dyn No. 4, a 40% free-flowing dynamite.



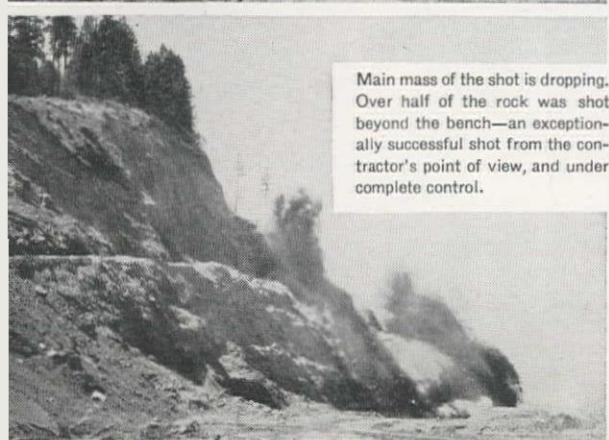
The action starts! The front moves out, gaining assistance from the back. A pattern of Rockmaster milli-second delay detonators helped in directing the throw. Note confinement of explosives energy.



Disintegration of the nose is well under way. Forward motion of the rock is still in progress, but gravity drop is beginning to take effect.



Downward motion is now pronounced. But, there still is a definite forward motion in accordance with the shot plan. Notice almost all the rock is clearing the bench.



Main mass of the shot is dropping. Over half of the rock was shot beyond the bench—an exceptionally successful shot from the contractor's point of view, and under complete control.

ENGINEERING WITH
ATLAS EXPLOSIVES

ROCKMASTER®

BLASTING

Reduces Costly Shovel and 'dozer Work

Oregon contractor employs *Atlas milli-second delay system* to make rock jump bench and land on valley floor.

Shovel work on a rough bench can be mighty expensive. Every cubic yard of rock that could be blasted off the "nose" and onto the valley floor meant substantial savings for the contractor on this highway and railroad re-location job near Lookout Point Dam, Oregon.

Leonard & Slate Ltd. of Oregon and E.C. Hall Company tackled the job with the milli-second delay action of the ROCKMASTER Blasting System. The result: over half of the rock was thrown to the valley floor. And they could have *kept the rock on the bench* if they wanted it there—thanks to ROCKMASTER's remarkable control over throw.

See how ROCKMASTER control can be put to work for *you*. Send for the free 20-page ROCKMASTER book showing typical loading patterns for all principal types of *controlled blasting*.

ATLAS EXPLOSIVES

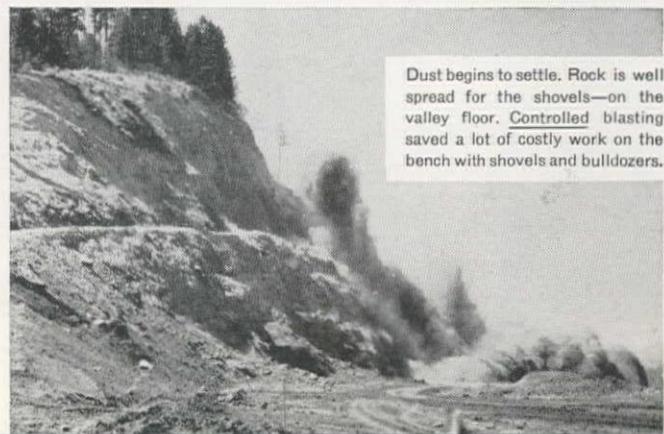


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Dust begins to settle. Rock is well spread for the shovels—on the valley floor. Controlled blasting saved a lot of costly work on the bench with shovels and bulldozers.

100th birthday party for CE's at Denver

AT ITS Denver convention next June the American Society of Civil Engineers will celebrate its 100th birthday. Since its founding by a group of New York engineers in 1852 the Society has spread over the entire world, to a present membership of more than 30,000. Honoring the occasion, engineers from all parts of the country will join in some 15 technical sessions during the convention, covering all the major departments of civil engineering science and art.

The convention will afford the visiting engineers opportunity to inspect important state and city engineering developments, among them highway modernizations in the plains and mountain areas, the additional storage dam under construction by the City Water Board, the four-lane limited access toll road from Denver to Boulder, the Valley Highway, and the City Coliseum. They will also be invited to visit the structures of the nearly completed Colorado-Big Thompson transmountain diversion project, from Green Mountain and Granby dams to the 13-mi. Adams tunnel and the extensive conveyance and power systems of the East Slope.

This latter inspection will provide the visitors a realistic representation of the reclamation planning and construction which has contributed so much to the development of the West. Federal Reclamation will have its semi-centennial in the week of the convention, as the original Reclamation Act was approved on June 17, 1902. The birth of reclamation will be commemorated by a special session on reclamation development in the United States, to be held under the auspices of the irrigation, hydraulics and other technical divisions concerned. Following this session the engineering laboratories of the Bureau of Reclamation at the Denver Federal Center will hold open house, affording opportunity for inspection of their manifold activities and showing the testing and experimental equipment in full operation.

At the close of the convention there will be opportunity for convention participants to relax by a visit to Estes Park and to get a glimpse of the mountain country and the scenic and recreational facilities offered by the parks and national forests within easy reach of Denver.

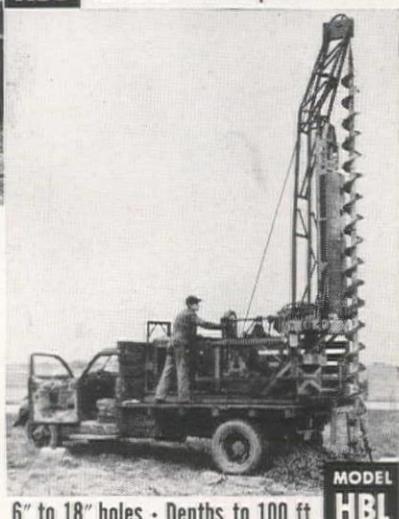
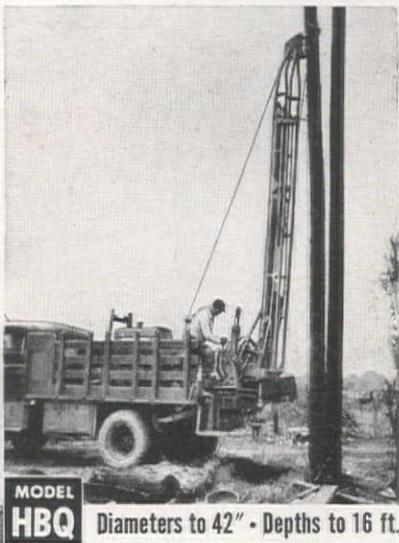
Private irrigation project in the Northwest?

SEVERAL THOUSAND acres of land may be involved in a private irrigation development in the Northwest within a year.

Land owners have met with the Rural Electrification Administration to discuss the development which would extend from Burbank into Columbia County along the Snake River. The country around the Snake River is now arid, but the sponsoring group feels that it could be transformed into a valuable area.

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FLATTENED STRAND
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SEE the keystone shape of the strands? Notice how compactly they fit together? That's the answer. There is more steel and less fiber in HERCULES Flattened Strand than in any other wire rope construction of equal size. And if you specify wire rope core, you get still more strength—7½% more—in the same diameter. That extra strength is often mighty useful—safer, too.

SEE how smoothly it fits the sheaves? Not one—but four wires in each strand touch the groove. That gives longer life to the rope . . . longer life to the sheave, too, because Flattened Strand's smooth outer surface prevents corrugation. And it's Preformed for easy handling.

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HERCULES RED STRAND
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"Wire Rope Handbook"

tells why, and where Flattened Strand can best fit into your particular operation. Write for Booklet P-3.



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One-cent added gas tax proposed in Montana

A ONE-CENT special gasoline tax is being proposed in Montana by the Governor's Interim Committee on Highway Finance. The tax would run for ten years and would be used exclusively for completion of Montana's primary road system. The 32-member interim committee has recommended that the tax be imposed by an initiative measure to be submitted to voters next November 4.

It would be possible by this measure to start collection of funds in 1953 for that year's construction program. Enactment of laws by petition and vote of the people is a privilege guaranteed by the Montana State Constitution. But sponsors of such a petition must obtain about 18,000 valid signatures throughout the state.

It is believed that the special tax would not handicap Montana's regular highway program, which is financed by a 6-cent gasoline tax. Bureau of Public Roads studies have shown that gasoline tax increases since the last war's end have had a negligible effect on sales of gasoline.

Urban highway program planned in Cheyenne

CHEYENNE, Wyo., will pursue a long-range program of proposed urban highway improvement which will require several years for completion.

Plans were submitted to the city council of Cheyenne during a recent meeting with the state highway commission. The program would cost about \$3,252,500 of which the city would be required to pay \$278,250.

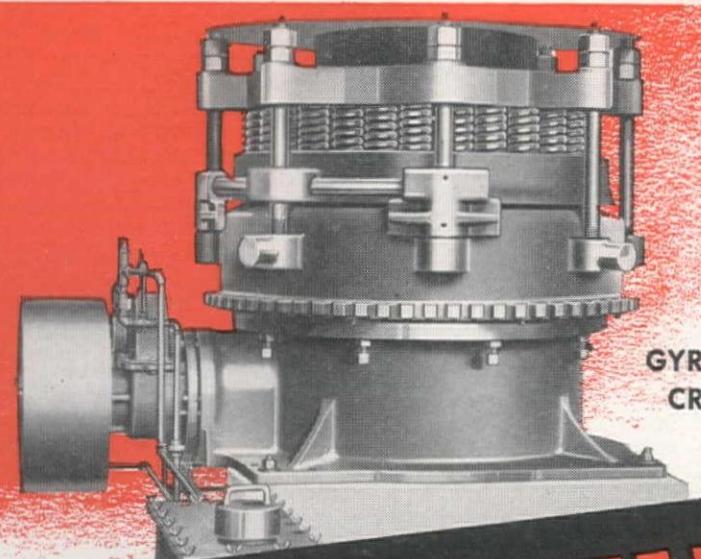
City officials, in meetings with state and federal agencies, pointed out that a long-range highway improvement program was the only feasible way to approach Cheyenne's traffic problems. First step in the program will be acquisition of land for construction of an overpass at the 9th and Dunn St. intersection.

Projected plans call for a solution to a truck traffic problem by providing a trucking route near the city. Location of this route and its eventual construction will not be a reality for several more years.

No slackening of work at Hanford atomic base

NO GREAT SLACKENING of the work force at Hanford Atomic Energy Works, Richland, Wash., is foreseen by Senator Bourke K. Hickenlooper of the joint congressional committee on atomic energy. The Senator predicted a moderate increase in activities during the next two years.

Hickenlooper squelched rumors that the works were scheduled to double in size, but indicated that "reasonable expansion" would mean no great lessening of the construction work force.



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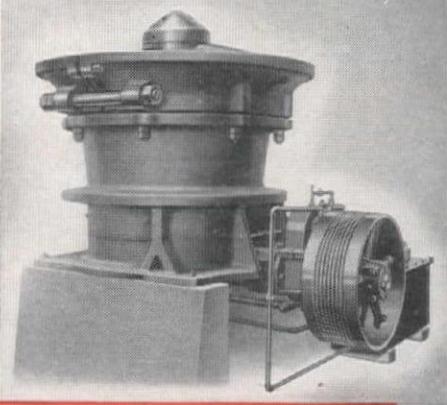
PRIMARY CRUSHERS

Jaw Crushers: Sizes 10 x 16 in. to 30 x 42 in., 22 to 240 tons per hr. capacity.

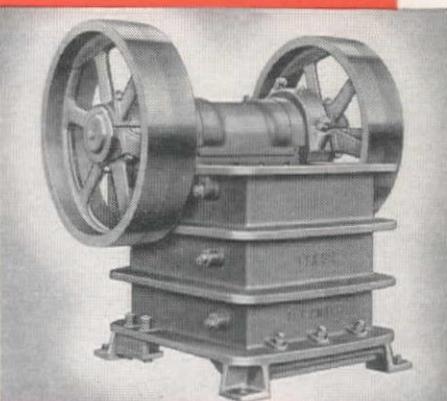
Gyratory Breakers: Sizes 6-B to 25-B, 26 to 400 tons per hr.

SECONDARY CRUSHERS

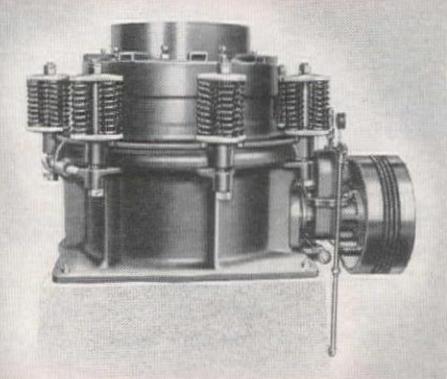
GyraspHERE: Sizes 24 to 48 in., 15 to 210 tons per hr. *Intercone*: Sizes 18 to 28 in., 26 to 68 tons per hr. *Double Roll*: Sizes 24 x 16 in. to 40 x 22 in., 75 to 132 tons per hr.



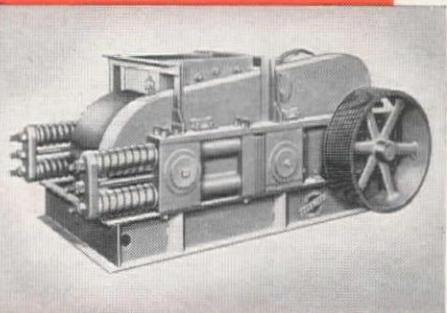
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Western stream run-off will be much above normal

PRELIMINARY SURVEYS are under way to determine run-off from snow packs in the various mountain areas which supply Western Rivers. A summary of the information available to date (February 1) is presented here. Federal and state agencies cooperate in the snow surveys. (Complete survey information will appear in the May issue of *Western Construction*.)

COLORADO—Snow accumulation on the headwaters of the Colorado River in

Colorado, Wyoming and New Mexico to February 1 is very much above normal. In most areas in the Colorado the snow water contents measured on February 1, 1952 far exceed any previous measurement on this date. Snow is also unusually deep in valley elevations above 6,000 ft. Reservoir storage in the upper basin is about the same as a year ago. Water supply outlook for Arizona tributaries is much better than for several years.

The Bureau of Reclamation's Region 3 announces that melting snow in the

Rockies this spring is expected to send 15,000,000 acre-feet of water down the Colorado River to Lake Mead in the largest anticipated April-July run-off since measurements were begun at Grand Canyon in 1922. In anticipation of this run-off record, the Bureau has stepped up power production at Hoover, Davis and Parker power plants in order to provide ample flood storage capacity in Lake Mead and at the same time generate by the end of May about three-quarters of a billion kw-hr of additional hydroelectric energy for the Pacific Southwest.

RIO GRANDE—In contrast to the past two years, the water supply outlook for the Rio Grande and its tributaries is very favorable as of February 1, 1952. Snow water content measured on snow courses surrounding San Luis Valley and in extreme northern New Mexico is far in excess of any previous February 1 measurement and in some cases exceeds any measurement recorded at the end of the snow accumulation season. A sharp decrease occurs in snow cover to the south in New Mexico where, near Santa Fe, only normal snow fall has occurred. The flow of the Rio Grande is about normal in San Luis Valley and much above normal in New Mexico.

OREGON—The high mountain snow pack, source of Oregon's 1952 water supplies, is generally twice as heavy as normal for this mid-winter date. Water content of the snow at 43 out of 83 measured snow courses broke all previous February 1 records. In 67 out of the 83 measured courses, water content is already greater than is usually found at the beginning of the melting season. Watershed soils are well wetted, but reservoir water is less than last year in 18 out of 22 reservoirs reported; however, several reservoirs are now being drawn down to provide for later run-off.

COLUMBIA BASIN—The water supply outlook for irrigation and power in the Columbia Basin for the 1952 season is excellent. February 1, 1952 snow surveys indicate that the snow pack on the entire Basin is above normal for this time of the year. Water in the snow pack varies from 2% above normal on the Wenatchee River to 206% above on the Methow River. As a result of last fall's heavy rains the soils are usually well primed for run-off this year, which will add to the volume of water expected from melting snow. With normal precipitation and snowfall for the spring months high water can be expected on the main stem of the Columbia River. Also, other rivers with vulnerable flood plains may suffer damage during the snow melt period. A continuation of above normal snowfall would result in a very dangerous high water potential stored on the mountains within Columbia Basin.

CALIFORNIA—California's precipitation for the 1951-52 season to date is well in excess of normal. The February 1, 1952 Sierra snowpack assures that coming summer run-off of major Sierra streams will be equal to or in excess of normal.



In this shell-concrete roof, each scallop serves as a beam, permitting a 42' cantilever over spectator stands.

Look how it goes together . . .

Although the specific gravity of concrete is comparable to aluminum, the U.S. annually uses many more tons of concrete than of all iron, steel, lead, zinc, copper, aluminum and other metals, all brick, lumber, tile and glass combined.

Equally remarkable, concrete is poured in many batches, each composed of innumerable particles of aggregate and cement. Yet architects and engineers depend on it to pro-

duce homogeneous structures, which it does, provided all batches have been properly and completely mixed.

This is why the ready-mixed concrete industry sets exacting standards for mixer design, and certifies to you that truck mixers and agitators, built to those standards, have the proper design, capacity, drum speed and mixing action and the accuracy of water control required to produce a homogeneous concrete of uniform strength.

Look for this Badge of Dependability on Truck Mixers:

You have a right to insist on this Rating Plate on any truck mixer that serves your jobs. It is available to all who comply with the quality standards established by the National Ready Mixed Concrete Association and the Truck Mixer Manufacturers Bureau.



These member manufacturers comply with Bureau standards:

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CONCRETE TRANSPORT MIXER CO.
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THE T. L. SMITH COMPANY
Milwaukee, Wis.

CHAIN BELT COMPANY
Milwaukee, Wis.

THE JAEGER MACHINE COMPANY
Columbus, Ohio

WORTHINGTON PUMP & MACHINERY CORP.
Dunellen, N.J.

Snowpack on all Sierra watersheds now exceeds the long period April-first normal. Measurements of water content at some of the snow courses surpass values of April 1, 1938. Values of all snow courses measured on February 1, 1952, indicate that, with minimum precipitation expectancy, summer run-off of all Sierra snow-fed streams should exceed the long period normal. All major Sierra reservoirs are expected to fill during the coming snow melt period, but reservoirs in areas where watershed runoff has been significantly reduced by drought conditions, probably will not fill to capacity, according to the State of California Department of Public Works, Division of Water Resources.

Site chosen for Arizona steam plant

SELECTION of a site for construction of Central Arizona Light and Power Co.'s \$12,000,000 steam plant is announced by company officials.

The project will be located on U. S. Highway 89 near Redrock and 35 mi. north of Tucson. Application to purchase the land was filed with the State Land Department. Operations of the new plant are scheduled to begin in 1954. A second 100,000-kw. unit, scheduled for attention shortly after work begins on the first, should be in operation in 1956 or 1957.

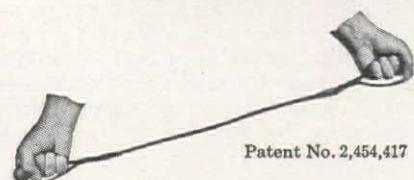
Location of the plant is near the main El Paso Natural Gas Co. lines in Arizona. It is located centrally in order to serve the southern Arizona communities scheduled to come under Arizona Public Service Co. with the merger of Calapco and Arizona Edison Co. this month.

Ice sculptor at Hungry Horse



ALTHOUGH old man winter has sculptured the Hungry Horse dam valve house in ice, work is progressing rapidly on the 285,000-kw. powerhouse and installation of the 71,250-kw. generators. The first two generators are scheduled to go on the line in October and December 1952, and power from all four units at the Bureau of Reclamation's big dam in Montana will be available by November 1953 to help alleviate power shortages in the Northwest.

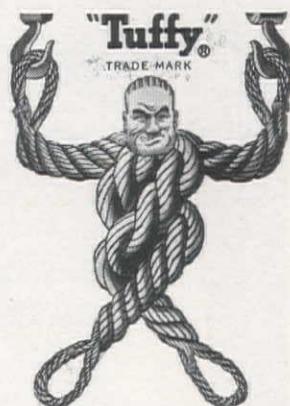
MAKE THIS TEST YOURSELF...WITH A FREE **Tuffy** SLING



Patent No. 2,454,417

Tie a knot in a Tuffy Sling, then pull it tight with both hands and feet. See how flexible it is — and how it straightens out without damage. The secret is in the braided fabric construction — a patented Tuffy feature!

Scores of wires are stranded into 9 parts, then machine woven into an interlaced wire fabric entirely unlike conventional wire rope slings. Even cutting one of the 9 parts does not result in stranding. And eye splices develop up to 95% of the fabric strength.



11 Types of Tuffy Slings If none of the 11 factory packaged Tuffy Sling types exactly meet your needs, Union Wire Rope engineers will develop one that does. Tuffy Slings are proof-tested to twice safe working load. The safe working load is stamped on a metal band attached to each sling. If you have your own rigging loft, Tuffy braided fabric is available by the reel.

MAIL COUPON TODAY FOR YOUR FREE SLING
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ADDRESS _____

CITY _____ ZONE _____ STATE _____

New water district in Los Angeles

THE BOARD of Supervisors in Los Angeles County, Calif., has ordered the formation of a large new water district which will extend south from Montebello to the shoreline in Long Beach and from Inglewood to the Orange County Line in the West.

This district will facilitate plans to release Colorado River water onto spreading grounds and allow it to infiltrate the underground areas to bring up water tables and stave off the influx of salt water.

An assessed valuation of about \$775,000 is placed on the area. Property owners will be taxed up to 5% per \$100 assessed valuation to cover costs involved in the project. Certain areas with sufficient independent water supply were exempted by the Board.

Aluminum towers for BC power line

ALUMINUM TOWERS to carry the power line from Kemano to Kitimat for the Aluminum Company of Canada are under experimental construction at the plant of Yarrows Ltd., Victoria, B. C.

If the fabrication can be successfully carried out the aluminum towers would save on steel and would overcome grave transportation problems. Much of the

equipment for the powerline will have to be moved by air in the 50 mi. of rugged mountainous country. The use of aluminum towers instead of steel would facilitate aerial transportation.

The towers would be approximately 100 ft. high, and if experiments in fabrication are successful the contract for the Yarrows plant would be substantial. Representatives of Aluminum Laboratories Ltd., Kingston, Ontario, are assisting in the experiments at Victoria.

Burro-crat in Arizona



SUSIE, a burro, represents one of man's oldest means of transportation. But here she's carrying a most modern development in fluid transmission. Owned by McClelland Supply Co., Phoenix, she is used to make deliveries in out-of-way places. Her load is 1,200 ft. of 1/4-in. diameter Carlon flexible plastic pipe, weighing 124 lb.

Denver replacing wood culverts

DENVER, COLO., officials estimate that almost \$5,000,000 will be required to remove all the treacherous wooden culverts from the city's streets.

The wooden culverts, long a hazard to motorists, are the result of high crown streets. Approximately 500 of the culverts were removed at an estimated cost of \$1,000,000 during the past four years, but 2,400 still remain in the streets.

Wooden culverts are being replaced with 6-ft. wide concrete gutters. Another 70 will be removed by the city during the 1952 paving program. Removal operations make regrading necessary, especially at intersections.

Removal of the culverts would take about twenty years at the current pace.

New sanitation district near Denver

RESIDENTS of South Englewood, Colo., near Denver, voted support for a measure which will set up a South Englewood Sanitation District No. 1, at an estimated cost of \$425,000.

The district covers about one square mile in area. Detailed plans and specifications will be ordered by the newly elected board of directors of the organization. Then a bond election and construction bids will be called.



WELLMAN

EASY HANDLING OF LARGE STONES

• Those big stones won't slip from the Wellman Stone Grab. Four-part closing cable reeving develops tremendous closing force on stones. Model shown has 5-ton capacity, 4½ foot jaw spread. Other capacities available.

Want Facts? Send for free descriptive bulletins.

THE WELLMAN ENGINEERING COMPANY

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CALIFORNIA—Coast Equipment Company, San Francisco, Calif.

OREGON—P. L. Crooks & Co., Inc., Portland 10, Oregon

WASHINGTON—Construction Equipment Corp., Spokane, Wash.

Clyde Equipment Company, Seattle, Wash.

"EUC" SCRAPERS

Haul More Yardage At Less Cost



The "Euc" Scraper has a struck capacity of 15.5 cu. yds., 21 yds. heaped... 10 speed transmission... 275 h.p. engine... top speed, loaded, 28.2 m.p.h.



Four wheel Euclid tractor provides easy, positive steering, excellent maneuverability, and has ample power, traction and flotation for fast loading and travel on steep grades and soft fills.

Owners in all parts of the country report that the Euclid Scraper with a heaped capacity of 21 cu. yds., has outperformed other scrapers of comparable size on a wide range of jobs. As one leading contractor puts it, "The 'Euc' outhauled other scrapers, had less down time, and maintenance costs were about 50 per cent less." After completing a rush airport job, one with a wide variety of soils, another contractor stated, "We're glad that our choice was Euclid over all other makes of rubber-tired scrapers."

Because of fast, easy loading, high travel speed, good traction and flotation and excellent maneuverability, Euclid Scrapers move more loads per hour at more profit per load. Have your nearest Euclid Distributor give you complete information and job proved performance data on this Euclid Scraper—get more production at less cost!

The EUCLID ROAD MACHINERY CO., CLEVELAND 17, OHIO

CABLE ADDRESS: YUKLID

CODE: BENTLEY



EUCLIDS

Move the Earth



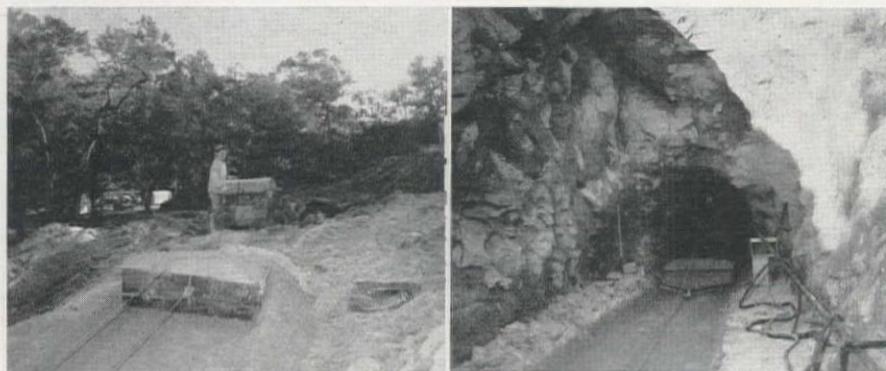
Contractor wasting no time at Glen Anne Dam

RESERVOIR CLEARING operations are nearly completed at Glen Anne Dam, where a regulating reservoir will be provided on the Bureau of Reclamation's Cachuma Project at Santa Barbara, Calif. While waiting for clear weather to permit earthfill operations on the dam structure, the contractor is driving the 350-ft. long, 7-ft. diameter horseshoe tunnel outlet in the right abutment. The small dam, which has all the aspects of a major dam project in miniature, is 102

ft. high and 250 ft. long, on the west fork of Glen Anne Creek, 4 mi. northwest of Goleta, at Tecolote Tunnel outlet. A \$733,740 contract for its construction was awarded to L. A. & R. S. Crowe of El Monte, Calif.

An interesting innovation will be the placing of a 12-in. asphaltic concrete layer on the upstream face of the dam. Experimental use of this mat is the result of inadequate rip-rap material in the area and the high cost necessary to

MUCKING OPERATIONS during driving of the 350-ft. long outlet tunnel were carried out using a 1½-yd. slusher powered by a gasoline-motored winch (left). At right, portal of the tunnel showing slusher emerging, air line going in at right.



AT THE DAM SITE: Roy Crowe (left), and W. L. Sanders, general superintendent for L. A. & R. S. Crowe.

import suitable materials.

Good progress is being made in driving the 350-ft. outlet tunnel through the sandstone knoll that will form the right abutment of the dam. Being driven to 9-ft. diameter, the completed 7-ft. horseshoe section will have a 12-in. concrete lining. An advance of 60 ft. has been recorded, with no shoring required. The tunnel is being driven from one heading by a two-man crew using a 22-hole hammer round and completing an average two 8-ft. rounds per day. Drilling is done with "Swede" drills with air supply from a Joy compressor at the heading. Mucking is accomplished with a 1½-yd. slusher powered by gasoline-motored winch (see cut).

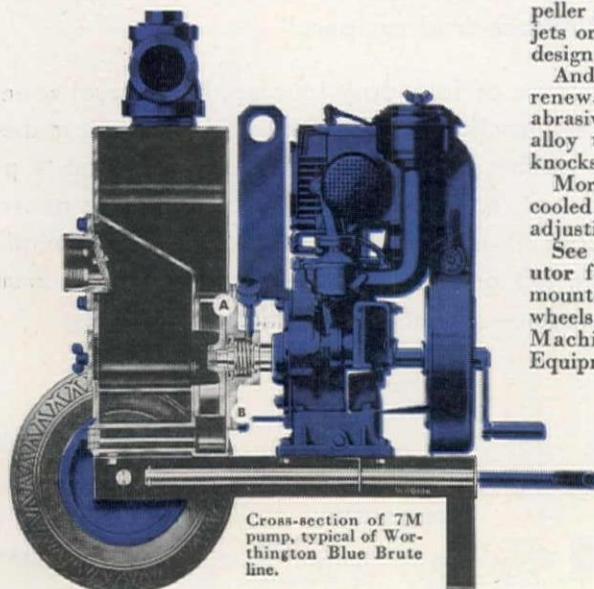
For lining the tunnel, the contractor plans to lay a track to carry forms and Pumpcrete machinery.

For placing about 170,000 cu. yd. of earthfill in the dam structure, the con-

Continued on page 120

Simplest, sturdiest, most economical contractor's pump ever built

MADE BY THE WORLD'S
LARGEST PUMP MANUFACTURER



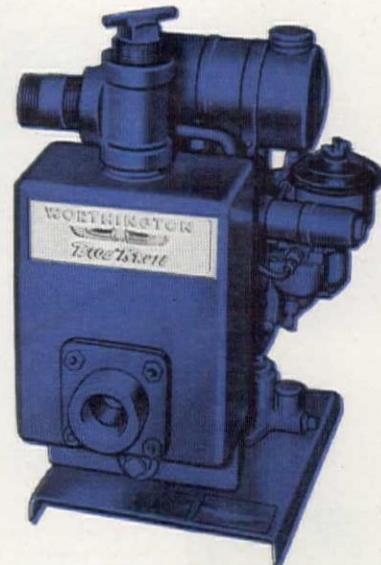
It takes Worthington's unequalled experience to give you the most in a self-priming contractor's pump.

Look—only two moving parts, the impeller (A) and shaft seal (B). And no ports, jets or valves to clog. That's the kind of design that keeps you out of trouble.

And look at the materials. Impeller and renewable wear plates made of special abrasive-resisting alloy . . . casing is a steel alloy that defies rust, erosion and hard knocks.

More trouble-savers: easy-starting air-cooled engine . . . fully-enclosed and self-adjusting dual shaft seal.

See your nearby Worthington distributor for the A.G.C.-rated sizes, base-mounted or with steel or pneumatic-tired wheels. Or write to Worthington Pump and Machinery Corporation, Construction Equipment Division, Dunellen, N.J.



RUGGED LIGHT-WEIGHT PUMP

Popular Worthington 4M has earned contractors' enthusiastic OK on all sorts of jobs. Has fabricated all-steel casing to take roughest service, yet weighs less than 75 lb. Hand carriage also available.

Buy Blue Brutes

WORTHINGTON



H.1.9

**"We wanted
a machine
that could
TAKE IT."**



**WE BOUGHT A
TRAXCAVATOR®**

Reports H. W. (Jack) Hartmann, Vice-Pres. of SMH Const. Co.

"We watched several machines go to pieces while breaking old concrete on a repaving job. Then we put a TRAXCAVATOR on the work and it took the pounding and always came back for more. Our T6 is never out of work. If it isn't breaking loose and loading old paving, it's levelling shoulders, filling around bridge piers, or doing any of its 101 other jobs. We couldn't do without our TRAXCAVATOR."

That's Jack Hartmann, Vice-President of SMH Construction Co., Peoria, Illinois, and veteran contractor talking. His T6 has been at work for over three years and there's still nothing that can replace its versatile power.

You, too, can assign your toughest tasks to a TRAXCAVATOR — and earn the top profits that the economical, versatile machines produce. Visit your TRACKSON-CATERPILLAR Dealer for production facts and specifications on the TRAXCAVATOR model that fits your work . . . Call him or write for information.

TRACKSON COMPANY, MILWAUKEE 1, WISC.
A Subsidiary of Caterpillar Tractor Co.



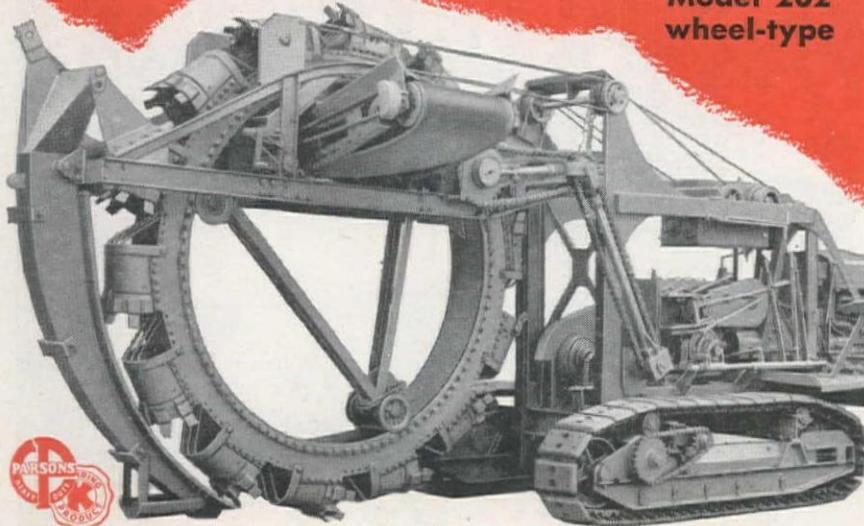
• A heaped load of wet, gummy topsoil is dug and dumped into an old creek bed by the T6 TRAXCAVATOR, owned by SMH. The work is in connection with a new housing development.

