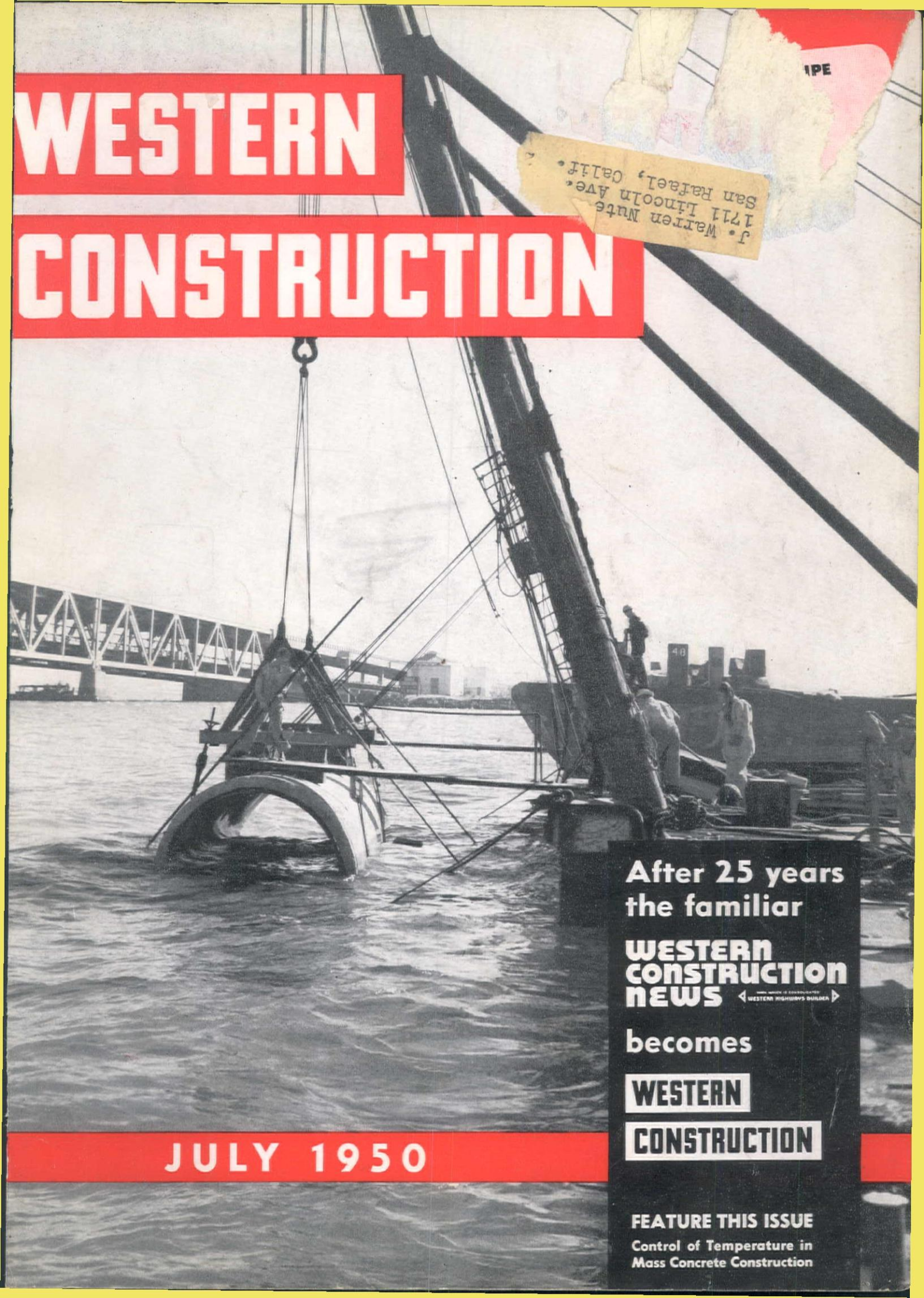
WESTERN CONSTRUCTION



After 25 years the familiar

WESTERN CONSTRUCTION NEWS

(WHICH IS CONSOLIDATED WITH WESTERN HIGHWAYS BUILDER)

becomes

WESTERN CONSTRUCTION

FEATURE THIS ISSUE

Control of Temperature in Mass Concrete Construction

JULY 1950

DIRT SEALED OUT! BEARINGS LAST LONGER

...when lubricated with TEXACO MARFAK

Dust, mud, moisture—they can't get into bearings protected with tough, tenacious *Texaco Marfak!* Protection is twofold. Inside the bearings, *Texaco Marfak* maintains a fluid, wear-resisting, lubricating film. At the bearing edges, it retains its original consistency—forming a "collar" that seals the lubricant in, seals contaminants out.

Texaco Marfak affords protection against rust and wear . . . assures fewer repairs and replacements . . . reduces maintenance costs. In addition, *Texaco Marfak* far outlasts ordinary chassis grease. Fewer applications are needed.

In wheel bearings, you get this same cost-saving protection by using *Texaco Marfak Heavy Duty.* Bearings last longer . . . and its self-sealing property assures safer braking. No seasonal change is required.

Two Other Maintenance Savings

Upkeep costs for engines—heavy-duty gasoline or Diesel—come down when you lubricate with *Texaco Ursa Oil X★★.* It cleans as it lubricates . . . helps reduce fuel consumption.

Crawler track mechanisms run better, last longer and cost less for maintenance when lubricated with *Texaco Track Roll Lubricant.* It seals dirt and moisture out of bearings even under severe conditions.

Find out how Texaco top-quality lubricants and the Texaco Simplified Lubrication Plan can help your machinery do more work at lower cost.

Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

MORE THAN 350 MILLION POUNDS OF MARFAK HAVE BEEN SOLD!

TEXACO REG. T.M.

TEXACO Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

THIS SHOVEL HAS STOOD *the Rock Test!*

Here's the kind of a job that tests the metal of equipment. Here you need smoothness of dipper control, ease of operation, accuracy in spotting with crawler maneuverability—these mean the difference between combined irritation, low output, daily loss—*or profit!* Only a real Rock Shovel can handle a job like this! The Northwest Dual Independent Crowd, the "Feather-Touch" Clutch Control, Uniform Pressure Swing Clutches and Differential Steering all combine to give greater digging ability. Remember, with a real Rock Shovel you get output in any digging.

CAN YOURS?

INDEPENDENT CROWD *plus* AUTOMATIC CROWD FOR GREATER DIGGING POWER

THE DUAL CROWD

NORTHWEST ENGINEERING CO.
135 South LaSalle Street, Chicago 3, Illinois

ocal NORTHWEST sales agents

only the best for the heart of the job

MAKE YOUR KEY MACHINE A REAL ROCK SHOVEL

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BUTTE, MONTANA
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WESTERN CONSTRUCTION

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B.F.Goodrich

The Super Traction, Universal and Rock Logger Silvertowns shown at right are available in All-Nylon cord construction—ideal for tough construction projects.

ALL-NYLON tires offer terrific savings; no flex breaks, no bruise breaks, no blowouts!

YOU can judge for yourself the tremendous savings possible from tires that do not blow out or develop bruise and flex breaks. That's exactly the record run up by BFG ALL-NYLON tires . . . a record proved by more than 2 years' actual use by our customers. To date, not a single ALL-NYLON Silvertown has blown out or been found to have bruise or flex breaks!

Strong, elastic nylon cord helps you make savings in other B. F. Goodrich truck tires, too. *All* truck tires with 8 or more plies have the popular *nylon shock shield*. This exclusive feature (U.S. Patent No. 2498859) is built in between tread rubber and the cord body of BFG tires. Under impact, the nylon shock shield distributes and absorbs the shock; shields the cord body. And there is a double shock shield for double protection in large, off-the-road tires.

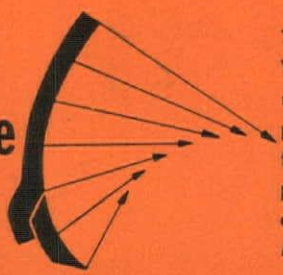
Only B. F. Goodrich gives you the added protection of the nylon shock shield; the added savings from (1) longer tire life (2) increased bruise resistance (3) decreased danger of tread separation (4) more recappable tires. And nylon shock shield costs no extra —you pay no premium!

There's a specially designed BFG highway truck, off-the-road or grader tire for every need. Call your B. F. Goodrich Dealer or *The B. F. Goodrich Company, Akron, Ohio.*

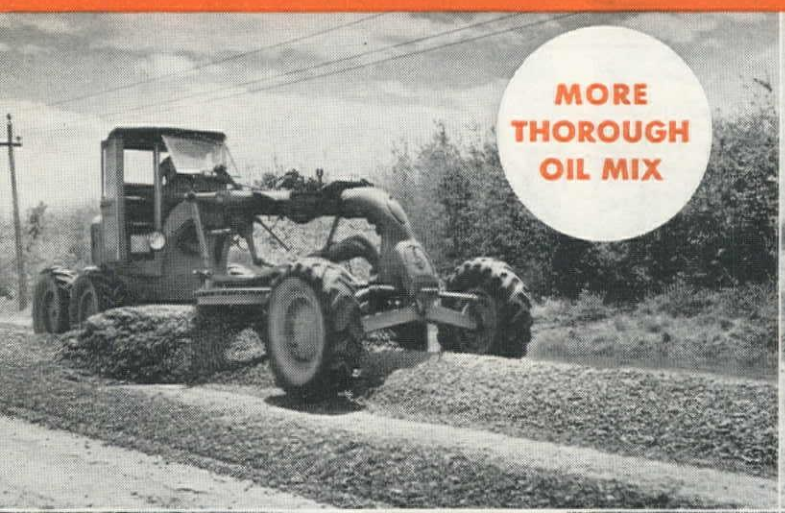
RESEARCH KEEPS
B.F.Goodrich
FIRST IN RUBBER
Truck Tires

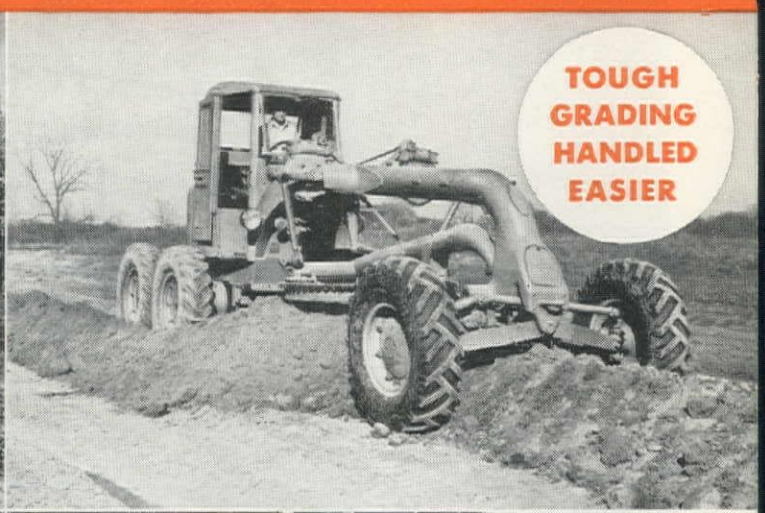
Only ALLIS-CHALMERS MOTOR GRADERS have the

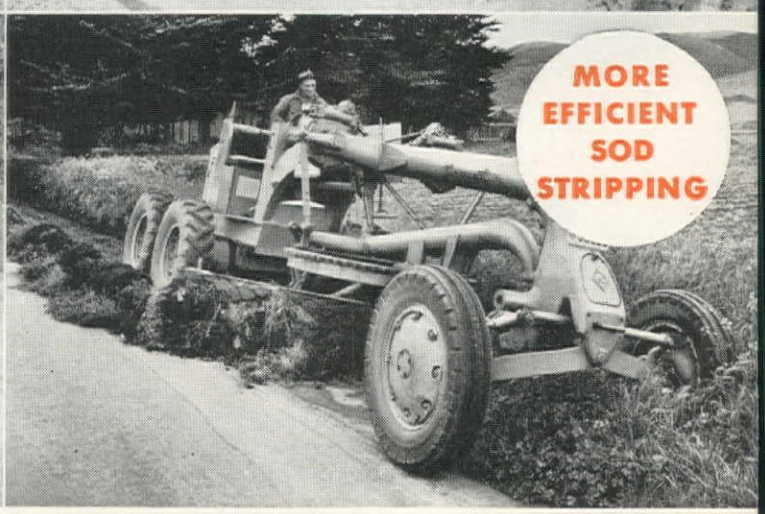
More and Better Work Done with Less Power Effort



The ROLL-AWAY Moldboard has an Involute or Variable Radius Curve that lifts material up and moves it away in an easy, rolling fashion. Each part of the blade forces material toward a different point instead of a fixed point — prevents packing, power waste and drag on entire machine. Material moves WITH an Allis-Chalmers Motor Grader — not against it!







Check these other outstanding advantages of Allis-Chalmers Diesel-Powered Motor Graders:

EXCLUSIVE TUBULAR FRAME Strong, snock-absorbing, protects control rods inside frame.

HIGH CLEARANCE under circle and axle to handle bigger windrows.

TRAVEL SPEEDS smoothly synchronized with operator controls. All the needed power applied as required.

FULL RANGE OF BLADE POSITIONS . . . plus leaning front wheels, for easier ditching and sloping. Seven pitch adjustments, two offset positions.

GREATER STABILITY. Lift cases directly over circle turn — blade held firmly on work through direct down pressure . . . precision cutting.

GENERAL MOTORS 2-CYCLE DIESEL POWER — dependable, economical, instant-starting.

PROPERLY BALANCED for maximum traction and control.

PLUS . . . easier steering, full visibility, larger clutch, electric gauges, numerous other time- and money-saving features.

Standard On All Allis-Chalmers Motor Graders

Model	Brake Hp.	Weight
AD-4	104	22,140 lb.
AD-3	78	21,825 lb.
BD-3	78	19,042 lb.
BD-2	50.5	11,772 lb.
D	34.7	8,500 lb.

The Moldboard That Moves Material the Easiest Way... by Rolling it!

"Seeing Is Believing." **Ask Your Allis-Chalmers Dealer For a Demonstration . . . NOW!**

ARIZONA
Phoenix—Neil B. McGinnis

NORTHERN CALIFORNIA
Oakland and Eureka—Buran Equipment Company
Modesto—J. M. Equipment Company
Fresno—Peerless Tractor and Equipment
Food Machinery and Chemical Corp.
Salinas and King City—Livingston Bros. Tractor Company
No. Sacramento, Stockton, Redding—Moore Equipment Company, Inc.
Mountain View—Redwine Tractor Co.
Visalia—Tulare County Tractor Co.

SOUTHERN CALIFORNIA
Bakersfield—San Joaquin Tractor Co.
Los Angeles, San Diego and Santa Barbara—Shaw Sales & Service Company

IDAHO
Idaho Falls and Boise—Southern Idaho Equipment Company
Lewiston—Fred M. Viles and Company, Inc.

MONTANA
Missoula—Mountain Tractor Company
Sidney—Northland Machinery Company
Billings—Seitz Machinery Company, Inc.

NEVADA
Elko—C. W. Paul Hardware and Machinery
Reno—Moore Equipment Company, Inc.

OREGON
Eugene, Roseburg and North Bend—Farm and Industrial Equipment Co.
The Dalles—Dielschneider Equip. Oreg. Ltd.
La Grande—Oregon Tractor Company
Medford—Tractor Sales and Service, Inc.
Klamath Falls—West Hitchcock Corp.
Portland—Wood Tractor Company

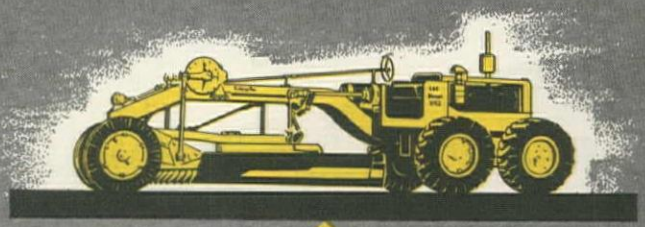
UTAH
Salt Lake City—Cate Equipment Co., Inc.

WASHINGTON
Seattle, Tacoma and Wenatchee—A. H. Cox & Company
Walla Walla—Northern Harris
Spokane—Fred M. Viles and Company, Inc.

WYOMING
Casper—Studer Tractor & Equipment Co.

Buy balanced

FOR MORE WORK



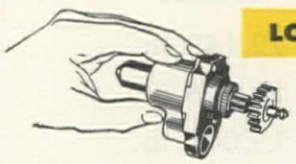
SPEED
WEIGHT
POWER

THE OWNER of the "Cat" No. 212 Grader shown here has a unique problem. "Can't keep operators away from the rig," says D. W. Klock, vice president of the Klock Construction Company, Amarillo, Texas. "This Motor Grader is so fast, maneuverable and well balanced, the boys *all* want to run it!"

Balance is the secret of "Cat" Graders' popularity with owner and operator alike. "Caterpillar" builds each Motor Grader from the ground up as an individual unit. The correct weight, plus the right horsepower, plus rated work speed—these things add up to *balanced* machines that solve your job problems at lower cost.

Informed buyers are finding that *assembled* motor graders are often poorly balanced. It stands to reason that when one engine or one frame is used for more than one model, the best use cannot be made of weight and power. But balanced "Cat" rigs are neither muscle-bound nor jumpy on the job. Their matching power cuts costs through superior performance and longer service life.

There's a size "Cat" Motor Grader for every type of work—with the stamina, punch and balance to do a particular job best. And don't forget what world-famous "Caterpillar" dealer service means in keeping equipment on the job—cutting down-time to the bone. Ask your "Caterpillar" dealer to show you his Motor Graders' bonus features—from tough blades with the maneuverability of a boarding-house reach, to "Hi-Electro" hardened final drive gears built to last.



LOOK UNDER THE HIDE

Fuel pumps are "Caterpillar"-designed and "Caterpillar"-built. Made of the cleanest high-chromium, high-carbon alloy steel obtainable, the pump plungers and barrels are diamond lapped. Pumps are heat-treated to maximum hardness to give users thousands of hours of trouble-free economical service. There is an individual pump for each cylinder. Pumps are adjustment-free and completely interchangeable. Look under the hide for quality—it doesn't show on the outside, it shows up in performance.

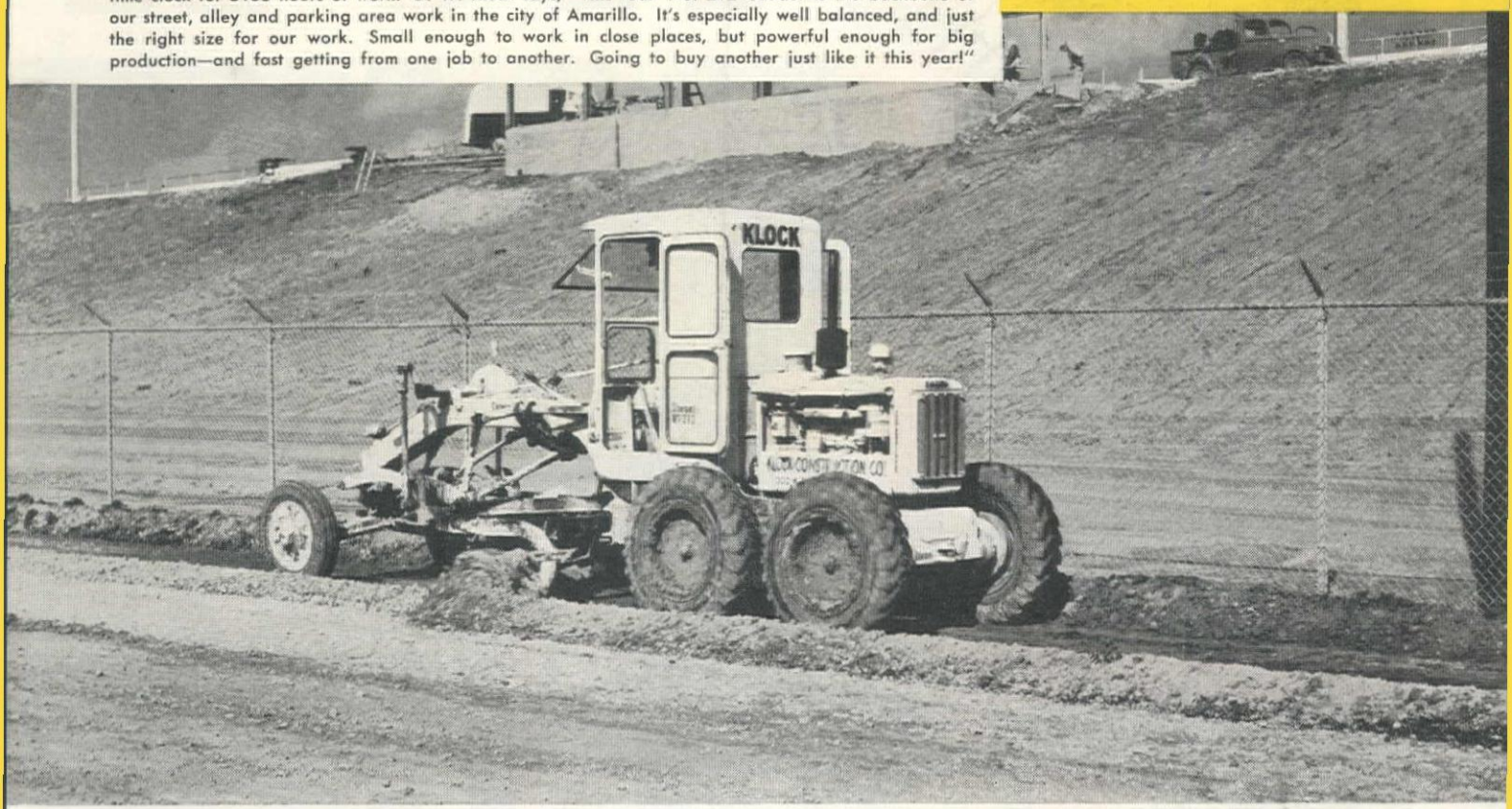
CATERPILLAR

REG. U. S. PAT. OFF.

"Cat" graders

AT LESS COST

Here's the Klock Construction Company's "Cat" No. 212 Grader working on the new municipal football stadium in Amarillo. Does subgrade, shoulder work and drainage. It's punched the Klock Co.'s time clock for 5186 hours of work. D. W. Klock says, "This 'Cat' No. 212 Grader is the backbone of our street, alley and parking area work in the city of Amarillo. It's especially well balanced, and just the right size for our work. Small enough to work in close places, but powerful enough for big production—and fast getting from one job to another. Going to buy another just like it this year!"



NO. 12

WEIGHT	22,200 lbs.
ENGINE	100 hp.
SPEEDS: 1st	2.3 mph.
2nd	3.6 "
3rd	5.5 "
4th	8.5 "
5th	12.0 "
6th	19.3 "
1st R.	2.7 "
2nd R.	4.1 "

In a No. 12 "Cat" Motor Grader you get a No. 12 from stem to gudgeon. The "Cat" Engine was built for a frame that gets full use out of its 100 hp. And the working speed range was engineered to get maximum production at each speed.

Price of the standard model No. 12 is $10,920, f.o.b. Peoria, subject to change without notice.

NO. 112

WEIGHT	19,330 lbs.
ENGINE	75 hp.
SPEEDS: 1st	2.1 mph.
2nd	3.0 "
3rd	4.0 "
4th	5.6 "
5th	11.2 "
6th	16.0 "
1st R.	2.8 "
2nd R.	4.0 "

With the No. 112 you get the No. 112's 75 hp. Engine on a No. 112 frame, with a No. 112 weight and a No. 112 transmission. You don't get mismatched power, weight or speed.

Price of the standard model No. 112 is $9545, f. o. b. Peoria, subject to change without notice.

NO. 212

WEIGHT: tandem drive	13,290 lbs.
single drive	11,010 "
ENGINE	50 hp.
SPEEDS: 1st	2.0 mph.
2nd	3.1 "
3rd	4.9 "
4th	11.9 "
R.	2.8 "

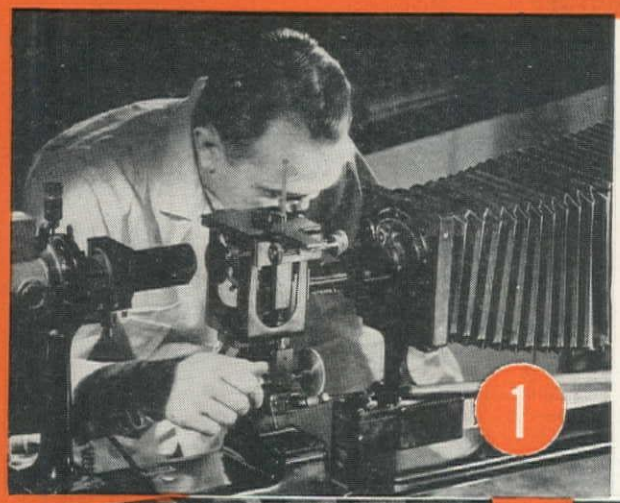
When you buy a No. 212 you get the same balanced performance. It has its own weight, its own frame, its own "Cat" Engine, its own working speeds.

Price of the standard model No. 212 is $6435, f. o. b. Peoria, subject to change without notice.

DIESEL ENGINES • TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

CATERPILLAR, San Leandro, Calif.; Peoria, Ill.
REG. U.S. PAT. OFF.

how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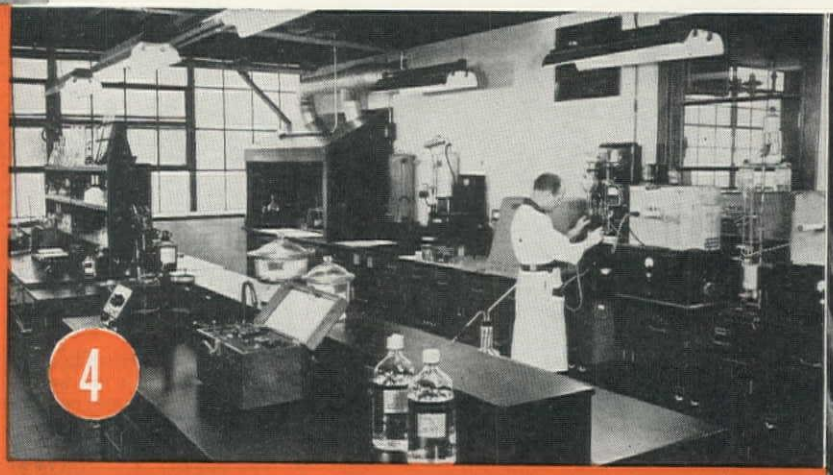
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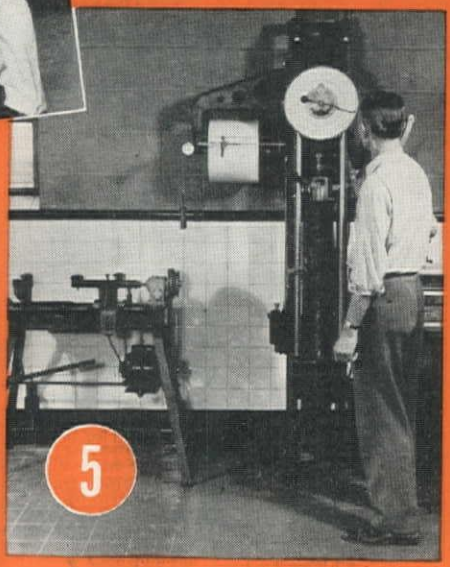
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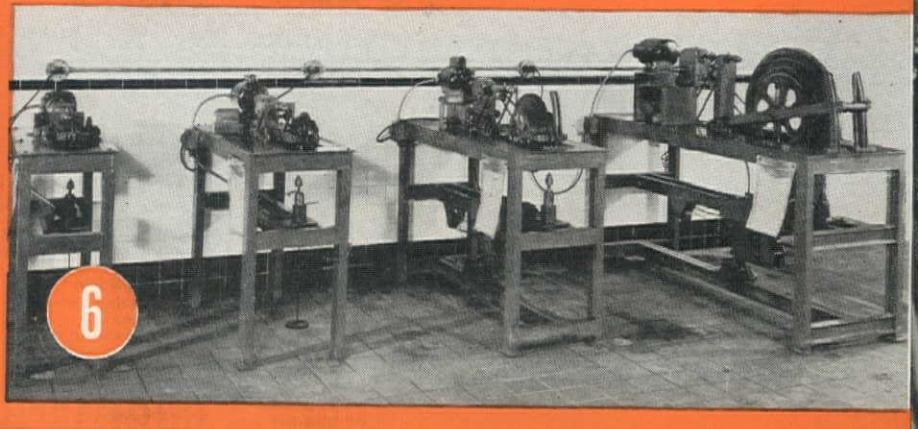
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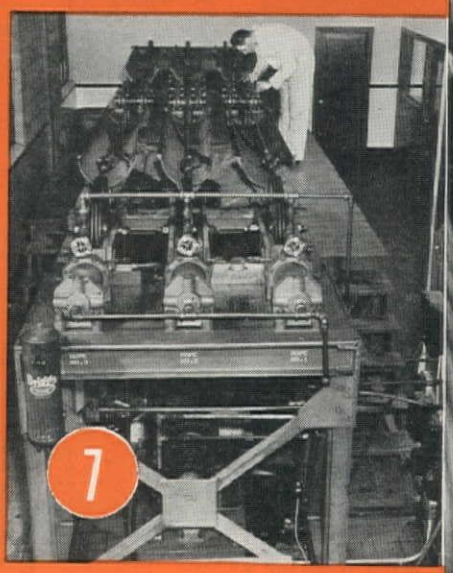
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Wire Rope Problems are Studied in the Field... and Whipped in Union Wire's Outstanding Research Laboratory by Technical Experts

Not content to sit back and make wire rope as it has always been made—just because it has always been made that way—

Union Wire Rope engineers continuously study problems in the field—bring them into the outstanding Union Wire Rope laboratory—and keep them under constant research until whipped and tested in the field.

The result is a growing line of new wire rope constructions, designed for specific uses, covered by the simplest kind of specifications and identified by the trademarked name TUFFY. Here are some of the steps taken to pre-determine Tuffy toughness that assures longer life.

1. Microstructure Tester. Under powerful magnification, Union Wire metallurgists examine the microstructure of the steel in rods and wires to see that rigid specifications are met and maintained in processing.

2. Static Flexibility Tester. The demand of machinery engineers toward smaller sheaves and higher speed made it necessary for Union Wire Rope Engineers to adapt this standard machine in order to test static flexibility.

3. Rope Testing Machine. This 3-story high machine is designed to test and record the breaking strength of the rope when finished and ready for the customer.

4. Chemical Analysis Laboratory. Steel for Union Wire Rope is made to rigid specifications. Here rods and wires are chemically analyzed to make certain that the correct combinations of carbon, manganese, etc., are kept under control.

5. Wire Tensile & Torsion Tester. In tension and under torsion, this machine tests wires to see that they measure up to the extraordinary high level of strength and toughness mandatory in Union Wire Rope.

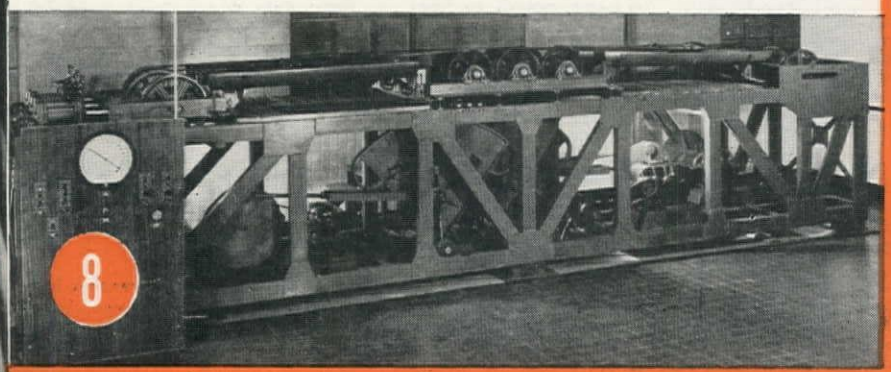
6. Wire Fatigue Testers. The fatigue strength of wire rope is the sum total of the fatigue strength of the wires in its construction. Here, the wires in tension and bending are tested for fatigue strength.

Wire Rope Accelerated Fatigue Tester—Only One of Its Type In Captivity

7. Top view—shows simultaneous testing of three different wire rope constructions. Here, in days, ropes are subjected to punishment equal to weeks or months of hard service.

8. Side view. Designed by Union Wire Rope Engineers, this accelerated fatigue tester is equipped with sheaves from 8" to 24" permitting application of any bending strain. Tensile loads up to 12,000 lbs. are applied. Thus wire rope life under toughest fatigue conditions is pre-determined.