TRACKSON

**TRAXCAVATORS®
PIPE LAYERS
TRACLOADERS
EARTH AUGER**

NEW PARSONS TRENCHLINER®

Model 202
wheel-type



9 trench widths . . . Parsons wheel-type Model 202 digs 13 to 31 inches wide . . . depths to 6 feet.

30 digging feeds range from 6.2 inches to 18.5 feet per minute.

Enclosed friction clutches accurately control wheel depth to grade.

Dual-purpose friction-type clutch drives digging wheel . . . automatically protects machinery from shock loads.

Digging wheel truck-rollers all equipped with antifriction bearings.

Quick-change bucket fronts have teeth or lips for dry or wet digging.

Easy-in, easy-out "Tap-In" teeth are self-sharpening, reversible.

Shiftable, reversible belt conveyor discharges spoil to either side.

Full crawler mounting . . . 16 or 20-in. treads, only 5 or 6 lbs. PSI pressure, depending on tread width.

All main gearing enclosed in constant oil bath assures dependable performance with 202 Trenchliner.



SPEEDS WORK SCHEDULES ON:

Drainage for roads, airports, railroads . . . parks, golf courses, farms, land reclamation. Utility and municipal water, gas systems, storm and sanitary sewers, cesspools . . . underground cables and conduits for telephone, telegraph, electricity, coaxial cables, railroad signal control systems. Oil, gas, gasoline, water transmission lines. Irrigation . . . artificial watering distribution systems. General construction . . . foundation footings for buildings and homes . . . highway widening . . . and many other uses.

P286

Also see us about **NEW 215 wheel-type for pipeline work**

AMERICAN MACHINE COMPANY	Spokane
PACIFIC HOIST & DERRICK CO.	Seattle
COLUMBIA EQUIPMENT CO.	Boise, Portland
HARRON, RICKARD & McCONE CO. OF SO. CALIF.	Los Angeles
MCKELVY MACHINERY CO.	Denver
KIMBALL EQUIPMENT CO.	Salt Lake City
NEIL B. MCGINNIS CO.	Phoenix
THE HARRY CORNELIUS CO.	Albuquerque
SAN JOAQUIN TRACTOR CO.	Bakersfield
ENGINEERING SALES SERVICE, INC.	Boise
KOEHRING CO., WEST COAST SALES DIVISION.	Stockton

tractor will be forced to move most of the material twice. Material stripped from the borrow pit in the bottom of the reservoir area will be stockpiled and later replaced. Material stripped from the dam foundation area will also be stockpiled and later used as earthfill material.

W. L. Sanders is general superintendent for the contractor, and P. O. Carver is assistant superintendent. M. W. Ball and V. L. Johnson are miners currently driving the tunnel. Richard E. Burnett is construction engineer and Max T. Hedges is field engineer in charge of Glen Anne Dam operations for the Bureau of Reclamation.

Meanwhile, it was announced last month by the Bureau of Reclamation, that construction work on the entire \$34,000,000 Cachuma Project has passed the halfway point. The \$13,063,000 Cachuma Dam and Reservoir (*Western Construction*—August 1951, pp. 63-65) is 65% completed by Mittry Constructors. This reservoir, with a capacity of 210,000 acre-feet, will store flood waters of the Santa Ynez River which now waste to the ocean and will provide a safe yield for Santa Barbara and adjacent water districts of 33,000 acre-feet per year. The dam, a rock and earthfill type will rise 200 ft.

The \$8,000,000 Tecolote Tunnel (*Western Construction*—September 1951, pp. 78, 79, 150) is about 50% completed by Halvorson Contractors after tough going through sedimentary formations and a fault zone. This 6.4-mi. tunnel will be used for transmountain diversion of water from Cachuma Reservoir to the south coast of Santa Barbara County.

The \$3,359,000 Goleta section of the South Coast Conduit is 85% completed. This 28-mi. pipeline will carry water to Santa Barbara and adjacent water districts. The conduit has a diameter of 4 ft. for 10 mi., decreasing for the remainder of its length, and a capacity of 70 cfs. for the first 10 mi. It will deliver about 30,000 acre-feet of water a year.

The construction schedule of the Bureau of Reclamation calls for the completing the entire project, begun in 1950, in the spring of 1954. Emmett R. Crocker is the Bureau's Project Manager on the Cachuma Project.

Montana contractor sued for share of bonus

GLENN GEERY, Missoula, Mont., contractor, is the defendant in a \$19,280 court suit filed by the Montana Engineering & Construction Co., according to press reports.

Subject of the litigation is a claim by E. A. Dalakow of Montana Engineering & Construction Co. that Geery failed to give him part of a bonus received on an Army construction project.

Dalakow and Geery were joint bidders, in Geery's name, on an Army road project near Troy. The job was completed 6 months ahead of schedule on the Army's promise of a 20% bonus. Dalakow claims that Geery received the bonus payment and has not shared it with his fellow bidder.

\$2,600,000 tunnel in downtown Los Angeles

A \$2,600,000 tunnel project in Los Angeles which will bore through Bunker Hill at Fourth Street, between Olive and Hope Streets is announced by the Board of Public Works.

Bid calls for work on the 735-ft. long, 50-ft. diameter tunnel will be sought within the next six months, and plans indicate that the tunnel will be under construction 18 months.

When the tunnel is completed, a viaduct will connect it with the Fourth St. bridge, now under construction. Plans and specifications are being readied by the City Bureau of Engineering. The State Division of Highways will award the contract. Funds for the project will be drawn from city, county and state.

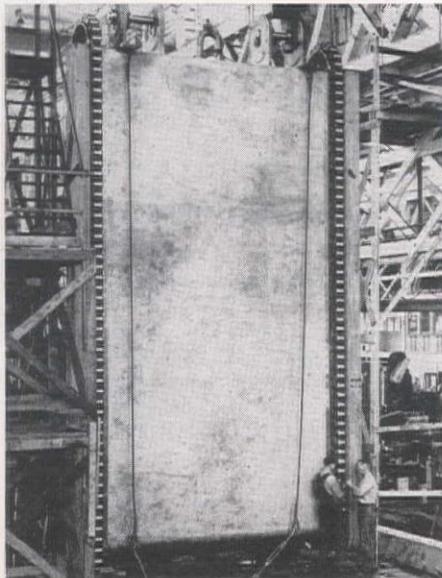
A 43-ft. roadway and a 5-ft. sidewalk will ease traffic when the new tunnel is complete.

Wyoming sets record for highway contracts

AN ALL-TIME record for Wyoming highway construction was set during the year 1951, according to State Highway Department officials.

Construction work on 455 mi. of roadway was authorized by the department in the form of 96 major contracts totaling \$9,885,000. Big Horn Construction Co., Sheridan, won the largest single award for 10.1 mi. of work on the Gillette-Moorcroft road in Campbell County, at \$707,913.

55-ton dam intake gate



THE BIGGEST intake gate for a hydroelectric project ever built is this 55-ton monster shown under construction at the Sunnyvale, Calif., plant of Westinghouse Electric Corp. It will be used at Garrison Dam on the Missouri River 75 mi. upstream from Bismarck, N. D. The fabricated heavy-steel gate is 27 ft. tall, 14½ ft. wide and 3½ ft. thick. It is one of ten similar gates being constructed at the Westinghouse plant.

WATER AND GRIT...



DON'T DAMAGE an OWEN BUCKET

With a less expertly designed bucket water would likely carry abrasive sand and grit into the bearings causing excessively rapid wear and deterioration.

Not so with an Owen.

Years ago Owen engineers learned the hazards of difficult underwater service.

And through experimentation and experience they designed bearings that retard these destructive forces.

For the protection of your buckets and in your own financial interest "buy an Owen" equipped with *abrasion resisting, pressure-lubricated bearings*.

Get the interesting Owen catalog.



"A mouthful
at every bite"

BUCKETS
AND
GRAPPLIES

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Branches: New York, Philadelphia, Chicago, Berkeley, Calif.

50th birthday party for L. A. Water & Power

CELEBRATION of the 50th anniversary of the founding of the Los Angeles, Calif., Department of Water and Power was marked by a gathering of one thousand interested persons at the Biltmore Hotel.

Officials of the Department and the City reviewed the tremendous population growth of Los Angeles and the development of water resources necessary to meet this expansion. The planning and construction of the Owens River Aqueduct, and the obtaining of Colorado River water were discussed by the speakers.

Duncan Shaw, president of the Board of Water and Power Commissioners, pointed out that Los Angeles always has had to plan five years in advance to be sure that water would be available to meet ever increasing demands.

New Mexico dump truck feud

A DISTRICT COURT in Santa Fe, N. Mex., heard three contractors contest the right of the State Corporation Commission to regulate the activities of dump trucks on highway construction jobs, according to press reports.

Isaac Block, Thurl A. Aufrey and W. C. Wilcox, the plaintiffs, wanted a declaratory judgment that dump trucks on

highway construction jobs are not common carriers and, therefore, do not fall under the regulation of the Commission. The contractors maintained that they had employer-employee relationships with the operators of the dump trucks, and so these operators should not be required to get Commission permits, meet Commission insurance requirements, etc.

The SCC stated in defense of its position that truckers were hired on a ton-mileage basis or an hourly rate and should come under Commission control on this contractual agreement basis.

Millions more needed for Denver water supply

IMPROVEMENTS to Denver's water supply system during the next nine years should require an expenditure of about \$59,000,000. That's the startling fact presented by Earl Mosley, secretary-manager of the Denver Water Board, to the city's board of water commissioners. The estimate is based on a prediction of a 750,000 population within the Denver metropolitan area by 1960. On April 1, a water rate increase of about 41% will go into effect in Denver to supply a major portion of the funds for the expansion.

Major items in the plan include: \$10,000,000 for completing Reservoir No. 22 Dam in South Boulder Canyon northwest of Denver; \$2,700,000 to build a power plant at Reservoir No. 22; \$10,800,000 during the next nine years to extend mains to new residential areas; \$550,000 for the new Wellshire Reservoir to go under construction this year; \$4,000,000 to enlarge the Wellshire Reservoir in 1959 and add a filter plant; \$3,500,000 to connect the Wellshire Reservoir with the Wellshire filter plant; \$2,400,000 to double the capacity of the Moffat filter plant, and \$8,000,000 for other major conduits.



DON'T LET FROST BITE YOUR PROFITS

Why let winter disrupt drainage jobs and cut your profits? By using Armco Corrugated Metal Structures you can get the job done quickly despite bad weather.

Lightweight Armco Structures are easily handled without heavy equipment. There is no formwork, no delay for curing, no need for protection against freezing.

What's more, the corrugated metal strength, tight joints and long lengths of Armco Structures prevent loss of alignment and disjoining. Spring thaws won't bring failures and costly repairs.

There is a winterproof Armco Structure to meet every drainage requirement. For normal service use Armco Galvanized Pipe, for resistance to abrasion—PAVED-INVERT, and where severe corrosion is encountered—ASBESTOS-BONDED. If headroom is limited select Armco PIPE-ARCH. For larger structures there is easily-assembled Armco MULTI-PLATE Pipe and PIPE-ARCH. Write for complete information.

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ARMCO
DRAINAGE STRUCTURES



Firm proposes 1,000-car garage in L. A.

PURCHASE of an 88-ft. frontage on W. 6th St. in Los Angeles, Calif., by Savoy Auto Parks and Garages, Inc. marked the first step in a proposed plan to build a 1,000-car garage building. The building will connect with the existing 5-story Savoy Garage building on Grand Ave. Over \$2,000,000 is involved in the land and the scheduled improvements.

Fort Lewis is a major Northwest military job

ONE OF THE LARGEST military construction projects in the Northwest is under way at Fort Lewis in Washington. Construction totaling about \$24,000,000 will get started in March, including 40 permanent barracks (\$17,000,000), motor pools, schools, etc. Northwest Construction Co. is already at the site working on a \$140,000 site clearing contract.

USBR offices combine at Spokane

AN ANNUAL SAVING of approximately \$30,000 will result from the merging of the Bureau of Reclamation's Kalispell, Mont., and Walla Walla, Wash., offices into a single office at Spokane, Wash.

The new Spokane office in the Haskins Building will handle the Bureau planning program for western Montana, northern Idaho, western and central Washington and parts of eastern Oregon. Central location of the Spokane office in relation to current work was given as the reason for its selection.

Employees of both the Kalispell and Walla Walla offices will be used to the fullest extent in the new Spokane office. There were 17 employees at Walla Walla and 11 at the Kalispell site.

Group urges non-federal Columbia River Authority

A GROUP urging the setting up of a Columbia River authority outside federal control is advancing plans.

States involved are Wyoming, Montana, Idaho, Washington and Oregon, and representatives from these states heard Chairman Jack V. Rogers urge the formation of a state compact to preserve power and water rights. First step would seemingly be getting Congress to pass an enabling act.

Agendas for future meetings included discussion of protection of state rights and state water laws, planning for control of Columbia water in cooperation with federal agencies, establishment of an order of preferential uses of the water, etc.

Utah and Nevada are involved but were not represented at the meeting.

CALENDAR OF MEETINGS

March 26-28—American Power Conference, Sherman Hotel, Chicago, Ill.

May 6-8—4th Highway Transportation Congress of the National Highway Users' Conference, Washington, D. C.

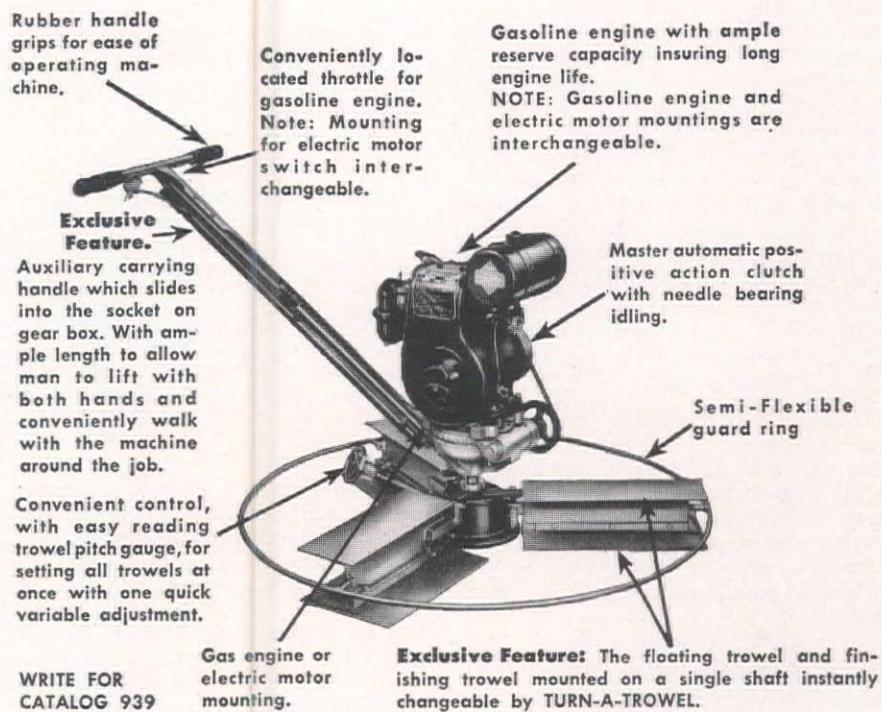
June 5-7—Western Association of State Highway Officials, Annual Meeting, Olympic Hotel, Seattle, Wash.

June 16-21—American Society of Civil Engineers, Denver Convention, Cosmopolitan Hotel, Denver, Colo.

June 23-27—American Society for Testing Materials, Annual Meeting, New York City, New York.

September 3-13—American Society of Civil Engineers, Centennial Celebration, Conrad Hilton Hotel, Chicago, Ill.

Only MASTER Provides Gas or Electric TURN-A-TROWEL Instant Change of Trowels



• FOR FLOATING AND FINISHING CONCRETE WITH A SINGLE MACHINE (34" AND 48" DIAMETER)

• SET ALL TROWELS AT ONCE WITH ONE QUICK VARIABLE ADJUSTMENT

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BETTER PRODUCTS FOR BIGGER PROFITS

COMBINATION DISC FLOAT AND TURN-A-TROWEL



16" AND 22" GRINDING HEAD



24" DISC FLOAT



MODEL NO. 48 CT



MODEL NO. 48 DT

Available in High Speed Heavy Duty Gasoline or Electric Models

ENGINEERS ON THE MOVE

Harold Ringrose, formerly with Swinerton & Walberg Co., is the director of labor relations for the Central and Northern California chapters of the Associated General Contractors. He will process all labor relations problems of the members and the chapters, working directly under the central committee. Ringrose will take a leave of absence and resign his directorship of the Central Chapter in order to fill this important coordination post. **King E. Parker, Sr.** was elected by the remaining directors to fill the vacancy created by Ringrose's new appointment.

Milton C. Zimmerman becomes the district engineer, Fairbanks District, Alaska Road Commission. Zimmerman replaces **Kenneth F. Goodson**, who leaves the Commission to join an engineering firm at work on Okinawa. Zimmerman joined the Commission in 1949 in the position of assistant district engineer.

W. E. Bawden, senior assistant maintenance engineer in the Montana State Highway Department for the past five years, takes over new responsibilities as planning survey engineer for the department. Bawden replaces **A. W. Greiner**, who resigned to join a highway institute in Seattle, Wash. **Martin Powers** will replace Bawden as senior assistant maintenance engineer.

R. C. Kay is the newly appointed city engineer of Cheyenne, Wyo. Kay moves from the post of assistant city engineer to fill the job previously held by **Henry G. Watson**. Kay, who has been with the department for the past year and one-half, was formerly sales manager in Wyoming for Armco Drainage & Metal Products.

John C. Boyle of Medford, Ore., was presented the Professional Engineers of Oregon Certificate of Merit at a recent meeting of the group. Boyle was chosen outstanding engineer of Oregon for 1951. Boyle is vice president, as well as general manager and acting chief engineer of the California-Oregon Power Company.

Warren Weber, formerly with the Bureau of Reclamation at Helena, Mont., takes over new duties as acting office engineer in the Great Falls office. Weber took his new position when the Helena office was closed in a consolidation move.

The County Engineer post in Kittitas County, Wash., goes to **Charles E.**

Riggs, who was formerly with the Bonneville Power Administration. Riggs replaces **Rowland Jones**, who resigned to accept a position abroad. Before joining BPA, Riggs was city engineer at Missoula, Mont.

Charles S. Hazen of the Bureau of Reclamation takes over new duties as general hydraulic engineer at Grand Coulee dam. Hazen was formerly planning engineer at Kalispell, Mont. The appointment means that Hazen will serve as Bureau representative on the International Columbia River engineering committee and the Columbia Basin Interagency committee.

Louis Escalada is now chairman of the Arizona Highway Commission. Escalada replaces **Earl Rogge**. **C. A. Calhoun** is elected vice president.

Two new appointments to the Western Highway Institute are announced. **Albert W. Greiner**, until recently with the Montana Highway Department as administrative officer and engineer, and **George Egan**, formerly of the Nevada Highway Department. Both men bring many years of valuable experience to their new posts. Greiner will supervise a truck operating cost study scheduled to

get under way in Washington shortly. Egan will handle liaison between Western highway departments.

Charles S. Rippon is now construction engineer for the Bureau of Reclamation on Alcova Power plant and appurtenant works. He was formerly construction engineer on Kortes Dam. Alcova Dam was completed in 1938, but the Bureau is now building a 38,000-kv. two-unit hydro plant.

J. J. Mangan transfers from his position as area engineer for the Bonneville Power Administration in Kalispell, Mont. to become manager of the Northeast District BPA offices in Spokane, Wash. The Kalispell office will now work under the supervision of the Spokane office. Personnel additions were expected at Kalispell.

Two retirements from the Portland District Corps of Engineers are announced. **James O. Hutchings** joined the Portland District in 1934 and was a machinist at Bonneville Dam. **Thomas L. McCullough** joined the office in 1937 as a construction inspector.

Colonel Henry G. Gerdes, Corps of Engineers, retires from active service. He is a veteran of 12 years active duty. Gerdes was a prominent engineer in both military and civilian circles during his career. His achievements included service as design engineer for Bonneville Dam, staff engineer for the Federal Power Commission in Washington, D. C. and work in South Carolina. In 1940 Gerdes, a reserve captain with the

Continued on page 126

EXCAVATING AND GRADING CONTRACTORS ASSOCIATION

1952 officers and board members of the Los Angeles, Calif., Chapter, E. G. C. A. FRONT ROW (from left): **Ray Westmyer**, director; **George Held**, director; **Edward R. Siple**, Edward R. Siple Co., Los Angeles, president; **Frank Erwood**, Kirby-Erwood, Sherman Oaks, retiring president; **Joe Holman**, director; **Jack Prince**, Westway Excavating Co., West Los Angeles, vice president. TOP ROW: **MacDonald Jones**, Jones Excavating Co., Los Angeles, treasurer; **Joe Walsh**, director; **Manuel Arrieta**, Radich Fergusson, Burbank, alternate director; **Harry D. Hicks**, director; **Francis A. Goplen**, secretary; **Bob Watson**, alternate director. This photograph was taken during the Chapter's annual dinner meeting where the new officers were elected.



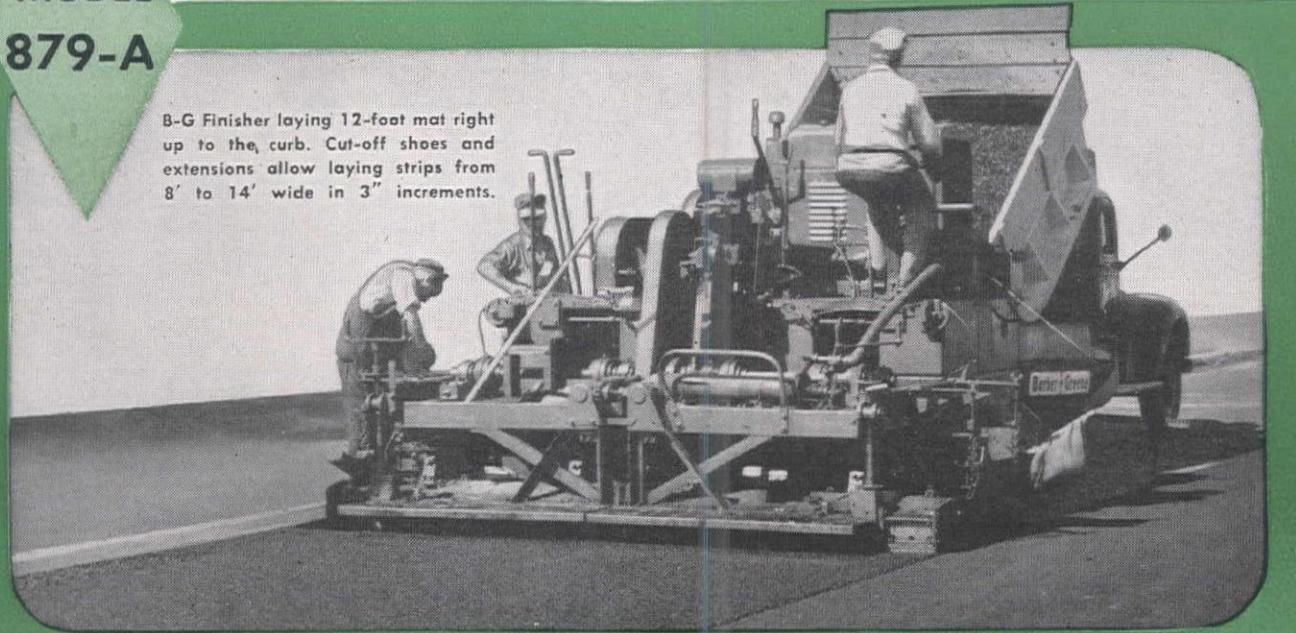
Barber-Greene

TAMPING-LEVELING FINISHER

MODEL

879-A

B-G Finisher laying 12-foot mat right up to the curb. Cut-off shoes and extensions allow laying strips from 8' to 14' wide in 3" increments.



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SPREADS material evenly
COMPACTS to uniform density
LEVELS automatically without forms

Unequaled method for properly laying a smooth, level surface for paving streets, highways, runways, parking lots, tennis courts and similar jobs.

The world's most widely used paving machine: gives superior performance in laying every type of surface—hot or cold—from clay stabilized gravel to high-type sheet asphalt.

Tamps, levels and strikes off simultaneously: automatically measures the correct amount of compacted material, produces a level surface that is maintained under rolling and traffic.

Compacts material as it is being laid: while it is hot and workable—assures a superior surface of uniform density, even when laid over an irregular subgrade.

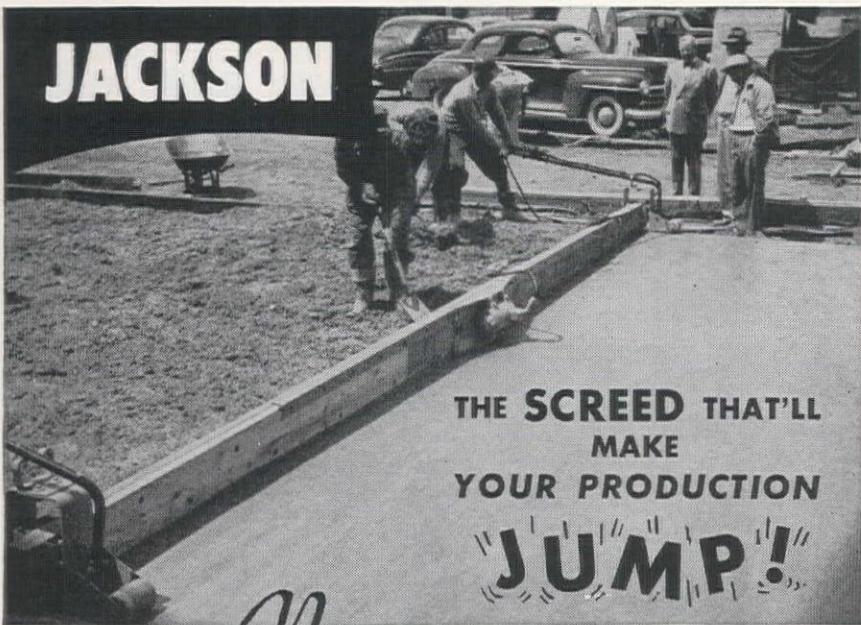
Whether paving over new subgrade or resurfacing existing pavement, the B-G leveling principle assures a smooth, ripple-free surface without the need of forms . . . abrupt changes in subgrade cannot change the grade line of the mat.

High capacity with low maintenance: saves truck time, reduces the amount of rolling required and size of crew.

See your Local Distributor:

BROWN-BEVIS EQUIPMENT CO., Los Angeles 58, California; COLUMBIA EQUIPMENT CO., Spokane, Washington, Seattle, Washington, Boise, Idaho, Portland 14, Oregon; WILSON EQUIPMENT & SUPPLY CO., Cheyenne, Wyoming, Casper Wyoming; CONTRACTORS' EQUIPMENT & SUPPLY CO., Albuquerque, New Mexico; RAY CORSON MACHINERY CO., Denver 9, Colorado; JENISON MACHINERY CO., San Francisco 7, California; WESTERN CONSTRUCTION EQUIPMENT CO., Billings, Montana, Missoula, Montana; KIMBALL EQUIPMENT COMPANY, Salt Lake City 10, Utah; STATE TRACTOR & EQUIPMENT CO., Phoenix, Arizona.

JACKSON



THE SCREED THAT'LL
MAKE
YOUR PRODUCTION
"JUMP!"

Nothing compares with it for convenience, thoroughness and productivity on municipal concrete paving, highway widening, bridge-decks and similar jobs. It strikes off to any crown, undercuts at curb or sideform, works up to and around all obstructions. Permits pouring slabs up to 30' without center joint. Requires only two men on widest slab and is the only screed that can be rolled back for second passes on **4 rollers**. Powered by Jackson 1.25 KVA Power Plant. Get the jump on competition. For Rent or Sale at your Jackson distributor. Details on request.

AND FOR A *Revolutionary* MEANS OF COMPACTING ASPHALT . . .

. . . in highway patching or widening, walks, drives, railway platforms and street crossings, etc. . . . investigate the new Jackson Vibratory Compactor. It delivers up to 4500 1 1/4-ton blows per minute; propels itself and will compact 900 to 1200 sq. ft. per hour close to maximum density of asphaltic mix used. Easy to move from one location to another by means of quick pick-up trailer unit on which Power Plant is mounted. Also ideal for granular soil compaction. For Rent or Sale at your Jackson distributor. Details on request.



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VIBRATORS INC.
LUDINGTON, MICH.

Engineers, was recalled to active duty. His positions took him to Brazil and then to over the Himalayas into China. The Asiatic theatre of the war was his assignment during most of the war. Eventually, Gerdes was officer-in-charge during the initial stages of permanent construction at Dugway Proving Ground in Utah.

John Burgess is promoted to the Chief Engineer post of the Denver, Colo., Board of Water Commissioners. Burgess replaced D. D. Gross who is retiring after 48 years of service to the Commission and its predecessor. Both men have watched and participated in the tremendous growth of Denver's water supply.

J. K. Shankland, a member of Region 3, Bureau of Reclamation Design and Construction Division force for almost six years, takes over a new post as chief of the division's Construction Branch, Boulder City, Nev. Shankland will serve as assistant to Regional Engineer J. P. Jones, who exercises technical direction over all of the Bureau's design and construction activities on water and power projects in the Pacific Southwest. Shankland has a long acquaintance with Western construction activities and served with many Western firms before joining the Bureau.



Shankland

Engstrom

W. R. Engstrom, vice president of The Austin Co., engineers and builders, is returning to Seattle, Wash., as vice president and manager of the Pacific Northwest District. Richard Ellis, since 1946 vice president and Seattle District manager of the company, will continue as vice president and consultant of the company in the district. Edmund J. Goodheart, who has served as Austin's general superintendent under Engstrom at the new AEC facility to be operated by The Dow Chemical Co. near Denver, Colo., takes over additional duties there as project manager. Engstrom, however, will continue to supervise this work for the company.

Changes in the consulting engineer firm of Stevens & Koon are announced by J. C. Stevens and H. Loren Thompson. R. E. Koon is retiring from the partnership and Charles V. Foulds, Frank T. Koehler and Marvin W. Runyan have been made Associates of the Portland, Ore. firm. The general practice of consulting engineering will be continued under the firm name of Stev-

ens & Thompson Engineers with offices at 600 National Building, Portland.

John W. Keyser, formerly with the water department of the City of San Diego, Calif., is now associate engineer with the Division of Water Resources in Sacramento, Calif. Keyser will be concerned with the design and construction of dams.

The Northern and Central California Chapters of The Associated General Contractors have recently moved into new joint offices at 850 Battery St., San Francisco, Calif.



Benson

J. R. Benson is appointed to a position by The Asphalt Institute. Benson will promote the use of asphalt in connection with studies to be conducted on various types of linings for canals, etc. Benson comes to his new position from a post as bituminous engineer at the Bureau of Reclamation's bituminous laboratory in Denver, Colo.

Carl Gronlund steps up from the position of superintendent of the Fresno Irrigation District to the post of manager. Gronlund has been with the District for 31 years. He replaces Henry Karrer, who will enter a private firm although continuing with the District in a consulting capacity.

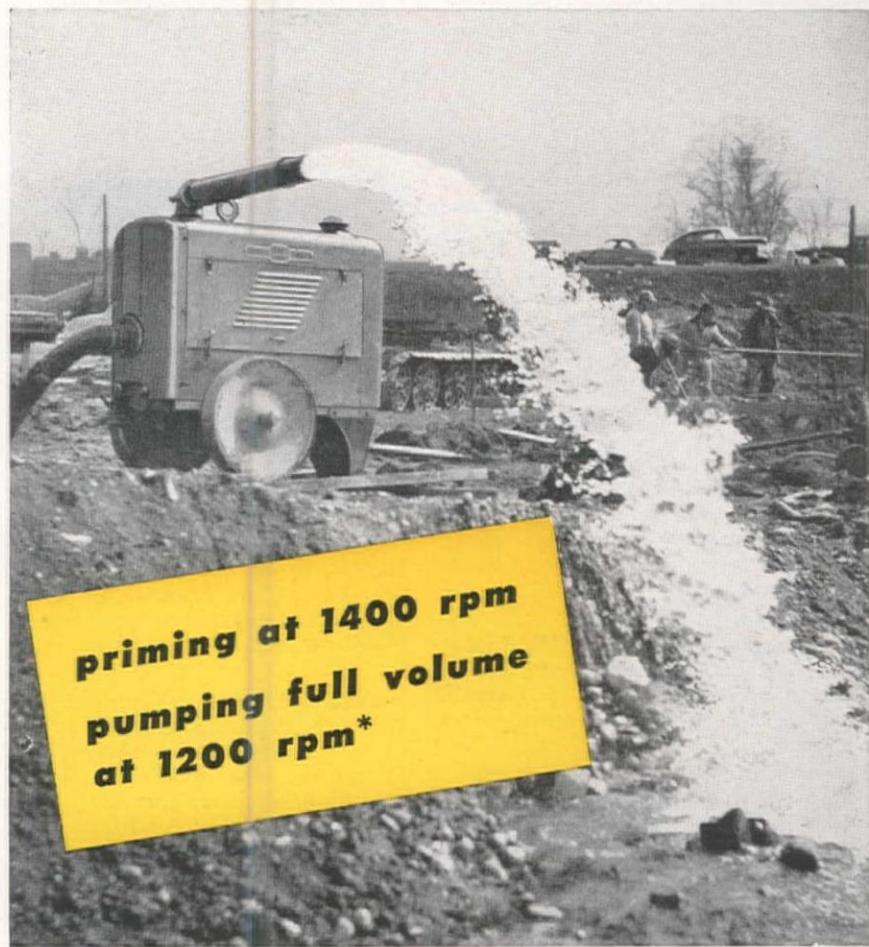
Carl P. Vetter, Boulder City, Nevada, Bureau of Reclamation engineer in charge of regulating the flow of the Colorado through Hoover Dam, is elected chairman of the United States Committee of the International Commission on Large Dams.