After Union Wire Rope designs pass all of the exhaustive testing imposed by this array of highly specialized laboratory equipment and technical experts, Union Wire Rope engineers submit it to the final test. In the field, under actual working conditions, they confirm the longer life expectancy indicated by laboratory findings and determine proper application which in itself is vitally important.



Tuffy® FAMILY SMASH HIT in Construction Industry

Fathered by necessity, conceived in research—the distinguished Tuffy family of wire rope and braided wire fabric constructions have won the popular acclaim of users throughout the construction industry on the dollars and cents basis of better performance. By running your own comparative tests you, too, will be convinced that Tuffy gives you the ultimate low cost wire rope.

Put Tuffy Draglines to any test. Watch them come out on top with unequaled money-saving records. No more complicated specifications. Just the length, size and name Tuffy. That's all.

Test Tuffy's ability to handle extra yardage. You will change to Tuffy reels on your whole fleet. The name Tuffy, the diameter and the length—that's how simple it is to buy scraper rope for new yardage records.

An entirely different, patented, interlaced wire fabric construction gives Tuffy extraordinary flexibility and stamina. Proof tested to twice working load. Ten types—factory fitted.

Write For Illustrated Folders on Tuffy Draglines . . . Slings Scraper Rope

union Wire Rope corporation

2146 Manchester Ave. Kansas City 3, Mo.

Get more jobs done

MORE THAN DOUBLES DOZER OUTPUT . . . Over twice as fast with load . . . instantaneous "no-shift" gear selection lets Tournadozer drift load at high-rolling speeds. Big, 11' 2" x 43" Bulldozer blade carries up to 2½ yards each trip. High-speed reverse cuts cycle time in half. Runs, instead of crawls . . . does 2 to 3 times the work of ordinary crawler-dozer.

HAULS SCRAPERS . . . Tournadozer's faster power makes it a big-yardage prime mover for use with 4-wheel scrapers. Quickly coupled to drawbar of 13.5-yard, electric-control E-16 Carryall . . . or hooked up to the cable-operated LS Carryall . . . it's the fastest loading, hauling, spreading tractor-scraper combination you've ever seen!

LIFTS TO 14 TONS with side-boom Crane. Has 12' lifting height . . . 12' reach . . . lifts 5 tons in maximum reach position, 14 tons with boom raised. Finger-tip electric controlled. Maneuvers, spots on a "dime" . . . works, travels anywhere . . . carries load over pavement, through mud. Saves money on your jobs . . . earns good pay on sub-contracts or rentals.

TOWS SHEEPSFOOT ROLLERS . . . Tournadozer's 180 "horses" and 4-wheel drive give plenty of power and traction for pulling single or multiple Sheepsfoot Rollers. Heavy Tournapacker, illustrated, has up to 1100 lbs.-per-square-inch ground bearing pressure. Tournadozer's giant 21.00 x 25 low-pressure tires add to compaction without tearing up fill surface.

PULLS WITH 50,000# LOGGING WINCH . . . the Tournaskidder . . . an unusual combination of Bulldozer and Winch, puts both ends of Tournadozer to profitable use. Bulldozer with special A-frame mounts on front . . . heavy-duty Winch develops 50,000-lb. line pull for skidding pipe, snaking logs, etc. Plenty of power for any winch application . . . makes either end equally productive.

ROOTS HARD MATERIALS . . . With handy hookup to rear cable PCU, versatile Tournadozer is ready for Rooter service. Plenty of drawbar pull to break up toughest layered rock . . . saves blasting. Other uses for Tournadozer: towing sprinklers, drawn graders . . . pulling heavy equipment and supplies mounted on flat-bed trailer . . . hauls anywhere on or off highway.

PUSHES TREES OVER . . . Forked, 23½'-long boom reaches high up on tree for extra leverage. When Tournadozer shoves, boom angle creates down-pressure on ground-grip tires . . . as the push increases, so does the traction. Uses same A-frame and PCU as Bulldozer blade . . . is readily interchangeable. Quickly pays for itself on large clearing contracts.

Arizona — Phoenix
ARIZONA EQUIPMENT SALES, INC.

California — Los Angeles, Bakersfield
CROOK COMPANY

Idaho — Boise
IDAHO MACHINERY COMPANY

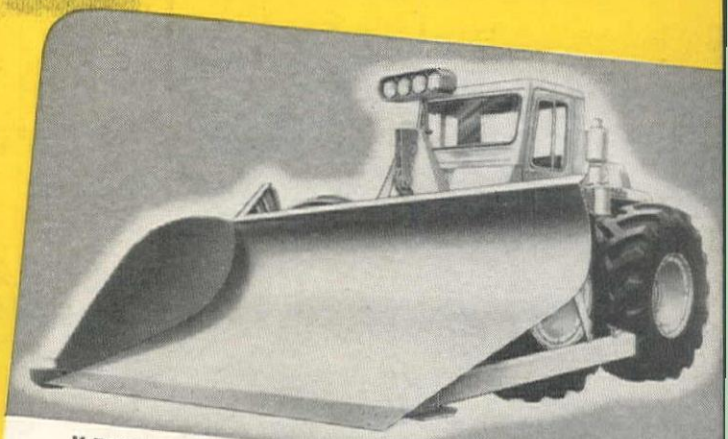
California — Sacramento
CAPITOL TRACTOR & EQUIP. CO.

Colorado — Denver
COLORADO BUILDERS' SUPPLY CO.

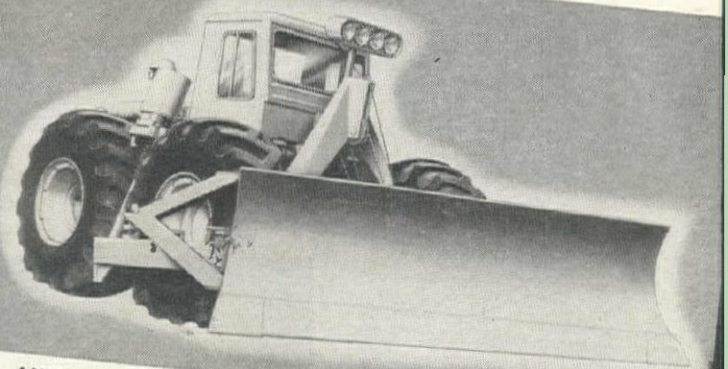
Idaho — Pocatello
J. K. WHEELER MACHINERY CO.

with TOURNADOZER

Tournadozer's faster-than-crawler speeds and 100% mobility on rubber can now be utilized on any job with a full line of interchangeable tools. These auxiliary Tournadozer tools offer new profit opportunities on your work — assure steady earnings the year-round on pushing . . . pulling . . . and lifting jobs. With each unit, Tournadozer's 180 h.p. engine, 4-wheel drive, and rubber-tired speeds will pay off in more work done . . . in faster moves on the job, and between jobs. Let your local LeTourneau Distributor give you all the facts. Call him . . . or write TODAY!



V-TYPE SNOW PLOW . . . has 12' 3" clearing width . . . flows snow 6½' high off ends of plowshare blade. Vertical divider plate, welded in center of "V", cuts frozen drifts . . . eliminates plowing snow back onto road when widening. Adjustable runner shoe, giant tires protect surface. Assures steady earnings during winter months! Optional electrically-operated Snow Wing available.



ANGLEDOZER . . . for extensive side-hill work, Tournadozer's regular Bulldozer is easily interchangeable with Angledozer blade and side arms. Husky 13' x 41½" blade can be angled 20° right or left . . . optional electric motor tilts either corner of blade 10" up or down for digging with blade point. Works off the same A-frame and fast-acting electric PCU as Bulldozer blade.

ROOT RAKE . . . offers you another low-cost, specialized tool for handling brush clearing with Tournadozer. Husky 11' 8" x 3' 4" rake has 10 curved teeth of 4" high-grade, heat-treated steel, placed 9" apart, for grubbing out roots, raking aside rocks. Gets the complete job done because of high-speed maneuverability and rubber tires . . . stacks brush in higher piles.

Tournapacker—Trademark
Tournadozer, Carryall, Roster, Angledozer—Trademark Reg. U.S. Pat. Off. C130

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

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CONTRACTORS EQUIP. & SUPPLY CO.

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J. K. WHEELER MACHINERY CO.

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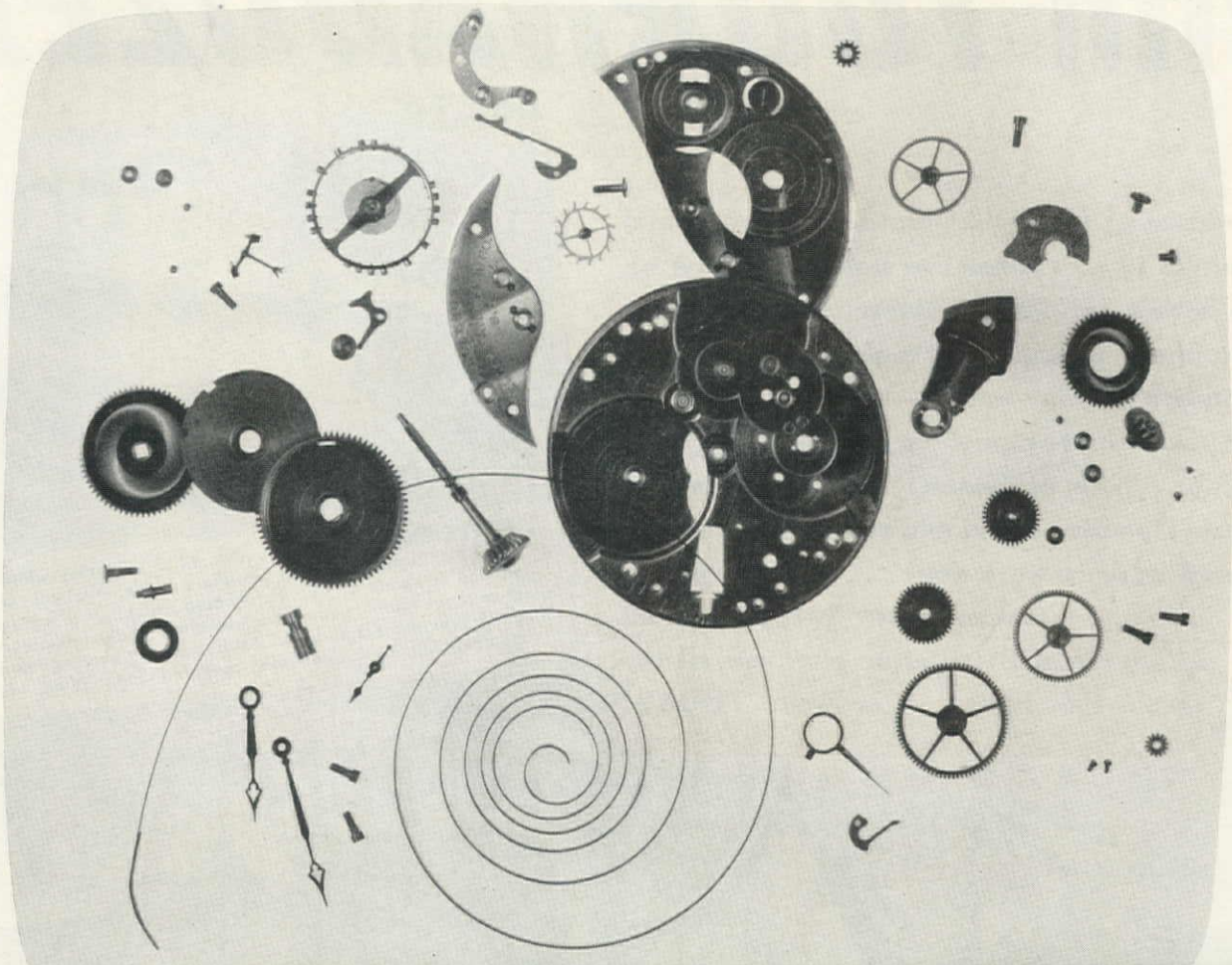

Nothing could be simpler...

To the man who understands it

This maze of wheels, springs, and screws was once a smooth-running watch . . . and can be again when a skilled watchmaker reassembles it. That's why we say, "Nothing could be simpler to the man who understands it."

This phrase, applied to your business, means you can get the most for your money only when the products you buy are engineered specifically for your particular job.

In addition to their general salesmen, REPUBLIC maintains a staff of factory-trained sales-engineers who are at your service to assure your selection of the right material and product. Call REPUBLIC and ask for engineering consultation when you have a supply problem. There's no obligation, no delay, and no better service; another reason why your business should rely on REPUBLIC.

Remember, the products you buy are no better than the Company that sells and services them.

CALL REPUBLIC

THE REPUBLIC SUPPLY COMPANY OF CALIFORNIA

AN INDEPENDENTLY OWNED AND OPERATED COMPANY SERVING WESTERN INDUSTRY

Piping • Tools • Rubber • Wire Rope • Industrial Supplies • Machinery

LOS ANGELES · OAKLAND · SANTA FE SPRINGS · BAKERSFIELD · WILMINGTON · HUNTINGTON BEACH
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EUCLIDS

JOB PROVED FOR PRODUCTION AND PROFITS!

BOTTOM-DUMP EUCLIDS
13 to 25 cu. yd. capacity. Top speeds loaded up to 34.4 m.p.h.

REAR-DUMP EUCLIDS
10 to 34 tons payload capacity. Loaded top speeds up to 32.2 m.p.h.

Engineered and built for heavy duty off-the-highway and industrial hauling, Euclids are job proved for high production at the lowest cost per ton or yard moved.

Owners prefer Euclid equipment for its efficiency and dependability under a wide range of operating conditions. Long service life combined with low operating and maintenance costs result in more profits and less down time. Operators prefer "Eucs" for their ease of handling, riding comfort, and positive control on soft fills and rough haul roads.

"Euclid is the best earth moving equipment we've ever used," say owners... "it does more work and costs less to own in the long run." Production records from hundreds of jobs prove that Euclids are the best for performance and profits.

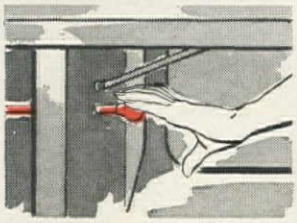
The services of a Euclid specialist are available without cost or obligation. Call or write for an estimate on your present work or future jobs.

The EUCLID ROAD MACHINERY Co. Cleveland 17, Ohio

EUCLIDS *Move the Earth*

CHAMPION

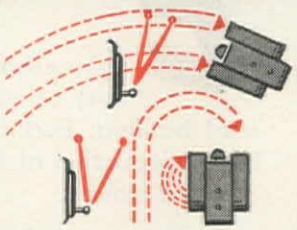
the NEW



Positive all-weather starting on gasoline, with quick change-over to full diesel operation, all from the seat.

Instant speed change up or down one speed, or stop, without declutching. Planet Power drive does it!

Separate reverse lever for quick change of direction. The tractor moves in the direction the lever is moved.



Planet Power steering puts turns with power on both tracks, feathered turns and pivot turns at your fingertips.

HERE ARE SOME OF THE CHAMPION'S EXCLUSIVE FEATURES

Self load and run with scrapers of 17-yard capacity—and shift gears on-the-go with the rolling load.

Cut waste shifting time out of work cycles; provide the best speed for every operation, 8 speeds in each direction!

Work on grades up to 100%. Its power, ground contact, balance and lubrication are right for licking any grade.

Handle heaviest loads on gradual turns as easily as straightaway because both tracks are powered in the turn!

"There Is Nothing Like The TD-24. It Can Out-Push Any Tractor On The Job."

"Here is the Champion of Crawlers," owners will tell you, "the tractor that will pull down your dirt moving costs."

Contractors and operators who have observed or operated the new International TD-24 diesel crawler are spreading the news. Here is a tractor that out-works and out-performs every other crawler known to the industry!

Operators compete with each other from Florida to Alaska to get "the big red devils," the TD-24's, assigned to them. They'll tell you no other tractor can compare with the TD-24 for ease of operation or work capacity!

# of Crawlers

INTERNATIONAL TD-24

Comfortable to ride, powerful, fast, safe and economical to operate, the TD-24 is revolutionizing ideas of what crawler tractors can or cannot do on the big jobs.

Regardless of what equipment you now use, visit your International Industrial Power Distributor and get a TD-24 demonstration. See for yourself what the TD-24 can mean to your operations in shortened time, reduced costs, extra profits.

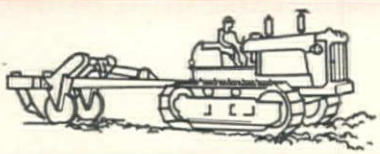
INTERNATIONAL HARVESTER COMPANY • Chicago

INTERNATIONAL HARVESTER

INTERNATIONAL

INDUSTRIAL POWER

Tune in "Harvest of Stars" with James Melton, Sundays, N. B. C.



It takes 48 tests to earn this!

When you order Kaiser Steel structural shapes, *you can be sure of highest quality!* Here's why:

More than 48 different analyses, tests and inspections are made of Kaiser Steel structural shapes, and of the materials that go into them.

These tests cover every stage of production — from the mining of ore through the last pass through the mill.

That's why experienced engineers have found that Kaiser Steel structural shapes measure up to precise specifications on every count.

Kaiser Steel's modern facilities produce a wide range of quality structural shapes. Because these facilities are nearby, delivery time is cut by as much as one-half — and engineering service is prompt and dependable.

So when you need structural shapes, remember this:

It's good business to do business with

Kaiser Steel

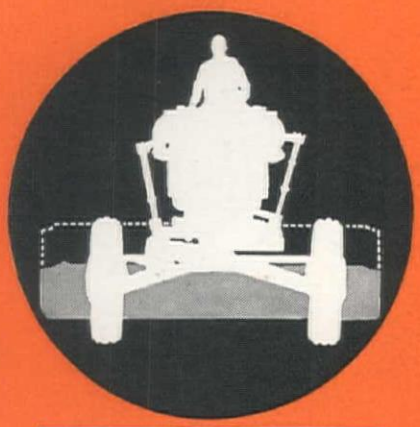
built to serve the West

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

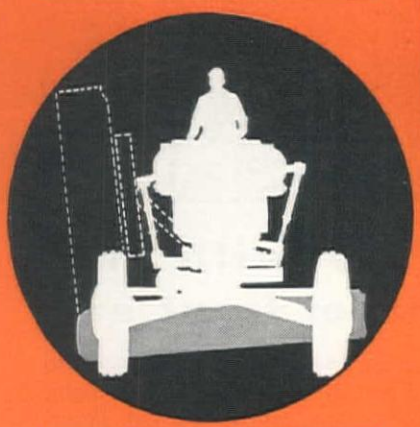
ONLY ADAMS

gives you this exclusive combination of advantages . . .

1. **8 Overlapping Forward Speeds . . . Flexible working range speeds work—increases output—provides high transport speeds.**
2. **Wide Range of Blade Positions—Without Mechanical Adjustments . . . Saves Time in Adapting Machine to Needed Cuts.**
3. **POSITIVE-ACTION MECHANICAL CONTROLS . . . Dependable, accurate adjustments—because they're geared . . . Easy, natural steering.**
4. **Ample Operating Clearances . . . Quick, easy adaptation to work . . . Operator comfort, convenience, efficiency.**
5. **Fast, Easy, Servicing Plus World-Wide Dealer Service . . . Saves time and money.**



Positive, Accurate Blade Adjustment



Free Blade Movement Without Mechanical Adjustments

Blade Angle can be Changed with Blade Loaded

The Adams mechanical control system offers a number of outstanding advantages that contribute importantly to fast, smooth, low-cost grading operations:

- Revolving gears always move positively and at uniform speed—insure positive, accurate blade adjustments of any kind, at all times.
- Extent of blade movement is not restricted as with hydraulic rams—blade moves freely from beneath grader to bank cuts, without mechanical adjustments.
- Controls are backed by full h.p. of grader engine, making it possible to change angle of blade and direction of material delivery with blade loaded. This is highly important on grade balancing work.
- Geared mechanical steering provides same natural feel and control of motor vehicles—steering is always safe, sure, easy.

This is but one of the *exclusive combination* of advantages that makes Adams Motor Graders your best buy—all ways. See your local Adams dealer for full details.

See Your Local ADAMS Dealer

CALIFORNIA DISTRIBUTORS

Bakersfield—Kern County Eqpt. Co., Inc.
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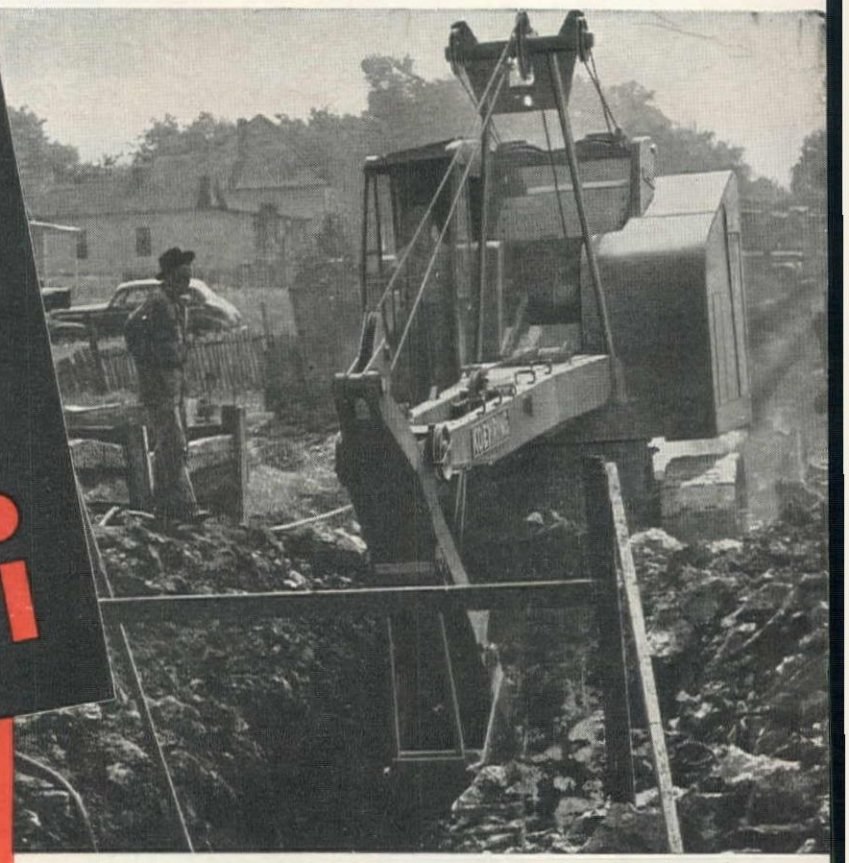
DISTRIBUTORS ALSO IN Seattle and Spokane, Washington . . . Portland, Eugene, Roseburg, Albany, Klamath Falls and Central Point, Oregon . . . Denver, Colorado . . . Phoenix, Arizona . . . Billings, Great Falls, Missoula and Kalispell, Montana . . . Boise and Pocatello, Idaho . . . Reno and Las Vegas, Nevada . . . Salt Lake City, Utah . . . Albuquerque, New Mexico . . . Fairbanks, Alaska.

KOEHRING 205

half yard PULL SHOVEL

fast • • • powerful



Husky, half-yard pull shovel dipper is 31" wide. Bottom and lip, one-piece manganese casting . . . side cutters are cast manganese, for extra-long, heavy-duty service. Teeth interchangeable with shovel.

Because both pull shovel and shovel use the same boom, this Koehring 205 combination costs 25% less than conventional units that require two separate booms.

KOEHRING HEAVY-DUTY

NO WEAVING with this rigid pull shovel front end

Extra strength, extra resistance to side-sway are built into the Koehring half-yard 205 pull shovel. You get a straight, clean ditch every time because here you have a pull shovel mounted on a rugged heavy crowd shovel boom. Front end will not weave . . . pull shovel dipper doesn't turn away from the cut, because wide, shovel-type boom point gives a wide connection to the rigid pull shovel dipper arm. Its long, deep digging reach (15' 3"), powerful half-yard bite, and easy dumping give high output.

Here are other Koehring 205 features that assure you more production at lower cost: independent traction, to travel, swing and operate boom all at the same time . . . double-fulcrum clutch, to reduce manual operating effort . . . dual-purpose boom to handle both pull shovel and crowd shovel. In addition, the 205 also can be converted quickly to dragline, clamshell, crane or pile driver . . . is available on crawlers or pneumatic tires, to suit your needs. Other Koehring pull shovel sizes: ¾-yard 304, and the big 1½-yard 605.

ASK YOUR KOEHRING DISTRIBUTOR ABOUT THE 205 HALF-YARD *TODAY*

Pacific Hoist & Derrick Co., Seattle, Wash.
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Kimball Equipment Co., Salt Lake City, Utah
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KOEHRING HEAVY-DUTY SHOVELS

CK81

KWIK-MIX 11-S and 16-S TOWER LOADERS

Now you can discharge concrete batches to forms above ground level, or direct into trucks with Kwik-Mix Tower Loader. Fits 11-S and 16-S Dandie mixers . . . discharges at 9'2" height. Big bucket holds full batch . . . is raised by power . . . dumps automatically. Mixer engine supplies power. Single-lever operated from mixer platform. Saves time and cost of overhead mixer installation.

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BAY CITIES EQUIPMENT INC., Oakland, Calif.
SAN JOAQUIN TRACTOR CO., Bakersfield, Calif.
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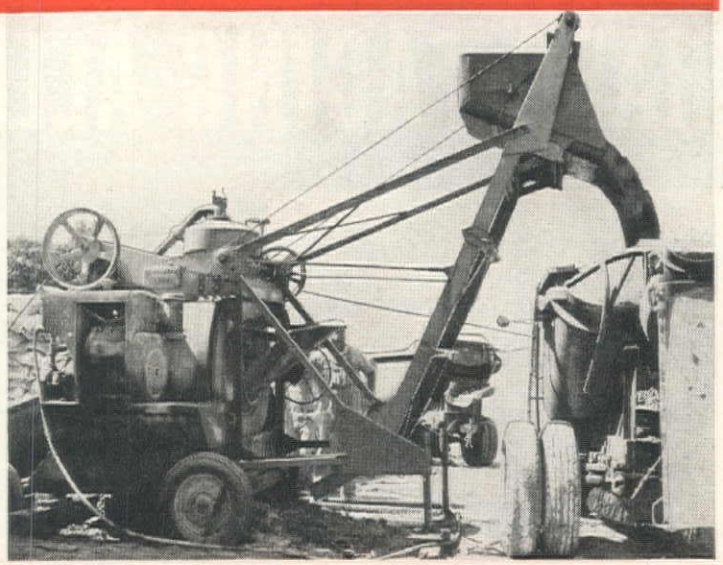

JOHNSON easy-loading and smooth operating CLAMSHELL

⅜ TO 2½ YD. heavy-duty Johnson clamshell buckets give you: FASTER OPERATION, because big needle-bearing-mounted sheaves deliver full power to cutting lips . . . BIGGER LOADS, because all-welded construction lowers center of gravity, lets teeth dig in deep. Three types: heavy-duty digging, wide-rehandling (illustrated) and general purpose. All feature sealed roller bearings sheaves for easy action and long life.

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WESTERN MACHINERY CO., Salt Lake City, Utah
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THE HARRY CORNELIUS CO., Albuquerque, New Mexico
BAY CITIES EQUIPMENT INC., Oakland, Calif.
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KING AND KRINGEL MACHINERY CORP., Denver, Colorado
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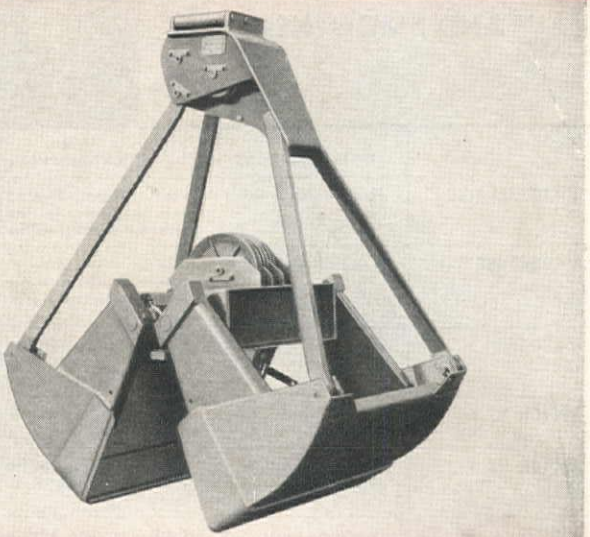

PARSONS heavy-duty, fast-digging TRENCHLINERS*

221 ladder-type Trenchliner (illustrated) digs up to 8' 6" deep, 16" to 36" wide. To deliver maximum production for the type of materials and size trench being exacvated, you have a selection of digging speeds from 5" to 146" per minute. For job-to-job travel, you get high-traction speeds from 1½ to 3¼ m.p.h. Get complete facts about the 80 Trenchmobile . . . the 200 wheel-type . . . 250 and big 310 ladder Trenchliners. *Reg. Trademark

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WESTERN MACHINERY CO., Spokane, Washington
COLUMBIA EQUIPMENT CO., Boise, Idaho; Portland, Oregon
HARRON, RICKARD & McCONE CO. of So. Calif., Los Angeles, Calif.
MOORE EQUIPMENT CO., Stockton, North Sacramento, Calif.
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KIMBALL EQUIPMENT CO., Salt Lake City, Utah
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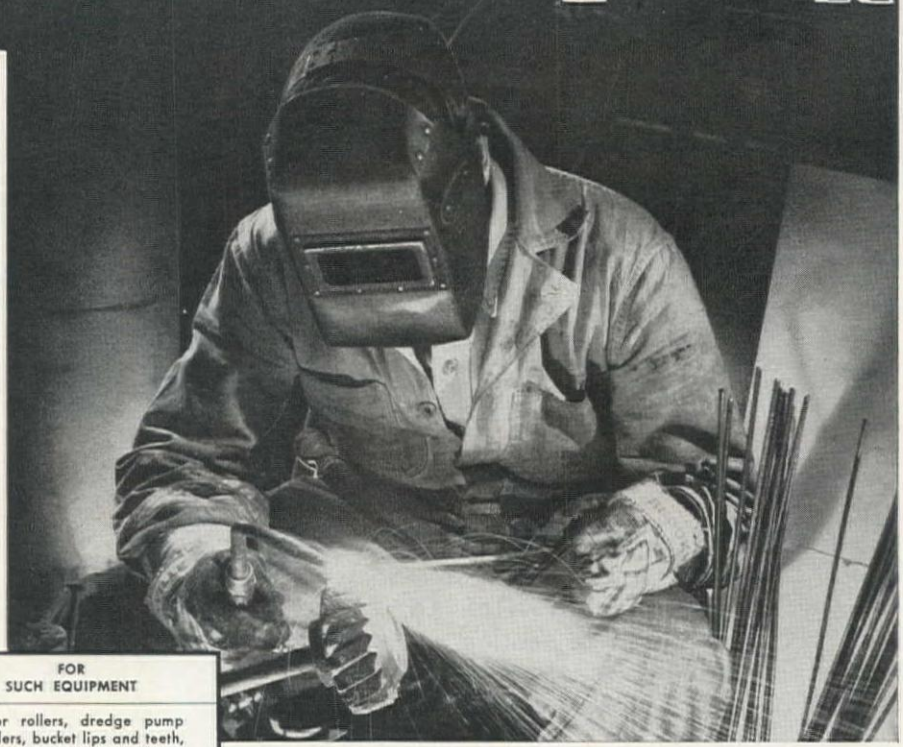
TRY THESE HARD-FACING ALLOYS BY VICTOR

Made to *stretch working life* of cutting, drilling, and crushing equipment wherever *abrasion, impact, corrosion* and *heat* are encountered.

THEY ARE FASTER AND SMOOTHER!



	FOR THESE CONDITIONS	FOR SUCH EQUIPMENT
VICTORALLOY	Abrasion and severe impact	Tractor rollers, dredge pump impellers, bucket lips and teeth, rock crushers, steel mill wobblers
VICTORTUBE	Severe abrasion	Scarifier teeth, dredge cutter blades, posthole augers, oil field tools, ditcher teeth
VICTORITE	Earth abrasion or sliding friction	Plowshares, cultivators, steel mill guides, cement chutes, shaft bearings, rolling mill guides
VICTOR HS 1	Corrosion, heat and abrasion	Saw-teeth, carbon scrapers, wire guides, rocker arms
VICTOR HS 6	Red heat, impact, corrosion and abrasion	Blanking, forming and trimming dies; cams, hot punches, pump shafts
VICTOR TUNGSMOOTH	Thin cutting edges	Coal cutter bits, brick augers, pug-mill knives, screw conveyors

Available in a full range of sizes for both acetylene and electric AC and DC application. Try VICTOR hard-facing rods on your own job NOW. Save money two ways; (a) in time . . . application is faster and smoother; and (b) by stretching the life of equipment used under severe operating conditions. Order a supply from your dealer TODAY.

VICTOR EQUIPMENT COMPANY

ALLOY ROD AND METAL DIVISION

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VICTOR's line of welding and cutting equipment is complete. For data on items you are interested in, just fill in coupon.

VICTOR

Welding & Cutting Equipment

SINCE 1910

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We want to know more about these items:

- ☐ Hard-facing alloys.
- ☐ Welding and cutting units. ☐ Portable flame cutting machines.
- ☐ Gas regulators. ☐ Air filter-regulator-lubricator units.
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Barber-Greene

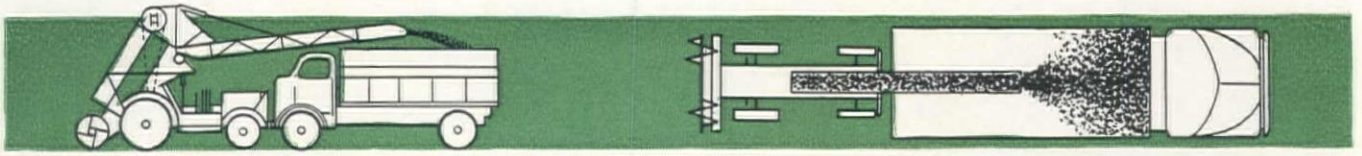
B G MODEL 543

Presents the New... Big...Faster

ALL-MATERIAL TRUCK LOADER

85028

WITH HYDRAULIC LOAD TRIMMER



LOADS HIGHEST, LONGEST TRUCKS, TRAILERS AND RAILROAD CARS

- 3 Yards per minute Loading
- Low Overall Height—12'-0"
- 15 M.P.H. Road Speed
- 4-Wheel Tractor Type Chassis
- Hydraulic Swivel Conveyor
- Hydraulic Brakes and Hoist
- 48 H.P. Engine
- 8' Wide Cleanup
- Convertible to 7-11 yd/min. Snow Loader

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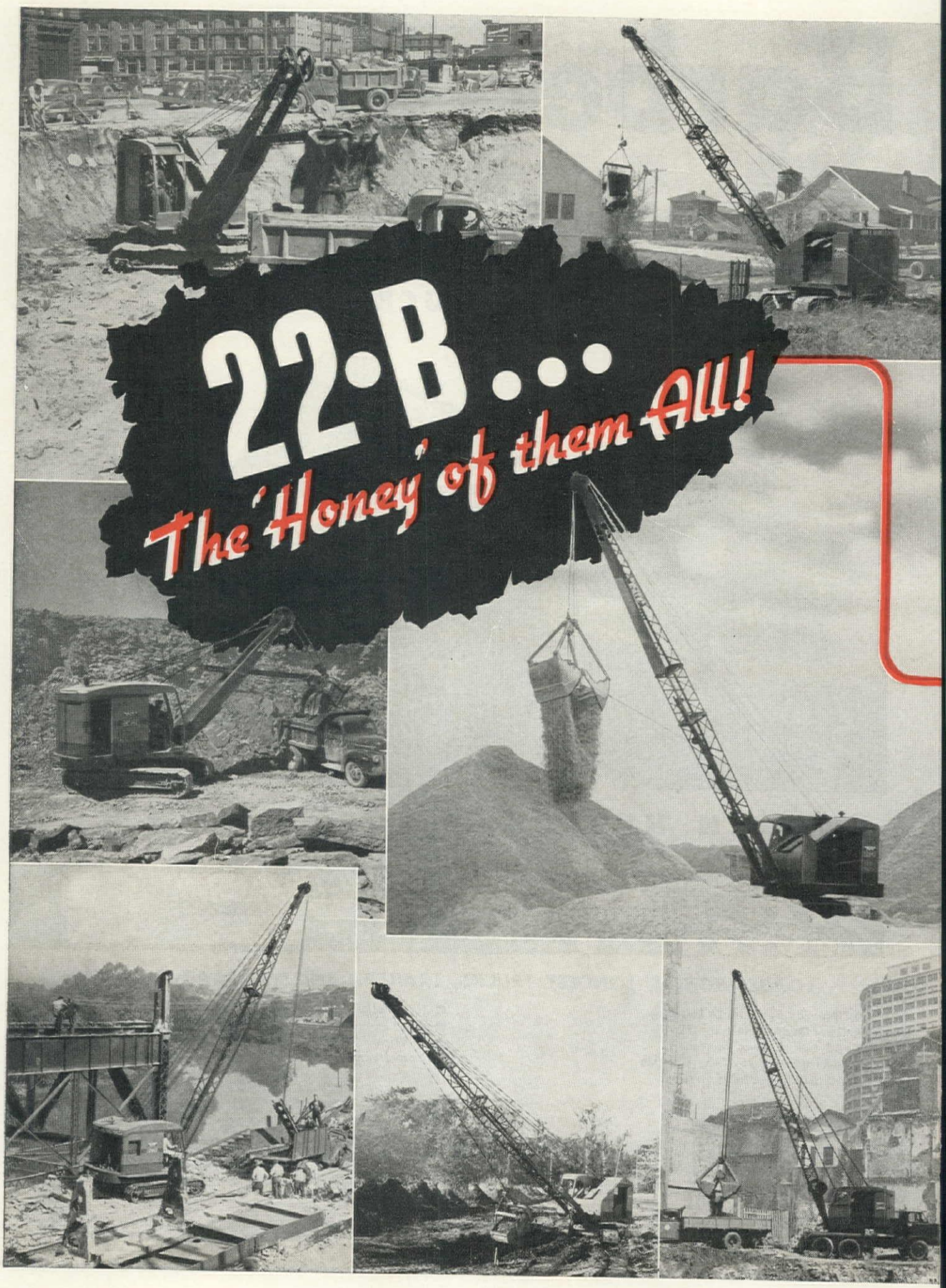
22-B...
The 'Honey' of them All!

Ask owners—they'll tell you that no other ¾-yd. excavator can match 22-B speed, control, durability, or OUTPUT in all types of digging.

Bucyrus-Erie Co.

South Milwaukee, Wis.

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See Your BUCYRUS ERIE Distributor

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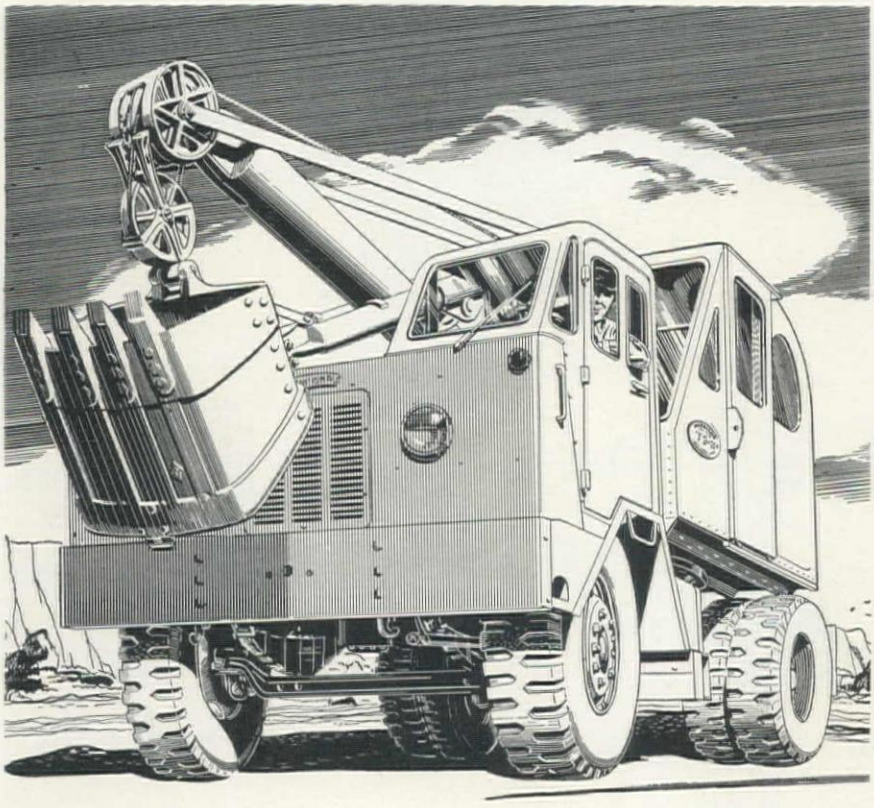
SHOVELS • DRAGSHOVELS • DRAGLINES • CLAMSHELLS • CRANES



Any MICHIGAN owner will tell you

—why he bought a Michigan Truck Excavator. It could have been Michigan's famous mobility . . . the heavy duty Michigan truck chassis . . . high yardage through air controlled clutches . . . cast steel turntable base . . . hook rollers . . .

But why not let a Michigan owner tell you in his own words. Your local Michigan dealer welcomes the opportunity to show you the most complete line of ⅜ and ½ yard excavators available. It will pay you to get in touch with him *today*.

MICHIGAN
POWER SHOVEL COMPANY
430 Second Street
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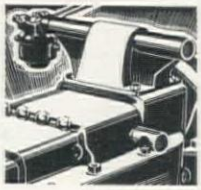
EASY STEERING
Heavy duty worm and roller steering gear, 20-inch steering wheel, minimize steering fatigue and help you thread through traffic easier, get around on the job faster.



EASY SHIFTING
Smooth meshing gears, no "fighting" the shift-lever or clutch pedal. Auxilliary transmission provides multiple speed range for every highway condition, for tough off-the-road travel.

POSITIVE TRACTION
Big, traction-tread tires easily pull you through deep sand, mud or heavy snow without delays. Their high-flotation takes you over soft ground with far less chance of bogging down.

COMFORTABLE CAB
Operators like it! Plenty of leg and elbow room for big men. Wide angle visibility through big, rubber-set windshield and windows. Familiar, automotive-type controls.

SEE YOUR MICHIGAN DISTRIBUTOR

STEFFECK EQUIPMENT CO., INC.
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MODERN MACHINERY CO., INC.
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MICHIGAN SALES & SERVICE CO.
1506 Fifteenth Avenue West
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ARIZONA EQUIPMENT SALES, INC.
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CONTRACTORS' EQUIP. & SUPPLY CO.
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and
P. O. Box 2039, El Paso Texas

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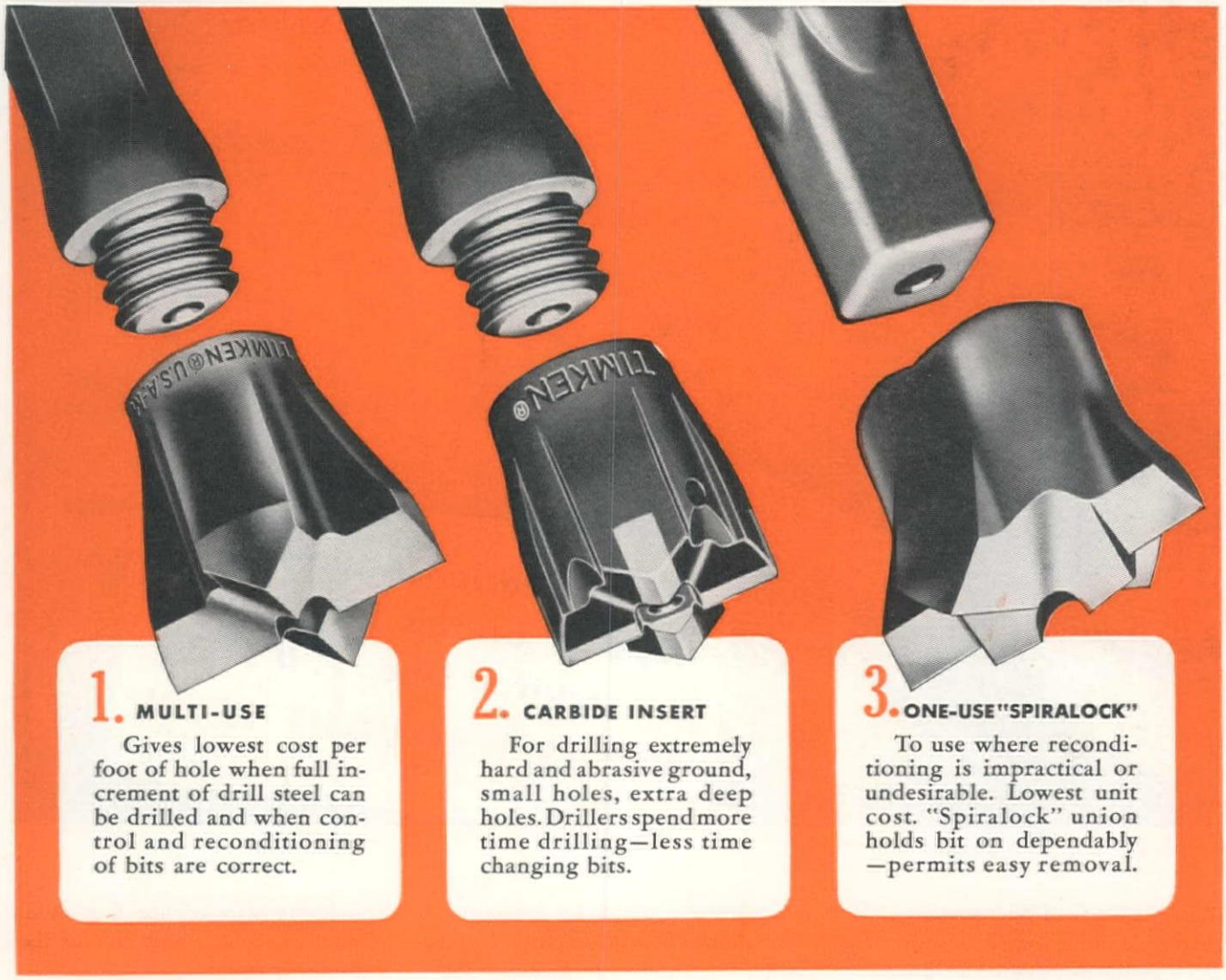
JAMES CASHMAN
107 N. Main Street
Las Vegas, Nevada

Only TIMKEN® offers all 3 rock bit types



1. MULTI-USE

Gives lowest cost per foot of hole when full increment of drill steel can be drilled and when control and reconditioning of bits are correct.

2. CARBIDE INSERT

For drilling extremely hard and abrasive ground, small holes, extra deep holes. Drillers spend more time drilling—less time changing bits.

3. ONE-USE "SPIRALOCK"

To use where reconditioning is impractical or undesirable. Lowest unit cost. "Spiralock" union holds bit on dependably—permits easy removal.

and a complete Rock Bit Engineering Service!

WHICH type of rock bit is best for *your* job? Let the Timken Rock Bit Engineering Service help you decide.

Timken Rock Bit Engineers have had years of experience in mining, quarrying, and construction. And with *all three* rock bit types to draw upon, you're sure of getting the bit performance your job demands, whether it be lowest bit cost, lowest cost per foot of hole, greatest possible drilling speed, or any other desired advantage.

Whichever type of Timken bit you select, you are assured of top quality. Every Timken bit is made of Timken electric furnace steel, with uniform hardness for longer wear, better cutting.

Free Booklet! For detailed information on Timken removable rock bits, write on your company letterhead for this new Timken booklet. The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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

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

When the city of Watsonville, Cal., made plans for a new sewage outfall line, the designers had the finest guide in writing specifications that anyone could ask: a previous outfall line, installed 25 years ago, and still in good condition.

With this to go on, the City Engineer, H. B. Kitchen, used 16-inch Byers Wrought Iron pipe. To aid in overcoming buoyancy, and to give extra protection against the abrasive action of shifting sands, the outermost 800 feet of the line was wrapped with steel mesh, and covered with gunited sand and cement. The next 600 feet was wrapped with steel mesh, inclosed with 8-gage steel casing, and the space filled with cement grout. As successive lengths were added by welding, the line was towed out to sea, riding on the small carriages shown in the illustration. The pipe was fabricated from ⅜ and ½-inch wrought iron plates by Pittsburgh-Des Moines Steel Company. Installation was handled by Granite Construction Company.

The use of wrought iron for outfall lines is wide-spread, and the reason is found in the excellent service records that the material has established. Wrought iron has an unusual structure, that makes it unusually effective against the corrosion encountered both from sea water, and from sewage. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity metal, halt and disperse corrosive attack, and so discourage pitting. The fibers also anchor the initial protective scale, which shields the underlying metal.

Descriptions of several wrought iron outfall line installations are included in our bulletin WROUGHT IRON FOR SEWAGE TREATMENT AND DISPOSAL INSTALLATIONS. We will be glad to send a copy on request, and to provide added detailed information if you wish it.

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

CORROSION COSTS YOU MORE THAN WROUGHT IRON

BYERS

GENUINE WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

T6 TRAXCAVATOR IS "One Man Band"!

This T6 TRAXCAVATOR'S tractor teammate carries a skull-cracker that breaks old slab. Next the T6 strips and truck-loads the broken concrete. No other piece of equipment can match the effectiveness of a TRAXCAVATOR on old pavement stripping — either concrete or blacktop.

A big TRAXCAVATOR is always profitably busy. It prepares subgrade — excavates for new culverts — back-fills sewer trenches — sprints all over the job dressing shoulders, shaping driveways, helping landscape and clean up. TRAXCAVATORS also help produce, stockpile and load aggregates — and charge hoppers.

Big TRAXCAVATORS, the T6 or T7, can thriftily handle the functions of a fleet of large, limited-duty machines. Lively, tractor-powered "crowd" on the TRAXCAVATOR'S bucket, enables digging and excavating tough clay or frost; loading shot-rock!

The T6 and T7 are *unit engineered* to match "Caterpillar" D6 and D7 tractors in capacity, low upkeep and long life. The 5 TRAXCAVATOR Models (1/2 to 4 cubic yards capacity) provide the only complete tractor-excavator line — give you a size choice for every job and purpose.

Ask your TRACKSON-"Caterpillar" Dealer to recommend the unit that fits your needs, or write direct to TRACKSON COMPANY, Dept. WC-70, Milwaukee 1, Wisconsin.

TRAXCAVATOR® *The Original Tractor Excavator*

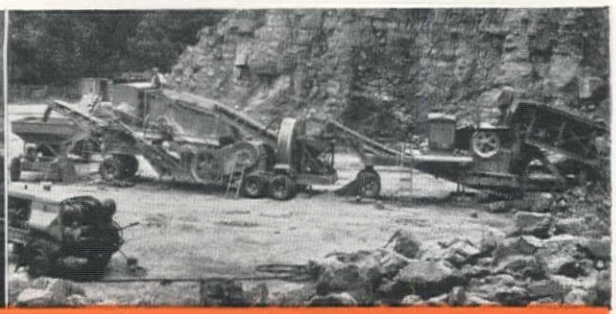
4 TOP PRODUCERS THAT INVITE COMPARISON

1 TwinDual Pacemaker Rock Plant

2 TwinDual Gravel King — three stages of crushing, two screens for pits with large boulders

3 TwinDual Master Gravel Plant—double the output of conventional two-stage plants of comparable size and weight

4 TwinDual Secondary with 546P Primary. High capacity with two portable units for quarry operation



UNIVERSAL'S TWINDUAL PLANTS FOR ROCK AND GRAVEL

Out in front! Universal TwinDual Plants are breaking production records and cutting costs per ton on finished aggregate.

Universal "Stream-Flo" engineering does it with the TwinDual Method — the modern system of crushing and screening that gives three full stages of reduction with only two crushers. You get more production, less jaw and roll shell wear, longer life, less maintenance.

Before you make an investment in a crushing, screening and loading plant for rock or gravel investigate the profitable bonus you get with a TwinDual installation. Compare TwinDual Plants with the field. Get the facts now.

How many crushers do you need for 3 full stages of reduction?

The TwinDual Method does it with two—
First Stage—Jaw Crusher
Second and Third Stages—TwinDual Rolls

UNIVERSAL ENGINEERING CORP. division of PETTIBONE MULLIKEN CORP.

323 Eighth St. N. W., Cedar Rapids, Iowa
Phone 7105

4700 W. Division St., Chicago 51, Illinois
Phone SPaulding 2-9300

Arizona Equipment Sales, Inc.....Phoenix, Arizona
Industrial Equipment Co.....Los Angeles 11, Calif.
Bay Cities Equipment, Inc.....Oakland 7, Calif.
Nevada Equipment Service, Inc.....Reno, Nevada
The Harry Cornelius Co., Albuquerque, New Mexico
J. K. Wheeler Machinery Co., Salt Lake City 1, Utah
Cheyenne Truck Equip. Co.....Cheyenne, Wyoming

it's made of sheet aluminum . . . it's worth many times its weight in gold

This little plate, on the truck mixer that supplies your job, guarantees its capacity to thoroughly *mix* and *agitate* as well as to deliver a full rated load.

This means that it has the proper drum design, accurate water control and speed of revolution, and the full specified amount of *free mixing space* proved necessary to produce quality concrete.

It is one simple, sure protection which the $250,000,000 ready-mixed concrete industry offers architects, engineers and other users against questionable concrete delivered by non-standard truck mixers.

Insist upon this rating plate on the truck mixers that supply *your* job.

* *The Bureau rating plate is available to any manufacturer who meets its quality standards and requirements.*

Affiliated with The National Ready Mixed Concrete Association

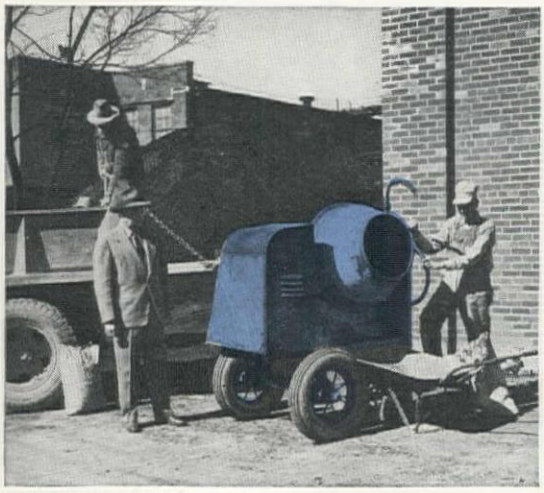
BLAW-KNOX DIVISION
Pittsburgh, Pa.
CHAIN BELT COMPANY
Milwaukee, Wis.
CONCRETE TRANSPORT MIXER CO.
St. Louis, Mo.
THE JAEGER MACHINE COMPANY
Columbus, Ohio
WORTHINGTON PUMP & MACHINERY CORP.
Dunellen, N. J.
THE T. L. SMITH COMPANY
Milwaukee, Wis.

Truck Mixer Manufacturers Bureau

BLUE BRUTE USERS AGREE:

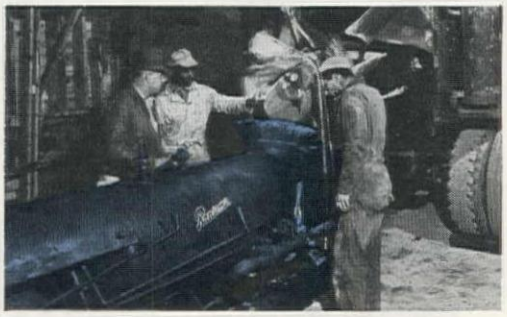
"It's a Great Line of Mixers!"

FOR CENTRAL MIXING This modern plant of the Clark Certified Concrete Company, Inc., of Baltimore, Md., produced 125,000 yds. of pre-mixed concrete during the past year. Vice-President Duncan writes: **"Your Blue Brute 84-S Stationary Mixer has proven entirely satisfactory. Maintenance costs have been practically nothing."**



FOR PORTABLE MIXING. Le Roy W. Vival, chief engineer of the O'Sullivan Rubber Corporation, Winchester, Va., reports: **"We are extremely gratified by our Blue Brute 3½S Tilting Mixer, which has had two years of constant, severe use. It is extremely mobile, well constructed and performs excellently. Long exposure has not decreased its efficiency. The mixing cycle is fast and the mix consistently uniform. It is a pleasure to endorse and recommend this equipment."**

FOR TRANSIT MIXING. President Bob McCorkle of the Abilene, Texas, Concrete Company, gives his reasons for re-ordering Blue Brute Hi-Up Truck Mixers: **"We have compared competitive makes on our jobs and find your Hi-Ups best in every way. Maintenance costs have been negligible. Just purchased your first chain-drive Hi-Up and find it even better than the older machines — faster charging and discharging, easier to maintain and smoother running."**



FOR PLACING. In building the Washburn vehicular tunnel under the Houston, Texas, ship channel, the "Trench method" of construction was used. The last yard or two of concrete placed in each of the section joints had to be placed *straight upwards* — a tricky pouring problem. Merritt-Chapman & Scott Corporation reports **an easy solution was found with the aid of a Blue Brute Pneumatic Placer, which performed excellently.**

Yes, among Blue Brute owners it's a never-ending story of more concrete at lower cost, trouble-free operation, time and money saved in every detail of mixing operations. Why not look into this proof that *there's more worth in Worthington*? See your nearby Worthington-Blue Brute Distributor, or write for bulletins on mixer types in which you're interested.

NATIONAL READY MIXED CONCRETE ASSOCIATION NRMCA

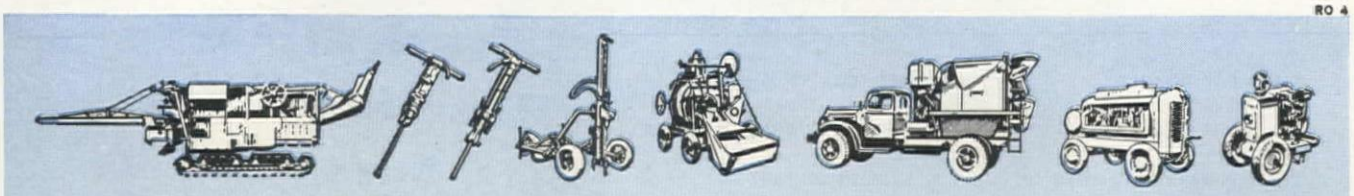
Worthington Pump and Machinery Corporation
Construction Equipment Department
Harrison, New Jersey

Distributors In All Principal Cities

WORTHINGTON

BUY BLUE BRUTES

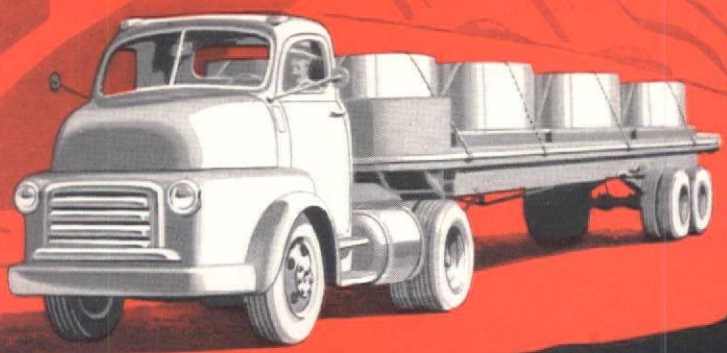
RO 4



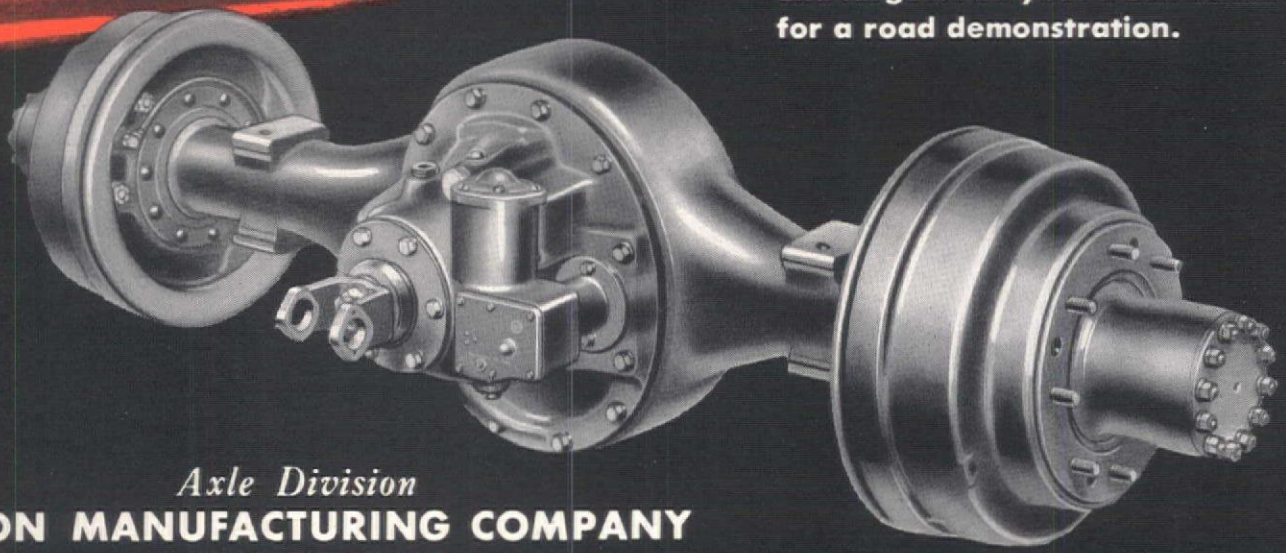
IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

Trucks get there *FASTER* at Lower Cost with ... EATON

2-Speed Truck AXLES



By combining pulling power and speed, Eaton 2-Speed Axles add to truck utility and permit faster trips, more pay-load miles—on the highway or off. Eaton Axles reduce stress and wear on engines and all power transmitting units. This means longer life and minimum maintenance cost... and Eaton's planetary design adds thousands of miles to *axle* life. Gear tooth loads are better distributed; gear speeds are slow; stress and wear are held to a minimum. Eaton Axles are available for most trucks of 1½ tons and larger. Ask your truck dealer for a road demonstration.



Axle Division

EATON MANUFACTURING COMPANY

CLEVELAND, OHIO

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

Save time, money, & headaches on Concrete Jobs with NOBLE STEEL FORMS

NOBLE'S steel forms experts are ready to help you estimate steel form costs on such concrete construction jobs as siphons, walls, conduits, tunnels, gravity or multiple arch dams. Practical designing and custom-building are a part of the job — and you get these plus-values in NOBLE steel forms installations:

Horseshoe tunnel form, 8'x6', designed and built by NOBLE for Platora Dam Outlet Works. Contractor, Hinman Bros. Construction Co., Denver.

Tunnel form with 4-foot circle, 6 feet deep, built by NOBLE for Campbell-Bennett, Ltd., Vancouver, B. C.

QUICK INSTALLATION—All NOBLE forms are shop-fitted at the factory, then marked, so on-the-job assembly is easy and fast.

SMOOTH WALLS—Joints of all skin plates are carefully fitted and ground smooth, so walls are free of ridges or indentations. Tunnel forms have doors at top and sides, making it easy to use vibrator while pouring. Doors open into tunnel, shut with positive wedge lock, do not protrude beyond skin plate when locked.

SAFETY FACTOR—NOBLE forms are designed and built with a safety factor of 2 to 4 times the load actually expected on your job. They are quickly stripped and moved.

FAST DELIVERY—We have 2 specialties . . . Steel Forms and Batching Equipment; on either we can make fast delivery.