H. Earl Parker, a member of the Northern California Chapter of the Associated General Contractors, is a newly appointed member of the Contractors State License Board.

Robert F. Herdman of Hardin, Mont., an engineer with 20 years' service with the Bureau of Reclamation, is scheduled to leave soon for Lebanon where he will again head a party of Bureau engineers and specialists engaged in a study of potential water-resource developments in the 4,000 sq. mi. nation north of Palestine.

Major Stillman E. Neff, former Air Installations officer at Eielson Air Force Base in Alaska, is now Air Force Installations representative for the USAF with an office in Portland, Ore. His work is related to the construction of air bases in the National Defense construction program.

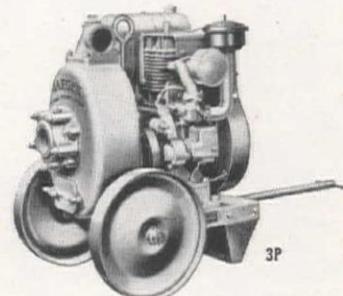
a JAEGER never races to prime



*Dewatering 1500' of 8' x 14' deep sewer trench at a river crossing, this 4" Jaeger pump handled 40,000 gph at an average speed of only 1200 rpm (10% to 15% lower speed than other pumps), and reprimed quickly, as needed, at 1400 rpm (compared with 1800 to 2000 rpm required to prime ordinary pumps).

Pump longer because they pull stronger at easy speeds

Jaeger "Sure Prime" Pumps are built oversize with larger shells and impellers, and generously powered. They hold more priming water and are subject to less abrasive wear. Exclusive double priming action is fast, dependable, without harmful racing of engine. No vapor lock even when pulling high vacuum on long intake lines—sustained efficiency on non-stop pumping, and thousands of extra hours of service from both pumps and engines.



Other sizes 1 1/2" to 10"

Sold and Serviced by:

Edward R. Bacon Co.....	San Francisco 10	Smith Booth Usher Co.....	Los Angeles 54
Nelson Equipment Co.....	Portland 14	A. H. Cox & Co.....	Seattle 4 and Wenatchee
Western Machinery Co.		The Sawtooth Co....	Boise & Twin Falls, Ida.
Salt Lake City, Denver 2, Spokane 11		Tractor & Equipment Co.	
Shriver Machinery Co.....	Phoenix	Sidney, Miles City, Glasgow	
J. D. Coggins & Co.....	Albuquerque	Central Machinery Co., Great Falls & Havre	
		Wortham Machinery Co., Cheyenne, Wyo.	

ELECTIONS, 1952



Rau

Arizona Section, ASCE—Officers for 1952 are: J. A. Rau, president; Prof. H. C. Schwalen, vice president; Dario Travaini, Sr., vice president; Hanen H. Williams, secretary-treasurer; P. F. Glendening, director.

Sacramento Section, Junior Forum, ASCE—Officers for 1952 are: Howard Payne, president; Irving Schultz, vice president; Thomas Wootten, secretary-treasurer.

Mountain Pacific Chapter, AGC—Officers for 1952 are: T. H. Youell, president; Don L. Cooney, vice president; Alex McEachern, treasurer; Paul Fredrickson, secretary.

Los Angeles Section, ASCE, Junior Forum—Officers for 1952 are: John B. Howe, president; William J. Carroll, vice president; Richard C. Gerke, secretary-treasurer.

Southern California Chapter, AGC—Officers for 1952 are: R. A. Smith, president; Harry L. James, vice president;

C. L. Parkhill, vice president; Spencer Webb, vice president and Donald E. Reed, treasurer.

Portland Chapter, AGC—Officers for 1952 are: Herb G. Palmberg, president; W. Ray Rogers, vice president; Harry I. Hamilton, vice president; Frank Lyons, secretary-treasurer; Henry A. Kuckenber, past president.



Palmberg

Bell

Colorado Contractors Association, Inc.—Officers for 1952 are: Dan G. Bell, president; C. M. Hanes, vice president; Walter Schmidt, vice president; Jack Harrison, secretary-treasurer.

Tacoma Engineers Club—Officers for 1952 are: Walter S. Gordon, president; Conant Dodge, vice president; William D. Smith, vice president; Harold A. Hagestad, secretary-treasurer; Lewis E. Jeklin, executive committee; John W. Judy, executive committee.

DENVER GENERAL CONTRACTORS



Building Chapter, Denver General Contractors Association 1952 officers are, left to right: *Keppel Brierly*, treasurer; *Nicholas R. Petry*, vice president; *Gerald H. Phipps*, president and *David A. Olson*, secretary.

Spokane Section, ASCE—Officers for 1952 are: Prof. Emmett B. Moore, president; Robert E. Tobin, vice president; Arthur J. Davidson, vice president; John P. Esvelt, secretary-treasurer.



Moore

Rowe

Sacramento Section, ASCE—Officers for 1952 are: R. Robinson Rowe, president; Walter G. Schulz, vice president; J. Carl Jennings, vice president; Henderson E. McGee, junior past president; Ralph W. Hutchinson, secretary-treasurer.

SO. CALIFORNIA CHAPTER, AGC



Pictured above, at the So. Calif. Chapter AGC Banquet and Stage Party at the Biltmore Bowl are, left, retiring President *Ben P. Griffith*, turning over the gavel to the President Elect, *R. A. Smith*. (Names of other officers appear on this page.)



WISCONSIN-Powered COMPRESSOR-SPRAYER

Fast towing to location and then quickly spraying large areas on the job sums up the story of this mobile compressor-sprayer, built by the DeVILBISS Co., Toledo, Ohio, powered by a Wisconsin Heavy-Duty Air-Cooled Engine.

Builders of fine machines and the buyers who use them endorse Wisconsin Engine Power . . . so much so that Wisconsin Engines are *first choice* in almost every field, 3 to 30 hp. For example, tapered roller bearings at both ends of every Wisconsin Engine crankshaft absorb all thrusts, reduce, too, the chance of bearing failure. And you'll also endorse fool-proof air-cooling in all weather, summer and winter, along with the easily-serviced OUTSIDE magneto with impulse couplings, delivering fast starts always.

Write for "Power Magic" telling about all 4-cycle single-cylinder, 2-cylinder and V-type 4-cylinder models, 3 to 30 hp.



WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 46, WISCONSIN

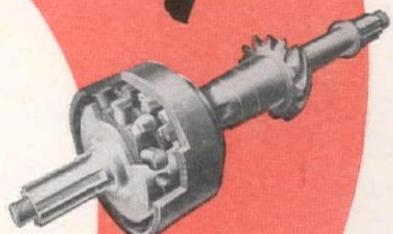
Professional Engineers of Oregon—Officers for 1952 are: W. C. Williams, president; Robert Shoemaker, vice president; Paul Christerson, treasurer; Evan Kennedy, Loren Thompson, Arnold Westling and John Boyle, trustees.

Mack six-wheelers get you *out of the rough*

Rough terrain or hub-deep mud holds no terrors for Mack six-wheel trucks. You can count on these unfaltering Macks to take your loads "out of the rough"...to maintain steady, dependable schedules...because they have the unique advantage of Mack's *Balanced Bogie with exclusive Power Divider*.

With the Mack Power Divider, a non-spinning true differential, torque is divided between the two bogie axles and between the four driving wheels. Delivering torque smoothly and continuously without destructive shock in proportion to wheel traction, the Power Divider stops power waste through useless slipping and wheel spinning—keeps Macks moving where other trucks bog down.

If your present truck equipment is having a hard time because of hard going, it will pay you to investigate the benefits you get from Mack six-wheelers in unfailing reliability and uninterrupted production...greater profits through greater output at lower cost. Write or call your nearest Mack branch or distributor.



Mack Interaxle
Power Divider



outlast them all

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



In tough dump truck service Mack six-wheelers get you "out of the rough" with unfailing dependability.

SUPERVISING THE JOBS

Rex Dunn is superintendent and Ed McPherson is assistant superintendent for Bechtel Corp. on industrial construction at Continental Can Co., Pittsburg, Calif. The \$3,500,000 job has Russ Barry as general foreman and J. Flynn as carpenter foreman. A. P. Campbell is project engineer.

N. M. Chapman is general superintendent for McGuire & Hester on construction of a 48-in. pipe line for the City of Antioch, Calif. Robert Jensen is assistant superintendent on the \$368,000 job.

M. O. Henderson is general superintendent and Howard Fickle is his assistant on the \$500,000 construction of a sewage plant for the City of Antioch, Calif. Morris De Rock is project manager for Ke-Ston Construction Co. on the job.

Dirt moving operations for the P. G. & E. power plant in Pittsburg, Calif., have Don Owen as foreman in charge

for Parish Bros. Merle Weekly is job mechanic.

Construction of dock facilities for Matson Steamship Lines in Wilmington, Calif., is under the supervision of Eldon McFarland with R. P. Yarbrough as assistant superintendent. Pugh Construction Co. holds the \$1,800,000 contract. J. A. Wilson is general foreman, track foreman is Louis Gomez.

K. K. Anderson is superintendent for James I. Barnes Construction Co. on the \$2,000,000 St. Vincent's College of Nursing in Los Angeles, Calif. Vic Apted is assistant superintendent. Ed del Pozo is concrete foreman, and William Marte is carpenter foreman.

Construction on Columbia Broadcasting System's Television City on Fairfax Ave. in Los Angeles, Calif., is being supervised by John Ogden. The William Simpson Construction Co. has the contract. Henry Pains is carpenter foreman,

Frank Martinez is labor foreman and Pat Andrews is carpenter foreman, also. R. F. Hooper is engineer and estimator.

Foundation piling for an overpass on the Hollywood Freeway is being supervised by Glen H. Barnes with William Greig as his assistant. Harvey Hunt is pile driver foreman and Howard Dufford is concrete foreman for Raymond Concrete Pile Co.



H. B. Shannon is superintendent for Martin Green Construction Co. on the Lucky Peak Dam Project near Boise, Idaho.

Work on the Palm Montgomery Freeway in San Diego, Calif. by the Griffith Co., has Jeff McMullen as general superintendent. Lloyd Leonard is grade foreman. R. A. Preston is project manager for the firm on all work in the San Diego area and Fred B. Cody is the equipment superintendent in the territory.

Jim Schebley is general superintendent with Jack Stockridge as his assistant on the \$2,000,000 runway and taxiway construction at Davis Monthan Air Force Base, Ariz. Work was started by M. M. Sundt and L. M. White, August 15, 1951. The job is scheduled for completion in October. John Huggard is project manager.

Bridge and road construction across the Calaveras River at Pacific Ave. in Stockton, Calif., is being supervised by J. Hamilton Higday for George Pollack Co. Gordon Pollack is project manager. Gus Windberg and Charles Lewis are engineers for the contractor and Doug Nelson is resident engineer for San Joaquin County.

Gordon Hanno is master mechanic and hot plant superintendent for McGillicuddy Construction Co. at the firm's main base of operations on Folsom Blvd. in Sacramento, Calif. Assisting Hanno are John Bobken and Tom Dean. Don Morris is in the hot plant welding shop. H. Erickson and Floyd Briggs are in the repair and machine shop.

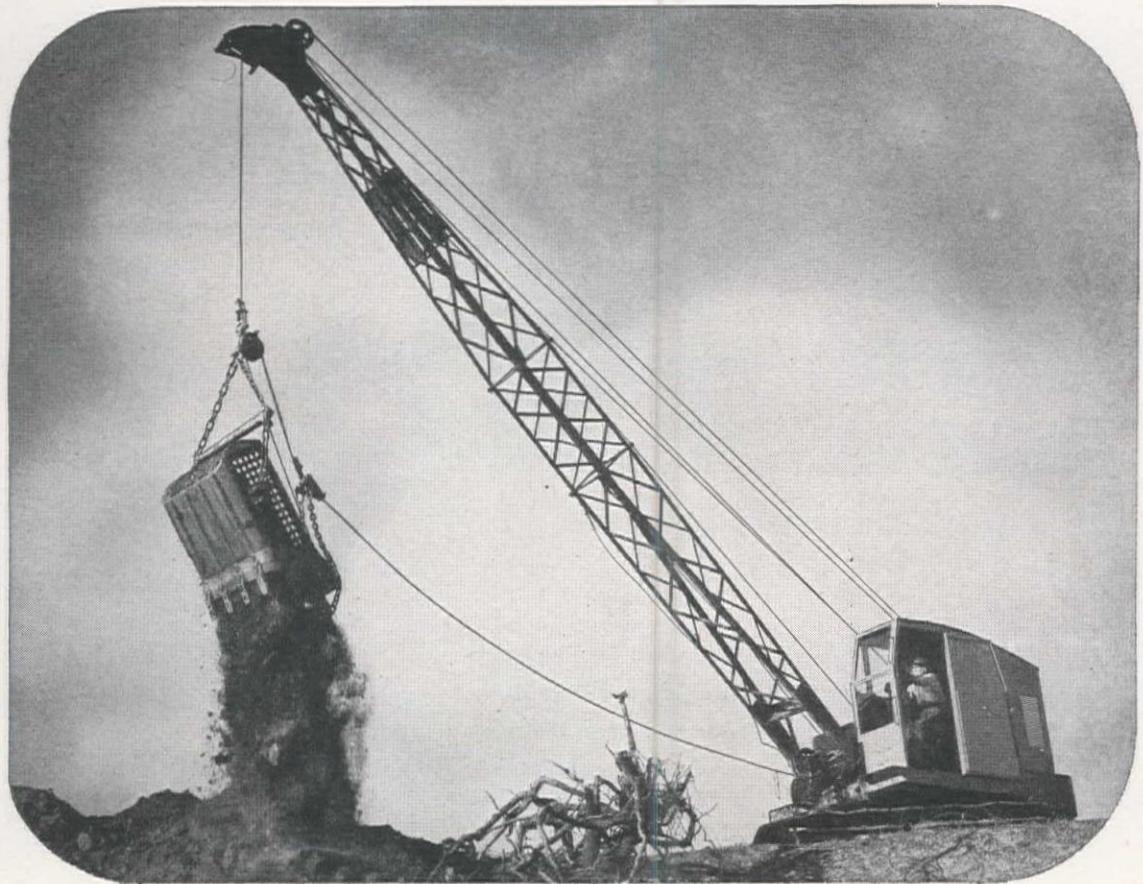
R. B. Kemper is general superintendent for Kemper Construction Co. on the \$1,380,702 construction of a reservoir in Eagle Rock, Calif. William Buchanan is job superintendent. The job involves

Continued on page 132

"I have news for you, Hardrock"

Drawn especially for Western Construction

WIRE ROPE



***This is the most economical rope
we've ever made for construction equipment***

ROEBLING is the best known name in wire rope. That's partly because we were the first wire rope maker in America. But more than that, we've always led in developing better wire and better rope for every purpose.

Today's Roebling Preformed "Blue Center" Steel Wire Rope is the best choice for efficiency and long life on excavating and construction equipment.

ment. This rope has *extra* resistance to crushing and abrasion . . . stands up under rough going. It saves you time and cuts costs.

There's a Roebling wire rope of the right specification for top service on any job. Call on your Roebling Field Man for his recommendations. John A. Roebling's Sons Company, San Francisco-Los Angeles-Seattle.

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FREDONIA AVE • CLEVELAND, 701 ST. CLAIR AVE, N. E.
• DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER
BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS
ANGELES, 5340 E. HARBOR ST • NEW YORK,
19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST
• PHILADELPHIA, 230 VINE ST • SAN
FRANCISCO, 1740 17TH ST • SEATTLE, 900
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When a job requires specialized hauling equipment, such as these units designed for a 25 ton capacity or 16 cubic yards, it's almost a sure bet the Utility engineers can design equipment to do the job better, faster and more economically. Every day Utility Trailers are chalking up performance records in every type of industry. Records that prove conclusively the superiority of design and lower operating costs.

If you have a specialized transportation problem or if you just need a standard trailer, a call to the Utility representative (they are located in all principal western cities) will give you full details on the many money saving exclusive design features only Utility Built Trailers provide.

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TRAILERS
Trailer Builders

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LOS ANGELES • CALIFORNIA

550,000 cu. yd. of excavation and approximately 10,000 yd. of concrete. Three tunnels and the installation of large steel pipe are also part of the contract.

Grading and paving along the Coalinga-Fresno Rd. in California is under the supervision of **S. F. Moody** and Earl Baker. **M. W. Stanfield** is project manager.

William H. Driver is superintendent for William Simpson Construction Co. on construction of the \$1,000,000 5-story Remington Rand building in Los Angeles, Calif. **Fred Conkos** is carpenter foreman along with **Howard Cain**. **Jim Tucker** is labor foreman and **David Simpson** is expeditor.

J. J. Devlin is job superintendent for **S. S. Mullen, Inc.**, on the \$720,611 construction of a remote receiver facility at Ladd Air Force Base in Alaska. **N. H. Latimer** is job engineer.



J. H. Harrison and **L. W. Sperling**, owners of the construction company bearing their names are pictured on a dike construction job in the Salinas River Valley near San Ardo, Calif.

Oscar Cheff is general superintendent for **A. J. Cheff Co.** on construction of the Sheffield Tunnel on the Cachuma Project, near Santa Barbara, Calif. Tunnel foremen are: **Homer Cheff**, **Art Fasso** and **Bill Van Patten**. The \$855,472 Bureau of Reclamation project is scheduled for completion in January 1953.

Construction of a 420-ft. tunnel at Gaviota Gorge, near Santa Barbara, Calif., is being supervised by **W. A. Ripley** with **H. N. Allinder** as tunnel superintendent. **F. F. Higgins** is master mechanic and **Frank Clary**, **Lloyd Oelschlagel** and **Robert Stoker** are walkers. **Rhoades Bros.** and **Shoftner** hold the \$403,000 contract.

Construction of the U. S. Navy guided missile plant at Pomona, Calif. is under the supervision of **Lewis Douglas** with **Fred Zumhofl** as his assistant. **Buttress** and **McClellan** holds the contract. **Leroy Green**, **Francis Johnson** and **Herbert McNeill** are carpenter superintendents, **Gerard Hills** is labor superintendent, and **Walter Crockett** is concrete superintendent. **Bud Worthen** is steel superintendent. **Max Richter** is construction superintendent, with **Robert Grace** as his assistant.

UNDERGROUND with the men at PERSHING SQUARE GARAGE

Pictured on this page are some of the men who are building Pershing Square Garage in Los Angeles. Ford J. Twaits Co., Morrison-Knudsen Co., Inc., and T-S Construction Engineers, Inc., are joint venturers on the project. Full details appeared in *Western Construction's* February issue on page 80.

(Identification is left to right,
unless otherwise noted)



ABOVE—*Gordon MacIntyre*, timekeeper; *Joe Phillip*, chief timekeeper; *Henry Odin*, form detailer; *Wally Talbot*, draftsman, and *Bill Baglin*, coordinator and detailer (kneeling).

BELOW—are carpenter foremen *D. H. Asher*, *Roy Morris*, *G. R. Newton*, *W. E. Rader*. *T. Mills*, equipment foreman, is kneeling in foreground.



Seated, above, is *Paul B. Tichenor*, president of T-S Construction Engineers, Inc., a joint venture in City Park Garage, Inc. *Charles A. McMahon*, project superintendent, is standing.



ABOVE—*Al Nelson*, general carpenter foreman, left, and carpenter foremen *Henry Pitcher*, *E. A. Gardner*, *Bill Ehrisman* and *Paul Anderson* (kneeling).

BELOW—*Russ Hurst*, buyer and expeditor; *Fred Miller*, project accountant; *Mike Owen*, office engineer, and *R. H. Kirkman*, project manager.



BELOW—*Dan Gomes*, general labor foreman, left, with *Jim Bennett*, *Robert Mercado* and *Dan Garcia*, labor foremen.



ENGINEERS ON THE MOVE

... Continued from page 127

The State Office, Soil Conservation Service, Laramie, Wyo., and assigned personnel moved to new headquarters at Casper, Wyo., where the mailing address will be P. O. Box 699.

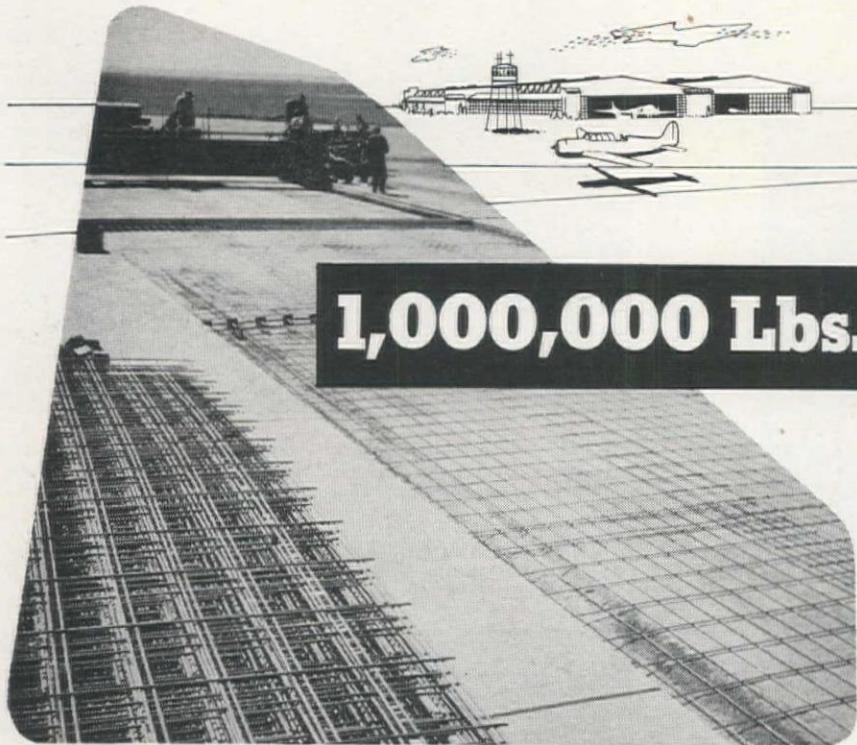
V. G. Fahrney, formerly with the Bureau of Reclamation on the King Hill, Minidoka, Owyhee, Columbia Basin and Missouri Projects, is now in the engineering department of Ebasco Services at Yale Dam, Wash.

F. A. Orton, superintendent of roads in Salt Lake County, Utah, resigns his

post to accept another position. Orton's successor is **E. O. Olsen**, who has been superintendent of shops for the Salt Lake City police department.

Kenyon C. Vail is now materials engineer with the U. S. Bureau of Public Roads in Turkey. Vail was affiliated with a laboratory engineers firm in Denver, Colo., prior to this new position.

George M. Tapley joins Knappen-Tippett-Abbet-McCarthy, New York engineering firm, as a hydroelectric engineer. Tapley was chief of the engineering division of the Alaska Road Commission. His new assignment takes him to Burma where he will make an economic and technical survey.



1,000,000 Lbs.

1,109,000 lbs. of Clinton Welded Wire Fabric is being used in the illustrated two-mile runway. All over the world airstrips like this Navy runway are being reinforced with Clinton Welded Wire Fabric to handle today's high-speed jets and their big brothers of the future. Here is a strongly bonded concrete strip for the savage use that jet planes will give it.

Laying this runway at the rate of one hundred feet per hour represents a saving in time and labor as well as in the amount of concrete used. Remember—when your peace and security are once again assured, build economically for permanence with CLINTON reinforced concrete.

THE CALIFORNIA WIRE CLOTH CORP., OAKLAND
THE COLORADO FUEL & IRON CORP., DENVER
WICKWIRE SPENCER STEEL DIVISION, NEW YORK

CLINTON WELDED WIRE FABRIC

THE COLORADO FUEL & IRON CORPORATION



DEATHS

Ranney Y. Lyman, 73, former assistant regional chief of engineering for the Bureau of Land Management, died in Huron, S. Dak.

Karl B. Kumpe, 75, construction engineer who worked on the Long Beach, Calif. breakwater system, and various other Southern California projects, died January 21 in Paris, France. He was president of Kumpe-Hauser Corp., Ltd. and Karl Kumpe Ltd.

Kenneth G. Gates, 50, Salina, Utah water superintendent, died January 13 while on a rabbit hunt. Gates suffered from a heart ailment.

L. N. Comer, 63, company superintendent for J. E. Beaulaurier & Sons Construction Co., died January 8, in Great Falls, Mont.

William G. Swigert, 53, president of Pacific Bridge Co., died January 16 in San Francisco, Calif. Swigert's firm was engaged in many of the major projects in the West such as the Golden Gate Bridge, Hoover Dam, and miscellaneous military construction.

Francis M. Smith, 43, president of the F. M. Smith Construction Co., died January 6 in Denver, Colo.

Maxwell D. Peterson, 65, resident engineer for the State Road Commission of Utah, died in Duchesne January 26.

A. P. Russell, 60, assistant state engineer of Wyoming, died January 21.

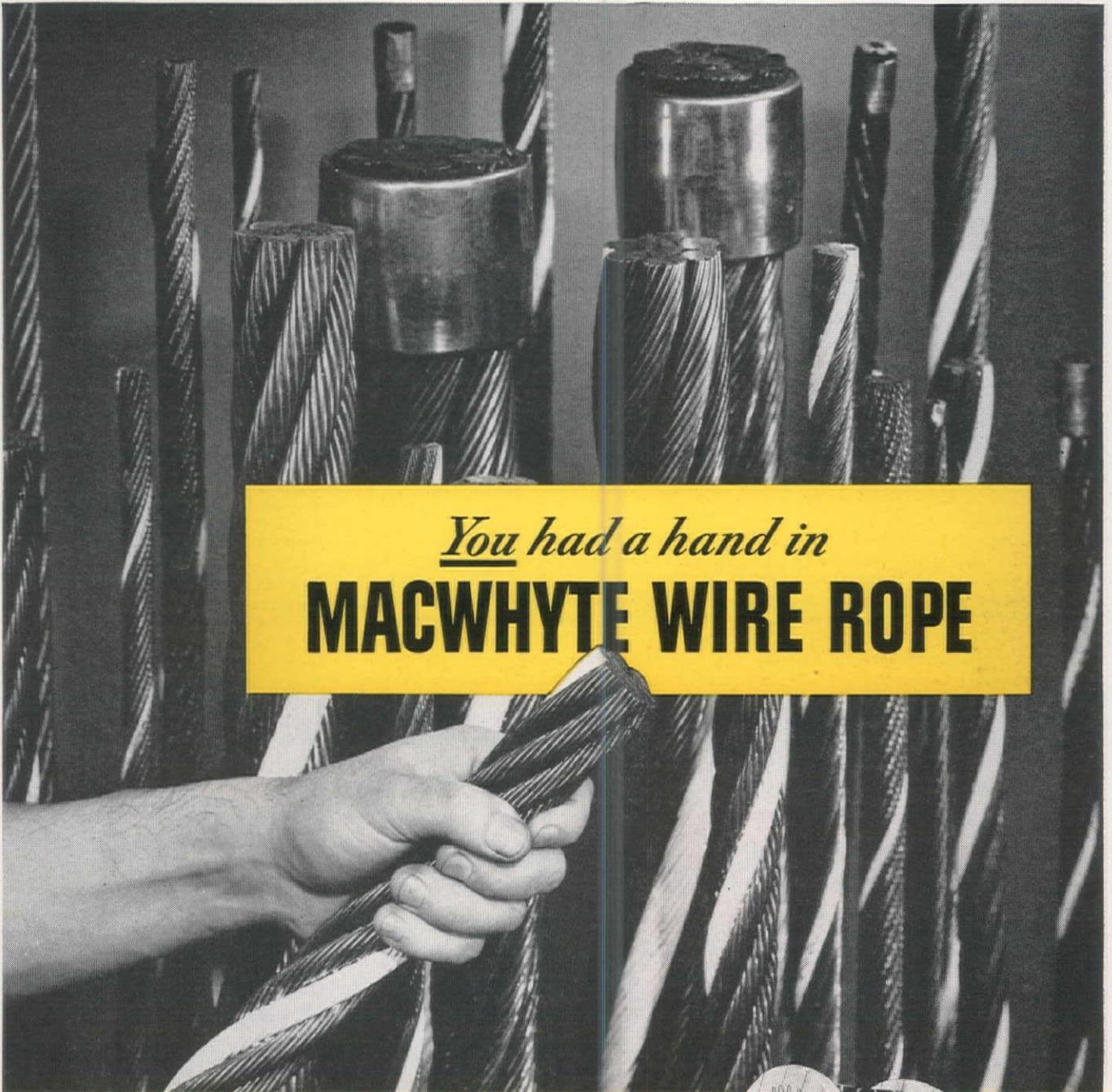
George M. Dougall, 72, engineer and builder, died January 23 in Salt Lake City, Utah. Dougall was an engineer with the Works Products Administration at one time.

Thomas I. Phillips, 70, retired chief engineer of the Western Pacific Railroad, died January 24 in San Francisco, Calif.

Sumner S. Boal, 70, retired member of the Los Angeles City Engineering Department, died January 23 in Los Angeles, Calif. Boal was in the department 41 years.

John F. Blakemore, 75, civil engineer with Morrison-Knudsen Co., Inc., died January 28 in a Salem, Ore. hospital.

Charles A. Carson, Jr., 60, prominent Arizona water law authority, died January 14. Carson was a loyal and valuable supporter of the Arizona claim to Colorado River water.



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A thousand and one wire ropes
PREformed and internally lubricated

The experience of hundreds of users—like yourself—goes into the making of Macwhyte Wire Rope. For more than half a century, their needs and yours have been studied by our engineers to produce the best wire rope for each job.

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NEW BOOKS

Hydraulic Research in the United States, 1951—Edited by Helen K. Middleton and Sonya W. Matchett. Published by the National Bureau of Standards, U. S. Dept. of Commerce, Washington 25, D. C. (Government Printing Office). 190 pages. Price \$1.25.

This book is published to serve as a guide to the current and completed projects conducted by various hydraulic and hydrologic laboratories in the United States and Canada. The editors have compiled the volume from reports by hydrologic laboratories in the United States and Canada.

Project reports in the volume cover work done at 66 private or state laboratories in the United States, 34 Federal laboratories, and five Canadian laboratories. The guide outlines a great number of individual projects being conducted by the laboratories on nearly 200 subjects in the field. An index shows the extensive nature of the guide and, in addition, provides a convenient means for rapid reference to the various projects under way on some specific subject.

Further material covered includes a list of committees working in the field and a list of foreign publications and translations available on loan, which enables the investigator to draw on sources

not otherwise known to him and to coordinate his work with that being done in widely separated parts of the world.

111
Data Book for Civil Engineers, Vol. I, Design and Volume II, Specifications and Costs—By Elwyn E. Seelye. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Vol. I, 521 pages, Vol. II, 306 pages. Both 9 1/4 x 12. Price \$10.00 and \$13.00 respectively.

These brand new editions of an important reference work in the field of civil engineering offer a complete guide. Volume I offers the civil engineer enough information to aid in any design problems which may confront him. The size of the book makes it possible for all charts, diagrams and tables to have great readability. Along with material contained in previous editions there is revision and addition of new data on airfield design, highway design and other important material.

Volume II contains sample specifications for practically any type of building and heavy construction. Contract and specification forms appearing in this work are satisfactory for use in verbatim form, and the engineer can cover the writing of specifications and contracts on a start-to-finish basis by consulting this complete guide. The timeliness of cost information will never expire since a new self-adjusting method is employed. The information is keyed to

the monthly *Engineering News-Record* cost index figures.

Volume III of this series is not available in a new edition but a 1947 edition is still available. It contains 306 pages and costs \$5.00.

111
14 Pocket-sized reprints of the Associated General Contractors' "Manual of Accident Prevention in Construction." Published by the AGC. 4 x 6. Priced 10¢ for one copy. Rates in quantity available.

Paper-bound, pocket-sized reprints from the AGC "Manual for Safety in Construction" are convenient for field use. Those who are familiar with the Manual itself know the advantages and excellent advice which it can provide. These 14 reprints cover a wide range of subjects, appropriately grouped in each reprint and designed for issuance to workmen on various types of jobs where safety should be constantly considered. The Manual itself is excellent for planning jobs in offices, but the reprints take precautionary measures right into the pockets of the man in the field. The American Standards Association has approved the manual material, which was completely revised in 1949.

111
Tentative Standard Specifications for Reinforced Concrete Water Pipe-Non-cylinder Type, Not Prestressed—By the American Water Works Association. 13 pages, 6 x 9. Price 20¢.

Specifications in this book cover the manufacture of the unprestressed pipe in sizes from 12 to 96 in. This type of pipe is designed for service in which the maximum

Continued on page 138

For Safer Blasting Operations

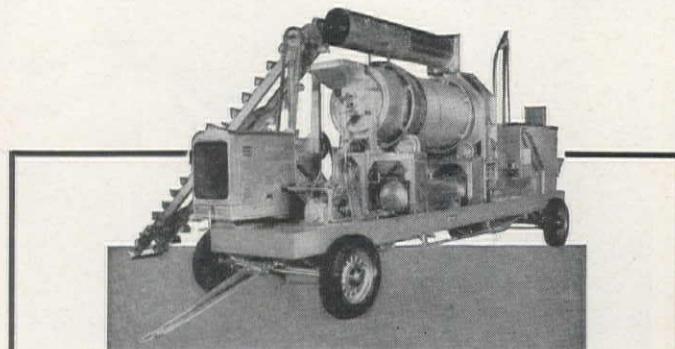
Insist on Primacord detonating fuse. It cannot be set off by friction, sparks or any ordinary shock . . . it is a non-conductor and is insensitive to any stray electrical currents. It must be detonated by a blasting cap, yet requires no caps in the holes. In contact with every cartridge in a round, Primacord assures complete detonation, eliminating danger of unexploded caps and powder in the broken rock.