HELP BEGINS WITH ESTIMATING

NOBLE engineers are ready to help you at every step—from estimating to trouble shooting. Call on us NOW. No obligation, just wire, write, or phone Steel Forms Division, Box

DESIGNERS AND BUILDERS OF

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

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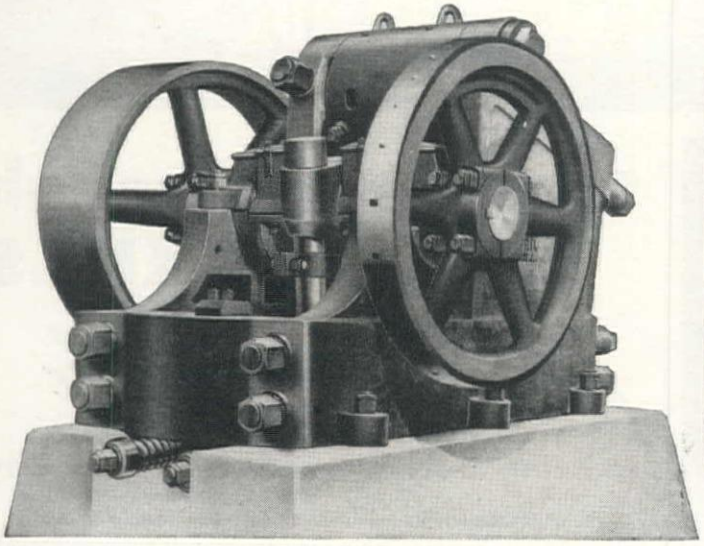
STAR MACHINERY COMPANY, Seattle; ENGINEERED SALES, San Antonio; HALL-PERRY MACHINERY COMPANY, Butte; RAY L. HARRISON CO., Albuquerque; LOGGERS & CONTRACTORS MACHINERY CO., Portland; EQUIPMENT SALES CORP., Oklahoma City, Okla.; TRI-STATE EQUIPMENT CO., El Paso; TRI-STATE EQUIPMENT CO., Spokane; J. K. WHEELER MACHINERY CO., Salt Lake City; CONNELL BROS., LTD., San Francisco; SIERRA MACHINERY CO., Reno, Nevada

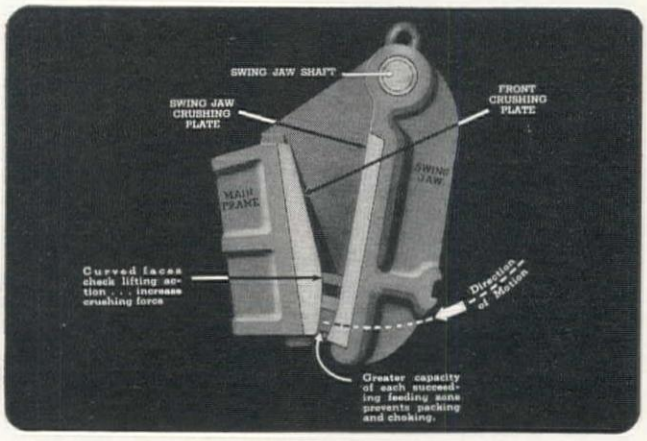
TRAYLOR CURVED JAW CRUSHER PLATES

more than double aggregate production

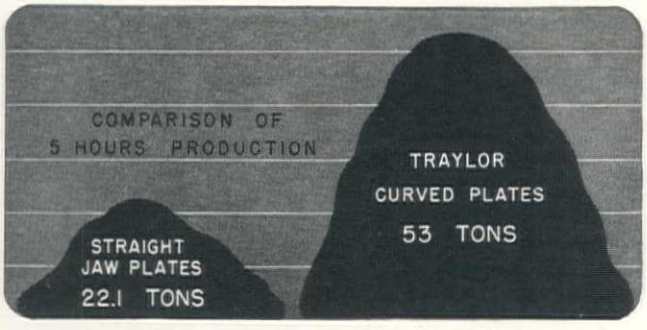
. . . cut costs per ton more than half



A 12" x 24" Blake type crusher with ordinary straight jaw plates required 12 hours to reduce 53 tons of rock. The same crusher . . . at the same setting and with the same stone . . . stepped up production to 53 tons *in just five hours* after being fitted with Traylor *Curved* Jaw Plates.



The faces of Traylor *Curved* Jaw Plates are scientifically proportioned so that the faces are opposed to the line of motion. Lifting and churning are eliminated . . . all power is used for crushing. Choking is prevented by the increasing size of each succeeding feeding zone. Only Traylor *Curved* Jaw Plates offer these advantages.



This graph tells the story. For every ton per hour that was crushed with straight jaw plates, 2.4 tons were crushed with Traylor *Curved* Jaw Plates. That means a reduction of 58% in operating cost!

On-the-job stone production is more dependable . . . costs less with TRAYLOR JAW CRUSHERS

Work moves on schedule with a Traylor Jaw Crusher on the job. If you are losing valuable time because of delays in stone production . . . if your aggregate costs are running too high . . . investigate a Traylor Jaw Crusher. Outline your requirements . . . we'll gladly send you a free bulletin on the Traylor Crusher best suited to your needs.

Traylor

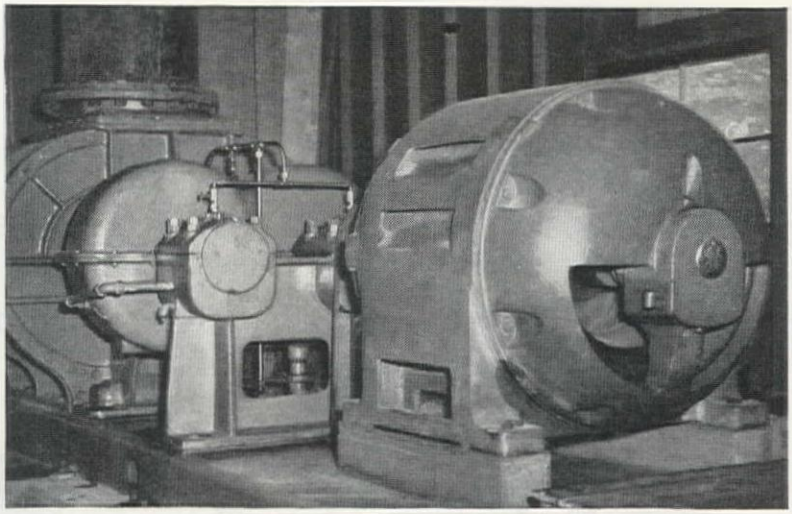
Jaw, Reduction and Gyratory Crushers
Rod Mills . Crushing Rolls
Apron and Grizzley Feeders

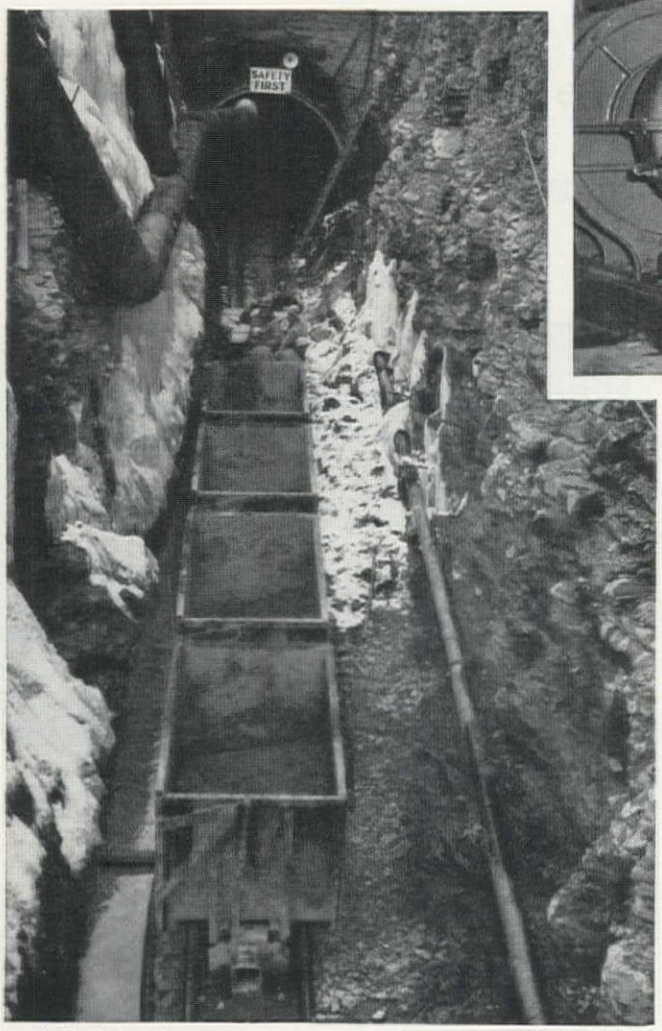
TRAYLOR ENGINEERING & MANUFACTURING CO.
361 Mill St., Allentown, Pa.

West Coast Branch: 919 Chester Williams Bldg., Los Angeles, California.
Northwest Distr.: Balzer Machinery Company, 2136 South East 8th Ave., Portland, Oregon.

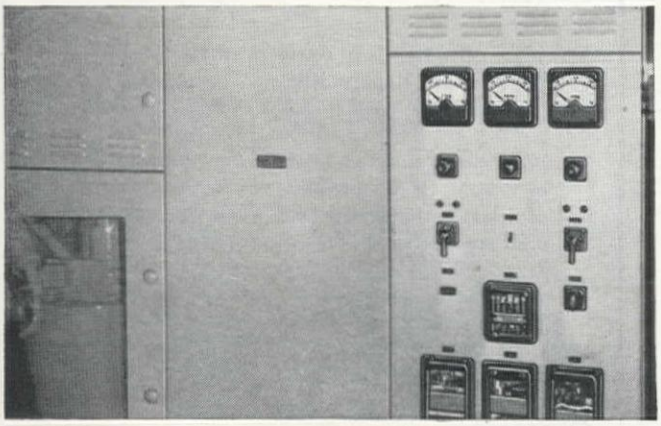
A "TRAYLOR" LEADS TO GREATER PROFITS

Ventilation for the Delaware Aqueduct tunnel is provided by blowers driven by sturdy G-E 200-hp induction motors. ▶





▲ Muck is efficiently hauled by 18 G-E battery and battery-trolley locomotives.



▲ Adequate d-c power for trolley service is obtained from eight G-E 150-KW stationary mine-type mercury-arc rectifiers specially designed for this project.

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: 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.

tunneling through the CATSKILLS

... Electrically

to bring more water to New York City

Adding 300 million gallons a day to New York City's water supply is a big job no matter how it's done. To help bring it from the Delaware River, the Walsh Construction Co. and B. Perini and Sons must bore 25 miles through the Catskill Mountains. At about 70 feet a day, they've still a long way to go, but expect to complete the job around July 1955 with *electrified* equipment co-ordinated and engineered by General Electric.

Every day, more contractors are looking to reliable *electrified* equipment for flexibility, safety, and ease of maintenance. With equipment driven by G-E motors and control, and supplied from G-E power distribution systems they get modern *electric drives* with the added advantages of G-E engineering assistance in application, installation and service. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

Ask him Today!

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

GENERAL ELECTRIC

664-10

"there's a great piece of machinery-

FOR DIGGING IN ROCK OR EARTH"

L-B-S OWNERS ARE GREAT L-B-S FANS

There's not much room in the contracting business for sentimentality, but in my travels around the country I find that Link-Belt Speeder owners have the same affection for their Link-Belt Speeder Shovel-Cranes that old time contractors felt for their hard working horses . . . and for the same reasons . . . Owners respect and admire faithful and dependable performance.

IT'S THE LINK-BELT SPEEDER LS-85

— The Super ¾ Yd. Shovel-Crane

When Otto Ashbach & Sons of St. Paul shipped their LS-85 to Decorah, Iowa to excavate 10,000 yards of rock, they knew that this shovel would do the job right, and at a profit . . .

Because they had learned years ago that Link-Belt Speeders are dependable and hard working—and have the speed to set good performance records.

After operating Link-Belt Speeders for 11 years, Ashbach superintendent, Clifford Cleveland, said to me: "I think Link-Belt Speeders will out perform any other machine."

I had heard those words many times before from owners, superintendents and operators, and once again I had a good report for the folks back home.

11,945

LINK-BELT SPEEDER

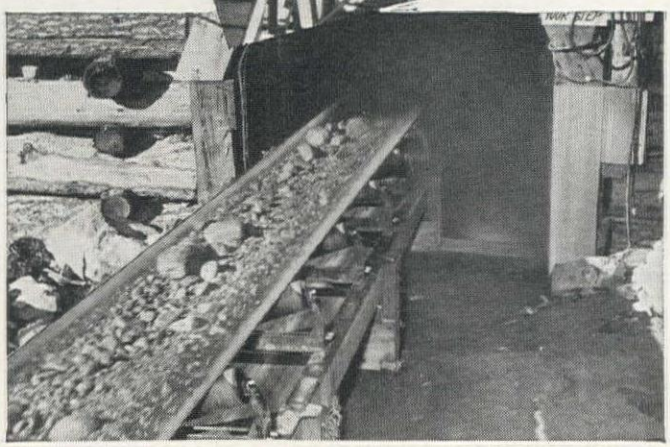
LINK-BELT SPEEDER CORPORATION, CEDAR RAPIDS, IOWA

Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

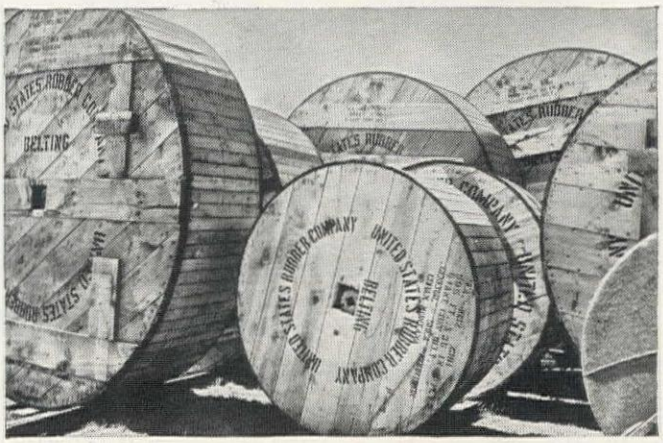
HUNGRY HORSE DAM FED BY "U.S." BELTING

Nearly 6 million tons of sand and gravel will be carried to site of mammoth job in Northwestern Montana—on U. S. Rubber Belting

NEARLY THREE MILES of U. S. Rubber Conveyor Belting, varying in width from 24" to 42", is used in all the phases of aggregate processing at the Hungry Horse Dam. Above is shown a series of the belts carrying sized materials to the storage piles.



UNITED STATES RUBBER ENGINEERS worked with the constructors of the dam and the designers of conveyor equipment to produce this highly efficient conveyor system. ALL the belting used to "feed" Hungry Horse was furnished by U. S. Rubber.



A FEW OF GIANT crates in which belts were shipped give an idea of the tremendous footage of belting—over 15,000 feet—used at Hungry Horse, country's third largest concrete dam when completed. It is being built for the U. S. Bureau of Reclamation.

Whenever you have a problem involving materials handling, no matter how big or small, get in touch with our engineers. They will gladly cooperate with your own men in working out a solution. Write to:

A DEVELOPMENT OF

U.S.RUBBER

SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

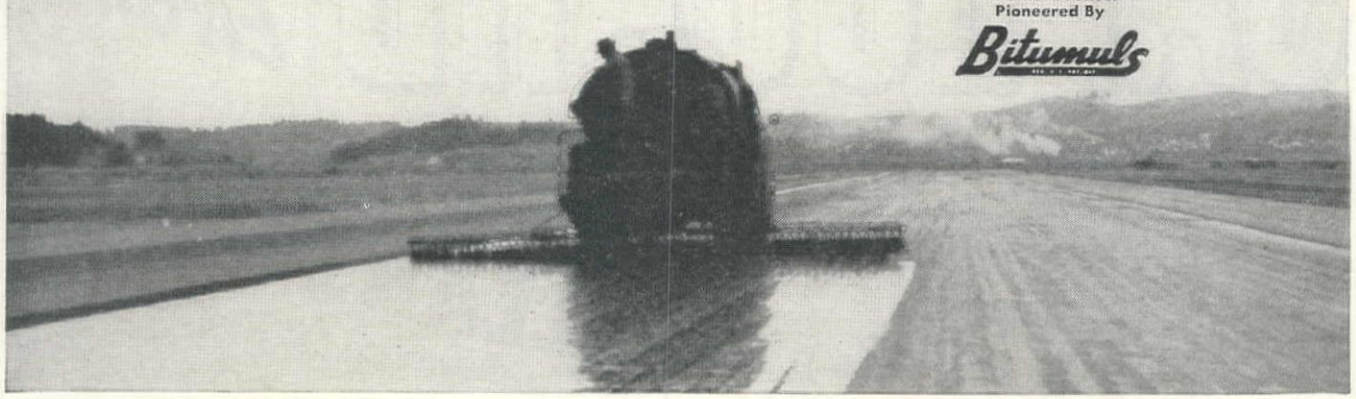
MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Bitumuls HV

REG. U. S. PAT. OFF.

High Viscosity
Asphaltic Emulsion
for Surface Treatment

Another Product
Pioneered By
Bitumuls



QUIZ for Paving Engineers

How do YOU answer these questions?

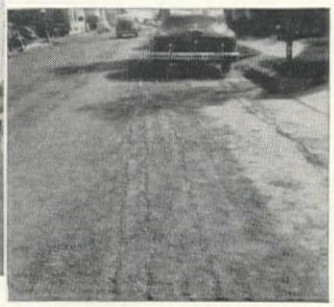
1. **Can you hold wet, round gravel or large aggregate with your present binder?**
2. **Does your binder stay on the road, when "shooting" a steep grade or high crown?**
3. **Are your surface treatments rugged, non-skid, and vapor-permeable?**

If your answer to all three questions is "Yes", you must be using *Bitumuls HV*—a "High Viscosity" asphaltic emulsion that is now used by a majority of State Highway engineers, because it really holds the aggregate, large or small, wet or dry.

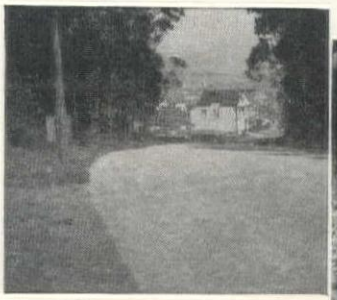
Precise application is easy. No excess binder to cause fatness or slippery pavements—or to act as a vapor barrier retarding drainage by upward evaporation. You get a non-skid, vapor-permeable seal.

If You have not used "HV", try it on one job—you, too, will adopt it.

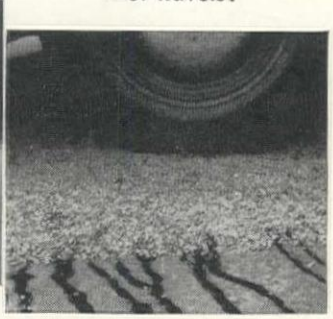
1. Stone Held?



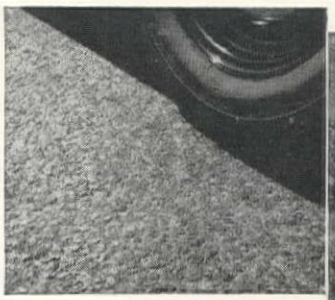
—or Ravels?



2. Binder stays put?



—or Runs Off?



3. Rugged & Non-skid?

—or Fat & Slippery?

The ASPHALT Twins

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STANCAL ASPHALT & BITUMULS COMPANY
200 BUSH STREET · SAN FRANCISCO 4, CALIF.
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SAFEGUARD YOUR ENGINE

CLEANS as it PROTECTS as it LUBRICATES

NEW TYDOL HEAVY DUTY COMPOUNDED MOTOR OILS FOR GASOLINE, DIESEL AND BUTANE ENGINES

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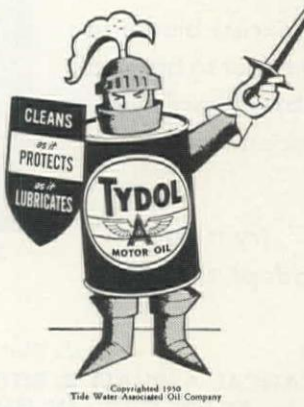

Check these Tydol safeguards

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- ✔ Contains anti-foam agent and assures positive lubrication. Low oil consumption.
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- ✔ Provides cleaner filter elements.
- ✔ Non-corrosive to alloy bearings and other engine parts.
- ✔ *Cleans* as it *protects* as it *lubricates.*

Call your Associated Representative for expert help on any lubrication problem.

TIDE WATER ASSOCIATED OIL COMPANY

3/4 YARDS OF *Speed, Power, Hang-on*

Look at a Lorain TL-25 . . . on the job . . . compare its performance with any other 3/4-yd. machine. Watch it dig! Watch it swing! Watch it bite into tough material! You can see it's faster, more powerful, with the stamina to hang-on until the 3/4-yard dipper is heaped. Lorain TL-25's easily prove their ability to out-perform others everywhere they work. And here are "built-in" reasons that make them the leaders of their class!

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DODGE trucks are "Job-Rated" for extra savings!

You can enjoy rock-bottom transportation costs and a brighter profit picture when you invest in a Dodge "*Job-Rated*" Truck.

You'll get a truck that's "*Job-Rated*" to provide peak performance at lowest possible cost on the toughest of assignments.

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Your Dodge dealer can help you bridge the gap between profits and losses by showing you a truck that's sized to your job. It will be "*Job-Rated*"! See him soon.

With all their extra value **DODGE** *"Job-Rated"* **TRUCKS** *are priced with the lowest*

8 Yards Per Minute

The Eimco 104 RockerShovel, equipped with a two yard sand and gravel bucket, averages 8 yards per minute. The 104 is a fast, efficient, heavy-duty loader for rock, sand, gravel or other materials.

Available with either electric or Diesel power, the 104 is delivered ready to operate. The operator controls the bucket with one simple convenient handle, and may bring the bucket up slowly to dribble the load into small trucks or fast to throw the load back into long trucks. For low-cost, dependable loading write for Bulletin L1021 on Sand and Gravel or see your Eimco "Caterpillar" Dealer.

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A254


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IN ENGINE WEAR
—ABOUT TWO OUNCES—
WILL RUIN YOUR ENGINE
Your engine weighs hundreds of pounds, but the loss of 2 ounces by wear — little more than the weight of the canary — will ruin it!
It's Acid Action - not friction - that causes most engine wear
Shell Research discovery counteracts Acid Action, prolongs engine life
• Few realize it's corrosive Acid Action—not friction—that causes up to 90% of engine wear. In typical "on and off" operation, your engine never warms up to efficient operating temperature.
Combustion is incomplete. Partially burned fuel gases and moisture attack the metal surfaces *chemically*. Shell scientists worked 9 years developing a new, unique "X" safety factor to counteract this biting acid.
Now 2½ millon miles of road testing, plus millions of miles of use by motorists, have proved that Shell X-100 Motor Oil prolongs engine life. This oil, long famous for its protection at sustained high speed, now brings this additional safeguard for every mile you drive.
For passenger cars and light trucks
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P&H TRUCK CRANES

STABILITY is the true test of a truck crane's value. Stability is what you get in a P&H — the ability to handle more on the hook . . . tackle a wider range of jobs.

STABILITY is designed into both the crane *and* carrier — with lower center of gravity, better weight distribution, exclusive torsion bar-mounted front axle. All these and more P&H Added Value Features mean you profit more from the machine.

DUAL POWER gives you the *right* engine combination for swifter travel and faster work. With P&H simplified front end attachments you can quickly convert for all these services: crane, shovel, dragline, trench hoe, clamshell and pile driver.

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GREATER STABILITY — with exclusive torsion bar-mounted front axle and lower center of gravity.

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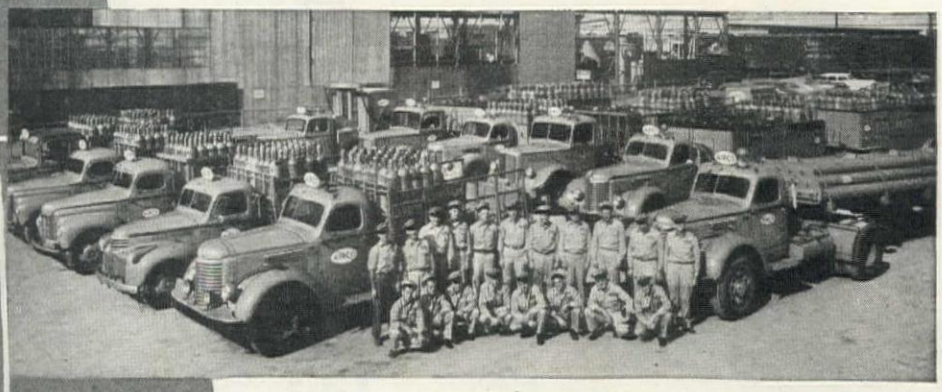

...assuring dependable oxygen and acetylene deliveries – from 234 supply points in 187 cities

Wherever your plant is located on the Pacific Coast you can depend on Airco Pacific's supply system for a steady, dependable supply of high quality oxygen.

Airco Pacific plants, warehouses, authorized dealers, or retail stores (and there are 234 of them scattered throughout these states) can supply oxygen in any volume—from a hundred cubic feet to many thousand cubic feet monthly.

Airco Pacific oxygen is "packaged" to meet varied needs—in individual cylinders or in trailers, and you always receive oxygen 99.5% pure.

In addition to oxygen, Airco Pacific supplies acetylene, rare gases, hand torches and tips, regulators, welding rods, arc welding machines and electrodes—in fact, anything and everything for oxyacetylene welding and cutting, and arc welding. Also, Airco Pacific customers get an important "extra"—information and assistance from experienced technical representatives.

If you would like more information about Airco Pacific, and the complete service it is equipped to render, write anyone of Airco Pacific offices listed below.

WCN

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A Division of Air Reduction Company, Incorporated

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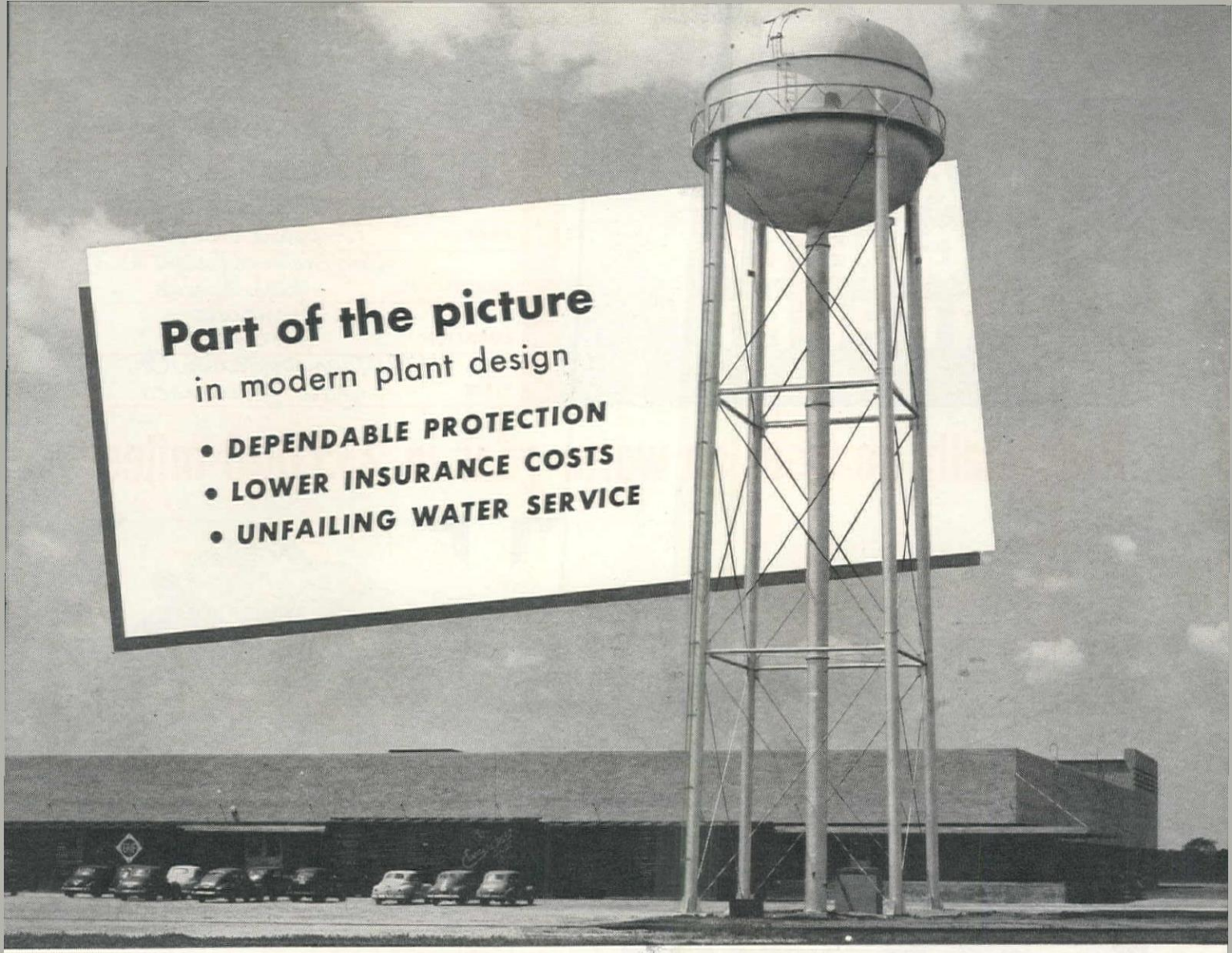

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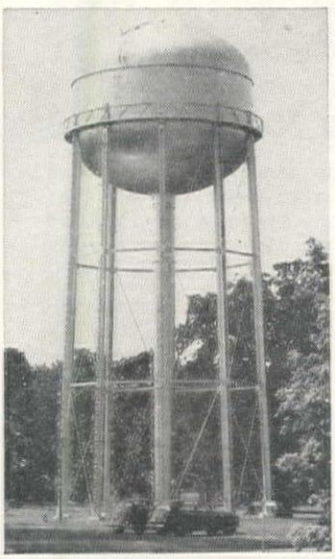

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Choose the Pittsburgh-Des Moines Elevated Steel Tank meeting your precise requirements in type and capacity, and you will enjoy every benefit of safe and certain water supply—at lower cost —*with guaranteed dependability*. Write for our latest "Modern Water Storage" Brochure.

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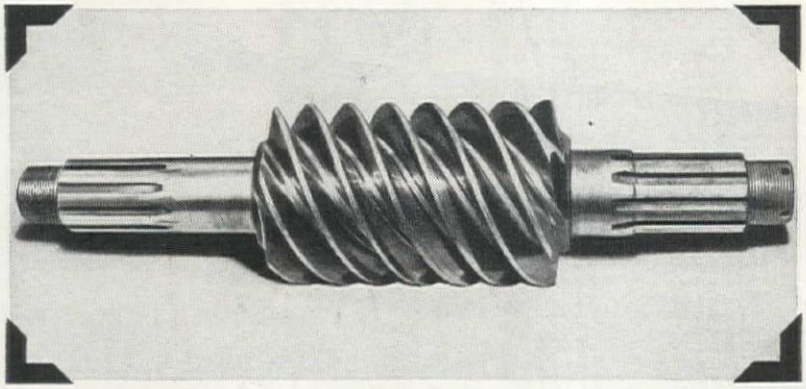
SEATTLE .....928 Lane Street
SANTA CLARA, CAL.....627 Alviso Road

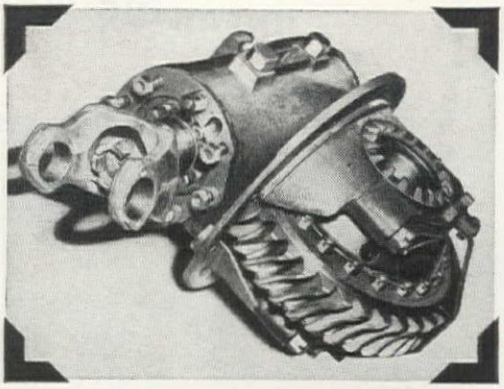
STANDARD ENGINEER'S REPORT

DATA

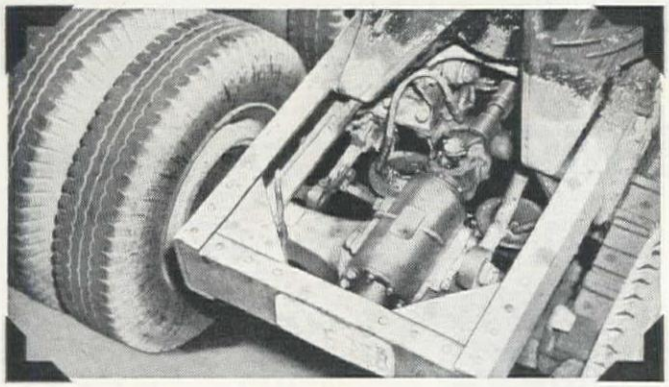
LUBRICANT	R.P.M. Gear Lubricant (compounded)
UNIT	"Semi" diesel Truck
PART	Differential carrier assembly – Timken Worm 3002
CONDITIONS	Long Distance freight haul – high speeds
LOCATION	San Francisco – Los Angeles
FIRM	Hills Transportation Co., San Francisco

Practically no wear on worm gear in 235,000 miles





IN A TRANSPORT TRUCK DIFFERENTIAL lubricated with RPM Gear Lubricant (Compounded), this worm gear had been in constant service for 235,000 miles when the unit (right) was overhauled. Teeth were still in excellent condition as the picture shows. The gear was replaced because of a loose spline. This was only the second overhaul for the differential unit in 648,326 miles of truck service.



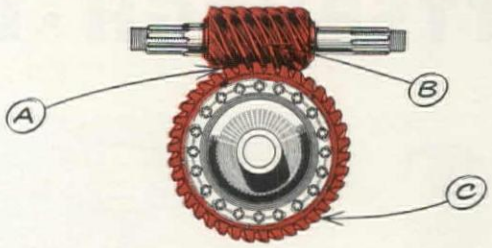
TWO "DROP-IN" UNITS of the same type were used together in the tandem differential of this transport truck. They pulled average daily loads of twenty tons on the highway in regular common-carrier service.