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Produced for immediate hot laying, or for deferred cold patching. Match any bituminous surface.

Mixes at plant, including labor, fuel, and overhead, cost about \$4 per ton, with \$2 aggregate. Average 160 to 200 sq. yds. 1" thick per hour. A money-maker for small contract work.

Also larger plants, 15 and 30 tons per hour.

Write for catalog and name of nearest dealer.

Elkhart 24 White Mfg. Co. Indiana

STANDARD ENGINEER'S REPORT

DATA

PRODUCT	Standard Diesel Fuel
UNIT	Cummins diesels
CONDITIONS	grades and turns 60% of the time
LOCATION	San Francisco to Eureka, Calif.
FIRM	Intercity Motor Lines, San Francisco

Diesel-fuel-pump disc good after 98,000 miles!



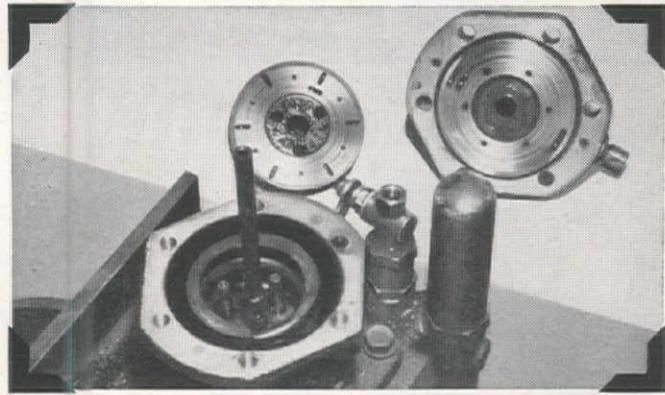
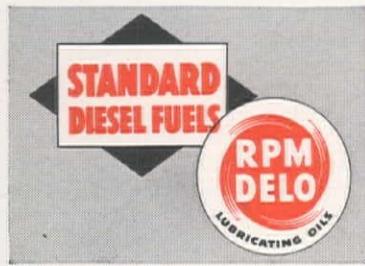
FUELED WITH STANDARD DIESEL FUEL, nine transport units like these are used by Intercity Motor Lines in common-carrier service on the tough, mountainous 287-mile run between San Francisco and Eureka. Nearly two-thirds of this route is extremely winding heavy grade. Despite these conditions, fuel

LUBRICATED WITH RPM DELO Special Lubricating Oil, this piston is from one of the transport diesels that has gone 126,000 miles since the last overhaul. Note that it is exceptionally clean, all rings are free and oil holes are open. All other parts of the engine were in this same good condition. RPM DELO Oil is used in all of Intercity Motor Lines' engines.



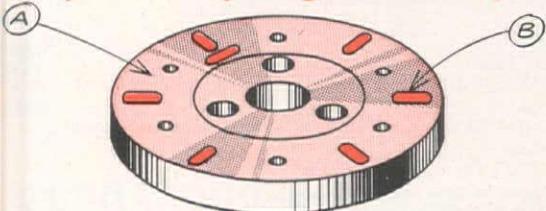
REMARKS: Standard Diesel Fuel and RPM DELO Oil work together to develop the highest efficiency in diesel engines and come in different grades to meet operating conditions in all sizes and types.

The fuel comes to you 100% clean and is made to exact specifications; the oil contains special compounds which resist oxidation, corrosion, stop foaming and prevent wear.



mileage of the units is very good and fuel-system-part expense is practically eliminated. An example of the long service of the parts is the fuel-pump disc above. Although it has been in service for 14 months—98,000 miles of truck operation—it shows very little wear and will be put back to work.

How Standard Diesel Fuel cuts repairs and ups engine efficiency



A. 100% cleanliness and viscosity within correct limits prevent wear of fuel-system parts.

B. Low pour-point assures free flow in all weather and temperature conditions.

Proper ignition qualities and controlled distillation range provide even burning and sustained power with minimum combustion shock, quick starting and smooth idling.

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

design head does not exceed 100 ft., and has been used on low-head transmission work and other specific applications mentioned. This book serves to point out the uses for which this material is designed, since it is not recommended for all uses. Engineers are cautioned to know the limitations of the material before accepting it for project use, and this book gives as many up-to-date details as are available at the present time on this subject.

Annual Report—Bureau of Public Roads, Fiscal Year 1951—Published by the Department of Commerce. Copies available from Superintendent of Documents, U. S. Government Printing Office, Washington.

ton 25, D. C. 81 pages, 5 3/4 x 9 1/4. Price 35¢.

This pamphlet-type annual report of the U. S. Bureau of Public Roads contains a resumé of Bureau activities during the year 1951 along with a sampling of pertinent pictures, tables and research information. Information contained in the book amounts to a progress report on some interesting aspects of the Bureau's activities. Subjects such as the Federal Aid Program, the National System of Interstate Highways, foreign activities, highway transport research, etc., are contained in the book. Those who are interested in keeping track of the agency's activities, and in keeping abreast of public road developments, should find this interesting reading.

New building near for Colo. Highway Department

SELECTION of a site in Denver, Colo., for the new State Highway Department building is near at hand. Two areas are under recommendation by the Mayor's committee.

Both the areas are adjacent to the proposed Valley Highway. One site is near the intersection of Buchtel Blvd. and S. Race St., and the other near Buchtel Blvd. and S. Colorado Blvd.

Highway department offices, engineering, drafting and other sections will be housed in the one-story building, with certain two-story parts.

Citizen protests about the construction of the building in the first area mentioned led to the appointment of the committee to seek available sites. State Highway Engineer Mark Watrous has assured residents that no heavy construction machinery would ever be kept in the building, which will be headquarters for the administrative offices of the highway patrol as well as the highway department.

ROAD-MIX—

...Continued from page 94

ed of introducing the liquid asphalt into the mobile mixers in controlled quantities as the mixer picked up a measured quantity of mineral aggregate from a windrow, permitting mixing to be accomplished while the liquid asphalt was still hot and with the objective of a complete mix in one pass of the machine. This latter objective is not always accomplished and many failures may be attributed to insufficient mixing. Additional blade mixing prior to spreading and compacting will overcome this difficulty.

Laying and compacting

One of the most desirable features of road-mix pavements that caused them to win early public approval was their extremely smooth-riding quality. This characteristic resulted from the method of laying the mix with long wheel-base power-driven blade graders. Blade mixing also contributed to the excellent profile as any uneven base conditions were usually corrected during the mixing process. Blade laying of mix, therefore, is still the approved method of spreading the material to the desired cross section and it is usually and preferably accomplished in successive thin layers with some degree of compaction of each layer obtained by the blade equipment or rubber tired rollers. This method of compacting the mix from the bottom up permits the removal of irregularities and depressions with the following layer of mix. Final compaction of the top surface may be accomplished with a steel wheel roller followed by traffic or, under controlled conditions, by traffic alone.

Costs

A discussion of road-mix construction would not be complete without some

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ROLLED SMOOTH for less resistance.
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SPRING MOUNTED deflectors.
ADJUSTABLE and oscillating shoes.

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LEVEL Lift.
TAILORED to truck to distribute weight and stress.
4 OR 6 POINT push using Wausau's exclusive toggle.
CHAFING for side thrust.

WAUSAU SPREADERS

Trailer Type

Positive control of Thickness
Positive control of Width
Positive control of Direction
No hazards to passing vehicles
Low Cost self contained unit
A differential drives the hopper agitator and spinner disc which prevents skidding and consequent loss of

spinning power while turning corners.
Attached or disconnected in a minute
Model A Operator platform
"Safety Built"
Long life construction --
Sturdily built
Spreads Materials from 8 to 20 Feet

Write for details

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reference to one of its most attractive features, its cost. The low cost of early treatments of existing gravel, crushed rock or sand roads was an important factor in the widespread acceptance by engineers. Much of this work was accomplished using mineral aggregates obtained by scarifying the existing untreated road metal to provide the 2-in. depth of mat generally specified. Cost of constructing a 2-in. road-mix oiled mat 18 ft. wide (exclusive of the cost of mineral aggregate) was between \$1,250 and \$1,500 per mile in Idaho during the late 1920's. Of this, the cost of oil, freight and application accounted for \$750-\$800, and mixing for \$400-\$500 per mile. The remaining costs were for road preparation, scarifying, shoulder work, ditches, etc. It will be seen that mixing, then, cost approximately \$.0425 per sq. yd.

A study of some 1951 road-mix contracts in Nevada reveals that the bid price of the oil, freight and application has about doubled since 1928. Mixing costs, probably due to the development of travel mixers, have remained about the same at \$.042 to \$.048 per sq. yd. for 2½- to 3-in. thick mats. Aggregate costs, of course, vary greatly from job to job with the availability of suitable materials. The cost of suitable aggregates for road-mix surfacing should not be more and is often less than for other types of asphalt paving.

Quality

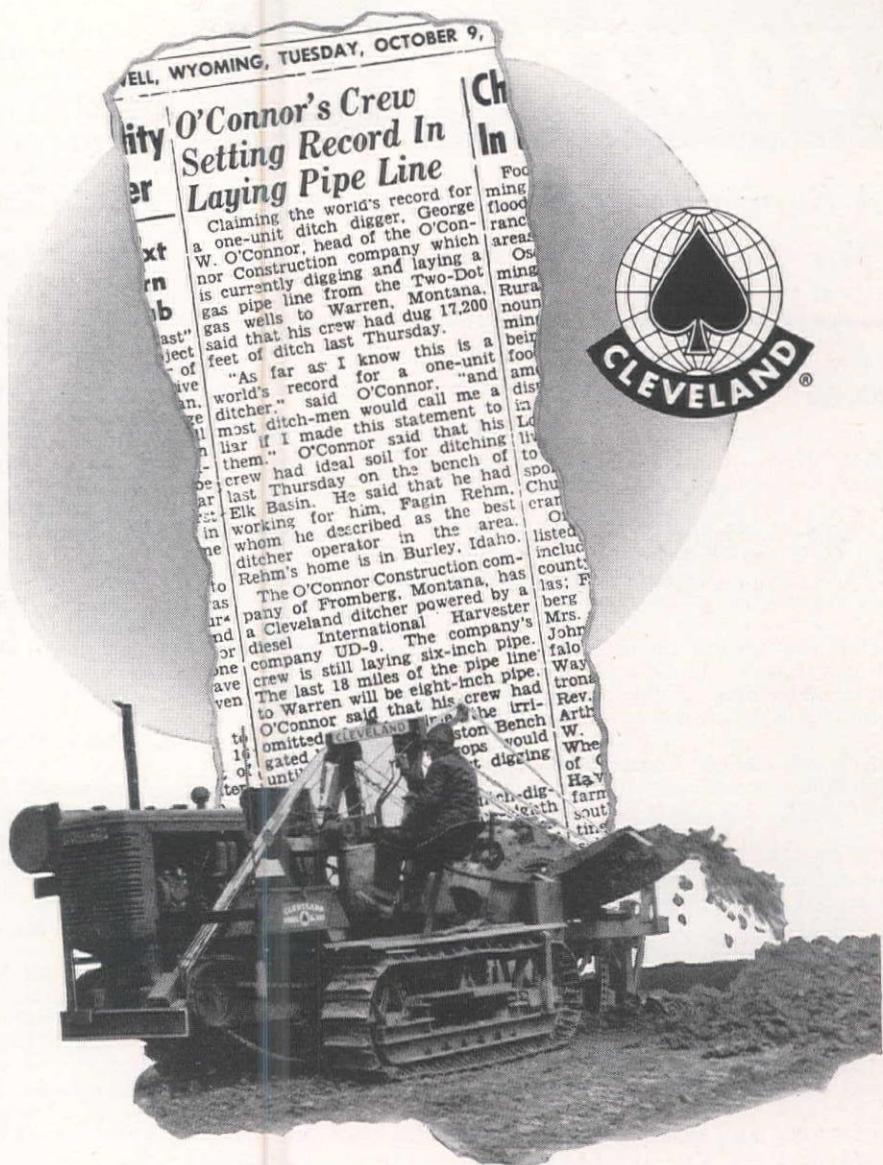
For the same quality of aggregate and the same type of asphaltic binder road mix differs from plant mix in two important features both of which affect the quality of the mix. In plant mix, the mineral aggregates are dried by heating and the proportion of the several sizes of aggregates and the asphaltic binder can be rigidly controlled. As road mix is only a method of uniformly incorporating asphaltic binder with mineral aggregate, the production of road-mix surfacing of plant mix quality requires processing the aggregate under the most favorable conditions of dryness and temperature and the careful control of the quantities of aggregate and asphaltic binder. Under these conditions it should be difficult to determine whether the completed surface was the product of plant mix or road-mix construction. The improvement in quality and length of life are the dividends of good supervision and control.

BUILDING COSTS—

...Continued from page 73

Acknowledgments

Acknowledgment is extended for assistance in this program to J. R. Libby, formerly Instructor of Civil Engineering, OSC; the Oregon State Highway Department; Moffat, Nichol & Taylor; Burns, Bear and McNeil, engineers and architects, respectively, for Food Technology Building; J. McDevitt, Glenn Stanton, engineer and architect, respectively, for Animal Industries Building; and the Donald Drake Construction Co., prime contractor for both buildings.



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CONTRACTS

A Summary of Bids and Awards For Major Projects in the West

Alaska

\$1,793,715—**Otto B. Ashback & Sons**, 2975 Hamline Ave. No., St. Paul, Minn.—Award for supplying aggregate and cement for local construction as government furnished; by C. of E.

\$548,708—**S. Birch & Sons**, 208 Central Bldg., Seattle, Wash., and **C. F. Lytle Co. and Green Construction Co.**, 312 Masonic Temple Bldg., Des Moines, Iowa—Award for construction of outside utilities at Elmendorf Air Force Base; by C. of E.

\$1,589,000—**Carson Construction Co., Inc.**, 1st National Bank Bldg., Helena, Mont.—Apparent low bid for construction of terminal building facilities for the Civil Aeronautics Administration at Anchorage and Fairbanks airports; by CAA.

\$2,108,000—**Denali Construction Co.**, Anchorage—Award for automotive maintenance facility at Elmendorf Air Force Base; by C. of E.

\$738,740—**A. J. Hopper**, 1200 Westlake No., Seattle—Low bid for construction of a utility distribution system from power plant to freight and passenger depot in Anchorage; by Alaska Railroad.

\$246,917—**Kiel & Peterman**, Juneau—Award for water supply and distribution, sewage collection systems, Haines; by Alaska Public Works, Dept. of Int.

\$7,131,840—**Patti-MacDonald Construction Co.**, 3829 W. Pine Blvd., St. Louis, Mo.—Low bid for construction of the Kenai army communications station; by C. of E.

\$1,725,920—**Patti-MacDonald Construction Co.**, 3829 W. Pine Blvd., St. Louis, Mo.—Award for construction of an elementary school building containing 28 classrooms at Ft. Richardson, and a 20-classroom structure at Elmendorf; by U. S. Housing and Home Finance Agency.

\$292,285—**Valley Construction Co.**, 7722 Rainier Ave., Seattle, Wash.—Sole bidder on water system extensions at Anchorage; by Alaska Public Works.

Arizona

\$1,099,033—**Macco Corporation**, 14409 So. Paramount Blvd., Paramount, Calif.—Low bid for earthwork, concrete lateral lining and structures, Unit I, Mohawk Distribution System, Wellington-Mohawk Division, Gila Project; by USBR.

\$749,919—**Alex Robertson Co.**, 14433 S. Paramount Blvd., Paramount, Calif.—Award for sewer, water main and related construction, Davis-Monthan Air Force Base; by C. of E.

\$237,674—**Wallace & Wallace**, Box 470, Phoenix—Low bid for 3.1 mi. of grading and bridge construction, 26 ft. wide, on Section D of the Salt River Valley-Junction Federal Highway 9 in Tonto National Forest, Maricopa County; by BPR.

California

\$120,167—**N. A. Artukovich Construction Co.**, 723 Union Ave., Montebello—Low bid for work on the East End District Sanitary Sewer, Escondido; by City of Escondido.

\$288,517—**Bebek & Brkich**, 9038 E. Rush St., El Monte—Construction of Section A of the Sunland-Tujunga Interceptor sewer, Los Angeles; by City of Los Angeles.

\$2,274,366—**Bongiovanni Construction Co.**, 2547 Canyon Dr., Hollywood—Low bid for 1.4 mi. of grading and surfacing with portland cement concrete pavement on cement treated subgrade. Work includes construction of three bridges, one pedestrian undercrossing and eleven retaining walls; by St. Div. of Hwys.

\$141,552—**Electric & Machinery Service, Inc.**, South Gate—Low bid for highway lighting and illuminated sign system on Hollywood Freeway, betw. Mulholland Dr. and Cahuenga Blvd., and between Gower St. and Hollywood Blvd.; by St. Div. of Hwys.

\$458,072—**Charles L. Harney, Inc.**, 575 Berry St., San Francisco—Low bid for construction of the foundations for a portion of bridge and miscellaneous road work to be constructed on 13th St., betw. Mission and Route 68, San Francisco County; by St. Div. of Hwys.

\$812,721—**Healy-Tibbitts Construction Co.**, 411 Brannan St., San Francisco—Award for construction of steel bulkhead and rock dikes, Outer Harbor Area, Long Beach; by Long Beach Board of Harbor Commissioners.

\$304,584—**Hoffman & Jacobs**, 1122 Gaviota St., Long Beach—Award for construction of utilities: electric light, power, telephone system, at Wilmington; by Los Angeles Harbor Comm.

\$2,516,564—**Peter Kiewit Sons' Co.**, 345 Kieways Ave., Arcadia—Low bid for 5 mi. of grading and paving with portland cement concrete and plant-mix surfacing. Six grade separation structures to be built, betw. Railroad Ave. in Pittsburg and A Street in Antioch; by St. Div. of Hwys.

\$153,988—**Vido Kovacevich Co.**, 5300 Imperial Hwy., South Gate—Low bid for improvement of Florence Ave., betw. Eastern Ave. and Priam Dr., Los Angeles; by Board of Supervisors.

\$3,000,000 (approximately)—**Leonard Construction Co.**, 37 S. Wabash St., Chicago, Ill.—Award for construction of acid and phenol plant at Avon; by Monsanto Chemical Co.

\$343,308—**Madonna Construction Co.**, P. O. Box 910, San Luis Obispo—Low bid for 10.3 mi. grading and surfacing with road-mixed surfacing and bituminous treated surfacing on imported base material, cement treated on Allen Rd. and Santa Fe Way, betw. Rosedale Ave. and State Route 139 in Kern County; by St. Div. of Hwys.

\$115,412—**Joe D. Miller**, 2002 Monterey St., Bakersfield—Low bid for sanitary sewer improvements in El Camino Tract, Bakersfield; by Bakersfield City Council.

\$1,374,001—**Myers Bros.**, 3407 San Fernando Rd., Los Angeles—Award for construction of 228 stucco dwellings in Los Angeles; by Allondra Park, Inc.

\$372,140—**H. B. Nicholson Co., James L. Ferry and N. P. Van Valkenburg**, 808 E. Colorado St., Pasadena—Low bid for construction of facilities, Naval Ordnance Test Station; by U. S. Navy.

\$1,018,750—**Pacific Coast Builders**, 2530 18th St., San Francisco—Low bid for construction of Las Palmas Junior High School, Sacramento; by Grant Union High School Dist.

\$1,392,001—**Shaw Construction Co.**, 8634 E. Firestone Blvd., Downey—Construction of dwelling units in San Bernardino; by Shaw Construction Co.

\$852,570—**Peter Sorensen**, 927 Arguello St., Redwood City—Low bid for construction of schedules 1 and 2 on water treatment plant, reservoir and related structures, Pittsburg; by City of Pittsburg.

\$1,079,070—**A. Teichert & Son, Inc.**, 751 S. Figueroa St., Los Angeles—Award for improvements on the Los Angeles River, from Van Nuys Blvd. to Sepulveda Dam; by C. of E.

\$1,101,138—**Howard J. White, Inc.**, 44 Encina Ave., Palo Alto—Low bid for construction of Wilbur Junior High School, Palo Alto; by Palo Alto Unified School District.

\$197,923—**C. G. Willis & Sons, Inc.**, 2119 E. 25th St., Los Angeles—Low bid for 5 mi. of grading and surfacing with road-mixed surfacing between Oceanside and Bonsall; by St. Div. of Hwys.



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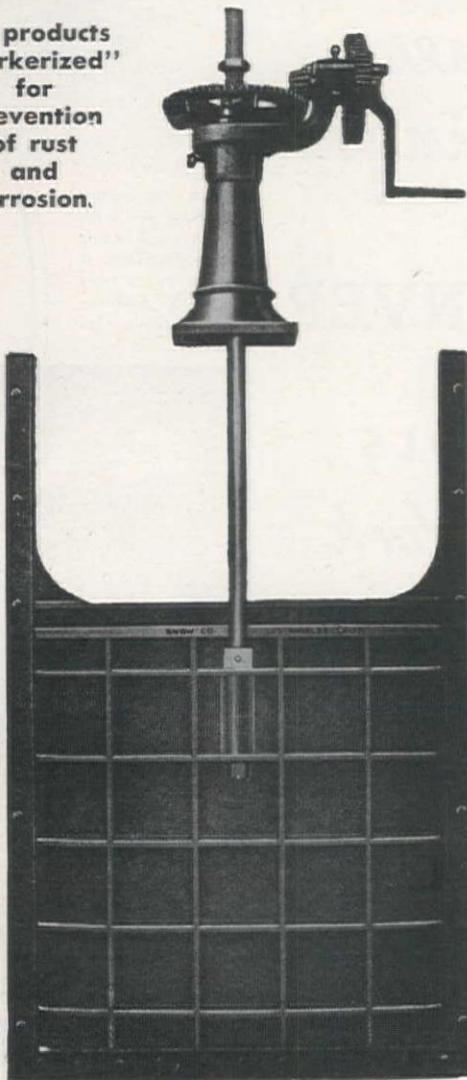
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\$1,593,410—R. V. Lloyd and Co., Coachella, Calif.—Low bid for earthwork, pipe lines and structures, laterals 97.0, 98.0 and 99.4, and 99.8-0.51 and sublaterals, Part 2 of Unit 9, Coachella Valley Distribution System, All-American Canal System, Boulder Canyon Project, Arizona-California-Nevada. Included are: Clearing, blasting, excavation for pipe trenches and excavation for structures; backfill in pipe trenches, and puddling and consolidating backfill; by USBR.

Colorado

\$226,978—Alger Construction Co., Lakewood—Low bid for 6.2 mi. of grading, stabilizing, structures and oil processing betw. Cedaredge and the junction of state highway Nos. 65 and 92 with 65, in Delta County; by St. Hwy. Dept.

\$155,983—Colorado Constructors, Inc., 725 W. 39th Ave., Denver—Low bid for 4.2 mi. of grading, structures, and oil processing between Hudson and Prospect Valley on State Highway 52 in Weld County; by St. Hwy. Dept.

\$134,498—Donovan Construction Co., 1725 Carroll Ave., St. Paul, Minn.—Low bid for installation of equipment and appurtenances, construction of structures and transmission line for Beaver Creek Substation; by USBR.

Nevada

\$299,622—Dodge Construction, Inc., Fallon—Award for 11.9 mi. of construction from Hay Ranch to Eureka; by St. Dept. of Hwys.

\$559,829—Wells Cargo, Inc., 1800 E. 4th St., Reno—Award for highway construction from the west slope of Mormon Mesa to the east slope of Mormon Mesa, Clark County; by St. Dept. of Hwys.

New Mexico

\$118,889—Allison & Haney, P. O. Box 1507, Albuquerque—Award for 4.6 mi. of work on the Tinnie-Sindle Road, State Highway 368, Lincoln County; by St. Hwy. Dept.

\$261,042—Lowdermilk Bros., P. O. Box 501, Los Alamos—Award for 11.1 mi. of work on the Weed-Pinon Rd., State Highway 24, Otero County; by St. Hwy. Dept.

\$196,766—Skousen Construction Co., 201 Springer Bldg., Albuquerque—Award for 12.6 mi. of work on the Ojo Feliz-La Cueva Rd., State Highway 21, Mora County; by St. Hwy. Dept.

\$551,557—Skousen-Hise, 201 Springer Bldg., Albuquerque—Award for 8.5 mi. of construction on the Artesia-Carlsbad Road, U. S. Highway 285, in Eddy County; by St. Hwy. Dept.

Oregon

\$346,087—Acme Construction Co., Eugene—Low bid for construction of the Suicide Creek-Pacific Highway section of the Coos Bay-Roseburg highway, west and east of Tenmile Post Office; by St. Hwy. Comm.

\$134,211—Babler & Rogers, 4617 S.E. Milwaukie Ave., Portland—Award for 4.93 mi. of grading and cinder base and 7.5 mi. oil mat surfacing on Powell Butte-Deschutes County Line section of the Powell Butte Secondary Highway, about 6.8 mi. east of Redmond; by St. Hwy. Comm.

\$267,180—Funderburk Construction Co., Sutherlin—Award for 4.0 mi. of grading and oil mat surfacing on the Lone Rock-Rock Creek section of the North Umpqua County Road, about 2 mi. northeast of Glide, Douglas County; by St. Hwy. Comm.

\$196,630—Carl M. Halvorson Inc., 218 Builders Exchange Bldg., Portland—Award for work on the Hood River overcrossing on the Columbia River Highway about 1 mi. west of Hood River Depot; by St. Hwy. Comm.

\$394,057—Howard Halvorson Co., 5103 N.E. 42nd St., Portland—Award for construction of a machine shop, drainage facilities and asphaltic pavement in the major maintenance area at McNary; by C. of E.

CHEAPER



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Compare the Adnun with lighter, cheaper units. The Adnun is heavily built and capable of handling the heavy loads of the courser grade stone without fear of constant breakdown. The Rubber Tired Stone Spreading Attachment gives full traction and saves your rollers for black top. The Overlapping Cutter Bar carries the aggregate up to, and compacts it with the parallel course, and the Power Cut-Off permits carrying hopper loads across intersections without tag-end run outs. The Adnun has been proved on all classes of material spreading and is the only Black Top Paver unreservedly recommended for spreading both aggregates and black top. Don't buy a one-purpose or substandard machine.

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\$4,888,600—**S. A. Healy & Co.**, White Plains, N. Y.—Award for construction of The Dalles Dam; by C. of E.

\$102,842—**Tom Lillebo**, Reedsport—Low bid for construction of three reinforced concrete viaduct grade separation structures over Silverton Road, Sunnyview Ave., and Garden Road on the Salem By-pass section of the Pacific Highway, east; by St. Hwy. Comm.

\$112,110—**Lockyear & White Inc.**, Longview, Wash.—Award for construction of a reinforced concrete viaduct approximately 312 ft. long over the Union Pacific Railroad Co.'s main line and passing track, Shogren overcrossing on the Columbia River Highway about 1 mi. east of Mosier; by St. Hwy. Comm.

\$218,144—**John A. Logan**, Portland—Award for 2.5 mi. of grading and rock surfacing on the Catching Slough-Enegren Ferry section of the Coos River secondary highway about 1.4 mi. south and east of Coos Bay, Coos County; by St. Hwy. Comm.

\$386,233—**P. S. Lord**, 4507 S.E. Milwaukie St., Portland—Low bid for Sullivan sewage pump station, Portland; by City of Portland.

\$199,101—**Joe Lundberg Construction Co.**, 3220 E. Republican St., Seattle—Low bid for work on municipal sewage treatment plant, Pendleton; by City of Pendleton.

\$160,846—**Parker-Johnson Co.**, 2002 S.E. Clinton, Portland—Low bid for Rock Creek Bridge, Mosier overcrossing, and Mosier Creek Bridge on the Columbia River Highway; by St. Hwy. Comm.

\$317,572—**R. & R. Construction Co.**, Tillamook—Award for 33.3 mi. of access road construction for Schedule 3 of the Big Eddy-TROUTDALE 230-kv. transmission line in Clackamas and Multnomah counties; by BPA.

\$867,361—**A. Ritchie & Co.**, Box 253, Walla Walla, Wash.—Award for construction of a high school building in Hermiston; by Hermiston School Board.

\$278,542—**Rogers Construction Co.**, 11760 N.E. Glisan, Portland—Award for 9.21 mi. of base and paving on the Stout Creek-Mill City section on the North Santiam secondary highway in and west of Mill City; by St. Hwy. Comm.

\$179,580—**Wixson & Crowe, Inc.**, P. O. Box 799, Redding—Low bid for clearing parts A, B and C of the Lookout Point Dam Reservoir area, including salvaging merchantable timber and disposal of the spoils of clearing operations; by C. of E.

Utah

\$261,905—**L. T. Johnson Construction Co.**, 709 Wall Ave., Ogden—Award for highway construction between the Nevada State Line near Garrison extending southeast 17 mi.; by St. Rd. Comm.

\$132,601—**Wheelwright Construction Co.**, 2300 East Ave., Ogden—Award for construction of Coal Creek bridge approaches; by St. Rd. Comm.

Washington

\$847,330—**Curtis Gravel Co.** and D-H Paving Co., Vancouver—Low bid for 7.0 mi. of draining, grading, surfacing and paving on Primary State Highway No. 3, Kennewick to Richland Junction; by St. Dept. of Hwys.

\$136,360—**Harrison Bros. Co.**, Tacoma—Low bid for construction of the freeway from Sixth and Pearl Sts. to Center and Gunnison Sts., in Tacoma. Blantz Blvd. Freeway is the official name; by Board of Contracts and Awards, Tacoma.

\$3,173,561—**M. H. Hasler Construction Co.** and D. & H. Construction Co., P. O. Box 387, Santa Ana, Calif.—Low bid for construction of Kennewick levees and pumping plants along the right bank of the Columbia River in the vicinity of Kennewick; by C. of E.

\$810,000—**L. H. Hoffman**, 715 S.W. Columbia Blvd., Portland—

How Bitumuls Controls Sand-drift for Railroads

When repeated applications of fuel oil and tank cleaning residue failed to hold drifting sand on embankments and cut areas, a railroad through Eastern Oregon solved the problem of mounting maintenance costs by applying a 1:1 dilution of

BITUMULS® HRM at the rate of about 0.75 gallons per square yard, diluted, with a penetration of $\frac{1}{2}$ to $\frac{3}{4}$ inch. Bitumuls, routed to the job in tank cars, was piped to a connecting box car, pump-fed to spray-bar for close-in work, to hose and nozzle for areas out to forty feet and more.

Bitumuls, versatile enough to hold shifting sands or to bind pavements to withstand the pounding of heaviest highway carriers, is made in many grades. Mixing Grades of Bitumuls are ideal for treating virtually all available aggregates. Quick-Setting Grades of Bitumuls are favored the world over for armorcoat and macadam work. High Viscosity Bitumuls is standard for surface-treating.

Nation-wide, trained and experienced Bitumuls Engineers are available at strategically located plants to consult with you, to your advantage, about your paving needs.

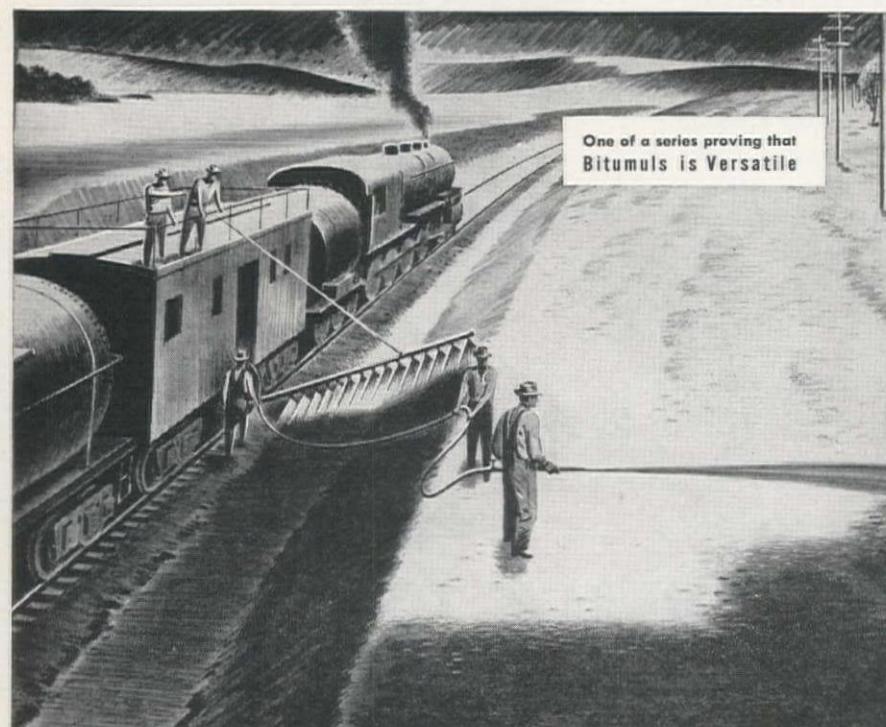
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COMPANY**

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District Offices: Tucson, Ariz. Inglewood, Calif. Oakland 1, Calif. Portland 7, Ore. Seattle, Wash.

Offices in Principal Cities



Award for construction of outside utilities, waste disposal facilities, paving and related work, Hanford Works Laboratory, Richland; by Atomic Energy Comm.

\$1,177,290—**A. G. Homann**, Lacy—Low bid for construction of facilities and related work, Ft. Lewis; by C. of E.

\$853,036—**Intermountain Plumbing Co.** and **Henry L. Horn**, Connell—Low bid for building three pumping plants and constructing laterals and miscellaneous structures on the Columbia Basin Project near Othello; by USBR.

\$302,610—**Harold Kaeser Co.**, Seattle—Low bid for construction of sections 1 and 3, sewage system, Medical Lake; by Dept. of Public Works.

\$102,190—**Manson Construction & Engineering Co.**, 821 Alaskan Way, Seattle—Award for repairs on Pier 36, Port of Embarkation; by U. S. Dept. of Commerce.

\$136,070—**C. J. Montag & Sons Co.**, 7805 N.E. Halsey, Portland—Low bid for 115-kv. transmission line construction, the Westport-Cathlamet, across the Columbia River; by BPA.

\$301,565—**R. L. Moss Co.**, Zenith—Low bid for construction of sections 2 and 4, sewage system, Medical Lake; by Dept. of Public Works.

\$451,488—**Northwest Construction Co.**, 3950 6th Ave. N.W., Seattle—Award for construction of the Kennydale north section of Secondary State Highway No. 2-A in King County; by St. Dept. of Hwys.

\$123,172—**David Nygren**, 309 Lloyd Bldg., Seattle—Award for construction of the Sherwood Creek bridge and approaches on Secondary State Highway No. 14-A, in Mason County; by St. Dept. of Hwys.

\$755,920—**Charles A. Power** and **A. J. Cherf**, E. 27 8th Ave., Spokane—Low bid for construction of division of intercepting sewer; by City of Spokane.

\$945,000—**Howard S. Wright & Co.**, 407 Yale Ave. N., Seattle—Award for telephone company building, equipment, Seattle; by Pacific Telephone and Telegraph Co.

\$3,793,180—**Zoss Construction Co.**, Portland, Ore.—Award for construction of five warehouses and related work at Auburn Depot; by C. of E.

\$1,346,504—**Zoss Construction Co.**, Portland, Ore.—Award for government-design construction of a 200 x 1,200-ft. warehouse in Mount Rainier Ordnance Depot; by C. of E.

Wyoming

\$193,208—**Platte Valley Construction Co.**, 900 S. Adams St., P. O. Box 595, Grand Island, Neb.—Low bid for grading, draining 1-3 continuous reinforced concrete girder span bridge over Old Woman Creek and miscellaneous work on 2.9 mi. of the Newcastle-Lusk rd. in Niobrara County; by St. Hwy. Dept.

ILLUSTRATED BROCHURES GIVE BEDROCK INFORMATION DATA

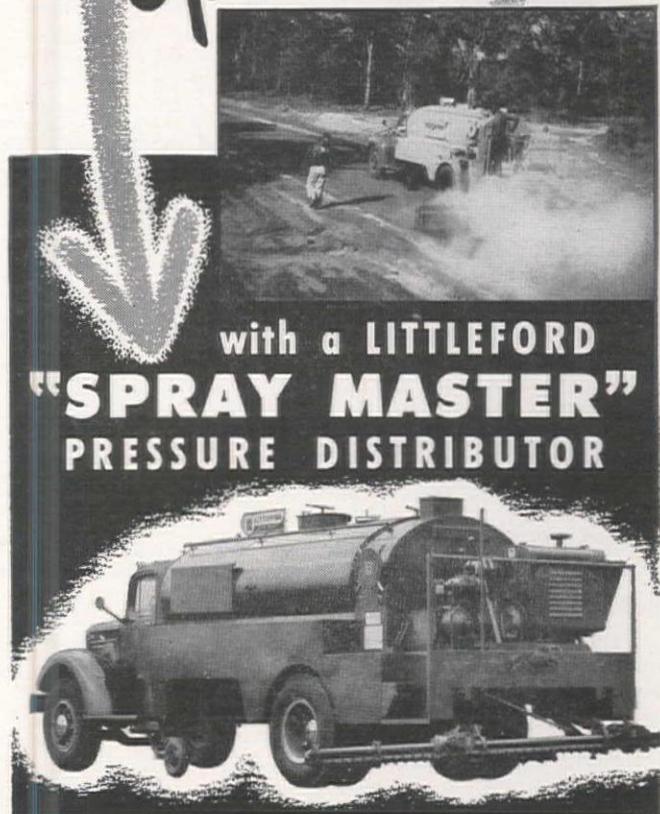
Free well illustrated material describing the refraction seismic method of subsurface exploration upon request. These pages of detailed information are of value to lay and professional readers interested in foundation problems. Detailed Bibliography also available.

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EDWARD R. BACON COMPANY, San Francisco 10, Calif.
FEENAUGHTY MACHINERY CO., Portland 3, Maine;
Seattle 4, Wash.; Spokane 2, Wash.; Boise, Idaho
HALL-PERRY MACHINERY CO., Butte, Montana
LUND MACHINERY CO., Salt Lake City, Utah
SHRIVER MACHINERY COMPANY, Phoenix, Arizona
SMITH BOOTH USHER COMPANY, Los Angeles, Calif.
YUKON EQUIPMENT COMPANY, Seattle, Washington



LITTLEFORD

LITTLEFORD BROS., INC.

502 E. Pearl St., Cincinnati 2, Ohio

NEWS of MANUFACTURERS

Seaman Motors, Inc. names new general sales manager

New General Sales Manager for Seaman Motors, Inc. is A. C. "Andy" Cartwright. Cartwright comes to his new position from a position as division sales manager with the Trackson Co. of Milwaukee.



Cartwright



Higbee

Higbee heads Gurley

W. & L. E. Gurley has a new president. Lester Higbee will serve as the fifth president of the 107-year-old engineering and scientific equipment firm. Retiring President Charles E. Smart will serve as chairman of the board. Robert Gurley Betts was elected to the newly-created position of executive vice president.

Bullard Co. names O'Donnell

Paul W. O'Donnell is new industrial relations manager for E. D. Bullard Co., San Francisco, Calif., manufacturer of safety equipment for industry.

Diamond Iron Works Pres.

J. P. Blaul is the new president of Diamond Iron Works, Inc. and Mahr Manufacturing Co. Division. Blaul succeeds L. J. Reay, who resigns but will remain a member of the board of directors.

Armstrong leaves US Pipe & Foundry

General Donald Armstrong, president of United States Pipe and Foundry Co. since 1948, resigns as president and director to accept an important post abroad in connection with economic mobilization in Europe. N. F. S. Russell, chairman of the board of directors, is now president. James J. Reynolds, Jr., returns to the firm as assistant to the chairman of the board of directors. Reynolds has been a member of the National Labor Relations Board.

Lamb heads East for Lull

Pat Lamb is appointed assistant manager of the Lull Manufacturing Co., Minneapolis, Minn. He was associated with the firm as district manager in the Western States and Western Canada prior to his new appointment. A. L. Stains replaces Lamb in the Western territory and will supervise the sales

UNIT BID PRICES

Selected bid abstracts for Western projects

Dam

Spillway rehabilitation at Black Canyon Dam

Idaho—Boise Project—Bureau of Reclamation. Morrison-Knudsen Co., Inc., Boise, submitted the low bid of \$366,940 for spillway rehabilitation at Black Canyon Dam, Boise Project. Unit prices were as follows:

(1) Morrison-Knudsen Co., Inc.	\$366,940	(3) Pacific Bridge Co.	\$847,150
(2) J. A. Terteling and Sons, Inc.	497,050	(4) Engineer's estimate	340,750

	(1)	(2)	(3)	(4)
Lump sum, handling discharges and unwatering foundation.....	\$100,000	\$190,000	\$150,000	\$115,000
300 cu. yd. excavation for spillway apron	15.00	29.00	150.00	6.00
730 cu. yd. excav. of existing conc. 3 in. and less in depth.....	18.00	12.00	200.00	15.00
50 cu. yd. excav. of existing conc. more than 3 in. in depth.....	280.00	67.00	\$1,500	100.00
1,800 lin. ft. drilling holes for anchor bars and grouting bars in pl.	4.00	6.50	10.00	2.50
3,750 bbl. furn. and handling cement	6.00	10.00	5.00	6.00
27,000 lb. placing reinforcement bars .....	.12	.15	.20	.10
5,000 cu. yd. concrete in spillway apron	40.00	45.50	75.00	35.00
Lump sum, furn. and welding steel plates on drum gates	\$2,000	\$5,250	\$10,000	\$3,000

Sewerage

Storm sewer distribution system

Colorado—Denver County—Corps of Engineers. Barks & Co. submitted the low bid of \$223,298 to the Corps of Engineers for construction of additions to storm sewer distribution system, Fitzsimmons Army Hospital, Denver. Unit prices were as follows:

(1) Barks & Co.	\$223,298	(5) Trewbridge-Oehring Construction Co.	\$293,036
(2) The Latimer Construction Co.	240,128	— Crocker & Ellett, Inc.	295,424
(3) Bill Garphy Co.	265,905	— Pentsien, Inc.	297,736
(4) Mann Construction Co.	280,566	6) Engineer's estimate	187,691

	(1)	(2)	(3)	(4)	(5)	(6)
3,598 lin. ft. concrete pipe, 8-in.	7.42	8.66	6.00	6.00	8.00	2.00
1,741 lin. ft. concrete pipe, 10-in.	9.57	8.82	7.00	10.00	10.00	3.05
1,158 lin. ft. concrete pipe, 12-in.	9.75	10.38	8.00	17.00	12.50	4.65
1,410 lin. ft. concrete pipe, 15-in.	9.89	13.64	10.50	18.00	13.00	6.58
453 lin. ft. concrete pipe, 18-in.	10.29	14.03	11.50	21.00	14.00	7.45
180 lin. ft. concrete pipe, 21-in.	11.35	14.44	12.50	22.00	16.00	9.50
1,201 lin. ft. concrete pipe, 24-in.	12.00	17.90	23.00	23.00	20.00	11.95
303 lin. ft. concrete pipe, 27-in.	16.51	24.05	24.00	24.00	22.00	15.55
665 lin. ft. concrete pipe, 30-in.	17.50	24.32	25.00	25.00	23.00	16.20
452 lin. ft. concrete pipe, 33-in.	18.30	23.70	31.00	26.00	24.00	17.20
1,460 lin. ft. concrete pipe, 42-in.	20.48	26.00	32.00	28.00	29.00	24.00
135 lin. ft. conc. pipe, 42-in., jacket under R.R. tracks	70.80	85.00	150.00	40.00	80.00	50.00
40 ea. manholes, 0-ft. - 6-ft. depth	300.00	160.00	260.00	170.00	400.00	380.00
300 lin. ft. extra depth	20.00	18.25	27.00	26.50	50.00	40.00
94 ea. catch basins, 0-ft. - 3-ft. 4-in. depth	200.00	150.00	195.00	300.00	300.00	260.00
40 lin. ft. extra depth	20.00	20.00	27.00	50.00	25.00	37.00
1,000 sq. yd. conc. pavement, remove and replace	6.00	5.50	8.00	10.00	10.00	8.50
1,000 sq. yd. bitum. pavement, remove and replace	3.00	3.00	11.00	4.00	10.00	4.50
150 sq. yd. sidewalk, remove and replace	6.00	3.60	5.00	9.00	5.00	5.40
400 lin. ft. curb and gutter, remove and replace	3.00	3.00	3.00	4.50	5.00	3.20
41 ea. drains and check valves, installed in steam manholes	200.00	150.00	105.00	145.00	100.00	180.00
24,000 sq. ft. grass sod, remove and replace .....	.50	.20	.14	.20	.30	.03
5 ea. tree removal and disposal	50.00	50.00	300.00	100.00	100.00	30.00

Bridge and Grade Separation

Structural steel overcrossing

Washington—Lewis County—State. State Construction Co., Seattle, received an award from the State Department of Highways on its low bid of \$187,685, for construction of the National Ave. Overcrossing in Chehalis. Unit prices were as follows:

(1) State Construction Co.	\$186,685	(5) Anderson Bridge Construction Co.	\$196,197
(2) Mathew McCarthy	187,545	(6) Sealand Construction, Inc.	196,934
(3) Lockyear and White, Inc.	191,843	— Hamilton Builders	208,253
(4) David Nygren	195,629		

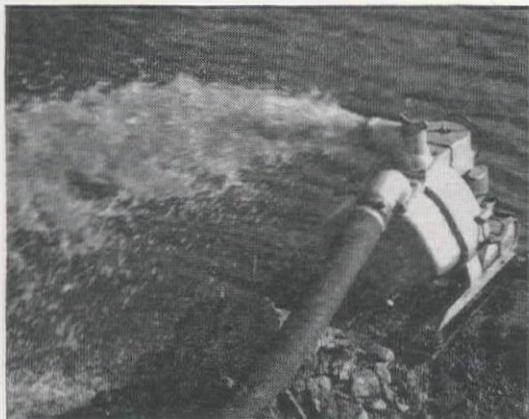
	(1)	(2)	(3)	(4)	(5)	(6)
550 cu. yd. structure excavation	5.00	2.50	9.00	20.00	20.00	7.50
9 days mechanical tamper	40.00	45.00	50.00	50.00	50.00	54.00
625 cu. yd. concrete, Class A	72.50	82.00	72.00	80.00	70.00	76.00
260 cu. yd. concrete, Class B	72.50	50.00	72.00	80.00	70.00	57.50
522 lin. ft. reinf. conc. bridge railing	10.00	8.00	9.00	10.00	10.00	10.50
207,000 lb. steel reinforcing bars .....	.115	.105	.12	.10	.12	.119
260,000 lb. structural carbon steel .....	.21	.23	.23	.20	.22	.215
4,800 lb. cast steel .....	.60	.65	.60	.50	.60	.58

Continued on page 148

Continued on page 148

For Cost Conscious Contractors...

HOMELITE COST-CUTTING



Pumps

Why let water waste time . . . which is money . . . on a job, when you can get rid of it fast with a Homelite Gasoline Engine Driven Pump. Light enough for one man to carry, your Homelite can be put into operation *quickly* at any spot on the job. No transportation problems. No delays. With fastest self-priming, it handles up to 15,000 gallons per hour and keeps seepage down to strainer level automatically. It has a 28 foot suction lift. Non clogging. Completely dependable in all kinds of weather.



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Operating power tools or floodlights with a Homelite Gasoline Engine Driven Generator gives you maximum possible savings. In the first place, you eliminate the cost and delays involved in having local power installed. But of even greater importance, with your lightweight Homelite set up right where you're operating tools, you eliminate long power-hungry cables that reduce the efficiency of your power tools and cause excessive repairs. Built for heavy duty service, a Homelite supplies plenty of power. It has a large overload capacity and is famous for its dependability.



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Clearing construction sites is a fast, low-cost operation with a 27 pound, 4 horsepower Homelite Chain Saw. In fact, one man with a Homelite Chain Saw can cut more trees in a day than several men could cut with axes or hand saws. Lightweight, easy to handle . . . on every type of cut, felling, bucking, notching or trimming . . . a Homelite cuts through an 18 inch pine in 16 seconds . . . an 18 inch oak in 28 seconds . . . and it handles trees 48 inches or more in diameter.

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Carryable Pumps • Generators
Blowers • Chain Saws



1303 RIVERDALE AVENUE • PORT CHESTER, N. Y.

NEWS of MANUFACTURERS

Continued from page 146

promotional activities with distributors of the company in the West.

Smith Engineering makes personnel changes

Changes in the personnel of Smith Engineering Works include the promotion of Donald D. Barnes, formerly executive vice president, to the position of president. Barnes succeeds the late Charles F. Smith. Gerald L. Smith, formerly vice president and director of sales becomes executive vice president and director of sales.

Head serves B-L-H in Southwest

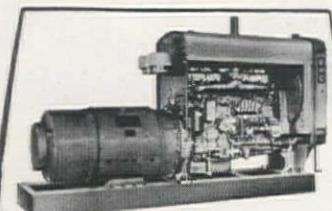
R. W. Head assumes new duties as district manager for Baldwin-Lima-Hamilton Corp. in the Southwest territory. Head will have offices at Dallas, Tex., but his territory includes the state of New Mexico.

Caterpillar expansion program

An expansion program has been announced by Caterpillar Tractor Co. Included are the construction of a new factory at York, Pa., additions to the Joliet, Ill., plant and improvements in the Peoria, Ill., plant. Major portion of the program is to be financed with a long term loan of \$35,000,000.

New Atlas department manager

D. J. Carroll Copps is appointed general manager of Atlas Powder Co.'s explosives department.



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UNIT BID PRICES . . . CONTINUED

8 only bridge drains complete	75.00	65.00	65.00	75.00	75.00	75.00	67.50
90 lin. ft. downspouts	6.00	4.90	2.00	6.00	8.00	7.45	
29.5 lin. ft. rubber water stop	5.00	2.00	10.00	2.00	5.00	3.70	
5,320 lin. ft. furn. precast concrete piling	3.50	3.45	3.00	3.50	3.25	4.15	
152 only driving precast concrete piles	75.00	80.00	80.00	70.00	75.00	106.00	
3 only furn. and driving precast conc. test piles	200.00	150.00	130.00	200.00	500.00	144.00	
Lump sum, blast plates	\$1,000	700.00	\$1,000	200.00	\$2,000	\$1,000	\$1,134

Small steel and concrete bridge

Washington—Pacific County—State. Hawkins & Armstrong, Seattle, received an award from State Department of Highways on its low bid of \$190,042 for 0.3 mi. of work on the Naselle River Bridge, PSH No. 12. Unit prices were as follows:

(1) Hawkins & Armstrong	\$190,042	(6) State Construction Co.	\$214,096			
(2) Kirkman & Strand	202,624	— General Construction Co.	215,000			
(3) Carl M. Halvorson, Inc.	207,296	— Hamilton Builders	219,056			
(4) S. S. Mullin, Inc.	211,309	— Grays Harbor Construction Co.	221,952			
(5) H. G. Palmberg	213,512	— Mathew McCarthy Co.	245,839			
		(1) (2) (3) (4) (5) (6)				
32.2 M.B.M. timber and lumber (salts treated)	450.00	390.00	390.00	355.00	450.00	400.00
202 M.B.M. timber and lumber (creosote treated)	350.00	300.00	375.00	372.00	400.00	350.00
1,560 lb. structural carbon steel .....	.50	.60	1.00	.60	.60	.75
Lump sum, removing portions of exist. struct.	\$18,000	\$18,000	\$21,000	\$24,370	\$30,000	\$24,000
Lump sum, surfacing bridge deck	\$6,000	\$8,000	\$5,000	\$8,000	\$8,000	\$8,500
774 cu. yd. concrete, Class A	65.00	89.00	78.00	78.00	69.00	85.00
258,800 lb. steel reinforcing bars .....	.115	.13	.12	.12	.10	.12

Streets and Highways

Gravel surfacing in Utah

Utah—Millard County—State. L. T. Johnson Construction Co., Ogden, submitted the low bid of \$261,905 to the State Road Commission for 16.7 mi. of gravel surfaced road from the Nevada Line near Garrison, southeast 17 mi. Unit prices were as follows:

(1) L. T. Johnson Construction Co.	\$261,905	(4) Reynolds Construction Co.	\$309,453			
(2) J. M. Sunson & Sons	278,834	(5) Thorn Construction Co.	375,626			
(3) W. W. Clyde Co.	287,486	(6) Engineer's estimate	273,305			
		(1) (2) (3) (4) (5) (6)				
93,000 ton crushed rock or crushed gravel surf. crse. ....	.58	.63	.63	.60	.70	.60
15,000 ton (cr. rk. or cr. grav. surf. crse. (pl. in stkpl.) ....	.50	.50	.55	.50	.60	.55
1,000 ton cover material (place in stockpile)	2.50	2.00	2.25	2.50	2.00	2.50
61,000 cu. yd. selected material base course .....	.40	.50	.52	.60	.80	.60
285,000 cu. yd. unclassified excavation .....	.26	.26	.29	.30	.35	.23
373,000 sta. yd. overhaul, Class "A" .....	.01	.015	.015	.01	.015	.015
6,000 yd. mi. overhaul, Class "B" .....	.20	.20	.20	.20	.15	.15
4,400 hr. rolling	4.50	4.50	4.00	5.00	6.00	5.00
6,200 1,000 gal. watering	1.75	2.00	1.00	2.00	2.00	2.00
136 lin. ft. 18-in. C.G.M. pipe	3.50	3.40	3.40	3.65	3.70	3.15
3,254 lin. ft. 24-in. C.G.M. pipe	5.00	4.75	5.25	5.40	5.00	5.00
224 lin. ft. 30-in. C.G.M. pipe	6.00	5.85	6.40	6.50	6.00	6.00
98 lin. ft. 36-in. C.G.M. pipe	10.00	9.65	10.20	10.50	9.50	9.60
208 lin. ft. 48-in. C.G.M. pipe	14.00	14.00	14.35	15.00	14.00	14.60
104 lin. ft. 60-in. C.G.M. pipe (beveled ends)	23.00	24.00	22.15	26.00	25.00	24.00
212 lin. ft. 84-in. C.G.M. pipe (beveled ends)	40.00	40.00	43.70	47.00	45.00	38.00
84 lin. ft. 96-in. C.G.M. pipe	50.00	45.00	51.90	65.00	55.00	46.50
264 lin. ft. C.M. pipe arches 29-in. x 18-in.	5.25	5.00	5.70	5.80	7.00	5.50
112 lin. ft. C.M. pipe arches 36-in. x 22-in.	6.50	7.00	7.00	7.20	8.00	6.50
42 lin. ft. C.M. pipe arches 50-in. x 31-in.	13.00	14.00	12.80	14.10	15.00	13.50
1,500 cu. yd. excavation for structures	1.50	2.00	1.50	1.00	2.00	1.50
5,000 cu. yd. channel excavation .....	.50	.40	.50	.50	1.00	.30
160 acre clearing and grubbing	20.00	35.00	50.00	15.00	50.00	30.00
2,400 cu. yd. loose riprap	4.00	5.00	3.00	10.00	15.00	3.00
6,000 lin. ft. surface ditches .....	.08	.06	.05	.10	.10	.10
7,400 lin. ft. right-of-way fence, Type "B" .....	.32	.30	.35	.35	.30	.30
3 ea. 14-ft. gates	35.00	40.00	50.00	30.00	35.00	30.00
4 ea. 16-ft. gates	40.00	40.00	50.00	35.00	40.00	35.00
149 ea. guide posts	6.50	6.00	6.00	7.00	8.00	5.00
Lump sum, furnish water equipment	\$1,000	\$1,000	\$6,000	\$1,000	\$5,000	\$3,000
Lump sum, furn. construction signs	500.00	500.00	500.00	500.00	\$1,000	\$1,000
180 ea. right-of-way markers	5.50	4.00	6.00	8.00	7.00	5.00
2 ea. F.A.P. markers	25.00	20.00	25.00	25.00	25.00	20.00

P.C.C. paving on cement-treated subgrade and six bridges on Ramona Freeway in Los Angeles

California—Los Angeles County—State. Griffith Co., Los Angeles, submitted the low bid of \$2,307,503 to the State Division of Highways for grading and paving about 1.7 mi. with portland cement concrete on cement treated subgrade and with plant mix surfacing on imported base material. Included also is the construction of six bridges on Ramona Freeway between 0.1 mi. east of Jackson Ave. and Rosemead Blvd. Unit prices were as follows:

(1) Griffith Co.	\$2,307,503	(5) United Concrete Pipe Corp.	\$2,445,295			
(2) Vido Kovacevich Co.	2,421,609	(6) A. Teichert & Son, Inc.	2,508,736			
(3) J. E. Haddock, Ltd.	2,422,648	— Bressi & Bevanda Constructors, Inc.	2,654,627			
(4) Guy F. Atkinson Co.	2,439,070	— Peter Kiewit Sons' Co.	2,663,233			
		(1) (2) (3) (4) (5) (6)				
Lump sum, remov. br. superstructure (Rubio Wash)	\$1,400	\$3,000	\$2,000	\$5,000	\$10,000	\$2,000
3,170 cu. yd. removing conc.	4.40	5.00	4.00	4.00	4.00	5.00
Lump sum, clearing and grubbing	\$10,000	\$30,000	\$30,000	\$13,340	\$25,000	\$20,000
240,000 cu. yd. roadway excav. ....	.45	.49	.50	.48	.51	.50
7,250 cu. yd. struct. excav. (bridges)	1.70	2.50	2.00	2.00	3.00	1.50

(Continued on next page)

Coming Up - More Steel

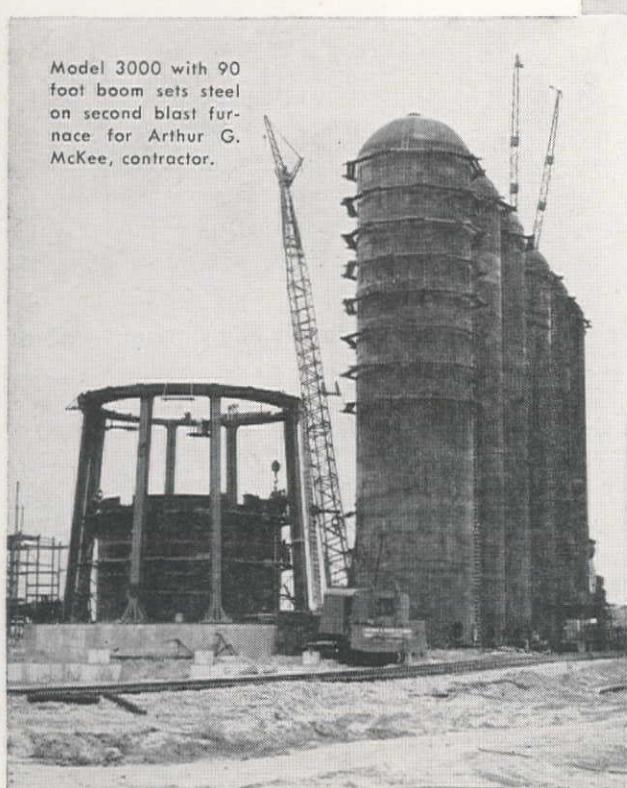
23 Manitowocs Speed Construction at U. S. Steel Fairless Works

On this huge Pennsylvania project 23 Manitowoc Cranes and Draglines, more than any other make, are carrying the brunt of the work excavating and steel erecting for the major contractors.

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And on most other major projects whether it be earth excavation or steel erection you'll find those big, husky Manitowocs handling the toughest parts of the job. They'll handle *your* job too. Manitowoc Engineering Works, Manitowoc, Wisconsin.

Model 3000 with 90 foot boom sets steel on second blast furnace for Arthur G. McKee, contractor.



American Bridge uses a Model 3500 and a Model 3900 Speedcrane to set a heavy girder for the Open Hearth building. Reach plus stability means speed and safety.

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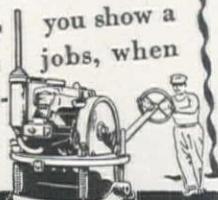
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OLSON MANUFACTURING COMPANY

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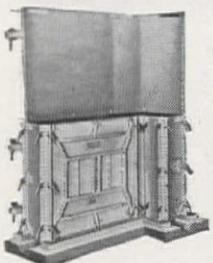
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Oakland, Calif.
Denver, Colo.

UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
12,210 cu. yd. struct. backfill (bridges)	2.50	2.50	2.00	1.75	1.50	1.50
52,500 cu. yd. struct. excav.	1.90	1.75	1.70	1.50	1.30	2.00
120,000 sq. yd. compacting original ground .....	.04	.05	.04	.02	.06	.05
800,000 sq. yd. overhaul .....	.004	.005	.005	.005	.005	.005
110,000 ton I.B.M.	1.15	1.12	1.25	1.30	1.20	1.30
13,500 ton I. perv. M.	1.55	1.50	1.60	2.00	1.70	1.50
12,000 sq. yd. preparing slopes (erosion control) .....	.11	.10	.10	.15	.12	.08
57,000 sq. yd. cultivating (prep. landscaping) .....	.07	.06	.05	.08	.09	.06
Lump sum, dev. wat. sup. and furn. wat. equip.	\$6,000	\$5,000	\$10,000	\$5,000	\$10,000	\$5,000
12,000 M. gal. applying water	1.40	1.55	1.30	2.00	1.40	1.80
Lump sum, finishing roadway	\$3,000	\$2,500	\$2,500	\$4,000	\$5,000	\$5,000
89,000 sq. yd. moving and compact. (C.T.S.) .....	.22	.22	.23	.25	.21	.20
4,300 bbl. portland cement (C.T.S.)	3.75	3.50	3.40	3.20	4.20	3.60
87 ton liquid asph. SC-2 (pr. ct.)	23.00	27.00	27.00	45.00	25.00	30.00
130 ton asph. emul. (pt. bdr. sl. ct. and cur. sl.)	45.00	40.00	41.00	45.00	30.00	40.00
16,000 ton mineral aggre. (P.M.S.)	4.00	4.00	4.00	4.75	3.50	4.30
825 ton paving asphalt (P.M.S.)	4.00	4.00	4.00	5.00	17.00	4.30
850 lin. ft. raised traffic bars	1.00	1.00	1.00	1.00	1.00	1.00
15 ton screenings (sl. ct.)	4.20	4.00	7.00	5.00	5.00	7.00
1,450 lin. ft. placing P.M.S. curbs .....	.90	.25	.45	1.50	.60	.10
21,000 cu. yd. P.C.C. (pav.)	11.00	12.50	11.50	13.00	12.90	12.00
17,750 ea. paving tie-bolt assemb. ....	.60	.50	.60	.60	.50	.60
13,500 cu. yd. Class "A" P.C.C. (struct.)	39.00	44.00	41.00	43.00	42.00	43.00
1,470 lin. ft. rubber waterstops	2.20	2.75	2.00	2.00	2.50	2.50
1,837,000 lb. bar reinf. steel .....	.09	.0825	.10	.09	.085	.09
74,300 lb. misc. iron and steel .....	.27	.33	.34	.30	.35	.30
1,359,000 lb. struct. steel .....	.13	.12	.13	.13	.125	.13
Lump sum, cleaning and painting structural steel	\$17,000	\$13,590	\$17,000	\$16,000	\$16,000	\$17,000
6,846 lin. ft. furn. steel piling	2.80	2.70	3.40	2.75	3.00	2.50
171 ea. driving piles	39.00	45.00	45.00	50.00	80.00	40.00
17 ea. steel pile splices	17.00	15.00	25.00	15.00	15.00	20.00
5,900 cu. yd. P.C.C. (curb, gutter and sidewalk)	23.00	23.50	21.50	25.00	28.00	25.00
4,635 lin. ft. steel railing	8.70	7.75	8.50	8.00	8.50	9.00
945 sq. yd. protect. covering .....	.90	1.00	.90	1.00	1.00	.80
945 sq. yd. membrane waterproofing	3.00	3.00	3.00	3.00	3.00	3.00
18,700 lin. ft. chain link fence	2.00	2.00	2.00	2.00	1.90	2.00
1,900 lin. ft. salv. exist. chain link fence .....	.50	.30	.40	.40	.45	.40
1,900 lin. ft. reconstructing salv. chain link fence .....	.50	.40	.65	.60	.50	.40
5,600 lin. ft. 18-in. reinf. conc. pipe (std. str.)	3.70	4.10	4.50	4.00	4.00	7.00
6,070 lin. ft. 24-in. R.C.P. (std. str.)	5.00	5.65	6.00	5.50	6.00	8.00
1,330 lin. ft. 30-in. R.C.P. (std. str.)	6.80	7.20	8.00	7.00	8.00	11.00
80 lin. ft. 30-in. R.C.P. (extra str.)	8.30	15.00	10.00	9.00	9.00	13.00
4,100 lin. ft. 36-in. reinf. conc. pipe (std. str.)	8.50	9.45	10.00	9.00	9.50	12.00
50 lin. ft. 36-in. R.C.P. (extra str.)	10.70	14.00	13.00	11.00	12.00	15.00
30 lin. ft. 42-in. R.C.P. (std. str.)	19.00	12.75	13.00	12.00	12.00	15.00
670 lin. ft. 48-in. R.C.P. (std. str.)	12.40	15.10	14.50	13.00	14.00	17.00
510 lin. ft. 54-in. R.C.P. (std. str.)	14.40	17.00	17.00	15.00	17.00	19.00
660 lin. ft. 60-in. R.C.P. (std. str.)	17.70	18.50	20.50	18.00	20.00	21.00
90 lin. ft. 60-in. R.C.P. (extra str.)	22.00	30.00	25.00	22.00	22.00	24.00
910 lin. ft. 72-in. R.C.P. (std. str.)	25.30	26.00	29.00	25.00	24.00	27.00
150 cu. yd. Class "C" P.C.C. (pipe reinf.)	15.00	12.00	20.00	25.00	23.00	40.00
548 lin. ft. 6-in. P.M.P. (16 ga.)	1.80	1.00	2.50	1.50	3.50	2.50
180 lin. ft. 8-in. P.M.P. underdrains (16 ga.)	2.40	2.00	2.20	2.00	4.00	3.00
658 lin. ft. 4-in. G.S.P. (10 ga.)	2.40	1.25	2.50	3.00	4.00	2.50
.65 lin. ft. pipe shaft manholes	15.00	12.50	15.00	20.00	20.00	20.00
1,000 lin. ft. metal plate guard railing	3.30	3.00	3.00	3.00	3.50	3.00
200 lin. ft. 6-in. clay sewer pipe (std. str.)	4.50	2.30	3.40	4.00	4.50	3.00
1,100 lin. ft. 8-in. C.S.P. (std. str.)	4.60	2.75	4.10	4.00	5.00	3.50
15 lin. ft. 10-in. C.S.P. (extra str.)	11.00	10.50	8.00	8.00	7.00	6.50
1,100 lin. ft. 24-in. C.S.P. (std. str.)	12.00	10.75	10.80	10.00	11.00	9.00
90 lin. ft. 24-in. C.S.P. (extra str.)	13.50	18.00	12.50	12.00	12.00	11.00
1,250 lin. ft. 36-in. R.C.P. (std. str., sanitary sewers)	14.00	14.00	14.50	13.00	14.00	12.00
90 lin. ft. 36-in. R.C.P. (extra str., sanit. sewers)	16.00	22.00	17.00	15.00	14.00	14.00
10 ea. manholes (sanitary sewers)	250.00	150.00	200.00	150.00	300.00	200.00
13 ea. adjusting M.H. to grade (sanitary sewers)	30.00	27.50	40.00	50.00	20.00	60.00
5 ea. abandoning M.H. (sanitary sewers)	55.00	22.00	65.00	60.00	40.00	60.00
9 ea. remodeling M.H. (sanitary sewers)	80.00	55.00	180.00	150.00	150.00	180.00
Lump sum, pump, electr., light and sig. sys. drainage pump, equip. (Del Mar Ave.)	\$7,000	\$7,500	\$6,800	\$6,500	\$7,000	\$6,500
Lump sum, P.D.E. (Walnut Grove Ave.)	\$7,700	\$8,000	\$7,600	\$7,000	\$7,000	\$7,000
Lump sum, P.D.E. (San Gabriel Blvd.)	\$7,700	\$8,000	\$7,650	\$7,000	\$7,000	\$7,000
Lump sum, pumphouse electr. equip. (Del Mar Ave.)	\$3,000	\$2,700	\$2,500	\$2,300	\$2,500	\$2,500
Lump sum, pumphouse electr. equip. (Walnut Grove Ave.)	\$3,000	\$2,800	\$2,800	\$2,500	\$2,500	\$2,700
Lump sum, pumphouse electr. equip. (San Gabriel Blvd.)	\$3,000	\$2,800	\$2,800	\$2,500	\$2,500	\$2,700
Lump sum, interchange hwy. light. and illum. sign sys. Hellman Ave.)	100,000	107,000	104,000	93,000	95,000	110,000
	\$1,000	\$1,200	\$1,000	\$1,000	\$1,000	\$1,000

(Continued on next page)

Grading and asphaltic concrete paving on Pacific Highway in Oregon

Oregon—Douglas and Lane counties—State. Leonard & Slate Oregon, Ltd. and E. C. Hall, joint venturers, submitted the low bid of \$1,530,464 to the State Highway Department for grading and paving the Divide-Anlauf Unit, Divide-Rice Hill Section of the Pacific Highway. Unit prices were as follows:

(1) Leonard & Slate Oregon, Ltd. and E. C. Hall	\$1,530,464
(2) Carl M. Halvorson, Inc. and Carl M. Halvorson	1,617,521
(3) Roy L. Houck & Son	1,654,614
(4) Rogers Construction Co.	1,693,873
(5) E. L. Gates & Co., Inc.	1,698,439
(6) Durbin Bros., Rush Construction Co. and R. A. Heintz Construction Co.	1,854,986
— C. J. Montag & Sons	1,857,254
— Kuckenberg Construction Co.	1,858,236
— McNutt Bros.	1,999,768
— Peter Kiewit Sons' Co.	2,155,103

	(1)	(2)	(3)	(4)	(5)	(6)
All specified, clearing and grubbing	\$77,000	\$50,000	\$142,000	\$120,000	\$130,000	\$100,000
All specified, removal of drainage structs.	\$4,500	\$3,500	500.00	\$10,000	\$2,000	\$8,000
2,600 cu. yd. structl. excav., unclassified	3.00	6.00	4.00	3.00	3.75	4.00
700 cu. yd. trench excav., unclassified	2.00	2.00	3.00	3.00	3.00	4.00
1,217,000 cu. yd. sta. short overhaul .....	.48	.47	.49	.58	.60	.74
2,997,000 cu. yd. sta. long overhaul .....	.02	.02	.015	.01	.015	.02
41,500 cu. yd. sta. long overhaul .....	.50	.70	.50	.50	.60	.50
5.63 mi. finishing roadbed and slopes	\$1,000	600.00	500.00	800.00	750.00	\$1,421
24,000 lin. ft. rounding cutbanks .....	.20	.15	.15	.17	.18	.25
230 lin. ft. 6-in. perf. metal drain pipe, coated	2.00	4.50	2.00	1.75	2.00	2.10
50 lin. ft. 18-in. corrugated metal pipe	4.00	4.50	3.80	4.00	4.80	4.25
160 lin. ft. 24-in. corrugated metal pipe	6.00	6.00	5.80	6.00	7.00	6.00

WELDED FRAME DESIGN CUTS STEEL TONNAGE 15%

THROUGH welded structural design, it has been possible to save 15% on steel in the framework for J. W. Robinson's new department store in Los Angeles. The most recent department store in Southern California, this 1700 ton frame is almost entirely field welded.