REMARKS: Because RPM Gear Lubricant (Compounded) has very high oiliness qualities and stability, it is especially valuable for the lubrication of bronze worm gears. It also meets the severe service conditions in transmission gear sets and conventional differentials. (For hypoids of all kinds, RPM Multi-Service Gear Lubricant is recommended.)

RPM

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

How RPM Gear Lubricant (Compounded) prevents wear in worm and conventional gears



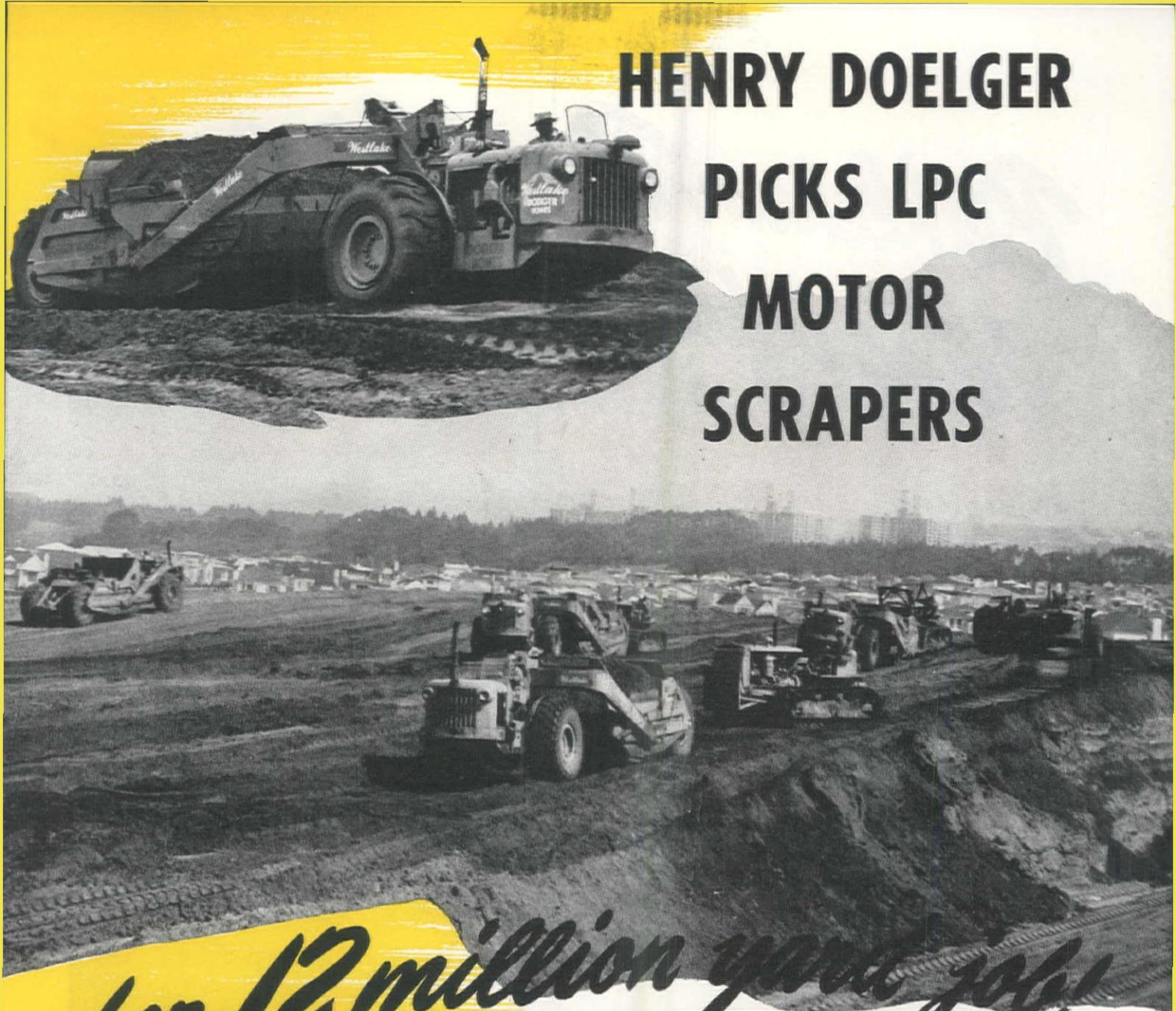
A. Made from paraffine stocks with special compounds that help provide a tough film – gives extra tooth protection, withstands shock and overloads.

B. Has high resistance to oxidation – resists deposit formation, assures lubrication in high temperatures.

C. Contains foam inhibitor – prevents high gear-case pressures.

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



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for 12 million yard job!

MOVING 12 million yards of sand is a man-sized job in anyone's language. Henry Doelger of San Francisco tackled it to make room for a 7000 new home housing project at Westlake, south of San Francisco. Six LaPlant-Choate Motor Scrapers are moving 11,700 yards per 8-hour day, working on a 1600-ft. cycle. Each load averages 14.3 pay yards. Material is damp sand, weighing 3000 lbs. to the yard. Average loading time is 1-minute. All ejection and spreading is done in high gear. Each unit hauls 17 loads in a 50-min. hr.

Whether you're moving sand, mud or good scraper dirt, you'll be money ahead if you use profit-making LPC Motor Scrapers. Get the story *first* hand — talk to the men who own them or run them. There are reasons why more and more smart contractors are using the Motor Scraper.

Available now in 2 sizes. The "300" in the 14-17.5 yard class. The "200" in the 9-12 yard class. LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa; LaPlant-Choate Sales & Service, 1022 77th Ave., Oakland, Calif.

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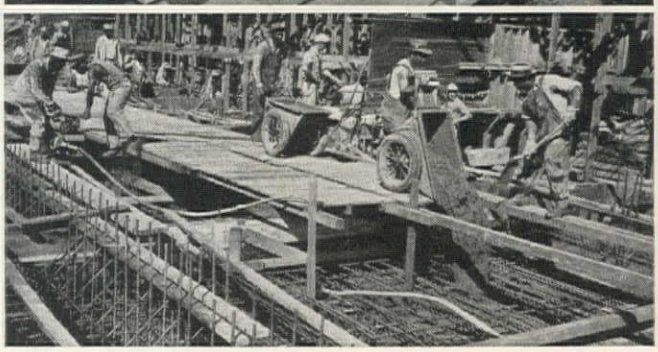
Bethlehem Pacific Steel doing a full-time job—

FOR MEDICINE

The new 6-story addition to Mt. Zion Hospital, San Francisco, shown during erection. This steelwork was welded rather than riveted so that all possible noise would be eliminated. Over 1400 tons of structural steel were fabricated and erected by Bethlehem Pacific for this project.

FOR TRANSPORTATION

Air King Manufacturing Co., Tigard, Oregon, uses high-grade materials and modern assembly line methods in building pallets for the Army Transportation Corps. 76,000 pallets in one order required more than 2,000,000 Bethlehem Pacific Bolts and Nuts.



FOR SANITATION

San Francisco's North Point sewage treatment plant, during construction. The principal part of this reinforced-concrete project, which covers an area of two city blocks, will be underground. The reinforcing bars were rolled and fabricated by Bethlehem Pacific.

Bethlehem Pacific has steel mills, bolt-and-nut plants, and fabricating works conveniently located in the coastal industrial centers of Los Angeles, South San Francisco, and Seattle. It is an integrated organization serving the principal steel needs of builders, fabricators and manufacturers throughout the industrial West.

BETHLEHEM PACIFIC COAST STEEL CORPORATION

Sales Offices: San Francisco, Los Angeles, Portland, Seattle, Honolulu

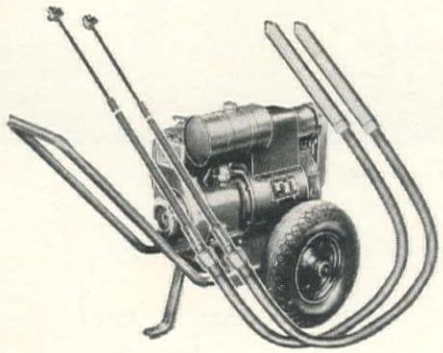
BETHLEHEM PACIFIC

BETHLEHEM STEEL

the Vibrator with the 400-foot cable

CP-220 Hicycle Electric Vibrators can be operated anywhere in a 400-foot radius, without stopping to move power unit.

- Built for one-man operation; has easily handled electric cable.
- Designed for concretes of 2″ slump and over; walls, footings, columns, floor and roof slabs; precast piles and similar products.
- Capacity of 30 to 40 cubic yards an hour.
- Operates at constant speed, at most suitable frequency for concrete placement.
- Extension hose handle permits use in forms 25 feet deep.
- Equipped with waterproof switch.



Two CP-220 Vibrators are powered with a CP-2KW gasoline-driven Generator, 220-volt, 3-phase, 180-cycle. Generator can also be used for portable lighting plants.

The complete CP line of electric and pneumatic vibrators provides just the right model for every concrete job. Write for full information.

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Power shovels of the Piombo Construction Co., Inc., put wire rope to work widening highway on the Black Point Cutoff, California

Tiger Brand Wire Rope is manufactured from raw ore to finished product under the strict quality controls of United States Steel. To help you get all the stamina engineered into American Tiger Brand, the services of a Field Specialist are available without charge.

Contact your Tiger Brand distributor or write Columbia Steel Company, Room 1422, Russ Bldg., San Francisco 4.

U·S·S TIGER BRAND Wire Rope

UNITED STATES STEEL

TOUGHEST for the MEANEST

ESCO 2½-yard All-Cast dipper with box type adapters and points. Installed on Manitowoc Shovel working on the Pennsylvania Railroad relocation in Ohio.

The meanest digging jobs and *ESCO* All-Cast dippers naturally belong together. For these tough, rock-type dippers have proved their ability to lick the most punishing jobs—clean them up without lost time and with almost no maintenance...and be ready to tackle the next job.

Reason for the unexcelled record of *ESCO* All-Cast dippers may be summed up by two simple facts:

All-Manganese Construction

All parts of the dipper are cast of *ESCO* Manganese Steel, the shock and wear resisting steel that becomes highly polished in use, gets harder, tougher the more it works.

Bulk Eliminating Design

Due to wear resisting properties of manganese steel, *ESCO* All-Cast dippers need not be made excessively heavy to allow for wear. Bulk is further reduced by hollow back beam construction. Fast, efficient digging results from clean, streamlined cutting lip with integral tooth holders; flaring outside teeth for full bite; tapered box for quick, easy discharge.

Ask for Descriptive Literature

ESCO catalog 182 gives the full story of *ESCO* All-Cast dippers, including sizes and dimensions and details of construction. A copy of this catalog is yours for the asking. Get it from the *ESCO* representative nearest you, or fill in and mail the coupon.

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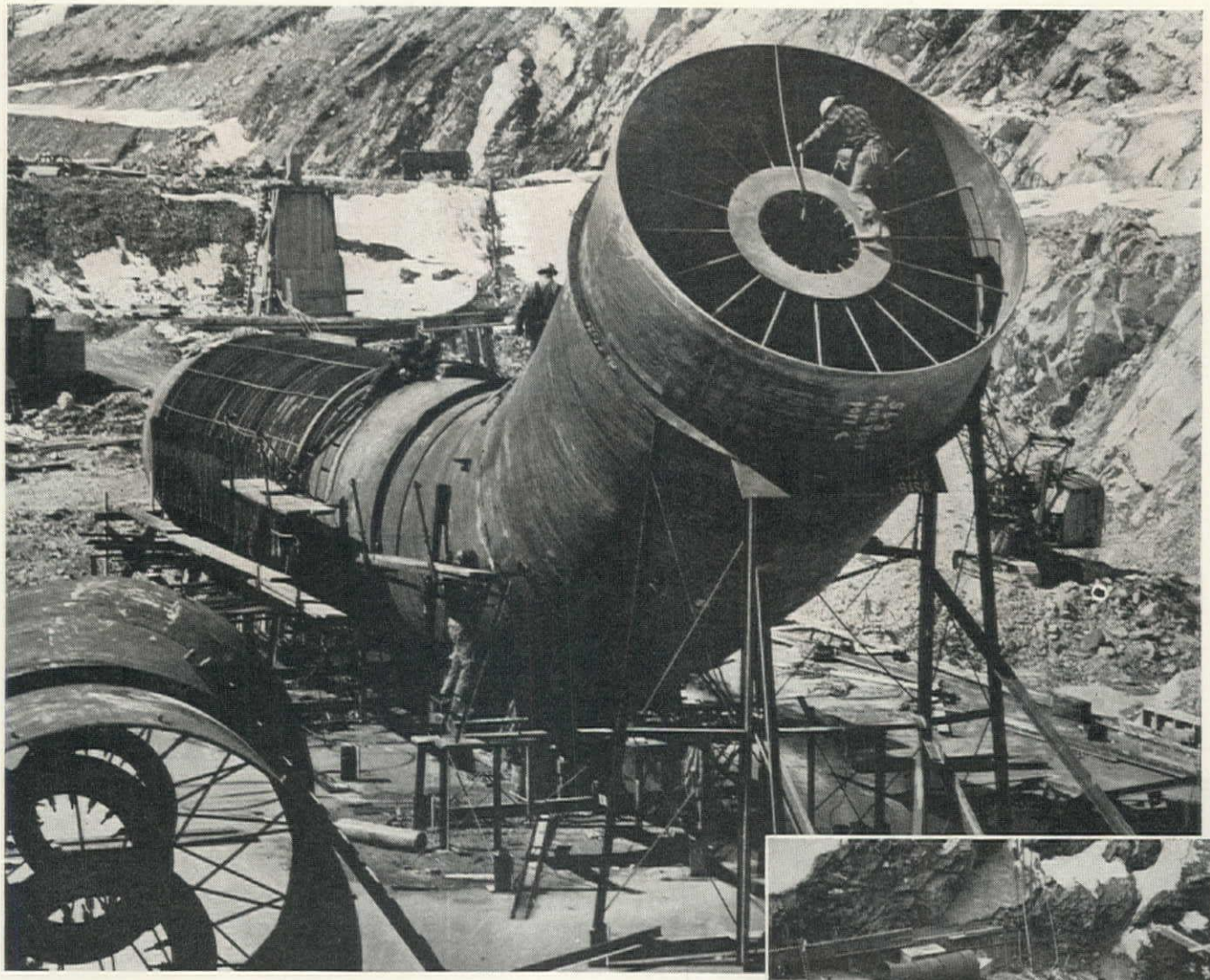

Erecting Penstocks at Hungry Horse Dam

Four welded steel penstocks, each 448 ft. long will deliver water to the 105,000 hp. turbines in the power house at Hungry Horse dam in northwest Montana. We fabricated the steel for these penstocks in our shops at Salt Lake City. The above view shows a portion of the first penstock shortly after we started its erection.

The Hungry Horse penstocks are made of plates ranging from 9/16 to 1-5/16 in. in thickness. They are 13 ft. 6 in. in diam. at the upper end and 11 ft. 9 in. in diam. at the lower end.

The erection of these penstocks will require 4,000 ft. of hand welded seam. The internal "spiders" are required to retain the penstocks' circular shape during their erection and while concrete is being poured around them. After the concrete sets, the "spiders" will be removed.

The penstock installation at the Hungry Horse project illustrates how well we are equipped to handle steel plate work for construction projects. Let our nearest office furnish quotations for your next job.

Above: This view shows two of the four penstocks being erected at Hungry Horse dam on the Flathead River in northwest Montana.

They will deliver water to the four turbines which, in turn, drive vertical type 71,250 kw. generators.

The upper end of the penstocks entrances will be in the upstream face of the dam, 246 ft. below the crest. The maximum operating head will be 484 ft.

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WESTERN CONSTRUCTION

July 1950 Vol. 25, No. 7

Private Construction Has An Advantage

PRIVATE construction can secure some of the advantages common to the European method of contracting, which are impracticable to most public works projects. As in the European style, where contracting organizations frequently compete in offering both design and construction services, industrial and commercial companies can utilize the know-how of contracting firms during the planning stage of the job. By the early selection of the firm that will carry out the actual work in the field it is possible to gain the advantages of conferences among the representatives of the owner, engineers and the contractor while the program is in its formative stage. These meetings bring together the interests representing the dollar, the design and the construction, with mutual advantages.

On public work, because of long established precedent and obvious legal requirements as to competitive bidding, it is necessary for designs and specifications to be completed before contractors are asked to study the matter of costs. This procedure emphasizes the need for designers with thorough knowledge of construction methods, equipment and current prices. Rather recently some of the larger public agencies—notably the Corps of Engineers—have tried out the idea of pre-bidding conferences designed to acquaint interested contractors with the general plans for the project and to exchange ideas on the most effective construction procedure. The success of these meetings depends on a frank and open discussion. Such an idea is rather idealistic under ordinary circumstances governing public work. Government engineers must of necessity refrain from doing more than explaining the general features of the project and the conditions at the site. Beyond these generalities lie legal restrictions based on the importance which might be attached to opinions and interpretations as to plans or conditions. This puts serious handicaps on the engineers' side of the conference. As to the contractors, there will be general reluctance in outlining specific ideas and suggestions before a group which includes "the competition." Any contractor will merely outline the obvious, or in some cases might even lead the discussion of a construction plan away from his own ideas to throw up a smoke screen. Thus it seems hardly possible for this type of pre-bidding conference to develop into any real and useful inter-change. The most that can be said of such meetings is that they do no harm in clarifying basic points.

Private construction does not have these restrictions and the accompanying formalities of public work. It would do well to take full advantage of contracting know-how at the earliest practical stage of any project. As in every engineering effort the closer the coordination of office design and field procedure the more satisfactory and economical the results.

Better Understanding of the Truck Problem

AFTER a long session devoted to truck transportation in this region, the Western Association of State Highway Officials at its convention in Reno tended to resolve the broad problem into two basic points: (1) the physical dimensions of the trucking units and (2) the effect of repetitive loads that are within the legal limit.

As to dimensions, the truckers are interested at the present time in gaining more cubicle contents and would like a height of 13½ ft. and lengths of 40 ft. for single trucks and 65 ft. for combinations. These dimensions do not exceed limits already in effect in some of the Western States, so the recommendation can be said to be in line with requesting uniformity. However, they do represent raising limits in some states, and particularly the height requirement would be costly. There are many structures to be brought up to existing standard in these states before increases can be considered, but engineers accepted the 13½-ft. height as a deferred objective. An opinion favored the retaining of 60 ft.

More serious problems are represented by the question of damage resulting from repetitions of legal truck loads. In line with accepted engineering principles it was pointed out that occasional stress reaching the allowable limit may not be serious, but that frequent applications of this same load intensity may result in failure from fatigue. As to the number and frequency of these damaging applications the factual information was admittedly scarce and inconclusive. Only by vigorous and coordinated study will a start be made on answering this fundamental question.

As a result of the exchange of ideas and opinions expressed by both sides at the Reno meeting the question of trucking on the highways of the West is much better understood and appreciated.

Science Studies the "Muck Stick"

SIMPLE engineering problems are often left to the last. Equipment engineers have spent time and talent lavishly on designing larger and more efficient earth moving machines, while the lowly "muck stick" was considered rather beneath such a technical approach. Only recently has it become the subject of its first scientific study, following these long years of service to the construction industry (page 63). Never before has the hand shovel been examined so thoroughly. Field studies were made and reported, laboratory investigations were carried out, even "operators" were questioned and their opinions and suggestions noted. Out of these studies there has been developed an improved design, which introduces changes in the interest of effective operation without disturbing the classic lines of the instrument or the general advantage of its simplicity.

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*.

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The Power Graders That Have Everything

"88-H"—a new model of medium size with all the extra traction and maneuverability of All-Wheel Drive and All-Wheel Steer.

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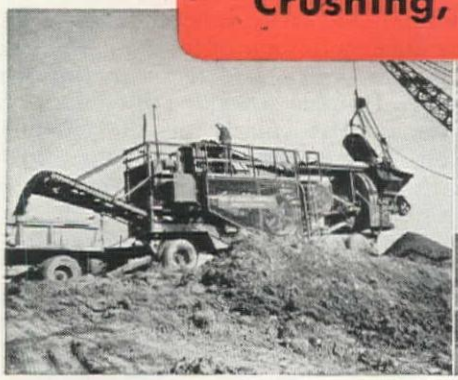
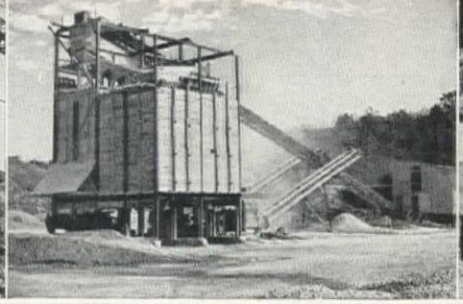
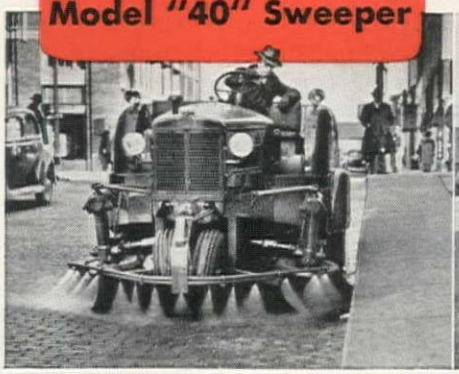




The AUSTIN-WESTERN LINE includes Jaw Crushers and Roll Crushers in a wide range of sizes; plus matching screens, elevators, conveyors and bins. Exclusive features increase output, and reduce maintenance costs.

Skilled engineering characterizes each and every Austin-Western crushing, screening and washing plant, which is tailor-made for a particular production problem. We would welcome the opportunity to discuss yours.

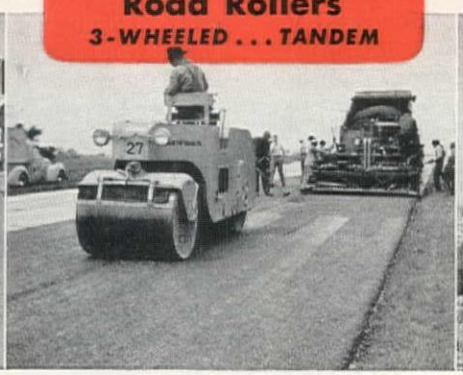
Model "40" Sweeper



Fast, maneuverable and economical. Dirt is thrown directly into the 2-yard hopper. Right-hand or left-hand gutter broom, or both.

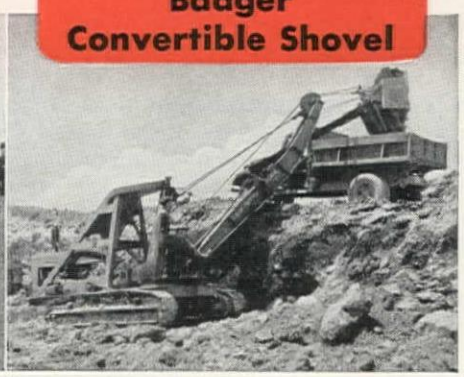
Road Rollers

3-WHEELED . . . TANDEM



3-WHEELED ROLLERS with hydraulic scarifiers. TANDEM ROLLERS of the variable weight type. All with gas or diesel engines.

Badger Convertible Shovel



The ¾-swing Badger wastes no power swinging extra weight; makes more swings per hour; can work in closer quarters.

Advanced engineering and honest construction characterizes each Austin-Western product. Your nearby A-W distributor will gladly recommend the one best suited to your needs.

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At Oakland, Contractors Are Working on Land and Under Water for—

3-mi. Outfall Through Soft Bay Mud

COMMON TO much construction in the San Francisco Bay area, the problems that come with soft bay mud and variable geologic conditions face the contractors for the $3,000,000 concrete sewer outfall being built for the East Bay Municipal Utility District, Oakland, Calif. The outfall, 14,990 ft. long, of 42 to 108-in. pipe, is partially on land with the remainder along the bottom of San Francisco Bay.

The construction is under two contract schedules. Schedule I, for construction of 9,030 ft. of 108-in. concrete lead-caulked pipe on land, was awarded to Ben C. Gerwick, Inc., and George Pollock Co., a Corporation, San Francisco, as joint venturers, at $1,688,000. Schedule II, including 5,960 ft. of 96 to 42-in. pipe and a transition structure, which comprises the subaqueous section of the outfall, is under contract at $1,267,000 to Healy Tibbitts Construction Co., San Francisco.

The land section

On the land section, the generally unstable material on which the foundation structures for the outfall are being placed has made heavy supports necessary. Isolated lenses of sandy clay lie beneath the surface at the site. Piles that penetrate through the soft mud and end on these lenses have failed in bearing after a period of years. Therefore, the contractor must drive piles through mud and through the resistant lenses but not beyond the recommended penetration in the layer of clay or in the thick layer of sandy clay with no more bay mud below. If the piles are not embedded properly, as evidently has happened during past pile work on the nearby Bay Bridge Toll Plaza and structures at the Oakland Army Base, local subsidence will cause uneven settlement.

Constructionwise, the expected service life of the land section outfall hinges on the successful completion of pile foundations, with enough bearing power and penetration. To this end, a graphical record of pile blow count vs. depth of each test pile has been worked into profiles for the specifications. At one point, 10-in. I.D. steel pipe piles are being driven under a highway overhead bridge to support a steel siphon section of the outfall where it crosses an existing sewer. These are driven in 20-ft. sections due to impaired overhead clearance and are connected with inside coupling.

Bedrock is 200 to 300 ft. below the surface; therefore, either skin friction, point bearing or both have to be depended upon for bearing power. In general, a heavy layer of fine sandy clay, probably of glacial origin, underlies the bay mud. Post-glacial runoff gullies, subsequently filled with clay, can be found all through the area. It is necessary to drive piles as long as 108 ft. at some of these areas, depending on the skin friction of the clay alone for bearing power. From previous load tests it was found that the conventional formula

Job highlights from the field editor's notes . . .

concrete pipe varies from 42 to 108-in. diameter

●

on land section, rate of placing pipe is 360 ft. per week . . .
long piles, some driven 108 ft.

●

special form jig for trench sheeting allows driving of 60 boards at one time

●

daring procedure used for placing elbow section of transition structure . . . entire form, weighing 45,000 lb., prefabricated at shop

●

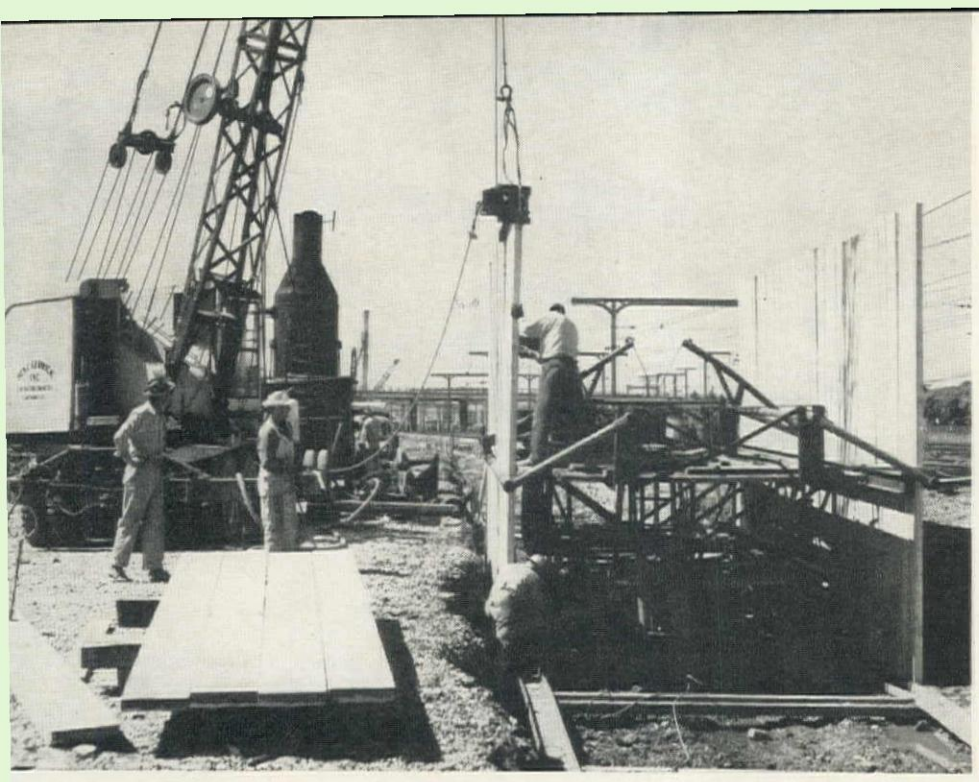
four barges in use . . . most activity on third barge from which jetting equipment is used, pipe is laid and divers operate

●

sections of pipe lowered at rate of three per day using strongback from barge's 100-ton A-frame

●

job cost, $3,000,000 . . . contractors are Ben C. Gerwick and George Pollock Co. on land section, Healy Tibbitts Construction Co. on subaqueous section



SPECIAL FORM JIG fits inside the trench paylines. Sheeting is clamped against sides of the jig in units of five until thirty boards line each side, ready to be driven.

for pile bearing does not hold true in clay, and piles are tested again the day after they are driven to determine any change in blow count per foot.

Moisture content of bay mud exceeds 60%, and the unit weight wet is from 80 to 90 lb. per cu. ft. Piles slide the first 30 ft. in most cases, through this black-grey material. Ground in the general vicinity of the project on the east shore of San Francisco Bay is subsiding, and conservative estimates made by the engineers allow another 4 to 5 ft. for settlement eventually.

Subsidence considerations

This subsidence, of course, greatly complicates pile design and driving procedure. For instance, the design loading of the piles is 20 tons each throughout the entire land section where they are used. However, the skin drag of the mud, consolidated for the immediate area of the pile, has been calculated to add up to 50 tons in addition to the design load. As a local spot subsides over the pipe, ultimate skin drag downward may bring a total load of 70 tons to bear on each pile. With a safety factor of 2, each pile on the job must be able to resist a thrust of 140 tons.

Special District No. 1 of the E. B. M. U. D. has found that by proper embedment in firm clays, piles will support loads up to the ultimate strength of the timber used. The pile point must penetrate bay mud to exactly the right depth in the firm clay below. The firm sandy clay layer has generally a gentle slope toward the bay. Piles could be driven into this material to a depth within 5 ft.±. Any sand lenses encountered at higher elevations had to be pierced because they were only floating in bay mud, and could give no support to a pile. Also, for lateral stability, piles had to penetrate to a certain depth and the upper layers of bay mud would give no such stability.

Pile bents support a continuous reinforced concrete slab. Above the slab, sand bedding, concrete sewer pipe, live load, and backfill add to the pile bearing. Steel reinforcing in the slab was designed to resist settlement due to failure of any one bent. Timber sheet piling—totaling 1,250,000 board feet—used in the trench wall during excavation, is being left in the trench. This timber, enough to build 100 average homes, is being left in place to prevent damage to existing construction and to retain sand embedment for the pipe. The sand embedment saves pouring a cradle and, if not confined, readily mixes with bay mud. Other precautions against settlement damage include fiber-core lead-caulking ribbon to give a semi-flexible joint, and a compacted coarse sand backfill 12 in. deep under pipe center.

Pipe is being laid at an average rate of 15 sections, 360 ft. per week. The trench is being backfilled with sand at a rate of 500 cu. yd. per shift. This backfill rate is made possible by the use of a portable conveyor belt, fed by a front-end loader. Three conveyors, 75, 60 and 30 ft. long, are on the job to place concrete on the pile caps, sand embedment on top of the concrete slab, and sand and gravel backfill, respectively.

Trenching and pile work

First trenching operation on the land section, after light pioneering work is done, is to make a 3-ft. rough cut on line with a 2½-cu. yd. dragline. Ten-inch steel H-beams, well cross-braced, are laid along the pay lines of the trench, and serve as track for special equipment used to drive wooden sheet piling. The sheeting is mostly 3 x 10 and 12 in., with 4-in. material used for unusually hard surface ground. Sheeting is brought to the trench by a lumber carrier, and stacked neatly in five rows by the crew. It is picked up five at a time off the top, set in a special form in place on the trench, and left in place while the crane picks up another set of five from the pile. A mobile rubber-tired truck crane is used for this new way of setting and driving sheet piling.

Key to the method is the form jig in the trench. It is a box frame, of welded steel pipe, which fits inside the pay lines for the trench. It is just high enough to hold the sheeting in place. The sheeting is placed against the side of the form and held by a steel bar acting as a clamp until ready to be driven. The form is loaded with five boards at a time until full. It is full when 30 boards line each side of the form, ready to be hammered.