The relationship of the columns and girders provides both vertical and horizontal continuity with a minimum of welding. The horizontal continuity reduces the deflection of the 32 ft. beam and girder spans to approximately 25% of what it would have been if they had been simply supported.

All girders are continuous through the column lines—the column rather than the girder being spliced at that point—and extend to a point approximately 6.5 ft. from the columns on both ends. This leaves a space in alternate spans of approximately 19 ft. between girder ends in which a suspended span is carried.

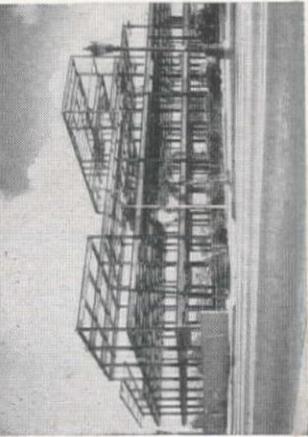


Fig. 3. Four Story Rigid Frame for the J. W. Robinson department store in Los Angeles, California. Architects: Pereira and Luckman and Charles O. Mathews. Structural Designing and Detailing: Paul E. Jeffers and Robert Wilder, Associate Structural Engineers. Steel Fabricators: Bethlehem Pacific Coast Steel Corporation.

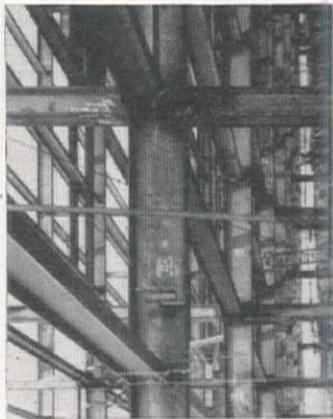


Fig. 4. Continuous Girder passing over column top is spliced at points of minimum stress.

This design idea also allows any variations in gap to be compensated in the splice welds and so further simplify field welding.

Approximately 6" less height per story results from this welded frame design. Distances between ceiling of one floor and the floor level above are also considerably less than with other types of construction.

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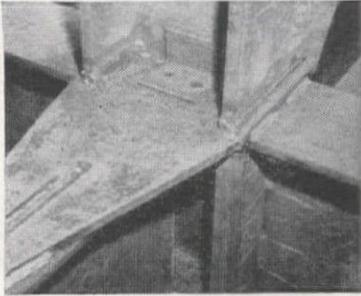


Fig. 1. Typical Column Joint—Develops continuity both vertically and horizontally. Vertical column continuities are shop welded to the continuous beam. Top plate, with slot to give extra weld area, develops continuity in transverse beams across column supports.



Fig. 2. Detail of Girder running through column. Column top and base are welded to beam flange. Vertical stiffeners provide continuity to column.

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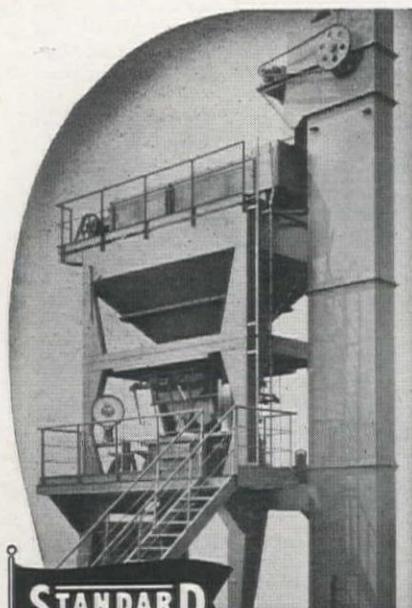
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UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
2,700 lin. ft. 18-in. concrete pipe	3.50	4.25	3.60	3.70	3.85	3.00
1,000 lin. ft. 24-in. concrete pipe	4.60	5.75	5.00	5.00	5.25	3.75
160 lin. ft. 24-in. extra str. concrete pipe	5.30	6.25	6.00	5.25	6.10	4.25
380 lin. ft. 30-in. concrete pipe	7.00	7.00	7.10	6.00	7.50	5.75
130 lin. ft. 36-in. concrete pipe	9.50	9.00	9.45	7.50	9.00	9.00
150 lin. ft. install 72-in. ex. str. corrugated metal pipe, protected invert	6.00	7.00	7.00	8.00	7.00	6.00
188 lin. ft. install 84-in. corrugated metal pipe, 8 gauge, protected invert	6.50	8.00	8.00	11.00	8.00	8.00
474 lin. ft. install 96-in. sectional plate culv., 8 gauge	10.00	10.00	12.00	12.00	10.00	18.00
162 lin. ft. install 102-in. sectional plate culv., 8 gauge	13.00	11.00	15.00	15.00	14.00	19.00
40 lin. ft. install 138-in. sectional plate culv., 7 gauge	16.00	15.00	20.00	15.00	16.50	24.00
522 lin. ft. install 138-in. sectional plate culv., 5 gauge	16.00	15.00	22.00	20.00	16.50	24.00
40 cu. yd. 3/4-in. - 0 backfill in drains	6.00	10.00	5.00	3.00	5.00	5.00
200 cu. yd. grouted cement rubble masonry	35.00	50.00	20.00	40.00	22.00	30.00
220 cu. yd. Class "A" concrete	60.00	60.00	65.00	65.00	53.00	53.00
37,000 lb. metal reinforcement	.12	.15	.12	.15	.13	.13
4 only concrete manholes	200.00	200.00	100.00	300.00	150.00	200.00
1 only concrete catch basin	150.00	150.00	75.00	150.00	45.00	80.00
630 lin. ft. metal guard rail	3.50	4.00	4.00	3.00	3.00	3.40
300 only concrete sight posts	10.00	11.00	15.00	9.00	12.50	11.00
155,000 cu. yd. 3-in. - 0 material in base	2.30	2.60	2.42	2.25	2.15	2.15
22,000 cu. yd. 3/4-in. - 0 matl. in base and shldrs.	2.40	3.05	3.00	2.25	2.15	2.15
5,200 M. gal. sprinkling	2.00	2.50	2.50	2.00	2.00	2.00
5.63 mi. preparation of base	200.00	250.00	300.00	200.00	200.00	400.00
1,800 cu. yd. 3/4-in. - 0 matl. in binder course	3.75	4.10	5.00	3.50	3.50	4.50
300 ton furn. and placing RC-3 asph. in binder course	45.00	46.00	38.00	42.00	42.50	50.00
40,000 ton Class "B" asphaltic concrete	6.00	7.05	6.70	6.75	6.25	5.85
170 ton RS-1 emuls. asph. in seal coat	50.00	47.50	40.00	45.00	47.50	55.00
1,020 cu. yd. aggregate in seal coat	5.00	5.00	5.00	5.00	5.00	4.50
400 lin. ft. asph. conc. traffic markers	1.00	1.25	1.00	1.00	1.00	.60

Road-mix surfacing on untreated rock base

California—Lassen County—State. A. Teichert & Son, Inc., submitted the low bid of \$310,780 to the State Division of Highways for grading and surfacing about 2.1 mi. road-mix surfacing on untreated rock base, between 4.5 mi. and 6.5 mi. north of Secret Valley. Unit prices were as follows:

(1) A. Teichert & Son, Inc.	\$310,780	(4) Eaton & Smith	\$359,888
(2) Harms Bros.	329,640	(5) J. Henry Harris	387,438
(3) O'Connor Bros.	329,987	(6) United Concrete Pipe Corp.	389,226

	(1)	(2)	(3)	(4)	(5)	(6)
105,000 cu. yd. rdwy. excav.	1.90	2.15	1.95	2.22	2.30	2.83
740,000 sta. yd. overhaul	.01	.01	.01	.008	.015	.01
550 cu. yd. struct. excav.	6.00	6.00	4.00	7.20	9.60	7.00
75 cu. yd. ditch and channel excav.	6.00	6.00	4.00	4.40	3.60	7.00
7,300 cu. yd. impt. subbase material	1.15	1.40	1.40	1.45	2.30	1.75
Lump sum, dev. water sup. and furn. wat. equip.	\$2,000	\$5,000	\$3,000	\$10,995	\$12,000	\$3,000
1,200 M. gal. applying water	3.00	2.75	2.50	1.20	4.20	2.20
110 sta. finishing roadway	15.00	15.00	20.00	22.00	24.00	12.00
12,300 ton U. R. B.	3.70	3.10	4.70	4.00	4.00	2.22
3,700 ton min. agrgr. (R.M.S.)	4.00	3.60	4.75	4.10	4.00	2.32
200 ton liq. asph. MC-3 or 4 (R.M.S.)	40.00	36.00	35.00	37.00	42.00	45.00
45 ton liq. asph. SC-2 (pr. ct.)	40.00	40.00	40.00	37.00	42.00	50.00
42,000 sq. yd. mix. and compact. R.M.S.	.12	.10	.12	.20	.15	.15
11,000 lin. ft. shap. and compact. R.M.S. dikes	.20	.15	.15	.25	.50	.09
250 lin. ft. placing R.M.S. ditches and slope drains	2.00	.70	2.50	1.00	1.25	.70
12 ea. install. r/w monuments	5.00	8.00	10.00	9.50	12.00	8.00
11 ea. 4 monuments	20.00	45.00	15.00	22.50	30.00	35.00
58 ea. culv. mkr. and guide posts	10.00	8.00	7.00	9.00	10.00	9.50
48 lin. ft. 22-in. x 13-in. C.M.P. arch (16 ga.)	3.50	4.50	4.50	6.00	5.00	5.00
32 lin. ft. 12-in. C.M.P. (16 ga.)	3.50	3.00	3.00	3.50	4.00	3.25
338 lin. ft. 18-in. C.M.P. (16 ga.)	4.50	4.00	4.00	4.60	5.00	4.60
134 lin. ft. 24-in. C.M.P. (14 ga.)	7.00	6.00	5.75	6.85	6.25	6.50
32 lin. ft. 48-in. C.M.P. (12 ga.)	23.00	19.50	16.50	18.00	16.00	19.00
1 ea. metal end section for 48-in. C.M.P.	250.00	215.00	225.00	235.00	300.00	250.00
268 lin. ft. 8-in. C.M.P. downdrain (16 ga.)	2.50	2.50	3.00	3.00	2.60	2.70
11 ea. spillway assemblies	30.00	37.50	35.00	37.00	54.00	33.50
70 lin. ft. salv. exist. pipe culv.	10.00	2.50	2.00	2.80	2.50	1.50
70 lin. ft. relay. salv. C.M.P. culv.	5.00	6.80	3.00	4.70	2.50	1.50

Grading and bituminous surfacing 4 mi. in Idaho

Idaho—Gooding County—State. Hoops Construction Co., Twin Falls, submitted the low bid of \$353,053 to the State Department of Highways for constructing the roadway and a bituminous surface treatment on 3.9 mi. of the North Side Highway from Wendell southeast. Unit prices were as follows:

(1) Hoops Construction Co.	\$353,053	(4) Peter Kiewit Sons' Co.	\$399,670
(2) Aslett Construction Co.	355,077	(5) Duffy Reed	413,458
(3) Barnhart & Wheeler	356,275	(6) Engineer's estimate	348,926

	(1)	(2)	(3)	(4)	(5)	(6)
80 ea. sel. removal of trees	7.00	3.00	5.00	12.00	4.00	10.00
1 ea. removal of culverts	400.00	100.00	400.00	500.00	250.00	200.00
1 ea. removal of siphon	100.00	100.00	100.00	150.00	350.00	100.00
250 lin. ft. remove guard rail	.50	.25	1.00	1.00	1.00	.50
3 ea. remove conc. checks	15.00	25.00	15.00	75.00	50.00	25.00
41,000 cu. yd. unclassified excav.	1.30	1.10	1.40	.81	1.15	1.10
2,500 cu. yd. excav. for structs.	4.70	9.00	7.00	5.00	8.05	2.00
182,900 cu. yd. borrow	.25	.29	.24	.32	.33	.25
26,400 sq. yd. overwash	.03	.025	.01	.02	.02	.02
201,600 mi. yd. haul	.16	.20	.16	.20	.20	.18
25,300 lin. ft. small ditches	.06	.15	.11	.15	.20	.10
46 days rolling power roller	45.00	40.00	40.00	45.00	40.00	40.00
304 days rolling tamping roller	36.00	37.50	40.00	45.00	40.00	40.00
9,125 M. gal. watering embankments	1.00	1.00	1.50	1.50	1.10	1.25
1,865 M. gal. watering base and surface course	1.00	1.00	1.50	1.50	1.10	1.25

(Continued on next page)

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40,700 ton cr. gravel base course, 2-in. max.	1.34	1.10	1.16	1.55	1.73	1.40
21,700 ton cr. gravel surface, $\frac{3}{4}$ -in. max.	1.46	1.20	1.23	1.65	1.87	1.50
1,012 bbl. MC-2 liq. asph. prime coat	5.82	5.85	6.00	6.00	7.40	6.00
1,770 ton cov. coat. matl., Type E	4.00	4.00	3.50	5.00	3.50	3.50
2,365 ton cov. coat. matl., Type F	3.00	3.50	2.50	4.50	3.00	2.50
250 cu. yd. concrete, Class A	52.50	59.50	55.00	55.00	70.00	65.00
29,000 lb. metal reinforcement	.14	.17	.16	.20	.18	.20
8 lin. ft. 12-in. C.M. pipe	3.50	2.05	2.25	3.00	1.96	2.50
130 lin. ft. 18-in. C.M. pipe	3.75	3.00	4.00	5.00	3.00	4.00
104 lin. ft. 24-in. C.M. pipe	5.40	4.60	5.00	7.00	4.25	5.00
200 lin. ft. 48-in. paved C.M. pipe	17.00	13.50	20.00	21.00	17.00	15.00
1,190 lin. ft. 12-in. reinf. conc. pipe	1.90	2.00	1.75	3.00	1.70	2.50
2,240 lin. ft. 18-in. reinf. conc. pipe	3.20	3.00	2.90	5.00	2.75	4.00
869 bbl. 404-E RC-5 liq. asph. seal coat	6.05	6.20	6.00	6.00	7.40	6.00
300 lin. ft. 24-in. reinf. conc. pipe	4.65	4.20	4.00	7.00	4.00	5.00
36 lin. ft. 30-in. reinf. conc. pipe	6.05	6.00	7.00	9.00	5.25	6.00
220 lin. ft. 4-in. vit. clay pipe	1.25	.90	2.00	1.25	1.00	.75
20 lin. ft. sal. 18-in. C.M. pipe	2.00	1.00	2.00	2.00	1.00	1.25
960 lin. ft. 18-in. C.M. pipe siphon	5.00	4.85	5.00	8.00	3.83	5.00
120 lin. ft. 24-in. C.M. pipe siphon	6.00	6.40	7.00	10.00	7.00	6.00
240 lin. ft. 72-in. C.M. pipe siphon	37.00	30.75	40.00	50.00	45.00	35.00
5.6 M.F.B.M. No. 1 common timber tr.	350.00	325.00	250.00	400.00	250.00	200.00
5 cu. yd. hand placed riprap	15.00	15.00	10.00	20.00	50.00	8.00
60 ea. guide posts	15.00	11.00	8.00	15.00	6.75	7.00
102 cu. yd. gravel backfill, Class A	3.00	2.00	3.00	7.00	5.00	2.00
2 ea. project markers	20.00	25.00	20.00	20.00	10.00	12.00
40 ea. right-of-way markers	8.00	6.00	7.00	10.00	5.25	8.00
7 ea. trash rack, Type 1	50.00	44.00	100.00	50.00	75.00	20.00
1 ea. trash rack, Type 2	60.00	45.00	100.00	55.00	75.00	25.00
1 ea. trash rack 72-in.	250.00	175.00	150.00	300.00	100.00	150.00
20 ea. standard wood gate	125.00	90.00	100.00	90.00	45.00	30.00
4 ea. wire gate	25.00	70.00	50.00	25.00	50.00	8.00
4,280 lin. ft. fence, Type 1-A	.25	.25	.30	.25	.24	.20
21,490 lin. ft. fence, Type 4	.34	.33	.40	.29	.40	.35
5,500 lin. ft. fence, Type 4-A	.34	.33	.50	.30	.44	.35
1 ea. sal. measuring gate	50.00	10.00	50.00	100.00	75.00	10.00
1 ea. move and remove met. headgate	100.00	15.00	25.00	100.00	150.00	15.00
1 ea. move conc. gate	125.00	25.00	25.00	100.00	100.00	25.00
1 ea. remove met. headgate	25.00	10.00	25.00	100.00	75.00	10.00
1 ea. remove weir	20.00	15.00	100.00	100.00	100.00	10.00
32 lin. ft. 43-in. x 27-in. C.M. arch pipe culv.	10.00	9.25	12.00	15.00	10.00	10.00
110 lin. ft. 58-in. x 36-in. C.M. arch pipe culv.	16.00	13.00	15.00	20.00	13.50	15.00
240 lin. ft. 6-in. helical pipe	1.75	1.15	2.00	1.25	1.10	1.25
240 lin. ft. 1-in. G.I. pipe and connections	.60	.60	1.00	.75	.75	.40
32 lin. ft. metal ditch liner	8.00	7.50	8.00	12.00	8.40	5.00
1 ea. 18-in. metal measuring gate	150.00	130.00	150.00	225.00	125.75	50.00
760 lin. ft. ref. conc. curb precast	4.00	2.85	3.00	4.00	3.20	2.50

Grading and asphaltic concrete paving on Old Oregon Trail

Oregon—Union and Baker Counties—State. Pacific Sand & Gravel Co., Centralia, submitted the low bid of \$848,677 to the State Highway Department for grading and paving the LaGrande-North Powder Section of the Old Oregon Trail. Unit prices were as follows:

(1) Pacific Sand & Gravel Co.	\$848,677	(5) Babler & Rogers	\$978,927
(2) E. C. Swaggart and D. F. McKenzie	868,993	(6) Peter Kiewit Sons' Co.	986,553
(3) E. C. Hall Co. and J. C. Compton Co.	905,330	— McNutt Bros.	1,007,303
(4) Porter W. Yett	918,409		

	(1)	(2)	(3)	(4)	(5)	(6)
Lump sum, clearing and grubbing	\$5,000	\$21,000	\$5,000	\$10,000	\$2,500	\$1,000
1,700 cu. yd. struct. excav., unclassified	2.50	3.00	2.50	3.00	3.00	2.00
50,000 cu. yd. special borrow excav., unclassified	.38	.40	.35	.40	.40	.55
23,000 cu. yd. gen. excav., location "A", unclassified	.58	.50	.35	.50	.50	.65
90,000 cu. yd. gen. excav., location "B", unclassified	.70	.25	1.15	.20	.90	.65
53,000 yd. sta. short overhaul	.02	.02	.02	.02	.02	.02
8,400 yd. long overhaul	.50	.50	.50	.50	.50	.60
230,000 yd. mi. truck haul on special borrow	.12	.15	.18	.15	.15	.17
3.39 mi. finishing roadbed and slopes	800.00	400.00	500.00	800.00	500.00	800.00
180 lin. ft. 12-in. concrete pipe	1.70	1.50	1.85	1.50	1.50	1.60
330 lin. ft. 18-in. concrete pipe	3.10	2.50	3.00	3.00	3.00	3.40
360 lin. ft. 24-inch concrete pipe	4.10	3.75	4.50	4.70	4.00	5.00
80 lin. ft. 36-in. concrete pipe	7.50	7.50	8.50	8.00	10.00	8.80
130 lin. ft. 36-in. corrugated metal pipe	13.00	14.00	13.00	14.00	15.00	13.50
80 lin. ft. 12-in. corrugated metal siphon pipe	3.00	6.00	5.00	5.00	5.00	4.50
20 lin. ft. 24-in. concrete siphon pipe	5.10	7.00	6.00	6.00	6.00	6.75
8 cu. yd. concrete end basins	46.00	50.00	80.00	50.00	50.00	70.00
250 lin. ft. 8-in. sewer pipe	1.85	1.00	1.00	1.00	1.50	1.25
1,700 lin. ft. 12-in. sewer pipe	2.25	1.50	1.75	1.50	1.50	1.90
900 lin. ft. 15-in. sewer pipe	2.60	2.00	2.00	2.00	2.50	2.50
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17,000 cu. yd. selected cinder topping	.32	.30	.35	.30	.40	.55
225,000 yd. mi. hauling cinder topping	.07	.06	.06	.06	.07	.07
57,000 cu. yd. 3/4-in. - 0 rock in leveling course	1.80	2.30	2.00	2.30	2.00	2.60
3,000 M. gal. sprinkling	2.00	2.00	2.00	2.00	2.00	2.00
24.27 mi. preparation of base	150.00	100.00	100.00	150.00	100.00	260.00
4,300 cu. yd. 3/4-in. - 0 material in binder course	2.00	3.00	3.00	3.00	3.00	3.55
700 ton turn. and placing M-C-2 asph. in binder course	40.00	40.00	42.00	45.00	45.00	49.00
90,000 ton Class "B" asph. conc.	5.45	5.60	5.40	6.20	6.40	6.00
400 ton RS-1 emulsified asph. in tack and seal coat	45.00	45.00	45.00	50.00	46.00	47.00
2,400 cu. yd. aggregate in seal coat	3.75	3.00	4.00	4.00	5.00	5.50

Equipment costs for opening 40-mi. mine access road

Nevada—Lincoln County—State. L. T. Johnson Construction Co., Ogden, received an award from the Department of Highways for its low bid of \$48,420 for 40.1 mi. of highway work from Lincoln Tungsten Mine to a point near Crystal Springs at a junction with FAS 634. Unit prices were as follows:

(1) L. T. Johnson Construction Co.	\$48,420	(5) Wells Cargo, Inc.	\$64,730
(2) Foster & McHarg	53,590	(6) Gibbons & Reed Co.	64,484
(3) J. M. Sumsion & Sons	55,420	— Dodge Construction Co.	82,238
(4) Young & Smith Construction Co.	64,260		

	(1)	(2)	(3)	(4)	(5)	(6)
480 hr. 95 H.P. tractor with angledozer	12.00	10.50	13.00	16.00	13.00	14.60
480 hr. 95 H.P. tractor with carryall and rooter	15.00	12.50	15.00	20.00	16.00	17.20
480 hr. power shovel	11.50	15.00	15.00	16.00	17.00	19.00
1,900 hr. two-ton dump truck	3.60	6.50	5.00	6.00	8.00	6.90
900 hr. motor graders	9.00	8.00	10.50	13.00	11.00	12.30
400 hr. compressor with jackhammer	5.00	7.00	7.50	6.00	6.50	7.60
600 hr. pickup truck	2.50	1.50	1.50	3.00	5.00	2.30
300 lin. ft. 24-in. corrugated metal pipe	3.50	5.00	4.60	7.00	4.50	6.00
100 lin. ft. 30-in. corrugated metal pipe	4.50	6.00	5.50	8.00	6.00	7.00

Asphaltic concrete paving

Oregon—Washington, Clatsop, Tillamook and Columbia counties—State. Porter W. Yett, Portland, submitted the low bid of \$507,900 to the State Highway Department for paving the Quartz Creek-North Plains Unit of the Necanicum Junction-North Plains Section of the Sunset Highway. Unit prices were as follows:

(1) Porter W. Yett	\$507,900	(5) Acme Construction Co.	\$590,100
(2) Warren Northwest, Inc.	520,725	(6) Babler & Rogers	592,000
(3) E. C. Hall and J. C. Compton	536,500	— E. C. Swaggart and D. F. McKenzie	608,600
(4) K. F. Jacobsen & Co., Inc. and		— Pacific Sand & Gravel Co.	633,300
J. M. Arenz	569,450	— J. N. Conley	678,750

	(1)	(2)	(3)	(4)	(5)	(6)
300 ton RS-1 emulsified asphalt in tack coat	33.00	34.00	54.00	42.00	38.50	30.00
70,000 ton Class "B" asphaltic concrete	5.80	5.85	6.10	6.46	6.79	6.80
400 tons RS-1 emulsified asphalt in seal coat	37.00	40.00	40.00	42.00	38.50	40.00
2,500 cu. yd. ag. aggregate in seal coat	4.00	4.75	5.00	4.50	4.50	6.00
22,000 cu. yd. 3/4-in. - 0 material in shoulders	3.00	3.25	3.00	3.40	3.40	3.40
600 M gals. sprinkling	2.00	2.75	2.50	3.00	3.00	2.00

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NEW LITERATURE

301

Wire rope assembly specification guide

Listing wire rope assemblies for machine parts and operating devices, this new catalog is now available from Macwhyte Company. "Safe-Lock Industrial Standards Wire Rope Assemblies" illustrates and gives detailed specifications for wire rope with fittings permanently attached. Assemblies are used, for operating controls, as a part of the machinery and equipment, and for slings and hoists. Catalog No. 5201 contains much valuable and clearly presented information in its 24 pages.

302

20-page steel feeder booklet on cement and quarry jobs

Physical details of the Manganese Steel Feeders, produced by Pioneer Engineering Works, are explained in a new booklet offered by the firm. Operational data, including capacities, horsepower and dimensions enabling the proper selection for every type of installation are contained in the booklet. Design features, which make for handling shock loads of heavy abrasive materials, are explained in the fully-illustrated book-

let. Various types of drives, and three systems for complete lubrication are also detailed for the reader.

303

Guide to elevator and conveyor belting available

Containing the necessary data required to lay out a drive or specify a belt, this booklet, offered by New York Belting and Packing Co. is filled with tables and statistics. Carrying capacities, horsepower factors, pulley diameters, maximum and minimum plies for proper troughing and other engineering information are included. Here is a good deal of information which can help you in the field.

304

Steel building products and facilities guide

International Steel Co. offers this 44-page book as a guide to construction men who wish to know where certain building products can be obtained and where to have certain jobs especially fabricated for them. The company offers this clearly-presented resumé of its facilities and many of its products. In telling its story, the book offers good

action photographs of jobs that seemed difficult to handle. International's many products are displayed in on-the-job scenes in the hopes that steel users will find helpful suggestions and applications in glancing through this book.

305

Surveyors!

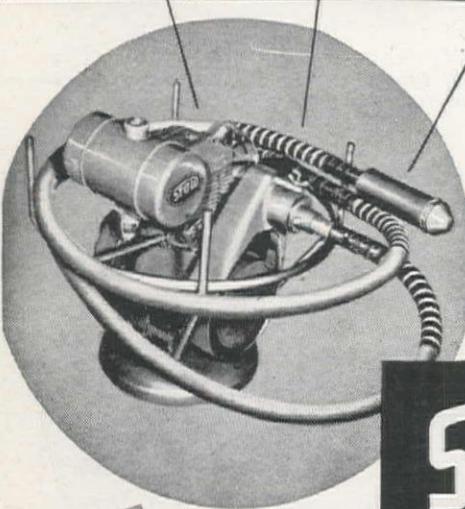
1952 Ephemeris aids determination of azimuth

An Almanac Supplement, listing 28 selected stars for determination of azimuth by stellar observation, is an innovation of the 1952 Edition of the Gurley Ephemeris, published by W. & L. E. Gurley. The supplement to the 84-page pocket-size Ephemeris is an abridgement of the American Nautical Almanac, and gives complete instruction for determining azimuths by methods similar to those used in observations of the sun and Polaris. This advance in methods of meridian determination should be of great service to surveyors. The 28 stars were selected by cadastral engineers of the Bureau of Land Management, U. S. Department of Interior. A column added to Table I in the main Ephemeris gives Greenwich Hour Angle of the Vernal Equinox for 0h Greenwich Civil Time for each day. A table in the supplement allows reduction to the time of observation. The main section of the Ephemeris includes definitions of astronomical terms, descriptions of methods of observation and examples of reducing data for determining a true meridian. Many more tables are included.

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306

52-page cable, wire guide

The 52-page engineering catalog on its line of electrical wires and cables for the mining industry is offered by United States Rubber Co. Complete performance and specification data on insulation and jacket compounds, portable cords and cables with a voltage rating up to 5,000 volts, are included in the booklet. Shielded portable cables, welding cables, bore hole cables, mine power cables, etc. are mentioned in the booklet in detail. Engineering data on splicing and patching, current carrying capacities, conductor resistance temperature correction factors and formulae for determining amperes are also incorporated in the booklet.

307

Cummins color power

Colored photographs of various kinds of Cummins-powered equipment, shown at work in construction, logging and transportation, have been collected and published in a miniature album by Watson & Meehan, Northern California and Nevada distributor of Cummins Diesel Engines. Equipment photographed in

"Winning the West with Power" belongs to the following firms: Santa Cruz Lumber Co., Santa Cruz; Walter G. Brix, Inc., Briceland; Crane Mills, Corning; Wooldridge Manufacturing Co., Sunnyvale; Coca Cola Bottling Co., Fresno; Guy F. Atkinson Co., Ben C. Gerwick, Inc., International Engineering Co., Matson Navigation Co. and White Motor Truck Co., all of San Francisco.

308

Safety connecting links

Interstate Drop Forge Co. announces publication of Bulletin 851UW concerning Universal-type Wedglok safety connecting links for chain or wire rope assemblies. The bulletin explains that only two links are needed to serve $\frac{1}{4}$ -in. to $\frac{3}{4}$ -in. chain, and tells of other sizes up to 3 in.

309

Geared drives

Individual bulletins are available from Cone-Drive Gears, Division of Michigan Tool Co., to those in the construction industry interested in geared drives requiring simple and compact, high load capacity, double enveloping gear sets and speed reducers or torque amplifiers. Available bulletins are: #503—A cementing company uses $15\frac{1}{2}$ -in. center distance gears to handle 141 hp. at 150 rpm. #512—How to save space with fan-cooled reducers. #513—Standardized double reduction reducers made up by combining standard single reduction Cone-Drive units. #517—Cost savings through use of fan-cooled reducers, and #522—Electric shovel's crowd capacity doubled by using enveloping gears.

310

A HANDBOOK—

"Colcrete Colloidal Concrete: Its History, Advantages and Applications"

This 22-page bulletin, published by Colcrete Limited, Great Britain, explains Colcrete colloidal concrete theory, discusses applications, and describes versatile mixers that have been developed by the firm especially for producing "Colgrout." Briefly, the Colcrete Process consists of (1) making a grout of cement, sand and water in which the cement has been so completely hydrated by high speed mechanical mixing that the grout attains a colloidal form; (2) when "Colgrout" is poured over pre-placed aggregate of over $1\frac{1}{2}$ -in. size, voids in the aggregate are completely filled by penetration and the whole sets as a dense, solid concrete which is termed "Colcrete." Although the Colcrete Process can be used for any type of concrete work in which aggregate of $1\frac{1}{2}$ in. or over can be used, it is ideally suited to conditions where large aggregate is available and it is immaterial whether the aggregate is

dry or inundated.

In discussing the Colcrete Process, the booklet presents history, characteristics and advantages, mixers which have been developed, specifications for materials, and detailed instructions on how to make Colcrete. Applications of Colcrete are described for mass concrete work, underwater work, roads and floors, and reinforced concrete. Applications for Colgrout at sites of difficult placements, joining-up work, prestressed concrete, etc., are given. The use of Colcrete mixers in making normal concrete is described. Special uses of the firm's "Roller Mixer" are given (mixing lime, vermiculite, plaster, lightweight "Colfoam," etc.). Both engineers and contractors should have a copy of this booklet, which is available by inserting key number on coupon below. Carroll E. Bradberry is agent for the firm in the United States of America.

311

Electrodes and welding alloys

"1952 Directory" of electrodes and welding alloys is now available from Eutectic Welding Alloys Corp. The 16-page booklet is profusely illustrated and contains data and technical information on a series of Eutectic Low Temperature welding alloys for use on cast iron,

steel, alloy steels, copper, brass, bronze, aluminum, magnesium, hard and machinable overlays and for cutting all metals. Two full pages are devoted to a full chart of over 100 of Eutectic's different welding alloys, their uses, bonding temperatures and tensile strengths.

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NON-FERROUS SCRAP IS NEEDED, TOO!

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Get in touch with your local scrap dealer and write for the free booklet, "Top Management: Your Program for Emergency Scrap Recovery" to Advertising Council, 25 W. 45th St., New York 19, N. Y.



WESTERN CONSTRUCTION

Subsurface exploration

Well-illustrated material concerning the seismic method of subsurface exploration is available from Fisher Research Laboratory. The detailed information should be of interest to those concerned with foundation problems. A detailed bibliography is also available.

Literature briefs . . .

PROTECTIVE COATINGS — Gates Engineering Co. offers three bulletins on its Neoprene protective coatings. N-1 bulletin is a general description of all the coatings with a chart of suggested uses for specified applications. N-2 describes Neoprene Liquid Lining N-200-1, and N-3 offers suggestions for cutting maintenance costs with Neoprene N-700 Air Curing.

V FOR V-BELTS — New standardized belt numbers and a list of standard sizes for Manhattan Single Groove V-Belts are described in a new bulletin issued by Raybestos-Manhattan, Inc.

PIPE COVERINGS — Bulletin G-11 pictures, describes and lists specifications for Lasco Pipe Coverings manufactured by Lynch Asbestos Co.

CONCRETE BREAKING — A 4-page, fully-illustrated folder on the Duncan Hydraulic Roc-Jack is now available from K. O. Duncan Co. On-the-job photos show how huge concrete breaking assignments have been completed without any blasting through the use of the Roc-Jack.

BURNING SYSTEMS — Two bulletins are now available from Hopkins Volcanic Specialties, Inc., concerning its oil and gas burning systems. The bulletins are brief and well-illustrated. Bulletin 1001 suggests solutions to drying problems while bulletin 999 points out the facts that Hopkins systems will burn anything combustible.

PLYWOOD PANELS — Smooth concrete work is accomplished by using well-suited form panels, and Douglas Fir Plywood Association is offering a free catalog on the advantages of plywood concrete form panels for many casting operations.

THE BASCULE GATE — A new bulletin has just been published which describes and illustrates the advantages of the Bascule Gate for pond level service and flood and ice control. S. Morgan Smith Co. offers the bulletin which explains sizes and the controlled regulation features of the gate.

SOIL STABILIZATION — Seaman Motors, Inc. offers bulletin 25 which discusses the latest methods in mixing for all types of stabilized construction.

ANOTHER

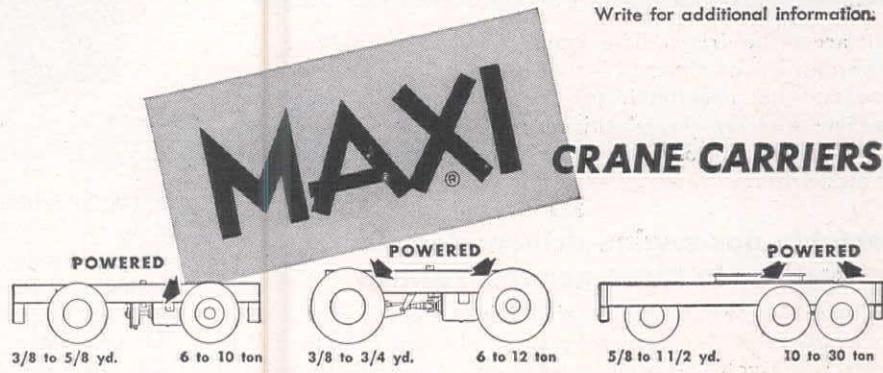
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- operation stability through 360°
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Write for additional information.



ENGINEERED AND MANUFACTURED BY SIX WHEELS, INC. • LOS ANGELES 11, CAL.

NEW EQUIPMENT

More information on any of the items in this section may be obtained by using coupon on page 157.

321

New tungsten carbide bits for drilling now available in all standard sizes

A new line of tungsten carbide bits has been added by Brunner & Lay, Inc. Rok-Bits are designed for use with

drill steels on wagon drills, jackhammers, stoppers and drifters. Due to the tungsten carbide cutting edges of the bit, drilling can be done faster through any type of rock or strata. Since tungsten carbide is one of the hardest materials known, the cutting edges of the bit can drill quickly and remain sharp to a degree far superior to standard steel edge bits. The bits come in all sizes from $1\frac{1}{4}$ in. to 4 in. To meet all

requirements, these bits are offered in the four-point cross type bit and in the two-point chisel type bit. Design features include full body support of the carbide inserts for proper absorption of impact and balanced air hole positioning for uniform high-efficiency air pattern in blowing.

322

Whatever the stakes... this machine will drive them

Driving stakes for snow fences and highway markers is the purpose of the Pneumadriver. It is a 7-ft., air feed with a paving breaker, for mounting on a Pneumatractor. The paving breaker is fitted with a steel shaped to fit the stakes



that are to be driven. The Pneumadriver, mounted on the Schramm Pneumatractor is used for the driving of steel or wooden fence posts in 1/10th the time required by the old hand method. On-the-job this machine with a two-man crew was able to drive 350 stakes per day. Schramm, Inc. is the manufacturer.

323

Portable gas-engine driven electric generators in three general ratings

These new portable gas-engine driven electric generators are available in three general ratings—1,000, 1,250, and 1,350 watts at 115-volts, 60-cycles, A.C. They are suitable for many power requirements of building contractors. These genera-

tors are ruggedly built, and they are equipped with sealed ball bearings for long life. It is said that the belted construction cushions shock to the generator, reduces vibration and increases the generator life. The generator's being mounted alongside the engine locates it out of the path of the hot air from the engine cooling system, thus promoting cooler generator operation. The unit is equipped with a universal mounting base which permits mounting any one of several popular makes of engines. Wincharger Corporation is the manufacturer.

324

Take a look at this 3 1/2-cu. yd. mixer

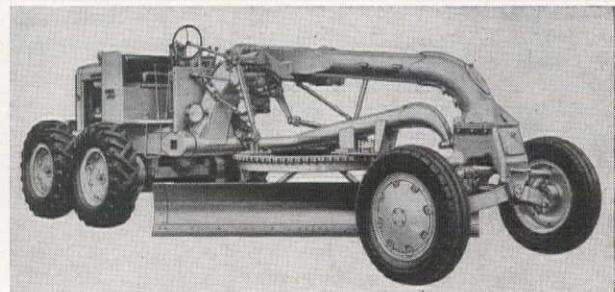


Pictured above is the latest addition to the complete line of Challenge Mixers. This is the 3 1/2-cu. yd. model announced by Cook Bros. Equipment Co. This model is designed and rated to carry 3 1/2 cu. yd. of specification concrete on two-axle trucks.

325

New motor graders offer range in horsepower, weight and speed

Models AD-40 and AD-30 motor graders are announced by the Tractor Division of Allis-Chalmers Manufacturing Co. The 4-cylinder, 2-cycle, diesel powered AD-40 weighs



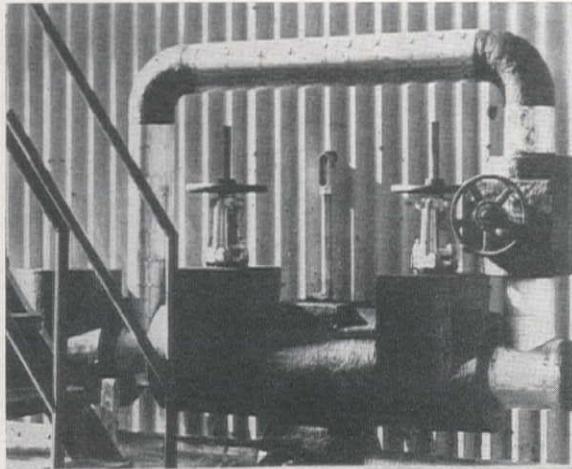
23,000 lb. and develops 104 brake horsepower. The AD-30 is powered by a 3-cylinder, 2-cycle diesel engine, weighs 22,700 lb. and develops 78 brake horsepower. Both graders are designed to easily and quickly handle the toughest grading or maintenance jobs. The General Motors 2-cycle diesel engine can easily handle the heavy-duty power requirements of any job. Tandem drive offers full traction under any ground conditions. Mounted on the outside of the dash, the hydraulic

pump and power take-off are out in the open for easy inspection and maintenance.

326

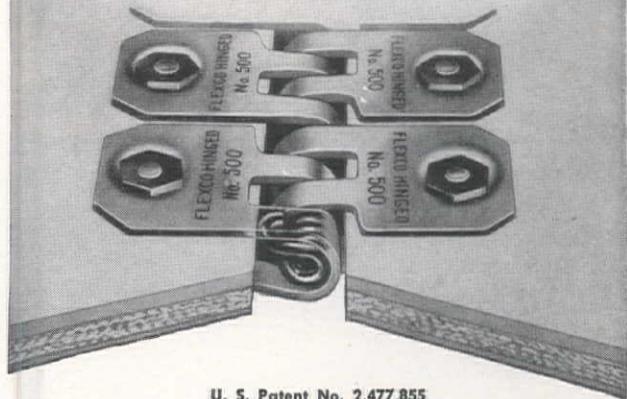
Weatherproof and waterproof cold setting cement now available

Outdoor piping and equipment can be protected from the harmful effects of the corrosion and the elements by Nerva-Plast, a weatherproof and waterproof cold setting cement. The compound may be applied directly to the pipe, or used



as an adhesive coating for heat insulating materials. According to the manufacturer, Rubber & Plastics Compound Co., Inc., Nerva-Plast when dry forms a tough, resilient, unbreakable elastic film. This film always remains continuous and contiguous, impervious to water and moisture vapor penetration. The film retains its flexibility and excellent ad-

... the new separable **FLEXCO HINGED BELT FASTENERS**

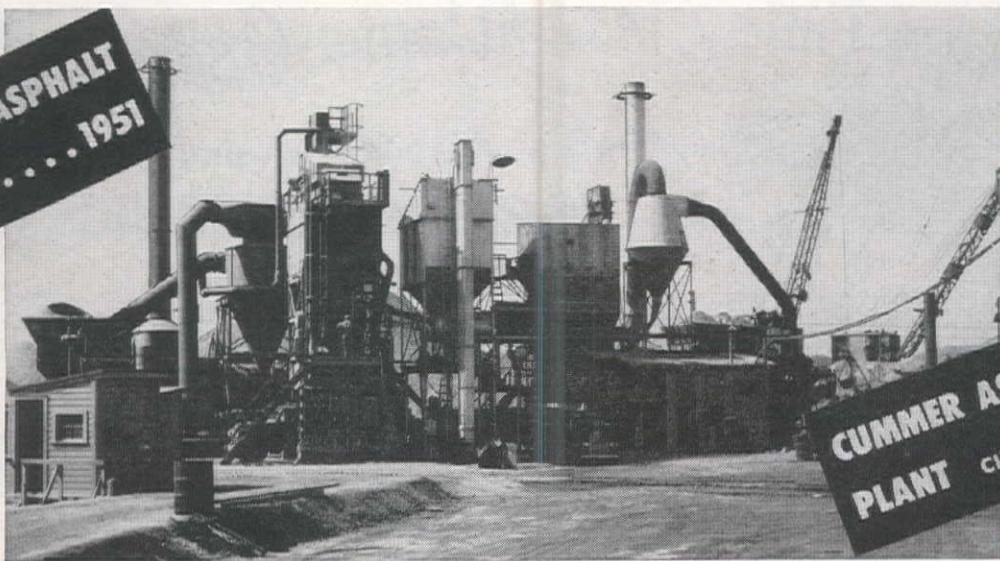


U. S. Patent No. 2,477,855

- ✓ For joining grader, trencher, ditcher and other earth moving conveyor belts.
- ✓ For belts $\frac{3}{8}$ " to $\frac{1}{2}$ " thick.
- ✓ A FLEXCO fastener that is HINGED. Has removable hinge pin.
- ✓ Troughs naturally, operates through take-up pulleys.
- ✓ Strong, durable . . . pull or tension is distributed uniformly across joint.

Order From Your Supply House. Ask for Bulletin HF 500.

FLEXIBLE STEEL LACING CO
4704 Lexington St., Chicago 44, Ill.



"Twin plants . . . We call them Grandpa and Son . . ."

In such words does Harold Thompson of Cooke Contracting Co. describe their efficient, profit making twin plant set-up at Centerline, Michigan. Daily, these two Cummer Plants turn out peak production that more than meets the rigid state specifications. The new plant has a capacity of 1,000 tons a day.

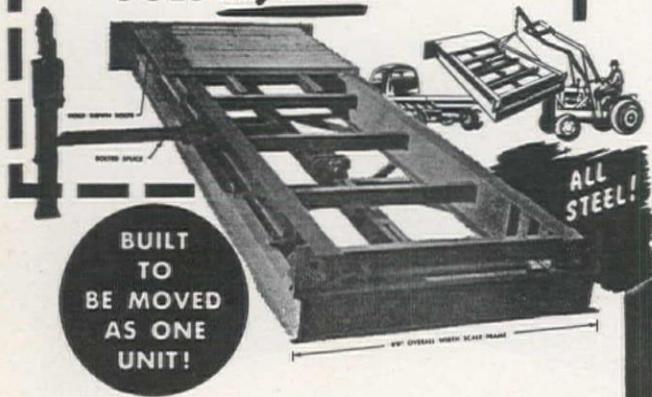
The 40 year old Cummer Plant has a 500 tons per day capacity . . . one ton mixer . . . belt and sprocket driven . . . vibrating screen has been added. Notice common dust bin. This is positive proof that Cummer Asphalt Plants give you continuous, high, efficient production. Write for catalog.

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MOVE IT HERE! MOVE IT THERE!...the

MURPHY Portable CONTRACTOR'S SCALE GOES Anywhere!



This rugged, all-steel, heavy duty scale is a proven time saver and money saver for contractors, road builders, and material handlers! Scale can be hauled completely assembled by simply removing tip end of transverse lever at bolted splice and tightening hold down bolts (see photo). No dismantling or reassembling! No wasted motion in moving from job to job!

Capacity Platform
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hesive and cohesive properties under a wide range of temperature and climatic changes.

327

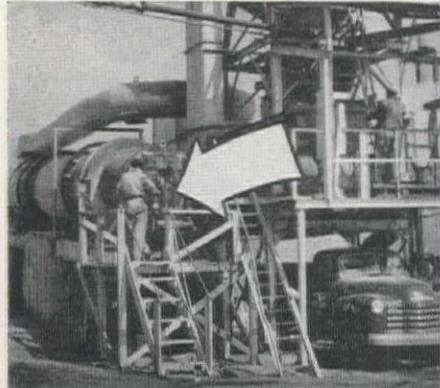
Truck mixer designed to suit varying conditions on the job

Ready-mix concrete suppliers, faced with varying local conditions, load limitations, payload requirements, etc., will be interested in the Model HMD "Mix Plus" truck mixer or agitator, in 3, 4½ and 6½-yd. sizes. This model of The Jaeger Machine Co. features fast-charging and discharging drum

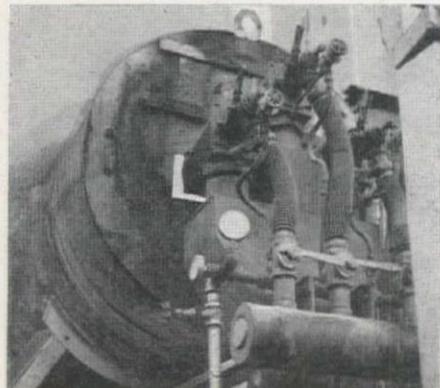


with "dual-mix" action, to which any additional equipment may be added to meet each operator's particular service requirements. Drum, frame, front trunnion and drum roller assemblies, in all models, are designed to handle the maximum volume of material which operators may wish to carry. All models also are equipped with mudguards and catwalks and the 3-piece "Swing-Away" chute which meets all discharge conditions.

At Sam Finley, Inc., Atlanta, Georgia



Finley Plant No. 1 has a Hopkins Combination Oil-Gas Dryer Unit



"We have 10 Plants using
**HOPKINS VOLCANIC
DRYER UNITS**"

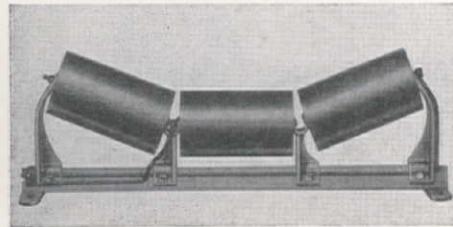
● Looking for a low-cost burning system for your asphalt plant? Let Sam Finley, Inc. tell you about their experience with Hopkins equipment: "We have ten plants using Hopkins equipment, and in every case, the units have proven very satisfactory to us. We find they have increased production and lowered fuel consumption. Our first Hopkins unit was installed several years ago, and we have been installing them as fast as possible since that time. All of the Hopkins Volcanic units have given us excellent service."

Why don't you take advantage of Hopkins' efficient operation, as has the above contractor? A letter or phone call will bring you descriptive literature, complete details, and follow-up by a Hopkins representative.

HOPKINS VOLCANIC SPECIALTIES, INC.
ALLIANCE, OHIO

Belt conveyor idlers get greasing design improvement

Chain Belt Co. announces a change in the greasing design of its belt conveyor idlers. Rigid steel grease piping has been replaced by reinforced flexible automo-



tive type grease tubing, which will take higher gun pressures, and will not be broken off in shipment. In addition to the flexible sections, which are made in lengths which allow them to hug the inside of the inverted angle or channel base, there is also a new more convenient location of the grease fittings. Safe servicing can be performed at any time.

329

Spraying problems solved with improved machine

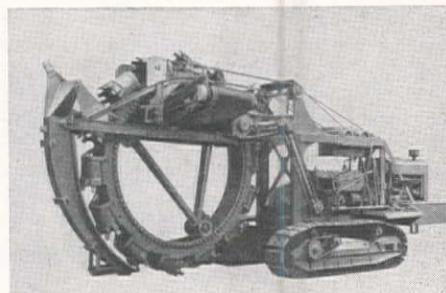
The heavy-duty Paintmaster, a product of The Gray Company, Inc., features an air-operated pump for easily handling in volume the new-type coatings, extremely heavy paints and many other fluids. These new air-operated, double action, reciprocating pumps are specifically designed to have greater volume

and pressure for supplying long-line circulating systems and multiple spray guns. Plants with spray outlets on floors above the supply room, for instance, are finding that the added power of the new Paintmaster eliminates former handling problems. Aeration in the paint is cut to a minimum since the circulating system delivers paint directly to the spray head and back through the supply lines, meaning no air pressure is exerted on the paint itself. Paint is kept thoroughly mixed at all times.

330

Two new Trenchliner models are now in production

After extensive field tests, these two crawler-mounted, wheel-type machines are now in full scale production at Parson Company. Model 202 is designed pri-



marily for drainage and utility trenching and Model 215 is a special pipeline Trenchliner. With a choice of either 52 hp. gasoline or 55 hp. diesel engine, the Model 202 is equipped to dig in 30 separ-

ate feeds from 6.2 in. to 18.5 ft. per minute; and in 9 widths from 13 to 31 in. wide and up to 6 ft. deep. Model 215 is designed for "mile-a-day" production on cross-country pipeline installations: 6 digging wheel speeds up to 11.2 rpm., standard-make tractor type crawlers with lug-type shoes, 18-in. treads, and choice of two standard-make 55 hp. diesel engines.

331

Arc gouging and cutting torch offers economy and speed

Designed to remove defects in castings or forgings, clean the root of welds and remove welds, this new Arcair torch



operates on an ordinary D.C. welding machine and a compressed air line. The torch is much faster than chipping and less expensive to operate than any equipment using oxygen. Though not much larger than an arc-welding electrode holder, it contains an air control valve and rotating nozzle which permits changing the electrode angle to suit the job, but maintains the air jet in perfect alignment. The device requires no gas cylinders or regulators. It can be used anywhere it is possible to weld and operates in spaces too restricted to ac-

MAKE YOUR OLD PIPE LINE LIKE NEW... WITHOUT APPRECIABLY DISTURBING SERVICE!

INCREASE CAPACITY... CUT COSTS

You can get new pipe line performance from old cast iron or steel pipe line economically and easily.

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Patented equipment used by Pipe Linings, Inc. removes all tuberculation and incrustation from the interior of old pipe lines... applies a new continuous, smooth-surface cement mortar lining... with only momentary interruption to install by-pass lines.

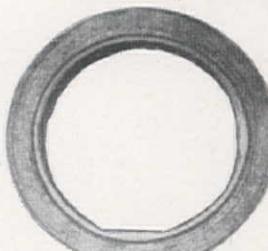
So... why not get new line performance from your old pipe line at much less than the cost of new pipe? Write for full information TODAY!

Cement Mortar Lining of Old Pipe Offers These ADVANTAGES...

- Protects against discoloration and contamination
- Protects against corrosion
- Improves flow coefficients
- Prevents leakage
- Reduces maintenance costs
- Reduces pumping costs



Typical pipe line before
Pipe Linings treatment



Old line after reconditioning
by Pipe Linings, Inc.

STATE PROCESS USED on Line 4" to 16"

CENTRILINE PROCESS Used on Line 16" to 144"

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PIPE LININGS, Inc.

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(In the East—CENTRILINE CORP.,
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PIPE LININGS, INC.
4675 Firestone Blvd., South Gate, Calif.
Please send complete information on how we can obtain new
pipe line performance from our old line.

Name _____ Title _____

Company _____

Address _____

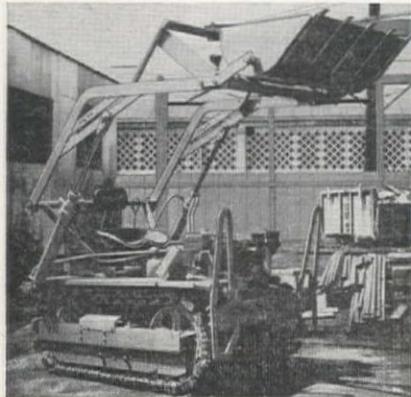
City _____ Zone _____ State _____

commodate a chipping hammer or oxy-acetylene gouging torch. No special parts are required for use on different materials. The resulting surface is clean and smooth and welding or brazing can be done without further grinding or cleaning. Arcair Company is the manufacturer.

332

Hydraulic lift bucket for midget-sized tractor

The Agricat, a midget-sized (6 ft. long) tractor, which performs well in restricted areas where use of a larger tractor is prohibitive, is now equipped



with a 5-cu. ft. capacity high lift bucket. It is powered by a Vickers 1,000-psi. pump, feeding into two rams whose pushing capacity is 491 lb. per 100-lb. pump pressure, and a pulling capacity of

368 lb. The high lift bucket lifts to a height of 68 in. from the ground level and can be lowered 4 in. below track level. Agricat's new long track adds 8 in. to the previous 36-in. track length, and gives the machine stability in handling the high lift bucket. The new long track is available in either standard steel tracks or on rubber tracks. Earl H. Pence & Co., Inc., is marketing the bucket for the Agricat, produced by Joose Manufacturing Co.

333

Steam cleaning unit will serve construction field

The Power Master Unit has two high pressure steam guns, each of which delivers 150 gal. per hour. The compact unit incorporates a high-pressure water gun supplying hot or cold water at a pressure of 500 lb. psi. One thousand gallons per hour are delivered by the power blast feature of the unit. In addition to blasting away accumulations of mud, heavy grease, etc., the unit has also been successfully used as a de-icer. This Kelite Products, Inc. unit offers simplicity of operation and ease of maintenance.

334 Bending tool for use in six different directions

The new Tal 6-Way Hickey has six no-slip bending jaws, which make it an ideal tool for making bends, elbows, sets, offsets, loops, saddles and stubs on open or slab work and in close quarters. New

feature of the tool is the stub hole, devised for bending or straightening conduit protruding from concrete floors or walls. The long safety neck extends into the pipe handle, making this tool danger proof against accidents caused by pipe handle breakage. Additional safety is assured by the sure grip jaws. This is a Tal Bender, Inc., product.

335

Tractor-mounted digger with hydraulic-actuated rake

Mounted on a Sheppard Diesel SD-3 and featuring hydraulically-operated power take-off, this digger has a 180-deg.

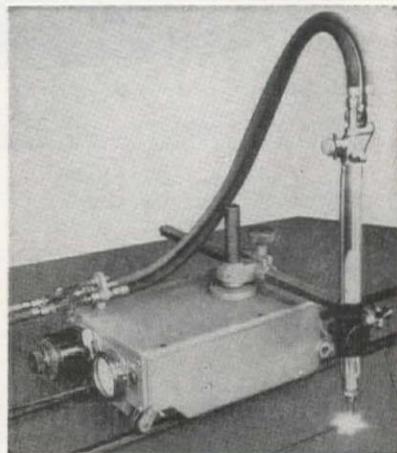


swing, 16-ft. reach and 19-ft. boom-extended height. The digging depth is 9 ft., and the operating pressure is 1,000 psi. The Hopto Digger has a lifting capacity of 2,000 lb., and larger capacities with stabilizers. The completely hydraulic unit has a Vickers and Blackhawk hydraulic system and is manufactured by Badger Machine Co.

336

Portable gas cutting machine offers help in the field

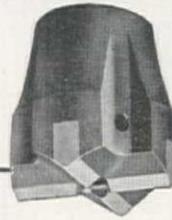
This is the first machine of its type specifically designed to be used as a travelling carriage for mounting such equipment as the Aircomatic Machine



• Use Brunner & Lay Rok-Bits to give you the most for your money from man and machine. Brunner & Lay Rok-Bits give full support of the carbide to absorb impact on every stroke. Channel design affords maximum clearance. To save money and time, ask your dealer for Brunner & Lay Rok-Bits ... or write to us.

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the reliable, leading source of supply since 1882

and Heliweld Machine Holder in addition to fulfilling the requirements of a portable, motor-driven, straight track-guided cutting machine. The transmission on this No. 20 Radiograph is a self-contained unit. All controls are conveniently located for easy operation. Any speed within the operating range (2-60

in. per min.) can be quickly and accurately set and maintained. Air Reduction Pacific Co. is the manufacturer.

337

Saw line offers quality at popular price

Building contractors should be interested in this new line of saw blades. The new line is made of Simonds Electric Furnace Steel and will cut fast, smooth and straight. Simonds Si-Clone saws are furnished up to 12 in. in diameter only, and come with round or special shape center holes for use on table, radial arm or electric hand saw machines. Simonds Saw and Steel Co. is the manufacturer.

338

Washing plant with catwalk for complete access

This improved washing plant, called the Wash-More, has a catwalk for complete access to all parts of the machine for easier and more productive operations. Mesh type screen guards to supplement the previous solid heavier type and

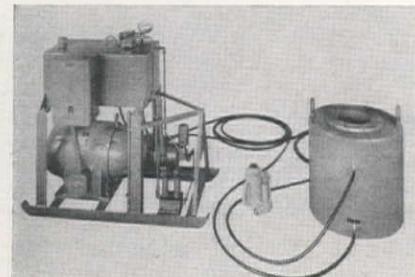


additional strength has been given throughout the plant for even more rugged wear. These improvements have been added without out-of-line price increase. The capacity of this plant runs as high as 80 cu. yd. per hour and it is completely portable for mobile operations. Lippmann Engineering Works is the manufacturer.

339

600-ton capacity for hydraulic jack

This new Simplex "Jenny" center-hole puller of 600 tons capacity made by Templeton, Kenly & Co., is operated



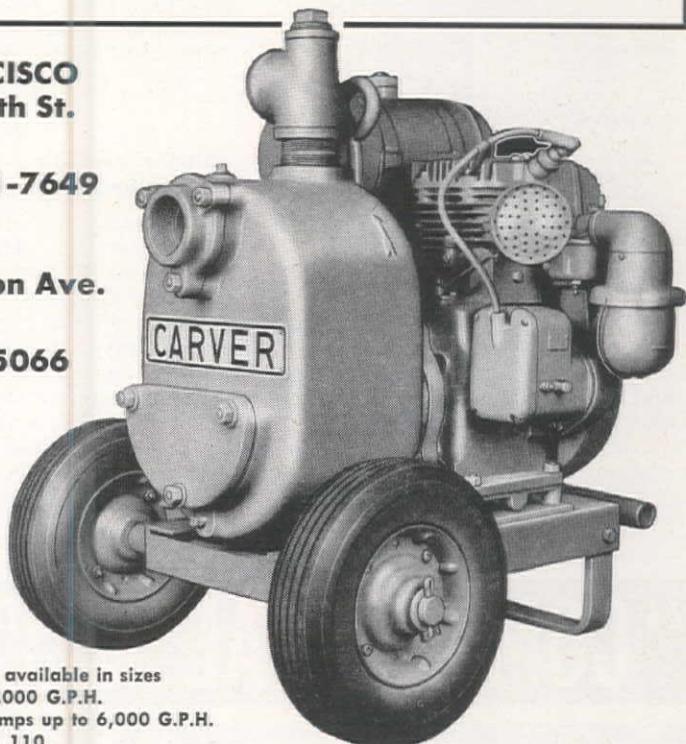
by a 10-hp. motor. It is double-acting for use in large electrical plants. The weight of the ram is 1,750 lb. Two hand pumps are incorporated, and after desired tonnage is run up with motor, extra tonnage can be added gradually with hand pumps. The outside diameter is 22 in., height 21 in., and a 6 1/2-in. travel is

RIDLEY COMPANY SAN FRANCISCO & SAN JOSE Now Offers You CARVER PUMPS

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Carver Self-Priming available in sizes from 4,000 to 240,000 G.P.H.
Also Diaphragm Pumps up to 6,000 G.P.H.
Ask for Bulletin No. 110.

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Now they can offer you construction pumps with reserve power and stamina for outstanding dependable performance throughout long life on all kinds

of construction work.

Put these Carver Pumps on any job you have. You'll be amazed at their lightning fast automatic prime, high suction lift, capacity to handle more water, faster, farther, easier.

RIDLEY COMPANY staff is trained to give you sound advice on pumping problems and is well qualified to help you select the right Carver Pumps for your requirements. Call or write them today at San Francisco or San Jose.

CARVER PUMPS

*Muscatine
Iowa*

provided in 7 3/4-in. center hole. The "Jenny" center-hole principle eliminates torque. The jack pushes or pulls in a straight line, vertically or horizontally.

340

Gasoline driven arc welder is now available

To centrally locate all controls for easier adjustment of the welding heat, this new gasoline driven arc welder has the control panel mounted on the generator end of the unit. The panel contains



generator controls, meters, welding and ground cable terminals, polarity switch, ignition switch, starter button, etc. The generator is of the symmetrical, 4-pole Multi-Range design. It has 4 laminated main poles and 4 interpoles which are

removable. Patented single unit brush rigging holds the generator and excitor brushes in a fixed neutral position. Control of the 1,000 combinations of welding current and open circuit voltage is accomplished by the large wheel and Volt-Amp Adjuster (field rheostat) within the large wheel. Prompt building up of voltage, and freedom from accidental polarity reversal are assured by a special oversize, inbuilt, 4-pole excitor. The generator is powered by a Chrysler Industrial Engine and includes a standard battery type ignition, charger and starting motor. The entire unit is enclosed in a weather proof steel canopy with piano hinged side panels that can be padlocked in place if desired. This new gasoline engine driven arc welder is available stationary or mounted on a pneumatic tired four-wheel trailer. Hobart Bros. Co. is the manufacturer.

341

Jointer available with narrower throat opening

This new '52 Model 6-in. jointer, manufactured by Heston & Anderson Division of St. Paul Foundry & Manufacturing Co., has a narrower throat opening, a fence that may be set at an angle across the cutter head for shearing cutting and for joining short stock safely. The guard turns under the table when rabbeting wide stock and is immediately returned; no adjustments necessary. The table is 60 in. over all and the rabbets 5/8 in., providing depth

cutting often needed. Direct drive models are now available.