The crane, in order to pick up five boards at a time, has a steel clamp on the end of its line. The jaws of the clamp tighten under line tension and the slip-knot action of levers and wire rope. For each cycle of five, one man with a lumber hook spots the top boards on top of the five rows. When they project equally from the top of the pile, two men place the clamp around the five ends. This completes the setting.

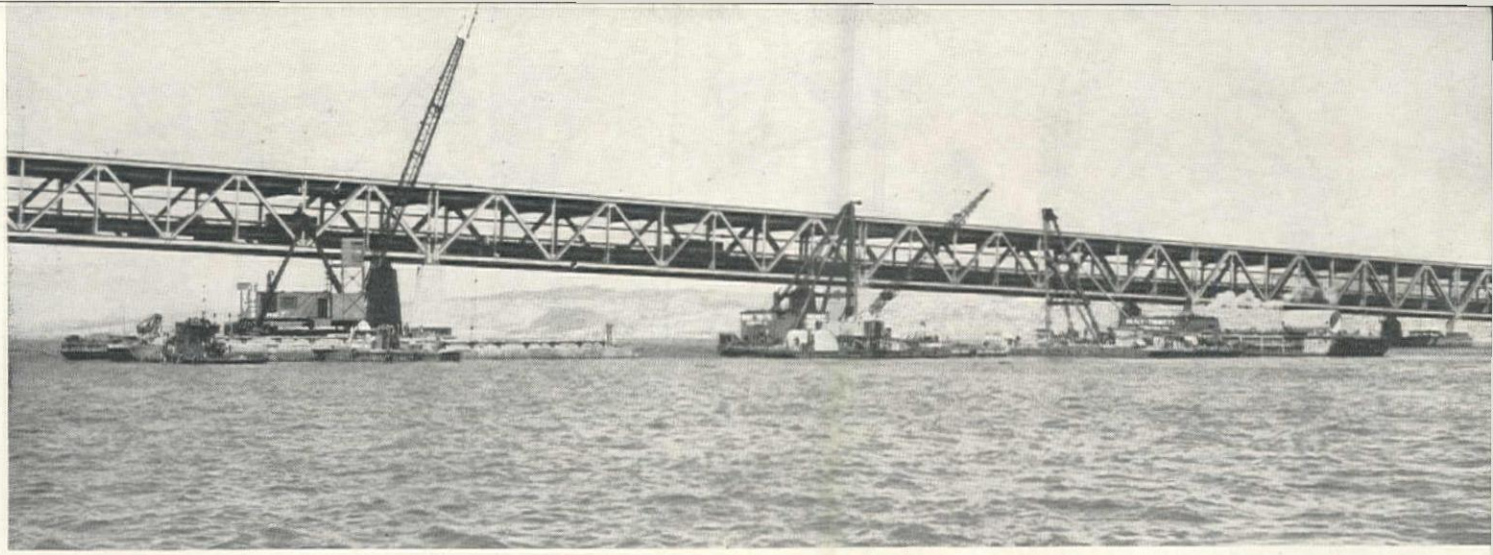
To drive the piles, lined up 30 on a side, a McKiernan-Terry No. 6½ hammer head is put on in place of the ingenious clamp. The 6½ Model is a No. 6 hammer with the steam chest power of a No. 7. In this manner, 240 ft. of steel H-beam can be laid in the trench, and 240 ft. lined, both sides, with sheeting during one shift. The hammer drives the 60 piles, 3 at a time, the crane switches back to the clamps, and the rig moves ahead on line. Each set-up takes 45 min., including change from hammer to clamps, and an average of 60 piles is driven per cycle. Originally, the pick-up clamp was built to hold 10 piles. This worked well, but not fast enough, so that the highest number of piles per hour was obtained with a 5-pile clamp on the 45-min. cycle.

Excavation is the next step in trench preparation. This is done with a 1-cu. yd. clamshell. Directly behind the clamshell a truck crane places 10-in. H-beam walers and 10 x 10-in. shores. One, two or three lines of walers are put in, depending upon depth. Trench walls are 13 ft. apart, and clear the outfall pipe by 14 in.

Wood piles for the pipe foundation slab are driven next. The contractor, in order to drive 110-ft. piles, rigged a big crane with a pair of 95-ft. fixed steel leads, supported at the end of the boom and by a steel pipe frame attached to the crane body. Running inside the leads is a pair of 30-ft. telescoping leads containing a Vulcan No. 1 hammer.

Operator skill does the job of driving 110-ft. piles with a rig 95 ft. high. With the bottom 20 ft. resting in the trench, the 110-ft. pile can be pulled plumb and fitted into the driving cap 95 ft. above. Maximum trench depth is 24 ft.

The big crane not only drives the long piles, but is also used to lay pipe. In 1½ hr., the 4-man crew plus operating engineer, foreman, and oiler can lay the big leads down and rig up the block to handle 24-ft., 32-ton sections of the 108-in. pipe. This includes an average haul of 1,000 ft. The crane works well away from the trench and needs no outriggers



FOUR BARGES alongside the Bay Bridge are working on the underwater section. First barge carries a clamshell for initial cut in trench; second carries equipment for the final cut; third barge carries divers, jetting equipment and strongback for laying pipe; fourth is for placing sand backfill.

or track pads to handle its load.

Piles are driven on either 4 or 6-ft. spacings, depending on the ground conditions. Steam boilers for drivers are 100-hp. portable units, specially rigged on trailer beds.

Two men using a chain saw cut off piles before a 2-ft. blanket of sand is conveyor-backfilled in the trench. A 6-in. layer of crushed rock or gravel is conveyed on top of the sand. The heavily reinforced 18-in. concrete slab rests directly upon the crushed rock and piles extend 6 in. through into the slab.

A rolled steel band is welded to the reinforcement at the spigot end of the pipe. It fits into the bell and is caulked with 2¼-lb. per ft. fiber-center lead gasket. Cement grout is poured on the outside using a belt over the joint, and the joints are gunited on the inside.

As the backfilling is done, the trench walls are spread with a 75-ton hydraulic jack while shores and H-beam walers are being stripped. The sheeting is then left in place. Spreaders, placed to allow pile driving, were also removed by the jack.

Daring procedures on the underwater construction . . .

Projecting the line into San Francisco Bay, the crews of Healy Tibbitts Construction Co. are laying the first major underwater pipe in bay waters for many years. Four barges make up the bulk of equipment in use, and the entire construction plant keeps moving on line.

First barge in line carries a 2-cu. yd. clamshell to make initial cut (15-30 ft. below water) in the bay mud. Second barge has a utility boom that either handles a clamshell for finish excavation or a sling for pipe block supports or general handling of supplies. Most activity is on the third barge, from which the divers operate. From this barge trench jetting equipment is used, pipe is laid, and line and grade are given. The fourth barge in line is for placing sand backfill.

The contractor is working two 7-hr. shifts on excavation and one shift on the pipe-laying barge. An average of three sections is laid per day, and the work at present is about 50% complete. As the first step in the underwater job, the contractor built the transition structure, located just offshore, between the 108-in. pipe on land and the submerged 96-in. pipe. Effluent will have a drop of 33.3 ft. through the transition. The 96-in. pipe necks down to a final 42-in. toward the center of San Francisco Bay, where it is 45 ft. below water surface. The end 288 ft. of pipe is perforated, and will diffuse the effluent with the outgoing tide. The outfall at this stage is embedded in a rock blanket of 4 to 12-in. material.

45,000-ton form prefabricated

A somewhat daring procedure was decided upon by the contractor as an effective method to pour the bottom 90-deg. elbow of the transition structure. In order to save the expense of square-to-round form construction at the bottom of the cofferdam, and to avoid the difficulty of placing reinforcing steel without proper working space, the contractor prefabricated the entire inside form. Of itself, this is not too unusual, except that 20,000 lb. of reinforcing steel was bent, placed, and tacked together around the form at the South San Francisco shops of the contractor, shipped across the Bay to the job, and slipped down into the waiting cofferdam in preparation for the pour.

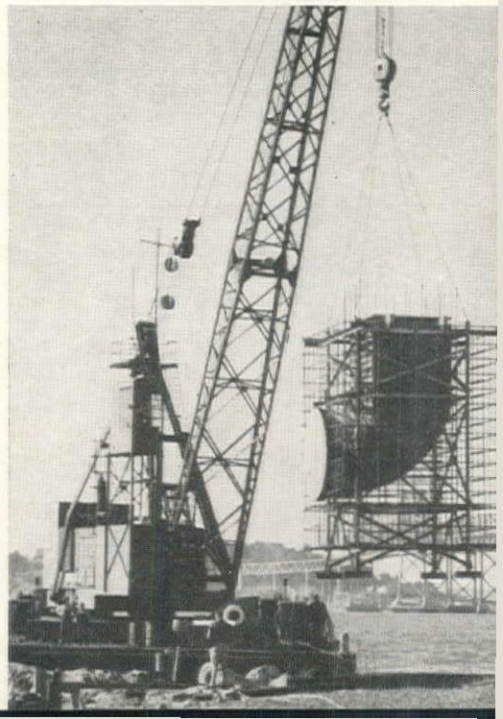
This wood and steel montage consisted of the reinforcing, 7,400 lb. of form surface and wooden struts, and a 12,000-lb. section of pipe. In order to hold this mass together, 6,000 lb. of 6-in. steel angle section was formed and welded to act as a skeleton of backbone and ribs. This framework was placed in the middle of the reinforcing, between the inside form and the outside, and acted to give strength to the 19 x 19 x 25-ft. high piece of work. The frame, surrounded by the reinforcing steel and welded as a part of the works, was left into the structure, although it was for strength only and not incorporated into the design.

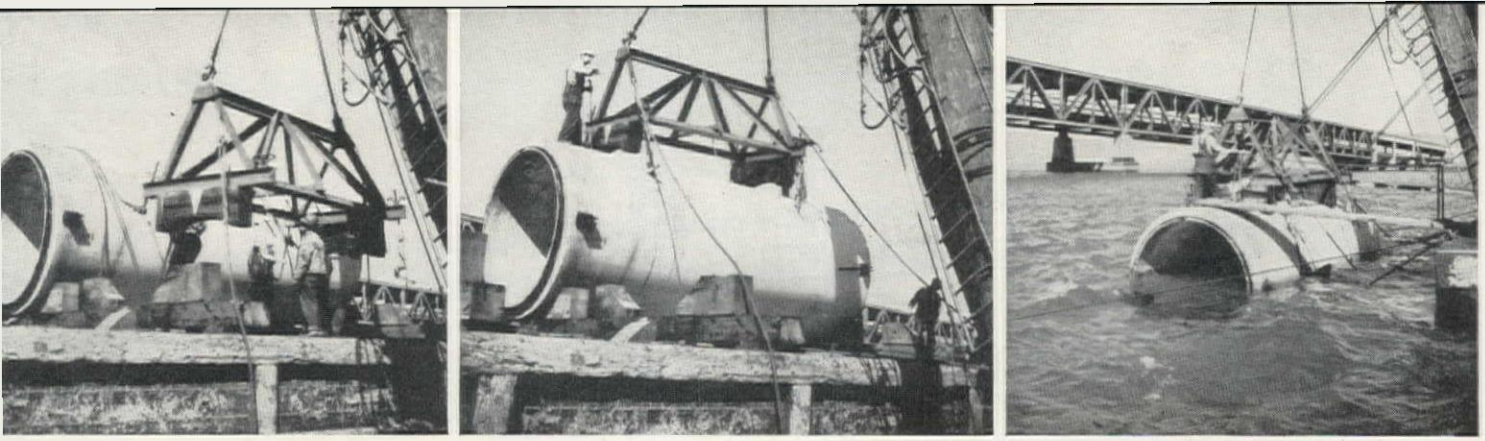
By using this method of lowering the form and reinforcing into the cofferdam, the contractor eliminated practically all hand work outside the shops. However, the steel sheet pile cofferdam, since it determined the location of the structure, had to be driven to within one inch of line. Before being slipped down the cofferdam, shoes were welded on the four sides and bottom to guide the frame. Small deviations in the cofferdam were compensated during the welding, to the end that the form and reinforcing were where they belonged. The cofferdam proper acted as the outside concrete form, and was externally braced by wales fastened around the outside.

The entire form, weighing over 45,000 lb., was hoisted by a four-point sling attached to the frame. Its weight was bearing on hardpan. A full day was required for the tremie pour, taking 351 cu. yd. of 7-sack mix.

Sections of the pipe being used underwater are held together by two bolts on each side, 1¼-in. diam., held by frames that are heavily bolted to a steel casting, in turn welded to the reinforcement. Entire seal is made by a 13/16-in. diameter rubber gasket compressed between skirt and bell section. The inside clearance is ¼ in., and the outside clearance of ¾ in. is filled with a redwood strip that faces the end of the pipe. Sole purpose of the ¾ x 6-in. redwood bumper block is to prevent concrete-to-concrete impact during possible subsequent movement.

THE 45,000-LB. FORM for the elbow section of the transition structure ready to be slipped into the waiting cofferdam at the bay's shore.





THE STRONGBACK is spotted plumb center on a pipe section, which is then lowered into the bay to become part of the outfall.

Once each section of pipe is under water it is never seen again. The water is black-opaque within 3 ft. of surface. When the pipe is ready to be lowered, the laying barge is spotted by four deck engines connected to mooring lines and anchors.

Concrete blocks faced with redwood are lowered into the trench, and bedded until at proper elevation. The pipe barge then swings around to line, and a section of pipe is picked up by a strongback on the laying barge's 100-ton A-frame. In order to fasten the strongback to the pipe in the right position, the contractor has a small caliber powder-driven stud set into each end of the pipe at the "12:00 o'clock" spot on top. A line is stretched between the studs at each end, and the strongback is spotted plumb on dead center. The studs also aid the divers during the critical moments when the pipe is first mated. The sling is on a 12-part line, giving fine control over the pipe section. Water surface on San Francisco Bay is relatively quiet at this time of year, and to date there has been no trouble in lowering and spotting the 24-ft. sections of concrete pipe. Crews shut down during rough weather.

Line was given from shore for the first 1,000 ft. A pile platform was then installed, straddling the pipe. The platform consisted of 6 piles driven on a batter with one brace pile on each of the four corners. A 2½-in. pipe with a notch cut in the base plate was held on the centerline pin of the pipe by the diver, the notch in the base plate fitting around the centerline pin which had previously been shot in. The same pipe with level tape glued to it was used for direct grade shots from the nearest Bay Bridge pier. Communication was either by power loud speaker or by large black numbers on light colored background, depending on the prevailing wind. Grade was read to ⅛ in. for the benefit of the barge crews. When bolts are tightened by hand, the pipe is shimmed to grade. Two divers then tighten bolts with ratchet wrenches which are pulled by the rigger leads of the deck engineers. When bolts are tight, inspection is made, and if the joint is accepted the pipe is chocked.

Inspection under water

An inspecting diver for the Utility District checks the pipe. Usually under for 30 min. at a time, the inspector's main check point is the joint of the pipe. He checks the joint inside to make certain it is pulled tight. To do this, he uses a series of ⅛-in. feeler gages to slip in between the edges on the inside of pipe. The manufacturer recommends a 1-in. gap around the outside edge (rim) of the pipe under present conditions for the pipe. The inspector checks outside distance by measuring a ¼-in. distance on inside rim of pipe. When the inside is ¼ in., the outside is the recommended ¾ in. This distance is the approved safety margin so that pipe will not crack or chip at the joints in case of slight movement or settlement.

Another check point is the previous section. Its joint is checked to see if new pipe disturbed the old. The chock blocks under the pipe are then checked to make sure that the pipe is securely held. There are 4 chock blocks per length, and each one must be toenailed. Last point is final check on joint bolts for stripped threads or possible fracture around the casting. The diver then goes ahead on line for 24 ft. to check general shape of the ditch. The trench, dug some 20% out from shore, is at —32 ft., and lies under 15 ft. of bay mud.

Specifications called for a bed of crushed rock 2 ft. deep for the pipe to rest on. This rock design was later changed to sand, extending up to the springline. The top of the pipe is covered with an 8-ft. layer of imported clean coarse sand. The bottom of the trench is usually 15 ft. deep or more as measured from the mud line. The trench is excavated to cut a minimum of 3 ft. into firm sand.

At the end, on the 288-ft. length of diffuser section, the pipe is embedded in a 400-ft. long base of heavy crushed rock. The crushed rock replaces the sand as the supporting medium for the pipe. Diffuser holes are 16 in., spaced down the line on 8-ft. centers, alternating directions.

LEFT—Bonnie Claussen, Healy Tibbitts assistant superintendent; Bill Kritikos, EBMUD assistant engineer; Otto Bohl, EBMUD resident engineer; Dave Scott, Healy Tibbitts superintendent. UPPER RIGHT—Bob Wendell, EBMUD inspecting diver. LOWER RIGHT—Manuel Freitas, captain of pipe-laying barge; Bob Clements, Healy Tibbitts diver.

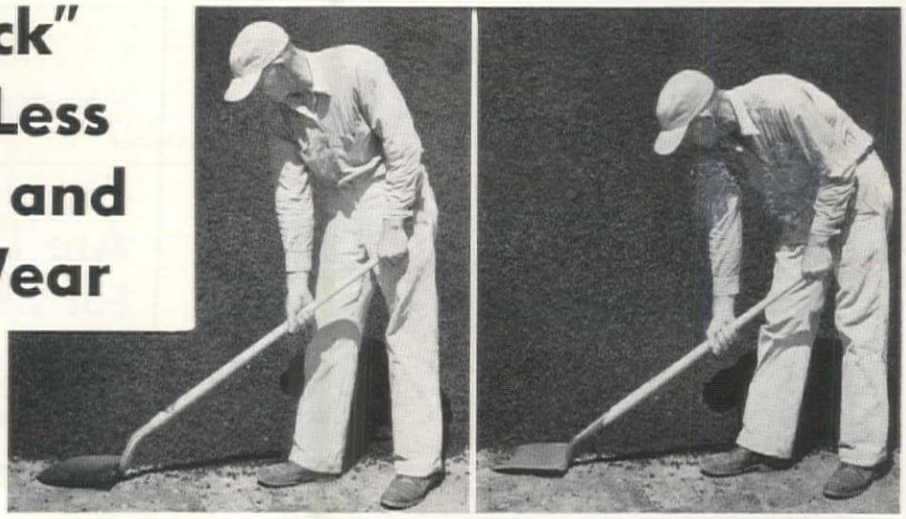
Personnel

John W. McFarland is general manager of the East Bay Municipal Utility District. Construction of the Sewage Disposal Project is under the general supervision of Robert C. Kennedy, Manager, Sewage Disposal, Engineering and Construction. Danell A. Root is supervising civil engineer in charge of hydraulic and structure design. R. C. Mathewson, supervising mechanical and electrical engineer, is in charge of the design of all equipment and electrical installations. Walter R. McLean is supervising civil engineer in charge of all field engineering and construction of Special District No. 1. Field work on the outfall sewer is under the immediate supervision of Otto C. Bohl, resident engineer.

For Gerwick-Pollock, Alfred Cantor is superintendent, and John Ford and Stanley McCoy are assistant superintendents. Bert Howell is office manager. For Healy Tibbitts, Dave Scott is superintendent and Bonnie Claussen is assistant superintendent.

All pipe is made in the Stockton plant of the United Concrete Pipe Co. and carried on flat cars to the job.

Lowly "Muck Stick" Redesigned for Less Worker Fatigue and To Withstand Wear



THE CALIFORNIA highway shovel, left, has a high lift that eliminates unnecessary back bending. Note comparative posture of worker using commercial shovel at right.

STILL one of the most important construction tools is the lowly "muck stick." During the war years, maintenance personnel of the California Division of Highways, who use about 4,000 shovels per year, became "shovel conscious" because good shovels were difficult to obtain. An investigation made by the Division's Stores Department, which determines what tools, supplies and materials are the most satisfactory for highway purposes, indicated that the hand shovel presented a fertile field for investigation and development.

After a preliminary questioning of maintenance men, several dozen shovels were procured which appeared to be the closest to what these men desired. These were purchased from various hardware firms and were the products of practically all of the leading shovel manufacturers. Each shovel was given an identifying number and the manufacturers' names obliterated to avoid any personal prejudice for trade names. The shovels were distributed at random throughout the State to various maintenance men who reported on a questionnaire after about three months use of the shovels, indicating their preference on several features which were found to be controversial in the preliminary questioning.

It was especially interesting to find that the major portion of highway maintenance work being done with hand shovels consisted of "mucking" or scooping loose material from ditches, shoulders, road approaches and subways; trimming around sign and guard rail posts, and loading trucks from stockpiles of premixed surface material, sand and rock.

Typical worker complaints

The questionnaires indicated the following major objections to the test shovels: (1) Too heavy, (2) handle too short, (3) handle too large in diameter, (4) insufficient lift, (5) poor balance. With these objections in mind, and by making physical measurements of the shovel parts which the men considered satisfactory, a composite of the desirable features then indicated the final design. This composite was the basis for specifications for long-handled shovels which now determine the purchase of such shovels by the Stores Department of the California Division of Highways.

The survey and analysis indicated that a shovel with a high lift is the most desirable for almost all maintenance work. The lift is measured by placing the blade of the shovel on a flat surface and observing the vertical distance to the tip of the handle. A high lift eliminates unnecessary back bending, reduces worker fatigue, results in more work done and a more satisfied employee. The California specifications now require the lift of shovels to be not less than 35 and not more than 37 in. This amount of lift is based on a shovel measuring 60 in. from the tip of the blade to the end of the handle.

In the illustrations above, the test shovel at right is closest to the preferred type and except for the lift and length of handle would be satisfactory. The shovel at left is constructed according to the new specifications. Note that the hand is higher on this shovel, requiring a lesser amount of stooping. This places the left hand in a better position to force the shovel into the stockpile. It is obvious that the bend at the shank of the two shovels is similar and the additional lift is accomplished with the longer handle. The natural angle of repose of the two shovels is identical.

A scientific shape

The specifications also cover the shape of the handle. It was obvious from the questionnaires which handles had an acceptable shape and such handles were calipered and plotted graphically. A mean line was drawn for the group and the maximum deviation from the mean was accepted as the allowable tolerance. The diameter in inches is a composite of 15 different shovels of various grades made by several different manufacturers. It was noted that a well shaped handle often made an inferior quality shovel more acceptable to the user than one of better quality with a cumbersome handle. Specified diameters for the handles are shown in Table I.

Table I

Shape of Handle

Distance in inches from end of handle	Diameter of handle in inches	Tolerance
2	1-9/32	1/32
4	1-1/8	1/32
6	1-1/32	1/32
12	1-1/32	1/32
16	1-1/16	1/16
20	1-5/32	1/16
24	1-1/4	1/16
30	1-3/8	1/16
34	1-7/16	1/16
Shank	1-7/16	1/16

Cheap material no economy

After a thorough examination of the test shovels, it was definitely apparent that there would be no economy in procuring a shovel produced from anything but the best materials. Handles made of inferior grades of wood were broken along the slash grain, splintered and badly checked, while those of first grade ash were still in excellent condition. The steel of the lower grade shovels showed two definite weaknesses. Some were extremely hard and fairly abrasive-resistant, but did not have sufficient ductility to stand the constant bending and so failed by cracking. Some of the steel was so soft that it was only a short time before the blades were so badly worn they were no longer usable.

The specifications require that the shovel blades be fabricated from 16-gauge sheets of suitable alloy steel which has a Rockwell Number for hardness between 45C and 50C. Flexure tests required of the manufacturer by the specifications assure ductility of the blade steel. Handles are required to be of seasoned ash, Grade SA as specified in the National Bureau of Standards, Simplified Practice Recommendations R 76-40.

Weight of the shovels as outlined in the specifications is as follows: Weight of round-point shovels, not to exceed 52 lb. per dozen and weight of square-point shovels not to exceed 54 lb. per dozen. Blades of the round-point type are specified to be not less than 8¾ in. wide and not more than 9 in. wide, not less than 11½ in. long, and not more than 12 in. long. Width of the square-point type is specified from 9¼ to 9½ in., with length requirements the same as the round-point type. Shank straps are required to be flush with the handle and polished, with all rivets countersunk, smoothly finished and polished.

Milton Harris is Stores Engineer of the California Division of Highways and H. L. Ferron is Assistant Stores Engineer.

They're Now Calling It "OPERATION HIGHBALL"

Are Lower Prices Possible For the Clearing of Large Reservoir Areas? —Take a Look at the Hungry Horse Operations!

By W. E. WHEELER
Chief, General Engineering Section
Hungry Horse Project
Bureau of Reclamation
Kalispell, Mont.

CLEARING the 23,500 ac. required for the Hungry Horse reservoir of its mass of virgin timber, second growth and standing snags presented a sizable undertaking. Ordinarily the clearing of forested areas is conducted with little thought of the glamour or romance which is usually associated with the more spectacular job of constructing a large dam.

Noteworthy advancements in the design and use of machinery by Wixson and Crowe and J. H. Trisdale on their three clearing operations at Hungry Horse are certain to affect the bidding on future Western clearing jobs of similar character.

The method for snagging the 7,210-ac. burned-over area of their first contract was described in *Western Construction News*, November 1949, page 68. The experience gained on this contract stood them in good stead when they divided up the final remaining 14,695 ac. Wixson and Crowe, Inc., was awarded 6,840 ac. in schedules 1 and 3 for $2,446,850. J. H. Trisdale, Inc., was awarded 7,855 in schedules 2, 4 and 5 for the sum of $2,484,360. Both firms have main headquarters in Redding, Calif.

HAPPILY clambering around on one of the 8-ft. balls are, left to right—S. L. "Red" Wixson of Wixson & Crowe; W. E. Wheeler, author of this article; Emil Felstet, Wixson & Crowe superintendent, and Fred Hodgson, Bureau of Reclamation reservoir inspector.

The clearing to be done in schedules 1, 2, 3 and 4 is particularly difficult because the area is covered with virgin stands of fir, larch, spruce and pine, from which the merchantable timber has been removed. The removal of this timber was done by standard logging methods leaving stumps not to exceed 36-in. high. There was no requirement for slash disposal as the dry branches would facilitate burning during the clearing operations. Consequently, some method had to be devised to snag the remaining small timber and standing unsound trees without uprooting the large stumps left from the logging operations. Not only would these stumps be difficult to uproot, but they would be difficult to dispose of by burning.

Several methods were considered for performing this operation, but the idea for the 8-ft. diameter balls gained in favor as being the solution. In theory the balls were designed to hold the cable high enough to pass over the top of the 36-in. high stumps. In practice it not only does this, but in light growth of willowy-type trees each 4-ton ball prevents the cable from "riding" up and over the trees without uprooting. Otherwise, the trees would later spring back into position and offer considerable resistance during the piling operations. Such difficulties often occurred with the unweighted cable drag employed on their previous contract.

The eight-foot ball is constructed of ¾-in. plate steel with two bronze bearings supporting the 4-in. steel axle on which the swivels and anchor chain links are connected. Six to ten gallons of lubricating oil was sealed in each ball to keep the bearings oiled.

One ball used with each pair of tractors has proved the method practical beyond their fondest hopes. John Trisdale is using two D-8 Caterpillars on his snagging operations. Red Wixson is using two H-D 19 Allis-Chalmers tractors equipped with Carco winches. Definite advantages accrue in the use of winches. The tractor operators can unreel the cable as they pick their way through the forest, avoiding swamps, stumps and danger trees. When dry and secure footing is obtained the tracks are locked and the operators proceed to reel in on the ball, first one operator and then the other, as he receives his signals from the foreman or spotter. In this way the ball zig-zags back and forth across a 100 to 150-ft. wide strip, toppling all trees in towards the center of the windrow. As soon as the ball is reeled in to within 100 ft. of the tractors, they are moved ahead and the operation is repeated.

Wixson and Trisdale, before the tryouts, referred to this method as "Operation Eightball" not knowing just exactly who was "behind the eightball." Since it has proven successful, with an average of about 75 ac. being "snagged" by each unit per day, it has been cheerfully dubbed "Operation Highball." Weather conditions this spring did not favor clearing and burning by the usual methods, but with the ground saturated by the heavy snows, even the largest trees overturned readily. Several areas on the southwest side of the river had snowdrifts several feet deep hidden in the shade of the trees, even until the middle of May, but this did not slow down "Operation Highball."

The "Twin Cat"

Equally important is the experimental step taken by John Trisdale in use of the "Twin" D-8 Caterpillar tractor unit developed by Peterson Tractor & Equipment Co. of San Leandro, Calif. (*Western Construction News*, February 1950, page 94, and June 1950, page 99.) This unit, two D-8's joined together in an arrangement which permits the transmission of the power from one engine to only one track, mounts a 21-ft., 8-in. rake blade. The unit is being used on the relatively flat land of schedule 5, located at the upper end of the reservoir, for piling the trees and brush ready for burning. The engines are synchronized by governors and should the load get unbalanced and start to swing the tractor to the side, the engine lagging in power output will speed up and balance the pull and swing it back into position. Trisdale states that this "Twin" unit will do the work of three D-8's operated separately. An average day's work for the unit is 10 ac. piled ready for burning.

The "Twin" is already about as universal as standard large tractors. All that is needed to join the two D-8s is the conversion unit, with 4,260 lb. of parts, and a set of blueprints and instructions. For the Hungry Horse "Twin," this material was forwarded by the Peterson firm to the Caterpillar distributor at Kalispell, Mont., the Westmont Tractor & Equipment Co.

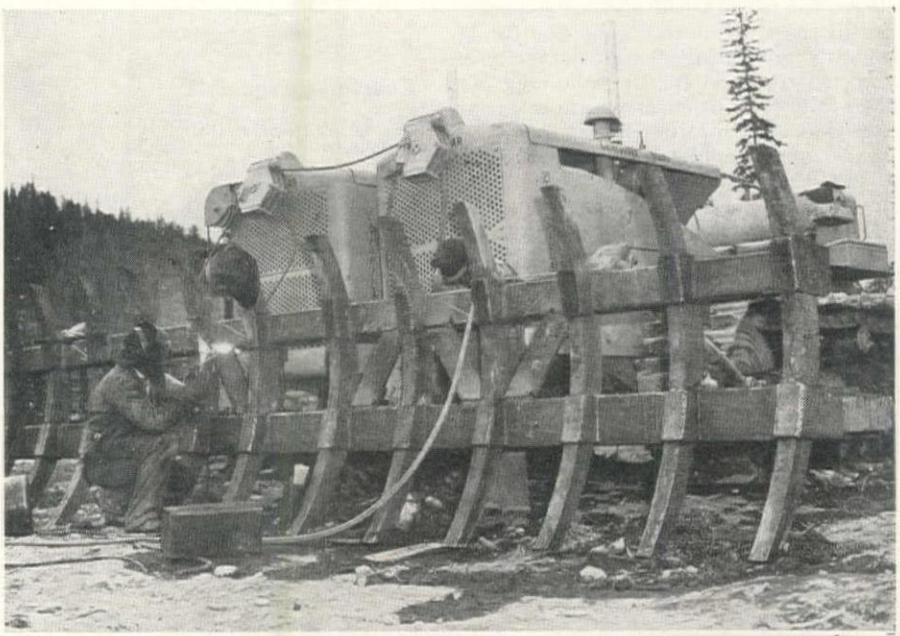
Largest part of the conversion unit is the "stiff bar," a welded beam 10 in. deep and 11 in. wide, built up of 1-in. steel plate. The bar is in two pieces, bolted together at the center with extremely heavy butt plates to carry a large part of the moment of force concentrated there. The only other connection between the two frames is a welded bracket at the rear, in combination with a rear axle. The rear axle itself is in two parts and threaded at the middle, so that it is easily removed. The axle acts as a king pin.

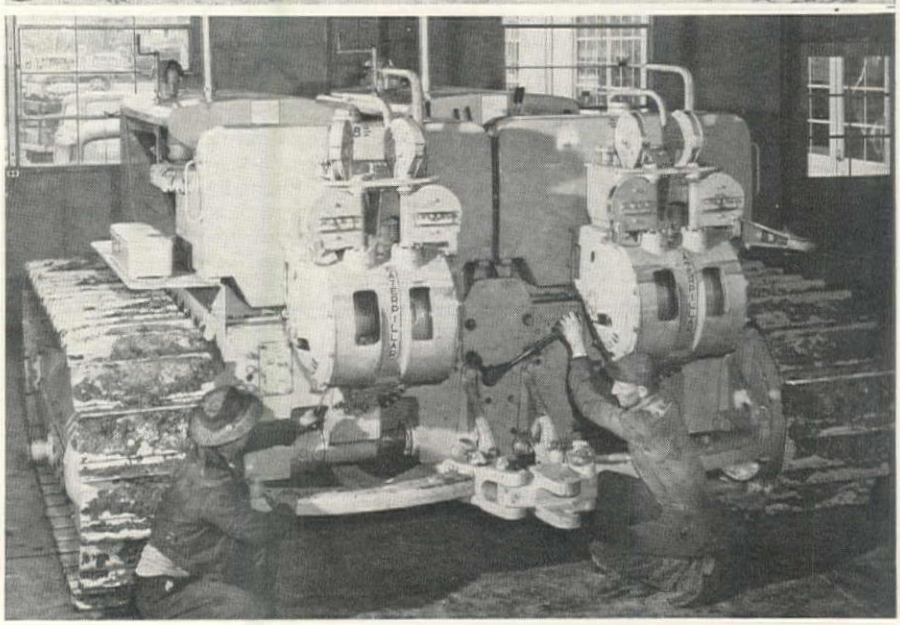
A special feature of the "Twin" which was assembled at the Peterson San Leandro plant, is the "hot rod" effect of reversing the bevel gear. The "Twin" has the same ratios as conventional D-8s, but reversing the bevel gear gives the "Twin" the opposite direction for each ratio; thus, the "Twin" has three loading speeds forward and five reverse speeds, giving two additional fast speeds for the return trips. The "Twin" now in operation at Hungry Horse has the conventional five forward and three reverse speeds.

"BUSTER" PETERSON of Peterson Tractor & Equipment Co., developer of the "Twin Cat," stands by the first model.

The development and use of new equipment and new methods by Wixson and Trisdale has definitely been a step forward in the clearing of reservoir sites under contract, and it will be reflected in substantially lower bids on future reservoir clearing contracts in the West.

THE SPECIAL rake blade, 21 ft. 8 in. wide, being attached to the "Twin Cat" at Hungry Horse, top. At bottom, mechanics Gerald McDonald, left, and Frank Janicke are shown putting finishing touches on the big unit in the shop of Westmont Tractor & Equipment Co.





Experience Dictates Needed Changes in the—

Design of Asphalt Paving Mixtures

By A. E. RYAN
Materials and Research Engineer
City of Oakland, Calif.

IMPROVEMENTS in the construction of asphalt pavements require the never-ending study of mineral aggregates and asphalt cement. Any increase in technical information on the characteristics of crushed rock, gravel and sand, when combined with corresponding data on asphaltic compounds, makes possible new advances in paving methods and results. The present paving program of the City of Oakland has produced some basic information which is reviewed in this article.

Asphalt paving mixtures may consist of mineral aggregates with cut-back asphalts, asphalt emulsions, slow curing oils, asphalt cement or a combination of asphalt cements and fuel oil. This article will discuss only the hot-mixed asphaltic concrete type—a mixture of mineral aggregates and asphalt cement. This is the type of asphalt paving mixture used for most of the street surfacing in the City of Oakland. The fundamentals governing design of the mixture, as outlined in the following, are the same when other asphaltic materials are used, mixed either hot or cold. Asphalt cement, as defined by the Asphalt Institute, is a refined asphalt, or a combination of a refined asphalt and flux, of suitable consistency for paving purposes. It has a normal penetration of between 40 and 300.

Mineral Aggregate

Mineral aggregate constitutes 90% or more of the asphalt paving mixtures used for street surfacing. The purpose of the asphalt cement is to protect this mineral aggregate from the action of moisture and the attrition of traffic. Stability of an asphalt paving mixture depends primarily on the stability of the mineral aggregate used. The resistance to wear depends primarily on the hardness and soundness of the mineral aggregate. Therefore, great care and judgment must be exercised in the selection of the mineral aggregate or combination of mineral aggregates to be used.

The mineral aggregate may consist of (1) a straight crusher product, separated into three to four sizes and re-combined in the mixing plant, or (2) it may be a combination of coarse aggregate, fine aggregate, and mineral filler from different sources. Under the City of Oakland specifications, mineral filler is seldom required, as sufficient fines are usually obtained from the fine aggregates used. Coarse aggregate is usually defined as the material retained on a No. 8 mesh sieve and fine aggregate defined as material passing a No. 8 mesh sieve. Mineral filler is a material of which at least 60% passes the No. 200 mesh sieve.

Coarse aggregate

Coarse aggregate should be hard and tough having a loss in the Los Angeles Rattler test of not over 45%. Materials showing a lower loss should be used where economically available. Oakland specifications require that the coarse aggregate be crushed rock, crushed gravel or a combination of both. It is acknowledged that perfectly satisfactory asphalt paving mixtures can be and have been produced using uncrushed gravel of the proper surface texture and grading. However, because gravel pit operators in the Oakland area can furnish the crushed material economically, crushed gravel is specified, since with the resultant angular particles it is easier to design the mix for maximum stability. Coarse aggregate should also be hydrophobic—showing a surface preference for asphalt instead of water. This reduces tendency to stripping. Both crushed rock and crushed gravel must be clean, and free of thin elongated pieces.

Fine aggregate

Fine aggregate may be either manufactured crusher fines or a natural sand. It must be clean, hard grained and sharp. Fine aggregate should also show a greater preference for asphalt than water. A blend of coarse sand and fine sand may be used, provided they are proportioned to give a well balanced grading.

It is a generally accepted fact that to obtain maximum desirable stability and density in an asphalt pavement a well graded inter-locking coarse aggregate should be used, and to retain the maximum points of contact between the particles of coarse aggregate the quantity of fine aggregate used should not be such as to spread the coarse aggregate apart. In carrying out this sound principle of design, the author believes there is too often a tendency to overlook the importance of the stability of the fine aggregate itself, as well as its ability to carry and hold the proportion of asphalt designed for it. In other words fine aggregate should not be considered as merely "something" to fill in the voids of the coarse aggregate.

Particle shape and surface characteristics are just as important in fine aggregates, even down to the No. 200 mesh or "flour" size, as in coarse aggregates. Asphalt like any oily derivative is a lubricant and if the fine aggregate is composed essentially of rounded or spherical particles the resultant action is similar to that of minute ball bearings, tending to reduce the stability of the composite asphalt paving mixture. If, in addition, as is generally the case, these spherical particles have a smooth or glassy surface, they do not retain the percentage of asphaltic material indicated by the grading and surface area. Therefore, if the full percentage of asphalt is used, as required by the composite grading, there is a tendency for part of it to leave the rounded or spherical shaped particles of the fine aggregate. This enriches the asphalt in the coarse aggregate sizes, producing instability or "bleeding" in the pavement surface. If the asphalt content is lowered a "dry" mix of potentially short life is the result.

The other important characteristic of a fine aggregate or blend of fine aggregates is the grading. It has been found both through laboratory research and experience that when the grading of the composite mineral aggregate for any given asphalt paving mixture plotted on semi-log paper produces a curve that is at least silghtly concave, good stability may be expected. An example is the solid line curve of Fig 1 (see page 68). If the grading of mineral aggregates is unbalanced—having a large percentage on any one of the finer sieve sizes—the grading curve of the composite aggregates will show a "hump" as indicated by the dashed line of Fig. 1. A grading of this type tends to produce an asphalt mix of low stability.

When appreciable amounts of fine aggregates having the undesirable characteristics are used, a brownish cast can be noted in the finished pavement.

PROBLEMS relating to materials, their properties and proportioning are always under active study by those interested in asphaltic mixtures. Progress in their solutions results from laboratory studies, correlated with observations from the field. At times the interest seems to be concentrated on the asphalt itself, and again the experts are off on a hunt for new angles in aggregate. So, between the lab and the field, and the asphalt and aggregate, there is progress in the use of this important engineering material. Occasionally, a round-up which includes all phases tends to highlight these developments. Mr. Ryan brings to date several subjects in this summary . . . Editor.

The Author Points Out . . .

". . . There is too often a tendency to overlook the importance of the stability of the fine aggregate itself . . ."

•

". . . When the grading of the composite aggregate . . . plotted on semi-log paper produces a curve that is at least slightly concave, stability may be expected."

•

"The author believes that with the use of fine aggregates of sharper grain and greater stability it is possible to use softer asphalts in dense graded mixes."

". . . Two or more asphalt cements of the same penetration, and meeting all the standard requirements may present different characteristics, with the same mineral aggregate . . ."

•

"The differences in the asphalt cements are due to the crude oils from which they are produced, and in some cases to the refining process."

•

"There is a challenge to the research laboratory to develop a real quality test for asphalt cement that will not restrict the use of proven materials."

Revisions have been recently made in the City of Oakland specifications to insure the use of fine aggregates as close as possible to the ideal particle shape and grading. One innovation is the requirement that the component materials be so proportioned that when the composition sieve analysis is plotted on semi-log paper a uniform concave curve results.

Mineral filler

Mineral filler has been used in asphalt mixes primarily to obtain increased density and stability. Some years ago efforts to develop stability were confined largely to the use of varying amounts of mineral filler. This was particularly true in the design of sheet asphalt paving mixtures. Since this type of mix consists of fine aggregate only, the use of filler has served a useful purpose particularly in the case of sand or fine aggregate that did not come up to standard in regard to grading and sharpness. With the development of the asphaltic concrete type of mix it was first thought necessary to include an appreciable amount of mineral filler in the mixes to attain density and stability.

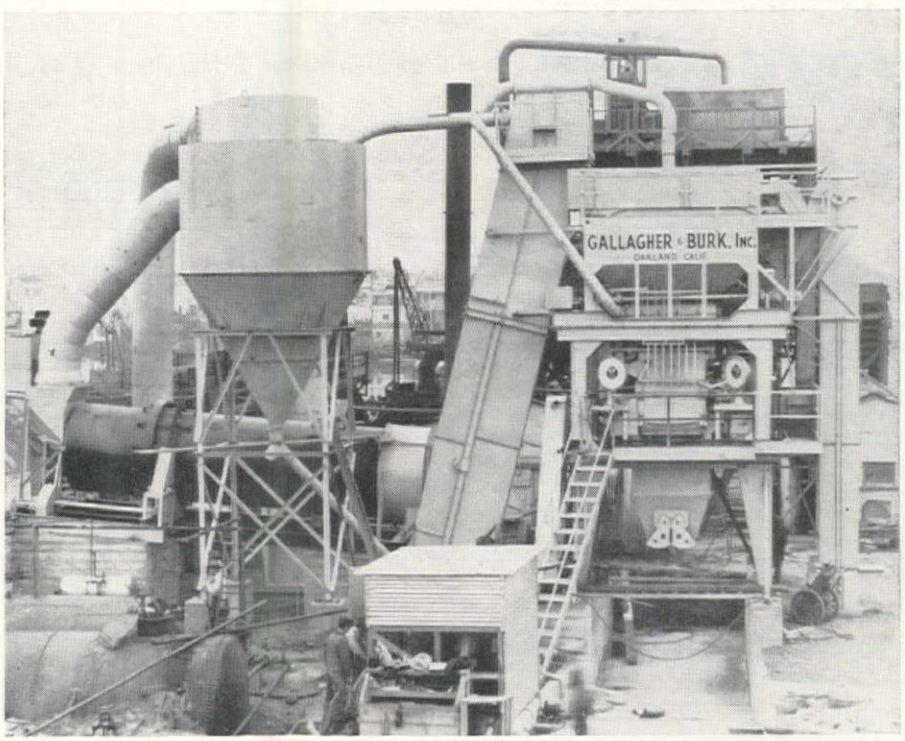
However, in more recent times it has been found possible to obtain entirely satisfactory density and stability in asphalt paving mixtures with: (1) careful selection of coarse and fine aggregate components, and (2) proper proportioning. The percentage of material passing the 200-mesh sieve has become of lesser importance and not essential to density and stability.

Oakland's specifications now permit as low as 2% material passing the 200-mesh sieve, when the maximum size of aggregate to be used in the asphalt mix is ¾ in., 4% when the maximum size is ½ in., and 5% when the maximum size is ⅜ in. Generally sufficient material of the 200-mesh size is obtained from the fine aggregates secured in the local area, so mineral filler is not required.

If the necessary fines are not present or it is not possible to obtain the quality of fine aggregate desired, then mineral filler should be required. Mineral filler may be either a natural or manufactured product with at least 60% passing the 200-mesh sieve. This fine portion should be further graded downward if the filler is to be effective. Limestone dust, hydrated lime and Portland cement are good fillers. Many rock dusts and gravel fines are also satisfactory for fillers. Silica dust is a denitely inferior filler. The mineral filler proposed for use should be laboratory tested prior to use. Suggested tests are void content, affinity for asphalt and microscopic examination.

If the only coarse aggregate economically available has some undesirable characteristics such as poor texture or is water preferential instead of oil, the adverse effect may sometimes be overcome by the use of a filler of good quality. Some years ago the author had occasion to deal with a coarse aggregate of this type in an Atlantic Coast State. The aggregate was well graded and sufficient fines were available from the crusher fines used so that the use of a filler was not indicated. However, when compressed cylinders of this asphalt mix were placed in a water bath at 140 deg. F. for one hour, incipient disintegration was noted. This condition was overcome by adding 3% hydrated lime to the mix. Later, in the interest of economy, a somewhat higher percentage of a good

ONE OF THE LATEST asphalt mixing plants. Close control in such up-to-date plants is not enough to guarantee stability of the asphalt mixtures used for paving.



AGGREGATE CHARTS

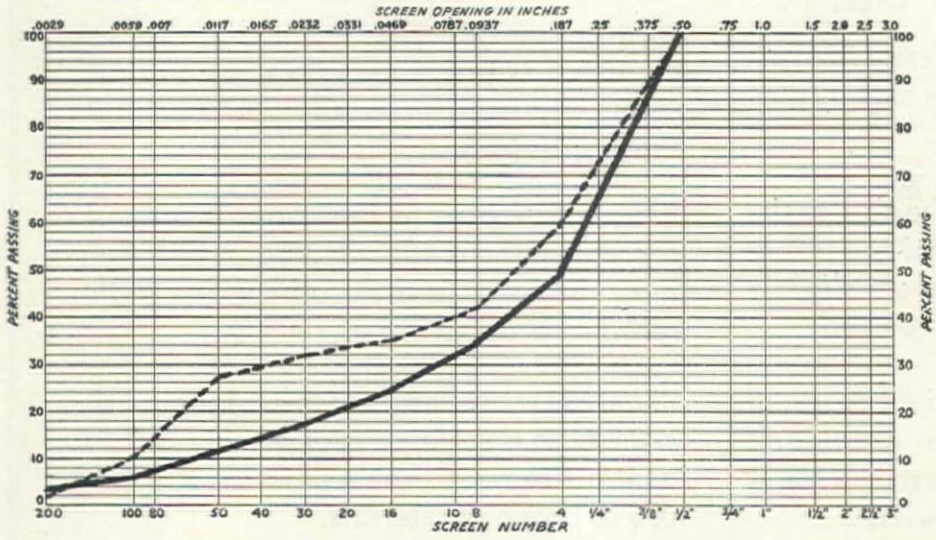


FIGURE 1—Solid line shows typical grading of satisfactory material. Dashed line shows typical aggregate grading that tends to produce a mix of low stability.

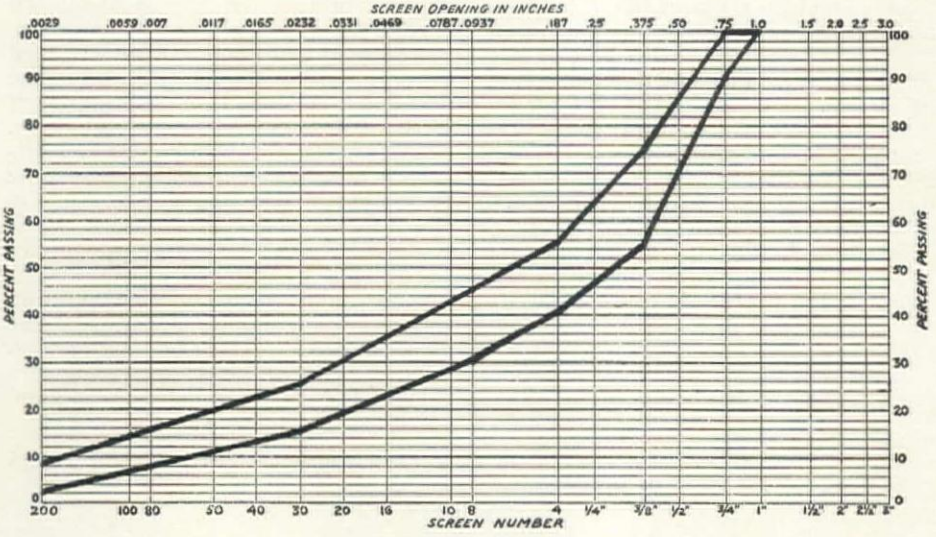


FIGURE 2—Typical curves showing specification limits for a dense type of mix with ¾ in. as the maximum size of aggregate.

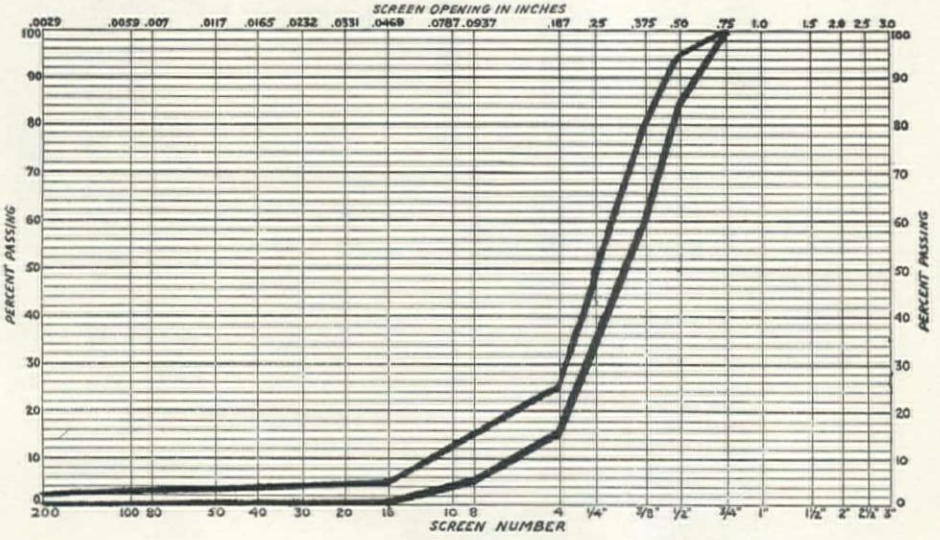


FIGURE 3—Specification limits for single course open-graded mixture.

grade of limestone dust was substituted for the hydrated lime with good results.

The major portion of street surfacing and resurfacing in Oakland is accomplished with dense graded asphalt mixtures, although some work has been done recently with an open graded mix. Three types of dense graded mixes are used having ¾, ½ or ⅜ in. as the top size aggregate. The open graded mix has a top size aggregate of ¾ in. A typical specification range for the dense type of mix is shown in Fig. 2 and the open graded type in Fig. 3.

Asphalt Cement

The penetration of the asphalt cement specified is 60 to 150. Normally, asphalt cement of 85 to 100 penetration is used in our dense graded mixes, and asphalt cement of 150 penetration is used in the open graded mix. It has been definitely demonstrated that the stability of an asphalt pavement is dependent on the mineral aggregate and not the hardness of the asphalt cement, since at low temperatures there is little difference in the brittleness of the asphalt cement and at high temperatures relatively little difference in the fluidity regardless of the penetration grade selected.

However, for practical considerations it has been found desirable to use somewhat harder grades of asphalt for Oakland street surfacing mixes than those used for state highway work. With the necessity of quick opening to traffic and the nature of that traffic, particularly in reference to turning vehicles and bus stops, there seems to be enough delay in final set or stability attained in the softer asphalt mixes to give some trouble. This is particularly true in hot weather when occasionally we have resorted to the use of asphalts having a penetration of 60 in the dense graded mixes and 75 in the open graded mixes. The author believes that, with the use of fine aggregates of sharper grain and greater stability, it is possible to use softer asphalts in dense graded mixes.

Amount of asphalt

The percentage of asphalt cement to be incorporated with the mineral aggregate is dependent on the grading of the aggregate and its surface characteristics. The more asphalt cement that can be used in the mix, the longer the prospective life of the pavement. Therefore, the percentage of asphalt cement specified should be as high as possible consistent with adequate stability. Dense graded mixes require thinner films of asphalt and open graded mixes require thicker films. The open graded mixes are composed almost entirely of coarse aggregate of high inherent stability but must be well protected from the action of water, hence the thicker film. In effect, asphalt cement is being substituted for the higher surface area fine aggregate.

It was formerly believed that, for dense graded mixes, sufficient asphalt should be used to fill the voids in the combined mineral aggregates. In practice it has been found desirable to leave 3% to 5% of air voids in the paving mixture, since even after final rolling it has

been noted that additional compaction will take place under traffic. If the voids are completely filled with asphalt some may flush to the surface of the pavement creating areas that are slippery.

There is definitely a difference in asphalt cements. By this is meant that two or more asphalt cements of the same penetration, say 85, and meeting all the requirement standards of A.S.T.M. and A.A.S.H.O. may present different characteristics, when used with the same mineral aggregate having the same grading. The author has worked with asphalt cements in the East, South, Midwest and more recently in California and has had considerable opportunity to note these differences in behavior.

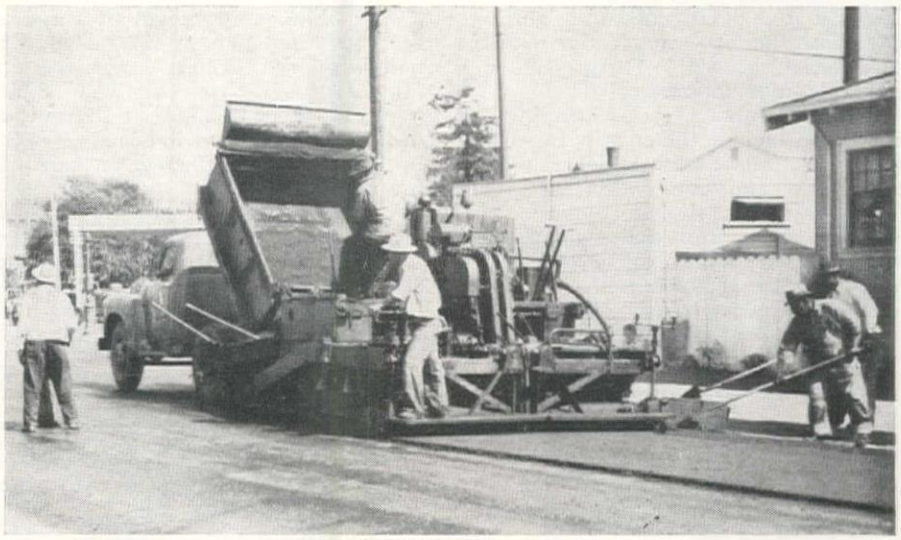
Given a standard aggregate and two asphalt cements of the same penetration and it will be found that the aggregate will carry a higher percentage of one asphalt cement than the other and yet have the same stability. In processing through the mixing plant it will be found that one asphalt can be heated to a higher temperature, without injury, than another of the same penetration. E. F. Kelley of the U. S. Bureau of Public Roads reports that in one series of tests three asphalt cements of the same penetration grade (85-100) were combined in the same proportions with granite coarse aggregate, sand and limestone dust. When tested by the Immersion-Compression Test, solely because of the differences in the asphalts, the retained strength of the soaked specimens ranged from 50% to 76% of the dry specimens.

The differences in the asphalt cements are due to the crude oils from which they are produced, and in some cases to the refining process. Some technologists believe the differences to be solely a function of susceptibility of the asphalt cements to temperature change. This belief resulted in the development of various tests such as the penetration-ratio, viscosity index, etc. Many of these tests proved to be merely source-identifying or restrictive and often rejected satisfactory materials, hence were never written into the specifications of the A.S.T.M. or A.A.S.H.O.

Adequacy of tests

There have been tests developed to identify asphalts refined by steam and vacuum processes from asphalts produced by cracking processes. The latter generally have a high susceptibility to changes in temperature and harden rapidly during mixing and subsequent exposure to weather. Since some steam-refined asphalts also have similar characteristics, these tests cannot be said to be satisfactory tests for quality.

There is no question but what the great majority of these asphalt cements of varying characteristics can be used with entirely satisfactory results. However, the author believes it to be true that an asphalt cement of somewhat inferior quality could be supplied under existing specifications. It might be added here that the same holds true for Portland cements. Two or more Portland cements may pass standard specifications such as A.S.T.M. and A.A.S.H.O. but concrete pavements in which these cements are used may have quite different physical characteristics. The author had ample opportunity to observe this on many experimental projects in New York State and New England.



A TYPICAL asphalt pavement resurfacing project. More rigid control of fine aggregates will make possible extensive use of dense graded mixes, with adequate stability.

There is a challenge to the research laboratory to develop a real quality test for asphalt cement that will not restrict the use of proven materials. On the other hand there is a challenge to the asphalt industry to produce, as near as practicable, uniformity in asphalt cements. They should have physical characteristics that will enable a higher percentage to be used in asphalt paving mixtures, resulting in still more durable pavements. Another desirable characteristic would be asphalts to withstand uniformly high temperatures in the hot mix plant without undue hardening. This would be of particular value for cool weather work. Such asphalt cements would probably be more resistant to subsequent weathering.

No attempt will be made in this article to go into the details of processing the asphalt paving mixture through the mixing plant. Needless to say close plant control is required under adequate inspection. Fig. 4 shows one of the modern contract asphalt plants in the City of Oakland.

Placing on the Street

Discussion of street surfacing will be limited to selection of the type of asphalt paving mixture to be used and the thickness to be laid. For new construction, on streets subject to a large volume of traffic and heavy wheel loads, the ¾-in. mix is usually selected and laid to a thickness of 3 in., in two 1½-in. courses. On residential or lighter traveled streets the ½-in. mix is usually selected, and laid to a thickness of 1½ in. These are both dense graded mixes, but there is no reason why in some cases the open graded mix could not be used to good advantage.

During the war, as in all other major cities, a large back-log of street repair or resurfacing developed. Consequently, by far the greater volume of our asphalt paving is that of resurfacing. To cover as large a mileage as possible each year, the thickness of the resurfacing is held to a minimum consistent with the condition of the street, traffic and general good practice. These thicknesses have varied from slightly under 1 in. to about 2 in. Surface heating and planing of some of the older and very rough asphalt pavements has been carried out prior to resurfacing. On a rough street that has not been planed it is recommended that the resurfacing be not less than 2 in., laid in two courses, the first course to act as a leveling course.

In the past, for resurfacing, it has been the policy to select the maximum size aggregate mix consistent with thickness, to obtain maximum stability. For a 2-in. thickness, one course of ¾-in. mix would be used; for a 1½-in. thickness either ¾-in. or ½-in. mix; and for a 1-in. thickness ½-in. mix. For any thickness less than 1 in., or shoulder work the ⅜-in. mix may be used.

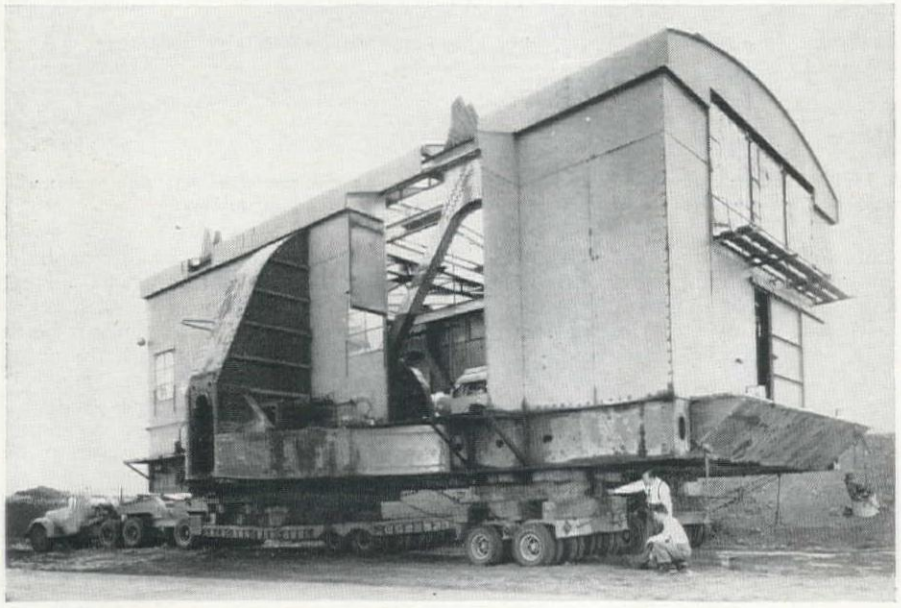
Some open graded mixes were used for concrete resurfacing last year. The thickness used was from 1½ to 2 in. To date they have proven quite satisfactory, particularly on steep grades where they provide both stability and resistance to skidding.

While dense graded mixes using maximum size coarse aggregate have a good record of service in Oakland, it is desirable for municipal streets to have a closely-knit uniform appearing mosaic type of mix both for appearance and ease of cleaning. With Oakland's new specifications, and exercising more rigid control over the fine aggregates used, it is quite possible that there will be more extensive use of the ½-in. and ⅜-in. dense graded mixes, with adequate stability. The open graded mix would still be specified where its use is advantageous. However, for dense graded mixes on State or county highways the author would recommend as large a top size aggregate as is consistent with the thickness.

The author wishes to acknowledge the excellent work done by his assistant, Ray Rose, in the development of Oak-

land's asphalt paving mixtures. Through Mr. Rose's many years' service with the city he has been able to furnish much valuable information.

Space does not permit extending this review to include the equally important phase of street design which relates to sub-grade and foundation problems. There is no intention to minimize this element of design and construction. However, several formulas for design thickness are available which take into consideration the volume of traffic, maximum wheel or axle loads and materials. Two of the more recent of these are developed in papers by Hveem and Carmany, of the California Division of Highways, and Steele of the U. S. Bureau of Public Roads. For the purpose of this discussion it will be assumed that in new street surfacing an adequate foundation has been designed and constructed, and that prior to the resurfacing of old pavements proper investigation has been made to determine that an adequate foundation is under the old pavement to warrant the cost of placing the new top or lift.



220-ton Trailer-Dolly Combination Carries Monighan to New Work Site

WHEN construction of the Delta-Mendota Canal, part of California's Central Valley Project, called for the moving of a 610-ton Bucyrus Monighan dragline from Tracy to Los Banos, Calif., construction men faced a major project. Normal method of moving this type of equipment is to dismantle completely just as when leaving the factory and to transport to the new site by rail or trucks and there re-assemble. This method involves a large expense in actual direct labor and loss of the machine's use during the months required in performing the move.

The Condick Co. of Berkeley, Calif., which specializes in heavy industrial work, and the canal contractors, Morrison-Knudsen Co., Inc., and M. H. Hasler, who together had solved a similar problem involving the hauling of canal lining machines as single 150-ton units, decided that a like operation could be applied to moving the Monighan in large sections, thus eliminating the major portion of the expense and time required by conventional methods.

The method which eventually was used involved both problems in obtaining right of ways and constructing hauling equipment of a capacity which would carry up to 220 tons. The use of an improved highway was, of course, out of the question as the largest unit, the main frame section, was 42 ft. wide x 50 ft. long x 30 ft. high. The moving contractor used a combination of approximately 30 mi. of unimproved country roads and constructed another 30 mi. of private roads through open farm lands.

Equipment used for this move included one diesel-powered truck tractor, one low-bed jeep and a full low-bed Fruehauf trailer owned and operated by the T. Donald Hagerty Drayage Co. of Berkeley, Calif. In addition to the foregoing equipment, two special contractor-built dollies with 16 tires each were used under the rear end, and two D-8 Caterpillar tractors were used in front as towing units. The combination of truck trailer and dolly equipment was run on a total of 66 B. F. Goodrich tires.

Western Highway Programs Tabulated in ARBA Survey

A NATIONAL survey by the American Road Builders' Association of highway construction in 1949 and 1950 includes a tabulation of the amounts of money set aside by the eleven Western States for highway construction in 1950. The amounts were given as follows: Arizona, $10,000,000; California, $72,400,000; Colorado, $17,000,000; Idaho, $12,000,000; Montana, $16,000,000; Nevada, $5,800,000; New Mexico, $12,500,000; Oregon, $20,000,000; Utah, $7,000,000; Washington, $17,000,000, and Wyoming, $9,000,000. Eight states with less mileage programmed this year as compared to 1949 are all in the eastern part of the country.