342

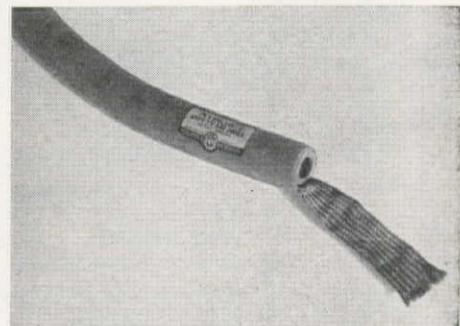
Interior and exterior wall coatings available

Cor-O-Last (exterior) and Con-Creto (interior) are one-application coatings that are stain, scratch, water and fire-resistant. Both equal in thickness in one coat, to three coats of ordinary paint. The exterior coating is weather resistant and can be applied over stucco, cement, cinder block, brick, etc. The interior coating may be applied over wood in addition to the above mentioned surfaces. Con-Creto eliminates the finish coat on plaster walls—it gives the same effect as sand finish in one coat. Neither coating will be recommended for self-application. Only specific applicators, in their own districts, will be authorized to apply the coatings, manufactured by The Con-Cor Paint Co.

343

Safety air hose passes tests and is now ready for field use

Accidents and possible fatalities resulting from contact with hidden power lines are prevented with the use of this new safety air hose by Mercer Rubber Corp. The hose was recently used in the field by a contractor working in con-



"COMMERCIAL" STEEL TUNNEL SUPPORTS



To build for permanency use COMMERCIAL STEEL SUPPORTS

For permanent stability in any kind of ground, you'll find COMMERCIAL Tunnel Supports are stronger and last longer . . . Your future tunnel projects will benefit materially—both in lower cost and faster schedules with COMMERCIAL supports . . . These easy to install supports are available in every size and radii for every job . . . Details upon request.

THE COMMERCIAL SHEARING AND STAMPING CO.
YOUNGSTOWN 1, OHIO

junction with a public utilities company. At a deliberate short circuit with an electric timer set for one second, with a current reading of 2,250 amps and a voltage reading of 480 volts, the hose became warm but not sufficiently warm to be uncomfortable; yet it tripped the circuit breaker within one second. The hose has specially engineered braided copper ribbon of 832 strands, which forms a high current-carrying medium which is securely bonded in the actual carcass of the oil proof, abrasion and heat resisting hose. The hose is available in 1/2-in. I.D. sizes, in 4- and 5-ply construction.

344

54 x 24-in. triple roll crusher added to line

This new crusher is big brother to the 40 x 22-in. and 30 x 18-in. triple roll crushers which have been available for some time. The new crusher has been designed for reduction crushing behind a 3042, or larger, jaw crusher, and is available for stationary or portable installations. Because of its high stage of reduction (two stages in one crusher) the 54 x 24-in. triple roll permits greater opening of the jaw crusher setting,

thereby increasing plant output. Stage of reduction varies from $6\frac{1}{2}$ in. to 2 in. when producing minimum sizes of products from 4 in. to $\frac{1}{4}$ in. minus, respectively. This means that when producing 4-in. minus product, pieces up to 9 x 9 in. can be fed. When producing $\frac{1}{4}$ -in. minus material, pieces up to $2\frac{1}{4}$ x $2\frac{1}{4}$ in. can be fed. Nominal production will vary from approximately 35 tons an hour of $\frac{1}{4}$ -in. minus to 500 tons an hour of 4-in. minus, based on material weighing 2,700 lb. per cu. yd. The manufacturer is Pioneer Engineering Works.

345

Single loop metal detector for near-surface exploration

This is a specially designed instrument, by Fisher Research Laboratory, Inc., for locating small near surface



metal objects and, in addition to that use, it may be used to locate lost or buried tools, keys, property markers, etc. Metal objects such as these may be located beneath soil, rock, asphalt, cement, wood, brick, snow, ice and fresh or salt water. Located metal objects are readily identified by a distinctive earphone tone as well as an indication on a visual meter. Its lightweight construction, weighs approximately 7 lb., simplicity in operation and durability under extended usage have been stressed in the design and production of this instrument.

346

Spring-action load binders give constant, uniform tension

With the addition of the compensating action of a sturdy spring to these new load binders, they will maintain a constant, uniform tension, eliminating breakage of chain and hooks to a marked degree. This development can lead to safer binding of loads for all types of commerce and industry. The "take-up" continuous action feature in the handle is an additional safety factor. Canton Cast Products Co. is the manufacturer.

347

2-cycle diesel engine makes appearance

Lever Motors Corp. announces the availability of its new 2-cycle diesel engine which features highest scavenging efficiency, longest power stroke, lowest peak pressures, no exhaust valve, etc. Power, reliability and economy are claimed for this piston engine.

Cut Costs!
with **ONAN** portable
ELECTRIC PLANTS

*Take 'em
Anywhere!*

MODEL 3CK
3,000 watts A.C.
5,000 watts D.C.
with carrying frame or dolly-mounted

Increase your profits by using fast-working, cost-cutting electric tools on every job, even where highline power is not available. Lightweight, sturdy, Onan engine-driven electric plants supply instantly-available power *anywhere* for lights, drills, saws, pipe-

threaders, planers, spades, tampers, repair-shop tools and other motor-driven equipment. Carry 'em, wheel 'em, or truck 'em right to the spot and plug in for all the power you need. Equipped with carrying handles or dolly-mounted.

Lightweight Air-Cooled Models: A.C.—400 to 3,000 watts. D.C.—750 to 5,000 watts. Heavy-duty models to 35,000 watts.

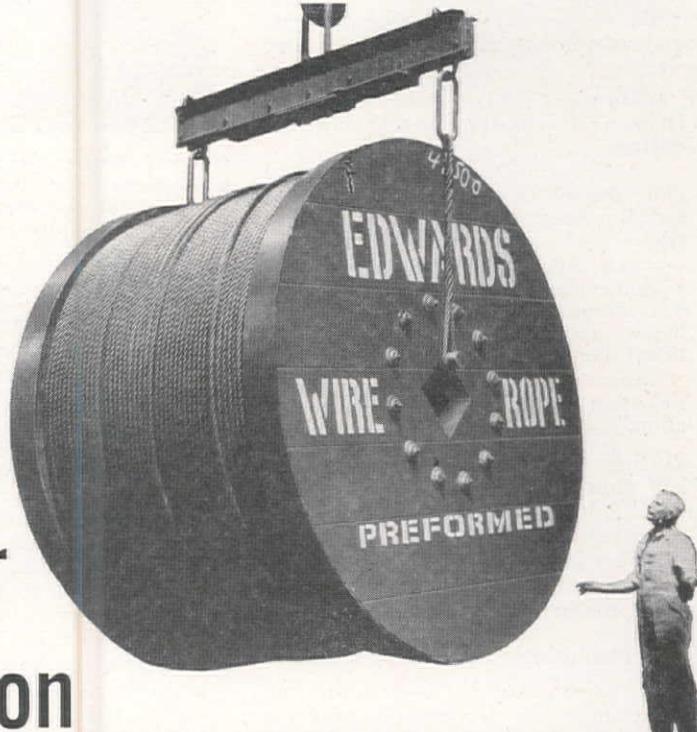
Authorized Distributors:

(Oregon)
NELSON EQUIPMENT CO.
521 S. E. McLoughlin Blvd.
Portland 2, Oregon

(California & Nevada)
ETS-HOKIN & GALVAN
551 Mission St.
San Francisco, Calif.
218 No. Avalon Blvd.
Wilmington, Calif.

(Washington & Alaska)
FREMONT ELECTRIC CO.
744 N. 34th St.
Seattle, Washington

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can
bet
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life on



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Chicago hosts 2,600 AED members in annual meet

Full business schedule includes talks by ranking government and industry experts — Mutual problems discussed by members before the Association's largest gathering — Hush of New York succeeds Arnold as president.

VIRTUALLY THE ENTIRE construction equipment industry converged on Chicago the last week in January for the 33rd Annual Meeting of Associated Equipment Distributors, held January 27-31 at the Conrad Hilton Hotel. Total attendance was 2,600 (last year it was 2,000).

The business program of the convention, probably the fullest ever scheduled for an AED meeting, drew top authorities from both government and industry. Topics covered in the four business sessions ranged from strictly association activities, to distributor business problems, national affairs, and the business outlook for the coming year.

Outgoing AED President R. L. Arnold, Arnold Machinery Co., Salt Lake City, Utah, opened the first business session on Monday, January 28, with brief report on AED progress under his leadership. In preparing to turn the mantle of responsibility over to future officers, Arnold suggested four major projects for development in the future. They were:

—to make AED the most important factor in the construction machinery industry.

—to make the association's executive office the source of industry information for all members and for all other industries.

—to greater publicize the construction equipment industry, especially the methods of equipment distribution, and the importance of the distributor to the national economy.

—to strive for greater membership participation in the affairs of the association."

During the first business session, AED went on record as recommending that CPR 105, enacted late last year without consultation with the construction machinery industry, be revised to more nearly coincide with the standard practices in the industry.

Three resolutions

AED also passed three additional resolutions at the meeting. The first was directed at both manufacturers and NPA, asking for balanced production of spare parts and new machinery. The second resolution was in opposition to public construction by force account and recommended that the contract method be employed on all construction by the Federal government and all governmental bodies. In the third resolution, AED asked that the Congress of the United

States practice every possible economy in its domestic and foreign expenditures and eliminate all unnecessary programs.

The second business session of the meeting, held on the afternoon of Monday, January 28, dealt with distributor business problems. The three principal speakers of the afternoon were Mrs. Marjorie Creim, Western equipment distributor; E. F. Longinotti, a banker, and J. D. Corrigan, a management consultant.

Mrs. Creim, secretary and treasurer of the Bow Lake Equipment Co., Inc., Seattle, Wash., was the afternoon's first speaker. Her address, entitled, "The Customer—Our Capital Asset," pointed



Harry J. Hush, vice president of Griffin Equipment Corp., New York, is the 1952 president of the organization. Hush was formerly executive vice president of the AED.

up the fine points of customer relations that are easily overlooked by the distributor, but which often spell the difference between success and failure.

The advantages of local bank equipment financing was the basis of Longinotti's address. Longinotti, who is vice president of the Union Planters National Bank and Trust Co., Memphis, Tennessee, pointed out some of the major pitfalls in financing and suggested some of the areas where local bankers could most effectively work to relieve the distributor of the worries of carrying customer credit.

Corrigan, the final speaker of the afternoon, turned to basic economics in his discussion of the "Sales Executives Hottest Problem." Using break-even curves and sales-profit ratio charts to demonstrate his talk, Corrigan outlined basic economic factors with which sales management should be familiar. Pointing to the results of several recent surveys which show that the sales executive is not holding his own when it comes to promotions to top management levels, Corrigan expressed his belief that sales

REPRESENTING Western Construction at the A.E.D. National Convention were Arthur J. Urbain, News Editor; R. C. Burns, District Manager, Cleveland Office; Richard Murphy, District Manager, New York Office; Arthur C. Petersen, District Manager at the Chicago Office, and Franklin Lyons, Sales Manager, San Francisco.

Reelected for another term as Director of Region XI is Beal Shaw, president and treasurer of Shaw Sales and Service Co., Los Angeles.



Frank Skidmore will combine the duties of vice president of the organization with those of Director of Region XIV. He is secretary-treasurer and general manager of Contractors' Equipment & Supply Co., Albuquerque.



J. G. C. Morgan, Vancouver Equipment Corp., Vancouver, B.C., is a vice president of the AED for 1952.



management is badly in need of better funding in basic business economics.

The third business session of the five-day convention opened with election of 1952 officers.

Third business session

This third business session, held Wednesday morning, January 30, filled the north ballroom of the Conrad Hilton to overflowing as distributor and manufacturer members of AED crammed into the smoked-filled room to voice their objections to government activities during the past year. Two OPS representatives—A. E. Loder and Leo Wasser—and two NPA men—M. B. Garber and C. J. Haring—spent nearly two hours that morning explaining the actions of their respective agencies in answers to questions directed at them from AED National Affairs Committee and from the floor.

CPR 105 got the main going-over as distributors tried to find, first of all, why it was issued, and secondly, how they

Westerners who attended the AED convention

Arizona

Arizona Equipment Sales, Inc., Phoenix—Joe E. Angle and Harold M. Olson.
Neil B. McGinnis Co., Phoenix—Neil B. McGinnis.
O. S. Stapley Co., Phoenix—L. Erwin Stapley and H. E. Walters.
State Tractor & Equipment Co., Phoenix—J. R. Robinson.
Western Machinery Co., Phoenix—R. B. George.

California

Allied Equipment Co., Fresno—M. C. Orendorff.
Bay Cities Equipment, Inc., Oakland—A. H. Mason, Jr.
Brown-Bevis Equipment Co., Los Angeles—John A. Benyon, Noble W. Nelson and Charles M. Weinberg.
Buran Equipment Co., Oakland—Irving R. Kraemer.
Casey-Metcalf Machinery Co., Inc., Los Angeles—T. D. Casey and Edward Metcalf.
Coast Equipment Co., San Francisco—P. R. Egli and W. M. Nosman.
Contractors Machinery Co., San Francisco—J. W. Beatty.
Crook Company, Los Angeles—C. D. Chase.
Electric Tool & Supply Co., Los Angeles—A. R. Williams.
Garlinghouse Brothers, Los Angeles—A. F. Garlinghouse.
Harron, Rickard & McCone Co., Los Angeles—James W. Savage and Alex B. Todd.
Industrial Equipment Co., Los Angeles—Victor Bailey and C. E. Skidmore.
Industrial Equipment Co., Oakland—John E. Quartarolo.
Jenison Machinery Co., San Francisco—E. S. Jenison.
Lee & Thatro Equipment Co., Los Angeles—L. B. Millar.
LeRoi-Rix Machinery Co., Los Angeles—W. Z. Bancroft and R. F. Deane.
The Merrill-Brose Co., Oakland—George Brose.
Moore Equipment Co., Stockton—Stanley S. Moore.
George M. Philpott Co., San Francisco—George M. Philpott.
Sacramento Valley Tractor Co., Sacramento—W. H. Pahl.
San Joaquin Tractor Co., Bakersfield—Sam Tobias.
Shaw Sales & Service Co., Los Angeles—H. I. Hickman, Beal Shaw and William B. Shaw.
Smith Booth Usher Co., Los Angeles—Carl E. Baker and Alex Kostyzak.
Western Machinery Co., San Francisco—L. M. Jones, L. T. McGuire, H. J. Mayer and H. A. Myers.
Western Traction Co., San Francisco—John Jorgensen.
Wicker-Wood Equipment Co., North Hollywood—Robert L. Eicker.

Colorado

Colorado Builders' Supply Co., Denver—C. E. Berry and C. B. Hansen.
Constructors Equipment Co., Denver—D. G. Gibson and T. M. Sanders.
Ray Corson Machinery Co., Denver—J. J. Booth and R. E. Corson.
Gunderson-Taylor Machinery Co., Denver—G. W. Gunderson and Edward F. Taylor.
King & East Machinery Corp., Denver—K. J. King.
Liberty Trucks & Parts Co., Denver—R. F. Carlson and W. W. Carlson.
McCoy Company, Denver—Jack Fincham.
McKelvy Machinery Co., Denver—J. R. McKelvy and Rex D. McKelvy.
H. W. Moore Equipment Co., Denver—Walter Babcock and J. C. Moore.
S. & M. Supply Co., Grand Junction—D. G. Son.

Idaho

Engineering Sales Service, Inc., Boise—H. W. Hurd.
Intermountain Equipment Co., Boise—E. A. Collins, Philip A. Dufford and R. W. Stevens.
Olson Manufacturing Co., Boise—H. J. Agee and D. L. Watson.
The Sawtooth Company, Boise—Peter H. Cohn.
Southern Idaho Equipment Co., Idaho Falls—M. G. Gooch.
Western Equipment Co., Idaho Falls—O. E. Miller.

Montana

Caird Engineering Works, Helena—Howard Bogie.
Hall-Perry Machinery Co., Butte—L. E. Jones and Ben L. Smith.

Industrial Equipment Co., Billings—W. C. Hardie.
Montana Powder & Equipment Co., Helena—W. T. McCullough.
Mountain Tractor Co., Missoula—J. E. Manning.
NorMont Equipment Co., Great Falls—J. B. Beatty.
Seitz Machinery Co., Inc., Billings—Melvin Seitz.
Treasure State Equipment Co., Kalispell—H. R. Heaton.
Western Construction Equipment Co., Billings—Harold M. Doolen and Lloyd J. Klinger.

New Mexico

J. D. Coggins Co., Albuquerque—Harold R. Bone and J. D. Coggins.
Contractors' Equipment & Supply Co., Albuquerque—R. A. Otterness and Frank Skidmore.
Harry Cornelius Co., Albuquerque—Homer J. Anderson and W. H. Cornelius.
Lively Equipment Co., Albuquerque—W. E. Lively, Jr.
N. C. Ribble Co., Albuquerque—N. C. Ribble.

Oregon

Cal-Ore Machinery Co., Inc., Medford—John M. Garner.
Clyde Equipment Co., Portland—Oscar B. Bjorge and W. H. Booth.
Columbia Equipment Co., Portland—F. B. McBath.
Contractors Equipment Corp., Portland—Oliver O. Jessup.
Cramer Machinery Co., Portland—C. P. Cramer.
P. L. Crooks & Co., Inc., Portland—P. L. Crooks, Jr.
Feenaughty Machinery Co., Portland—D. J. Feenaughty and M. B. Mack.
Loggers & Contractors Machinery Co., Portland—A. F. Sersanous.
Western Equipment Co., Eugene—A. E. Vanstrom.
Wood Tractor Co., Portland—Roy E. Wood.

Utah

Arnold Machinery Co., Salt Lake City—R. G. Arnold, R. L. Arnold and J. W. Plant.
Cate Equipment Co., Salt Lake City—David E. Hughes.
Foulger Equipment Co., Salt Lake City—W. D. Archer, Bert L. Foulger and Jack T. Holland.
Heiner Equipment & Supply Co., Salt Lake City—William Dameron and K. P. Heiner.
C. H. Jones Equipment Co., Salt Lake City—Russell S. Stewart.
Kimball Equipment Co., Salt Lake City—John F. Kimball.
The Lang Co., Inc., Salt Lake City—John Lang, William A. Lang, Richard H. Rampton and Frank Scheffner.
Lund Machinery Co., Salt Lake City—Joseph N. McRae.
H. H. Nielsen Co., Salt Lake City—Hubert H. Nielsen.
Wheeler-Kershaw Co., Salt Lake City—Walter W. Kershaw and J. K. Wheeler.

Washington

American Machine Co., Spokane—F. H. Etter.
Blackwell-Coleman Equipment Co., Spokane—R. E. Blackwell.
Bow Lake Equipment Co., Inc., Seattle—Conrad Creim.
Construction Equipment Co., Spokane—Harry H. Ferris, Harlan Lemmer and F. G. Peterson, Jr.
A. H. Cox & Co., Seattle—John A. Widrig.
General Machinery Co., Spokane—E. J. Simons, Jr.
Jameson Engineering Sales, Inc., Seattle—Clifford T. McBride.
Modern Machinery Co., Inc., Spokane—C. H. Davis, E. C. Stephenson and G. A. Wynkoop.
Pacific Hoist & Derrick Co., Seattle—Elmer R. Schoen.
Jack Sahlberg Equipment Co., Seattle—A. J. Sahlberg.
Star Machinery Co., Seattle—J. T. Hatten, Bert McNae and F. J. Schurr.
Universal Equipment Co., Seattle—J. A. Dougan.
Western Equipment Co., Spokane—K. E. Ahern and J. H. Patterson.
Yukon Equipment, Inc., Seattle—N. A. Ruthruff and S. B. Tatom.

Wyoming

Studer Tractor & Equipment Co., Casper—R. A. Studer.
Wilson Equipment & Supply Co., Cheyenne—Glen Moss and J. R. Wilson.

could work under it. Principal objections to the regulation were brought against the ninety-day clause, which is contrary to industry practice, the method of figuring base price, the guarantee provisions of the regulation, lack of consideration of freight charges in figuring base prices.

Both Loder and Wasser expressed the belief that CPR 105 would be amended to more nearly conform with industry practices, neither were willing to guess how long it would be before any amendments became effective. Neither could promise immediate relief from the inequities of the regulation.

On the NPA side of the discussion, most of the questions revolved around priorities. Garber, who was making his last public appearance before retiring as Director of the Construction Machinery Division, and Haring, his successor, took the stand that priorities should be de-emphasized by both the manufacturer and the distributor. Priorities, according to the NPA officials, were only safeguards to assure the ultimate delivery of machinery, and did not guarantee faster delivery.

J. T. King, AED Washington Representative, moderated the government panel.

Before the panel discussion opened on Wednesday, Milton Rosen, past-president of the American Public Works Association and Commissioner of Public Works of St. Paul, Minn., brought attention to the highway crisis that is rapidly developing in this country with an address entitled, "What's Being Done About the Threat to Highway Transportation?"

This theme, the pressing need for

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Homer Knox succumbs

Homer F. Knox, a well-known heavy equipment distributor in the San Francisco Bay Area, died suddenly at his home in San Francisco on February 7. Knox had been prominent in the equipment business for 41 years and began his career as a young boy with the J. D. Adams Co. of Indianapolis. He came West as branch manager of the Austin-Western Co. In 1940 he purchased the Western Traction Co., which he continued to operate until March 1951, when he retired from business and sold the firm.

Alaska "Cat" distributor names service manager

John R. Heggem moves into the new position of general service manager for Caterpillar equipment in the machinery division of Northern Commercial Co., distributor for Alaska and the Yukon. Heggem will supervise Caterpillar service for the firm's seven machinery branches in Alaska and the Yukon and

highway improvement, was picked up again during the final business session on Thursday morning, January 31, the program of which was arranged by members of the Manufacturers' Convention Suggestion Committee.

In the first address of the morning, Julian R. Steelman, president of CIMA and president of the Koehring Company, Milwaukee, predicted shortages of heavier construction material before the year was up, with a relatively balanced supply of lighter types of equipment. Heavy tractors, for example, would be in short supply; but small crawler and rubber-tired tractors would probably be easy to obtain for civilian use.

One of the difficulties, right, he said, was that DPA had cut the production of machinery by roughly 75% while construction, especially the heavier types, would equal the all-time highs of 1951 with defense building replacing residential construction.

Following Steelman on the Thursday program was Walter L. Couse, Walter L. Couse Construction Company, Detroit, past-president of Associated General Contractors, who surveyed the year ahead from the point of view of the contractor. Like Steelman, he saw increased activity in heavy construction with a corresponding decline in residential and private construction.

Mr. Couse also expressed concern over the possibility of a shortage of repair parts for construction equipment and added his endorsement to the resolution passed earlier calling for a balance of parts with new machinery.

Harry J. Hush, vice president and secretary of Griffin Equipment Corporation, New York, was elected 1952 presi-

dent of the organization, to succeed R. L. Arnold of Salt Lake City. Hush's election to the presidency culminates a rapid rise in the association. During 1951 he served as AED executive vice president, and during previous years he has held the offices of vice president and director of Region II (New York and New Jersey).

Other AED officers elected include S. John Oechsle, Metalweld, Inc., Philadelphia, executive vice president; G. W. Gagel, Machinery & Supplies Co., Inc., Kansas City, Mo., vice president; Frank Skidmore, Contractors' Equipment & Supply Co., Albuquerque, vice president; J. G. C. Morgan, Vancouver Equipment Corp., Vancouver, B. C., vice president, and E. J. Crosby, Hedge & Mattheis, Boston, treasurer.

Beal Shaw, president and treasurer of Shaw Sales and Service Co., Los Angeles, was re-elected by mail balloting of equipment distributors from California and Nevada for another two-year term as Director of Region XI. Frank Skidmore, secretary-treasurer and general manager of Contractors' Equipment & Supply Co., Albuquerque, in addition to serving as vice president of the national organization (see above), will continue to serve AED members from Colorado, New Mexico, Utah and Wyoming, as Director of Region XIV.

FOR SALE

Air Compressor, Portable Worthington 210 C.F.M.
On 4 pneu. tires. As new.
Welder Lincoln 200 Amp., gas drive, trailer mtd.
As new.

BEYER OIL BURNER CO.

Rosamond, Calif. Phone Rosamond 2533

its marine branches for Seattle and Western Washington.

Interstate Tractor & Equipment personnel changes

Byrle H. Hunter, vice president in charge of the Portland, Ore. store of Interstate Tractor and Equipment Co., has been named to the position of exec-

utive vice president. Thomas McNeill, Salem, Ore., store manager, who became vice president and director last April, replaces Hunter as Portland store manager. E. F. Holmes, Longview store manager, takes over management of the Salem store, and Louis A. Zanon, Portland territory manager, moves up to the management of the Longview store.

ROEBLING'S SONS CO. NEW LOS ANGELES HEADQUARTERS

Marking its fifty-first year of branch operations in Los Angeles, the John A. Roebling's Sons Co. moved its operations to a new structure at 5340 Harbor St. The new plant, with 40,000 sq. ft. of warehouse and 4,500 sq. ft. of office area will serve as distribution center for the full Roebling line in So. Calif., Ariz., Western Texas. Below, left: general view of the new operations center. Right, below: R. C. Groesbeck, district manager, Wire Rope Division, chats with E. C. Low, vice president, sales, from Trenton, N. J.



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Serial No. 50023

USED ONLY 6 WEEKS

INCLUDES: Jackson Vibratory Tube, generator, all wheels.

This machine is practically new . . . used only six weeks on one job. You'll never get a buy like this again for

ONLY \$9000.00

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3706 AIRPORT WAY • SEATTLE 4, WASH.

FOR SALE

Gerlinger 1,000 gal. capacity Oil Distributor with full circulating boom and extensions up to 12 feet. Price \$1,500.00 complete.

Etnyre 1,000 gal. capacity Oil Distributor with full circulating boom and extensions up to 12 feet. Price \$1,500.00 complete.

Oil Heating retort complete with Dean Bros. 4 x 4 x 6 steam pump. Price \$1,250.00.

20 HP. Farquhar Boiler complete with Oil burner and national generator, 32 volt capacity for lights. Price \$850.00.

One-half yard Link-Belt Speeder Shovel. Price \$3,750.00

WEST SALEM MACHINERY CO.

Seventh Street and Murlark Avenue
P. O. Box 242
SALEM, OREGON
Phone 4-2213

SOLD • RENTED • REPAIRED

Transits • Levels
Steel Tapes • Compasses

PORTLAND INSTRUMENT CO.
334 S.W. 5th nr. Stark,
PORTLAND 4, ORE., AT 3598



FOR SALE

1—**BUCYRUS-ERIE SCRAPER—MODEL 250B, 22-27 Yard.** Used one job—Perfect condition.

1—**MURPHY 30 TON PORTABLE CONTRACTORS SCALE.** 24' x 9' Equipped with Type Registering Beam, Heavy Plank Floor. Used only three weeks—New condition.

1—**INTERNATIONAL WD9 WHEEL TRACTOR**—Complete with Standard Attachments. This combination used on only one job.

1—**TAMPO MODEL R13 ROLLER—13 (750 x 15) Pneumatic Tires.**

1—**BUCYRUS-ERIE MODEL TD096 SHEEPSFOOT TAMPER.** Double Drum—Each drum 40" Diameter—48" Long. Condition like new—Used only one job.

1—**LeTOURNEAU MODEL W3 SHEEPSFOOT TAMPER.** Triple Drum.

GRANT CONSTRUCTION COMPANY

Box 351 — Coeur d'Alene, Idaho — Phone: Hayden Lake 4121

STOP that WATER

WITH FORMULA NO. 640. A clear liquid which penetrates 1" or more into concrete, brick, stucco, etc., seals—holds 1250 lbs. per sq. ft. hydrostatic pressure. Cuts costs: Applies quickly—no mixing—no cleanup—no furring—no membranes. Write for technical data—free sample. Haynes Products Co., Omaha, Neb.

DESIGN ENGINEER FOR HYDRAULIC MACHINERY FOR HIGH DAM IN INDIA

The Government of Punjab (India) desires to engage on contract for two years in the first instance the services of a design engineer for hydraulic machinery i.e. gates, outlets, valves, etc., for a 680 feet high straight gravity dam.

The applicant must possess a college degree and have about ten years experience in design of such features with a reputable firm of designers or a Government organization.

Furnished quarters fitted with electricity and water supply available in the Project Township having other Americans with families.

Apply by mail in duplicate to M. R. Chopra, Technical Counselor, Embassy of India, Washington, D. C. giving full details of qualifications and experience, stating minimum net salary acceptable after deduction of Indian income tax.

FOR SALE

1—#95 Diamond Portable Crushing and Screening Plant with Feeder Conveyor and Hopper.

1—125 H.P. Allis-Chalmers Electric Motor with Controls.

1—27 C.Y. Jackleg Bin.

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INDEX TO ADVERTISERS

IN THIS ISSUE

A	
Air Reduction Pacific Co.	27
Allis-Chalmers Mfg. Co., Tractor Division	92 & 93
American Bitumuls Company	144
American Hoist & Derrick Company	41 & 152
American Pipe & Construction Company	3rd Cover
American Rubber Mfg. Co.	46
Armclo Drainage & Metal Products, Inc.	122
Atlas Powder Company	110
Austin-Western Company, Subsidiary of Baldwin-Lima-Hamilton Corporation	58
B	
Baker Manufacturing Company, The	104 & 105
Barber-Greene Company	125
Bay City Shovels, Inc.	45
Blaw-Knox Company	8 & 9
Brunner & Lay	164
Bucyrus-Erie Company	6 & 7
Buda Company, The	111
Byers, A. M., Company	22
C	
Carver Pump Company	165
Case, J. I., Company	39
Caterpillar Tractor Company	24
Chapman Valve Mfg. Co., The	44
Chicago Bridge & Iron Company	56
Chicago Pneumatic Tool Co.	42
Chrysler Corporation, Industrial Engine Division	30
Cleveland Trencher Company, The	139
Coast Mfg. & Supply Company	136
Coffing Hoist Company	154
Colorado Fuel & Iron Corporation, The	134
Colorado Fuel & Iron Corporation, The (Wickwire Spencer Steel Div., The California Wire Cloth Corporation)	51
Commercial Shearing & Stamping Co., Inc.	166
Cummer, F. D., & Son	161
Cummins Engine Company, Inc.	34
D	
Detroit Diesel Engine Division, General Motors Corporation	55
Douglas Fir Plywood Assn.	12 & 13
Dow Chemical Company, The	25
E	
Eaton Mfg. Company, Axle Division	35
Economy Forms Corporation	150
Edwards, E. H., Company	167
Eimco Corporation	103
Electric Tamper & Equipment Co.	126
Ets-Hokin & Galvan	148
Euclid Road Machinery Company	117

F	
Fairfield Engineering Company, The	155
Firestone Tire & Rubber Co., The	18
Fisher Research Laboratory, Inc.	145
Flexible Steel Lacing Co.	161
Foote Company, Inc., The	143
G	
Galion Iron Works & Mfg. Co.	26
Gardner-Denver Company	141
General Electric Company	37
General Tire & Rubber Company, The	31
Goodrich, B. F., Company, The	5
Gorman-Rupp Company	106
Gradall Division, Warner & Swasey Company, The	99
H	
Harnischfeger Corporation	32
Homelite Corporation	147
Hopkins Volcanic Specialties, Inc.	162
Huber Manufacturing Company, The	101
I	
Insley Manufacturing Corporation	53
Iowa Manufacturing Company	20 & 21
International Harvester Company, Inc. Industrial Power Division	10 & 11
J	
Jaeger Machine Company	127
Johnston, A. P., Company	172
K	
Kaiser Steel Corporation	91
Koehring Company and Subsidiary Companies	120
L	
La Plant-Choate Manufacturing Co., Inc.	33
Leschen, A., & Sons Rope Company	112
Le Tourneau, R. G., Inc.	16 & 17
Lincoln Electric Co.	151
Littleford Bros., Inc.	145
M	
Mack Manufacturing Corporation	129
Macwhyte Company	135
Manitowoc Engr. Works	149
Marion Power Shovel Co.	47
Marvel Equipment Corporation	154
Master Vibrator Company	123
Murphy, L. R., Co.	162
N	
Noble Co.	49
Northwest Engineering Co.	3
O	
Onan, S. W., & Sons, Inc.	167
Owen Bucket Company, The	121
P	
Parsons Co.	120
Pioneer Engineering Works	14 & 15
Pipe Linings, Inc.	163
Pittsburgh-Des Moines Steel Co.	36
Q	
"Quick-Way" Truck Shovel Co.	97
R	
Ramset Fasteners, Inc.	50
Raymond Concrete Pile Co.	4th Cover
Richmond Screw Anchor Co., Inc.	40
Roebling's, John A., Sons Company	131
S	
Screen Equipment Co., Inc.	43
Shell Oil Co.	29
Silver Booster Manufacturing Co.	155
Six Wheels, Inc. of Los Angeles (Subsidiary of Insley Manufacturing Corporation)	159
Smith Engineering Works	113
Snow Irrigation Supply Co. (Div. of Bardco Mfg. & Sales Co.)	142
Standard Oil Company of California	137
Standard Steel Corporation	152
Stow Manufacturing Co.	156
Superior Concrete Accessories, Inc.	54
T	
Texas Company, The	2nd Cover
Thew Shovel Company, The	28
Timken Roller Bearing Company, Inc., The, Rock Bit Division	89
Trackson Company	119
Traylor Engineering & Manufacturing Co.	52
Truck Mixer Manufacturers Bureau	114
U	
Union Oil Company	23
Union Wire Rope Corporation	115
United States Rubber Co.	107
Universal Form Clamp Co.	48
Utility Trailer Mfg. Co.	132
V	
Vibro-Plus Products, Inc.	150
W	
Warner & Swasey Co., The, Gradall Division	99
Wausau Iron Works, Inc.	138
Wellman Engineering Company, The	116
Wellman, S. K., Company	108
White Mfg. Company	136
White Motor Company	38
Wisconsin Motor Corporation	128
Woolridge Manufacturing Company	88
Worthington Pump & Machinery Corp.	19 & 118

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