Growing Alaska Will Need More Kilowatts

POWER requirements for principal load centers in Alaska may reach 864 million kilowatt-hours within the next decade, almost seven times the 1947 requirements of the Territory, it is estimated in a report issued by the Federal Power Commission. The report, entitled "Alaska Power Market Survey," says that approximately 173,000 kilowatts of generating capacity probably will be required to meet this total potential 1960 market. Of this amount, it is estimated that about 92,000 kilowatts may be drawn from the Territory's enormous hydro power potential. The estimates were made on the assumptions that in 1960 relatively low-cost power would be available from hydro installations; that Alaska's wood pulp industry and the Arctic oil fields would be developed; and that present military activity would be continued.

High costs of construction and operation which resulted in high electric rates are largely responsible for the slow development of power in the past, the report points out. Although electric power has been a minor factor in Alaska's economy, the report says, the development of the Territory in the future will probably be related closely to the utilization of its potential hydroelectric power.

In this connection, the report says that future expansion of Alaska's basic industrial economy probably will depend chiefly on the anticipated production of wood pulp in the southeastern part of the coastal zone and in the production of petroleum in the Arctic zone. The development of these two industries would result in the general expansion of the Territory's economy and a relatively large increase in power requirements.

The report may be purchased from the Publications Section, Federal Power Commission, Washington, D. C., for $1.00 a copy. The order number is F.P.C. P-22.

AFTER 2 YEARS of work, the 3-mi. tunnel for Portland's sewage disposal project is completed. Crews of Peter Kiewit Sons' Co. holed through on May 25, and concreting was completed May 31.

The tunnel, biggest item of the sewage disposal system, cost $2,800,000. It is an 8 x 8-ft. horseshoe tunnel and involved 65,000 cu. yd. of excavation. Lining is of reinforced concrete. The tunnel eventually will carry sewage from the East Portland district through additional connecting lines to the new treatment plant. From there, it will be carried by outfall sewers to Columbia and Oregon Sloughs by way of Hayden Island.

Speed Records Established On Colorado Tunnel Project

The day-by-day story of how cutting government red tape and teamwork by contractors made speed records possible on the emergency Grand Valley irrigation tunnel

THE BUREAU of Reclamation set a speed record last March for contract negotiations by a Federal agency when it made an award for construction of an irrigation tunnel only 7 days after an emergency had arisen. But the attention of the construction industry was almost immediately shifted to the contractors who accepted the assignment along with heavy penalties which would be assessed if the job was not completed within a time limit. The job is now history, but an accolade is due both the Bureau, for its unbureaucratic efficiency, and to the contractors—Grafe-Callahan Construction Co. and Rhoades-Shofner Construction Co.—who completed the construction in 48 days of the specified 72 days. Both the Bureau and the contractors gave a demonstration of teamwork at its best.

The emergency was created March 8 when Tunnel No. 3 of the Grand Valley project in western Colorado, built in 1914, collapsed under the weight of a landslide. Some 30,000 ac. of orchards and truck crops depended on water moving through this tunnel. Production loss was quickly estimated at $1,300,000 if a bypass tunnel could not be completed before July 1, but the loss could be held to an estimated $200,000 provided water could be moved before June 1.

How the 2,240-ft. horseshoe bypass tunnel of 13-ft., 9-in. diameter was contracted and constructed to avert the threatened crop loss is briefly reviewed in the following day-by-day report.

March 8—Southern extremity of the Little Book Cliff mountains near Cameo in western Colorado collapses crushing 500 ft. of Grand Valley Irrigation Tunnel No. 3. Engineers report tunnel will never again be able to carry water. L. N. McClellan, chief engineer of the Bureau of Reclamation, orders all-out effort aimed at saving every possible day in getting water to the Grand Valley Project through a tunnel by-passing collapsed tunnel section.

March 9—Telegrams sent to 22 of the nation's tunnel contractors, prospective contractors for the emergency construction, by William Warne, Assistant Secretary of the Department of Interior.

March 10—Preliminary specifications assembled at Bureau's Denver headquarters and issued to prospective contractors.

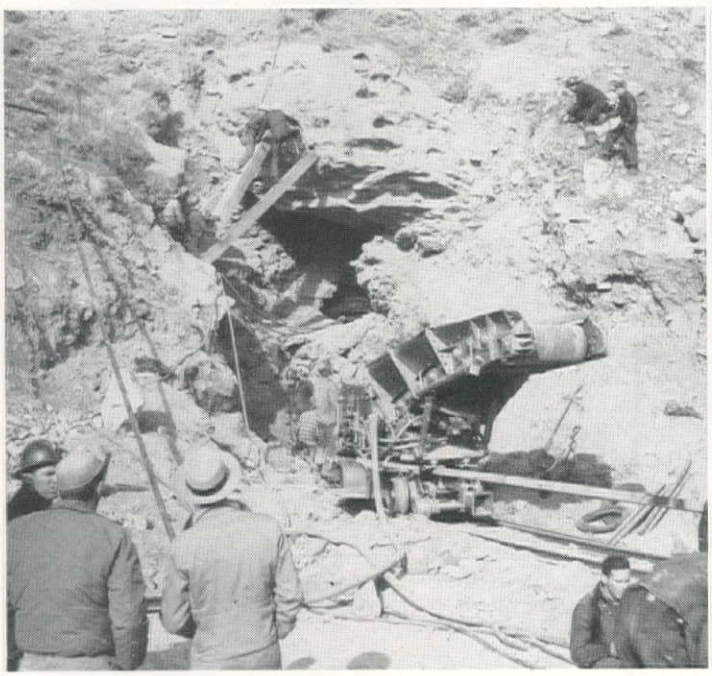
March 13-14—Ten representatives of contracting firms convene at Denver for pre-bidding conference and adjourn to the tunnel site for an on-the-spot inspection.

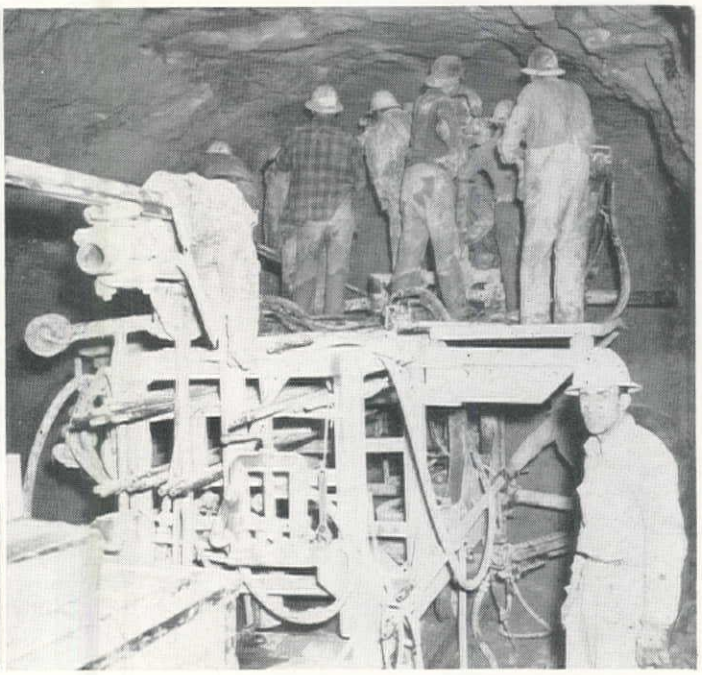
March 15—Contractors re-convene in Denver for contract negotiations.

March 16—Contract awarded, on a bid of $609,800, to the Grafe-Callahan Construction Co. and Rhoades-Shofner Construction Co. of Los Angeles. Work to be completed within 72 days (completion date May 28). Liquidated damages specified in the contract unusually heavy because of the importance of the time element—$2,500 a day for the first five days, $5,000 a day for the next ten days, and $7,500 a day thereafter. Award made on lowest of four offers. Contractors represented at negotiations by B. A. Peters, project manager, and Everett Seabury, vice-president of Grafe-Callahan. Ray Blasongame, currently the firm's tunnel superintendent on the Duchesne tunnel job in Utah, notified by telephone immediately after contract award. Ross Billings, veteran tunnel man with the Bureau of Reclamation, assigned to direct the work as construction engineer.

RAY BLASONGAME, left, tunnel superintendent, wears a big grin a few minutes after the tunnel was holed through ahead of schedule.

March 17—Blasongame loads 16 trucks with equipment from the Duchesne tunnel job and has them on the road by nightfall. Also, 65 men sent by car from the Duchesne job.





MUCKING MACHINE on the tracks ready to go after the fourth day, left. At right, drillers crowd the 6-position jumbo used on the downstream working face of the tunnel.

March 18—Private plane carrying Howard Woods, Duchesne project engineer, Peters and Blasongame leaves Duchesne project and arrives at Grand Junction. An auto court near the job site leased by the contractors; one cabin turned into an office, other cabins to house key construction personnel. Access road ½ mi. long, built to the west tunnel adit.

March 19—First trucks arrive from Duchesne project and unload equipment.

March 20—Installation of power lines and equipment housing begins. Construction crews divided for simultaneous work from both headings of the tunnel location.

March 21—Shops completed to house jumbo drill rigs, battery chargers and other equipment. Track laid for access of tunnel equipment to adit headings. Water piped in.

March 22—A total of 70 ft. driven for the west adit using three crews of 20 men each working on three shifts during full 24-hr. period. Arrangements made for 24-hr. work at each heading, west and east, until the job reaches completion.

March 24—Started driving tunnel from the west portal. Five sets of drills mounted on jumbo penetrate 7 to 8 ft. for setting milli-second charges.

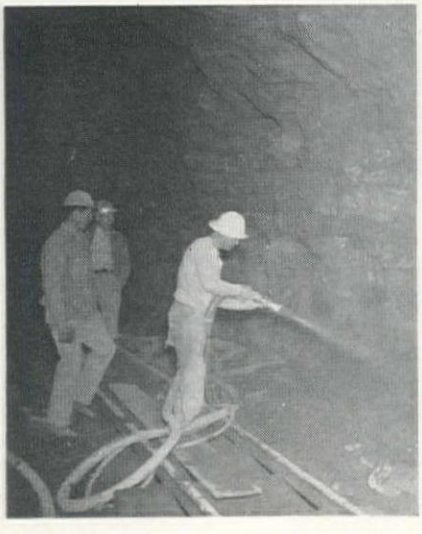
April 1—Started driving tunnel from the east portal. Progress already past 100 ft. from the west portal. At the east portal, the tunnel is in dirt section and steel ribs had to be placed on 4-ft. centers and legged solid.

April 10—Work proceeding at rapid and satisfactory pace at both headings. Appears that average pace for duration of contract will be about 20 ft. per day from the east end (through sand section) and 60 ft. a day from the west end (through rock). Holing through predicted at noon on May 2, or 20 days ahead of scheduled completion date.

April 27—Tunnel holed through at 12:12 a. m., 33 days ahead of schedule. Crews from east end complete 45 ft.; crews from the west, 1,745 ft. Mrs. Everett Seabury organizes holing-through party featuring a cake weighing 38 lb. Entire personnel from both headings gather and talk about "how we did it."

After April 27—As a precaution against water percolation and its resulting seepage and landslide over tracks of the Denver & Rio Grande Western railroad, the 400 ft. of tunnel through sandy section lined with gunite.

GUNITING operations were necessary to seal off possible leaks through seams in the solid rock of the newly-excavated tunnel.



Some records

The speedy placing of the job under contract and subsequently its speedy completion by the contractors established a number of noteworthy records. These were—752 ft. of hard-rock tunnel driven within a month after the first bid call; 1,324 ft. driven within a month after the contract award; the fastest recorded time for negotiating a repayment contract by the Bureau of Reclamation, and a similar record for the award of a contract by the Bureau.

Bureau of Reclamation personnel on the job included: A. B. Reeves, field engineer; Ross Billings, resident engineer; Clifford Jex, office engineer, and R. J. Mandeville, inspector.

Contractors' personnel included: B. A. Peters, project manager; Ray Blasongame, superintendent; Howard Woods, company engineer; Jeff "Curley" Henderson, office manager; Elmer "Booger" Barr, assistant superintendent; Dick Olerich, assistant superintendent, and Merle Miller, master mechanic.

Spreader Butters Building Blocks With Only Half the Usual Mortar

A MECHANICAL mortar spreader of a new and unusual type has been invented at the Washington State Institute of Technology. The device uses only half as much mortar as is normally required in laying unit masonry. It is designed for use on standard building-blocks.

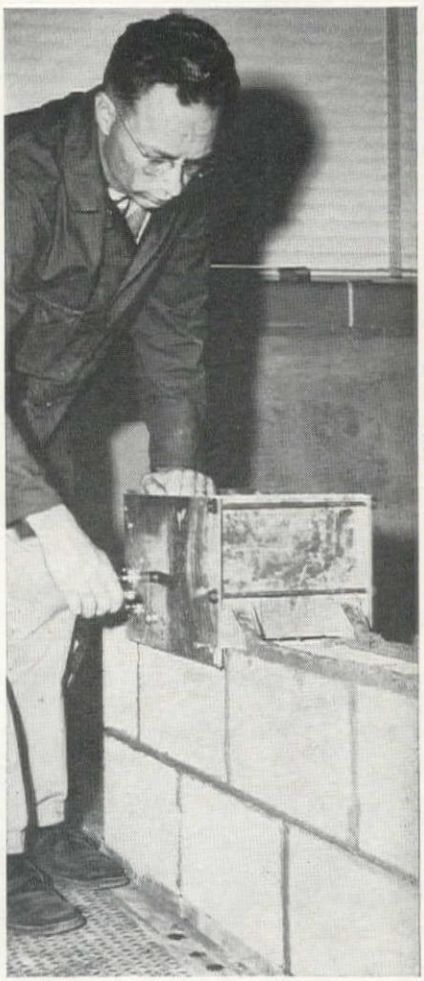
Its operation is continuous and rapid. The spreader, filled with mortar, is set on a previously laid course of unit masonry. Then, as a crank is turned, it advances along the wall, distributing the proper quantity of mortar on each face-shell. The mortar is laid neatly and uniformly. There is no waste. The head-joints are buttered by running the spreader along a row of up-ended blocks.

The novel mechanism was invented by Jack J. Wegner, a chemical engineer on the staff of W.S.C.'s Industrial Research Division. Wegner estimates the 50% mortar saving on the basis of general recommendations for laying unit masonry. Four cubic feet of mortar are usually recommended for laying 100 standard building-blocks. But less than 2 cu. ft. of this remains in the wall. The rest is waste. With the new spreader, the factor of waste may be disregarded.

Essentially, the invention consists of a hopper-body 16 in. long, 7½ in. deep, and 9½ in wide. Two augers, horizontally spaced, are in the bottom of the hopper, extending its full length. The augers pass through openings in the rear end of the hopper-body and terminate flush with the outer-body surface.

The augers are rotated in such a manner as to carry mortar from the hopper-body and force it through the openings at the rear. Rotation is produced by turning the operating crank through suitable gears, sprockets, and chains.

The hopper-body is supported on the masonry by wheels in front, and wheels or skids in the rear. The front wheels move the spreader forward as the operating crank is turned. They are covered with rubber tires for better traction.



FAST-GROWING infant of industrial minerals is Perlite, a siliceous volcanic rock containing water that when crushed and suddenly heated pops into a very lightweight material. Heat and sound insulation properties qualify it for use in plaster, light-load-bearing concretes, and prefabricated masonry units. Only a mineral curiosity in 1940, it is now mined in several Western states and shipped to more than 40 expanding plants from coast to coast.

Temperature Control Problem in the Construction of Mass Concrete Dams

By W. R. WAUGH
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Washington, D. C.

How the problem developed and its importance . . .

THE PROBLEM of temperature control in mass concrete dam construction has been recognized for many years, but only in the last two or three decades has it become acute to the point of taxing the ingenuity of engineers to find ways and means of effecting the required control. The two factors which have largely influenced the present importance of the temperature control problem are:

a. Increase in **size** of the mass concrete dams constructed in the last thirty years.

b. Development of high speed large scale construction plant equipment to cope with the increasing size of dams.

Design and construction of concrete gravity dams, 200 to 400 ft. high and even higher, has now become commonplace, whereas prior to thirty years ago very few mass concrete dams in excess of 200 ft. in height had been built.

The necessity for and extent of control of temperatures in mass concrete dams is often debated. The lack of control of temperatures can result in serious cracking, and the two principal objections are:

a. Interruption of the continuity of a dam, if the crack is of sufficient size and extent, which can materially influence its structural integrity.

b. Formation of passageways for the entrance into and movement of water through a dam to cause leakage, and to contribute to the beginning and continuation of disintegration by natural weathering.

The unprecedented size of dams and the development of rapid methods of construction gave impetus to the study of the temperature control problem. Initially, studies were directed toward the investigation of the influence of the chemical and physical properties of Portland cement on heat generating properties. These studies largely influenced the development of two of the present specifications for the five types of Portland cement. Types II and IV are specifically designed for use in structures where temperature control is a principal problem.

Concurrent with the study of cements, a study of temperature changes in mass concrete was also under way. As a result of these studies, methods were developed for the mathematical analysis of temperatures in massive structures. This information made possible rational predictions on which to base the necessity for and extent of necessary temperature control. These studies indicated the value of dissipation of heat through natural diffusion, which led to the adoption of regulated construction progress as a means of temperature control.

The necessity for closer control over temperature changes than can be achieved by controlling the rate of construction, and using a minimum of cement having favorable heat generating characteristics, led to the development of forced cooling and precooling as methods of temperature control. Recent emphasis has been directed toward developments which will allow the use of the lowest possible cement content commensurate with the strength and other requirements of a structure. This has resulted in specifications for fine aggregates graded to fall within narrow limits and to meet strict uniformity requirements. These requirements have prompted a debate of the merits of such requirements, particularly as they affect construction costs.

The cycle of temperature rise and fall . . .

There are two prominent conditions in connection with the construction of mass concrete dams in which "restraint" acts to set up tension in parts of the structure, which if not controlled may result in objectionable cracking. To appreciate fully how restraint acts, it is necessary first to understand the cycle of temperature change which takes place in a mass concrete dam during and after construction.

The temperature cycle starts with the "placing temperature," which, unless influenced by artificial treatment, is usually close to the average seasonal air temperature. The generation of heat immediately causes the temperature of the concrete to rise. This rise continues until such time as the loss of heat (by whatever means) from the structure is equal to the gain of heat from heat generated due to setting. After the temperature has reached a maximum, a decline in temperature begins. This decline continues until the temperatures reach a "stable"condition after which the variations in temperature within the structure are largely influenced by seasonal temperature variations in the air and water which surround the structure.

In a large dam, the seasonal variations are effective in causing appreciable changes in temperature only near the faces of the dam. The interior concrete may be considered to have reached a constant temperature condition. The three important points, therefore, in the cycle of temperature change are: (1) placing temperature, (2) the maximum temperature and (3) final stable temperature. There are many factors which influence this temperature cycle; the most important are:

a. Heat generating characteristics of cement.
b. Quantity of cement used.
c. Thermal characteristics of the concrete.
d. Construction schedule.
e. Climatic conditions.
f. Special treatments.

How temperature changes cause cracking . . .

With this outline of temperature changes in a mass concrete dam as a background, it is possible to discuss "restraint" and how it acts to cause cracking. One of the prominent conditions of restraint common to all mass concrete dams is foundation restraint. When concrete is placed on and becomes bonded to a relatively unyielding rock foundation of practically infinite extent, the concrete is restrained from changing freely in volume with the rise and fall in temperature.

Initially, as the concrete temperature rises there is a tendency for the restraining effect of the foundation to set up compressive stresses in the concrete. The magnitude of compressive stress set up is influenced principally by the magnitude of the temperature change, the degree of restraint and the elastic and related properties of the concrete. Having reached a maximum, the temperature begins a decline and the compressive stress is gradually relieved. Subsequent reductions in temperature tend to set up tensile stress due to the restraining effect of the foundation.

The magnitude of tensile stress set up is influenced by the same factors that govern compressive stress, but because

PROBLEMS of mass concrete are distinctly Western. Construction engineers and contractors of the West must be thoroughly familiar with these problems and the solutions which are being developed by the design staffs of leading engineering agencies. Because of the recent interest which has been expressed in the method of temperature control specified by the Corps of Engineers, *Western Construction* presents this authoritative review of the subject.
—*Editor.*

of changes in the elastic and related properties of the concrete, the effect of tensile stress is much more pronounced. A less critical but similar restraint condition also occurs when concrete is placed on and is bonded to other concrete which has been in place for a relatively long time and has "cooled off" and hardened appreciably.

Another of the prominent conditions of restraint, which is common to all mass concrete dams, is restraint due to differences in temperature throughout the structure. The most common situation of this type occurs when concrete temperatures at and immediately adjacent to the exposed surfaces are close to average seasonal air temperature, while concrete temperatures remote from the exposed faces are appreciably higher. The net result of this condition is that exterior portions of a dam are in tension while the interior portions are in compression. The tendency to crack under such conditions is largely influenced by:

a. Temperature difference.

b. Temperature gradient.

c. Elastic and related properties of the concrete.

Sudden and severe drops in air temperature contribute materially to the tendency to crack due to this type of condition. It has been observed that cracks from this cause occur most frequently in fall and winter in concrete placed in late summer and early fall. Cracks from this cause are less likely to occur in concrete placed in late winter and early spring. It is obvious from these observations that when concrete temperatures and air temperatures have trends which are in opposite direction, the tendency toward cracking is very great, whereas, when temperature trends are in the same direction, the tendency to crack is materially reduced.

The present Corps of Engineers' specifications contain two stipulations which are intended to reduce the tendency for this type of cracking to occur. First of these, which limits the differential in height between adjacent monoliths to 25 ft., except where blocks are left low for stream diversion purposes, is intended to reduce the time of exposure of bulkhead faces, thus reducing the chance of having these surfaces subjected to sharp drops in temperature while the interior temperatures are relatively high. Second is the stipulation that when a wide differential in temperature exists between the concrete and the prevailing atmospheric temperature, protection equipment and form removal shall be handled so that concrete surfaces will not be subjected to a sudden drop in temperature of more than 25 deg. F.

Basic devices for control of temperature . . .

The present emphasis on special methods for the control of temperature such as precooling of concrete (utilization of depressed placing temperatures) and forced cooling by means of embedded pipe systems has resulted in a general tendency to overlook the fact that a number of other means are also regularly used in the control of temperatures in mass concrete dams. These other devices are now so universally recognized and used that they may be considered as basic to the problem, and for the present purpose will be so differentiated from the more specialized type of temperature control devices, such as forced cooling and precooling.

It is interesting to remember that when these so-called basic devices for the control of concrete temperatures were first used they evoked as much interest and discussion as do the special methods now. It is also interesting to note that by the fullest use of the newer developments for the control of temperatures it is possible to modify some of the basic control devices, as will be pointed out in the following discussion of control methods.

Temperature control methods referred to here as basic consist of the following:

a. Use of a cement having favorable heat generating characteristics is essential to any temperature control program. Type II cement is being widely used for this purpose and in certain instances where the combined properties of low total heat and relatively slow early rate of heat generation are essential, the use of Type IV cement is indicated.

b. Use of very lean mixes for all of the concrete in a dam except for thin facings (usually 6 to 8 ft. thick) of relatively rich, low water-cement ratio concrete at the exposed upstream and downstream faces. Cement contents as low as 2.5 bags per cu. yd. for interior concrete are not unusual, and the use of as low as 3 bags per cu. yd. has become commonplace. Regardless of cement type, the use of a minimum of cement offers one of the most positive and effective of all of the means of controlling temperatures. The total amount of heat generated is directly proportional to the quantity of cement used and for a given set of conditions the temperature rise due to heat generation is also proportional, for all practical purposes, to the quantity of cement used. It is therefore self evident that the use of a minimum of cement is an essential part of any temperature control program.

c. Placing of limitations on the construction procedure, to include limiting the thickness of lifts to 5 ft. generally, and specifying the use of 2½-ft. lifts in certain parts of the dam. Limiting the rate of progress requires a minimum exposure of a lift before casting the next succeeding lift above. The use of lifts not exceeding 5 ft. in thickness and limited to a thickness of 2½ ft. in certain critical locations, with a reasonable time of exposure between layers, is an effective and positive means of controlling temperatures under certain circumstances. In the discussion of the effect of precooling on temperature control, it will be seen that the influence of lift thickness and length of exposure on temperature rise is significantly altered when the placing temperature of the concrete is appreciably lower than the prevailing average ambient temperature.

The method of "depressing" placing temperature . . .

The special method of temperature control, which is being widely utilized by the Corps of Engineers, consists of "depressing" the placing temperature of the concrete. The means or combination of means used to accomplish the depression of the placing temperature is dictated by the amount of depression required.

In the earliest use of this method, the depression of placing temperature was accomplished by using refrigerated mixing water and ice. This approach to the problem has obvious limitations imposed by the relatively small quantity of ice and water in the mix as compared to the total of all ingredients. Where it is necessary to effect appreciable reductions in placing temperature (20 deg. F. or more) it is necessary to resort to the cooling of some of the other components of the mix.

The aggregates comprise a very large proportion of a typical mass concrete mix, and therefore the cooling of all or part of the aggregates offers the best means of appreciably reducing placing temperatures. Usually, cooling of the three coarser sizes (cobble, coarse rock and medium rock) and the use of refrigerated mixing water and/or ice will accomplish the desired reduction in temperature. Where reductions in temperature of 30 deg. F. or more are necessary, the fine rock, sand and cement can also be cooled. Corps of Engineers' specifications do not state how the necessary cooling is to be accomplished but rather leaves the choice of means up to the contractor who is free to exercise fully his ingenuity in selecting the means of accomplishment.

Two means of cooling aggregates have been developed and successfully used up to now. The first of these, called the "inundation method," consists of immersing the aggregates in refrigerated water. The second, called the "air cooling method" consists of circulating refrigerated air through the aggregates.

Depressing the placing temperature results in a lowering of the maximum temperature of the concrete, which reduces the magnitude of the temperature drop from maximum to final stable temperature. This method also reduces the differential in temperature between the interior concrete and the exterior concrete caused by normal seasonal changes in air temperature and unusual reductions in air temperature due to sudden and sharp temperature drop. The reduction in magnitude of the temperature drop from maximum to final temperature is of primary importance in the concrete forming the base of the dam, which is restrained by the foundation. Under otherwise identical conditions, reducing the temperature drop results in a corresponding reduction in tendency toward development of tensile stress and consequent reduction in the tendency to crack.

Depressing the placing temperature does not result in a corresponding **equal** lowering in the maximum temperature.

It can be readily seen that concrete placed at a temperature considerably below average ambient temperature will lose less heat during a given period of exposure than concrete placed at a temperature about equal to ambient temperature. There are two reasons for this:

a. No heat is lost by radiation during the first few hours after the concrete is placed because the temperature of the concrete is below the temperature of the surrounding air.

b. The temperatures of differences which develop between concrete and surrounding air are smaller than when concrete is placed at a temperature about equal to average ambient temperature.

Limits of "depressing" on construction procedure . . .

The effect of depressed placing temperature on lowering of maximum temperatures is emphasized because of its influence on the necessity for limits and the extent of such limits on construction procedure. If the placing temperature is depressed below the average ambient temperature by an amount equal to or greater than the quasi adiabatic temperature rise of the concrete, it is evident that neither thickness of lift nor exposure time will have any appreciable influence on temperature rise in the concrete. The combination of circumstances necessary to achieve this situation includes:

a. High prevailing ambient temperature.

b. Low cement content.

c. Concrete of high specific heat.

d. A very low placing temperature.

The foregoing would seem to indicate that when the appropriate conditions prevail, the limitations on lift thickness and time of exposure could be eliminated from the requirements. As far as temperature control alone is concerned, this would be true, but there are two other practical considerations which justify limiting the thickness of lifts to a maximum of 5 ft. First, the already difficult problem of placing cobble concrete under a sloping form at the downstream face is further magnified by increasing the thickness of lifts beyond 5 ft., and second, as lift thicknesses increase above 5 ft., the area of concrete surfaces not to grade which have to be kept "fresh" is increased, thereby increasing the difficulty of preventing cold joints.

The first of these is probably of greatest importance. However, the second can become a matter of critical consideration in the warmest summer months, particularly in very dry climates. Considering exposure time alone, there are limited benefits to be derived whenever concrete temperatures exceed average ambient temperature during the period of exposure. The circumstances necessary to achieve a condition in which the placing temperature is below the average ambient by an amount equal to or greater than the quasi adiabatic temperature rise are rarely in effect. During the hottest summer months these circumstances may prevail.

However, during the remainder of the year, when average ambient temperatures are lower, the concrete temperatures during a reasonable period of exposure always exceed the average ambient temperatures. In the coldest winter months, conditions usually prevail which result in average ambient temperatures below placing temperature and, under these circumstances, the greatest benefits are derived from loss of heat through radiation during exposure.

During winter, other practical considerations also influence the rate at which forms can be moved and cleanup can be completed. The slow rate of hardening which delays completion of cleanup and raising of panel forms also makes it necessary to delay placing of concrete until the concrete has developed enough strength to prevent anchor bolt "pull out." The time between successive lifts in a monolith in winter, therefore, may be limited by these practical considerations rather than a specified minimum exposure time.

Controlling temperature by forced cooling . . .

The other special means of controlling temperatures in mass concrete dams which has been and is being extensively used consists of artificial cooling of the concrete after it is placed by circulating a cooling medium (usually water) through pipes embedded in the concrete. This method is being used only to a limited extent by the Corps of Engineers. It has been used extensively by the Bureau of Reclamation and somewhat less extensively by the Tennessee Valley Authority.

This method is flexible and allows a wide variation in the manner and degree of application to the various problems of temperature control in mass concrete dam construction. All other conditions unchanged, the amount of cooling and degree of temperature control which can be achieved will be principally influenced by pipe spacing and the temperature of the cooling water circulated for cooling. This flexibility provides an opportunity to vary the use of the method to suit variation in cooling requirements influenced by seasonal variations in temperature.

Forced cooling can be utilized to:

a. Control the temperature rise and consequently the maximum temperature.

b. Reduce the interior temperatures after the maximum tempertaure has been reached.

Regardless of placing temperatures, removal of heat begins when, and can be continued as long as, cooling water temperatures are lower than concrete temperatures in the concrete surrounding the cooling pipes. As in the case of precooling, forced cooling also influences the extent to which limits on construction procedure are necessary. Vertical spacing of the pipes and lift thickness are usually equal. Where it is necessary to control temperature changes within very narrow limits the use of thin lifts and close horizontal spacing of pipe is essential.

Limitations of the forced cooling method . . .

Conditions which require close control are usually associated with the base of high dams where the influence of foundation restraint is critical, and in other parts of a structure where similar conditions may exist. Steeply sloping abutment monoliths, where tilting due to differential shrinkage from cooling in the wedge-shaped base concrete is a problem, also require special consideration.

In other parts of a structure where the tendency to crack results from differences in temperature between the interior concrete and thin exterior portions of the dam due to variation in air temperature, the problem is to reduce the interior temperatures. In such cases, control of temperature rise is not as important as reduction of interior temperature to a safe level after the maximum has been reached but before seasonal reductions in ambient temperature take place. Concrete placed in spring and summer can be cooled to safe levels before late fall with pipe spacings of 6.25-ft. horizontal on 5-ft. lifts.

The influence of lift thickness and vertical pipe spacing on time of exposure is also important. When close pipe spacings both horizontally and vertically are used with thin lifts in conjunction with low cement factor concrete and either Type II or Type IV cement, the maximum temperature is reached in a relatively short period of time after casting. This assumes that the circulation of water is started concurrent with the start of concrete placement and is carried on continuously.

It is obvious, therefore, that the effect of loss of heat through radiation from the exposed top surface on control of temperature rise ceases soon after the peak (maximum) temperature is reached. The loss of heat through radiation from the exposed surface continues, however, as long as the concrete temperatures are higher than average ambient temperatures. For this reason a reasonable exposure period is required. The same parallel exists where 5-ft. lifts and wide pipe spacings are used. In most situations where pipe cooling is used, the time required for setting forms and completing cleanup will be greater than the necessary minimum exposure time.

Another special method . . .

In addition to the basic and special methods already described, another special control device has been used to a limited degree and is being studied extensively. This device consists essentially of reducing the potential heat generating properties of the cementing materials by the use of blends of Portland cement with special cements or by the

substitution of pozzolanic materials for part of the Portland cement.

Choice of method depends on these considerations . . .

The choice of a combination of methods for temperature control is influenced by a number of considerations, the most important of which are:

a. Degree of control necessary.
b. Ease of application and control of available means under field conditions.
c. Cost.

The first of these is probably the most important and also the most difficult to evaluate. There are many factors which influence the degree of temperature control necessary. The two most important are probably the size of the structure (height and base thickness) and the climatic conditions at the site. Another important factor, but one which is difficult to evaluate, is the effect of elastic and related properties of the concrete. Having determined the degree of control necessary, the choice of methods should be influenced to a great degree by the ease with which a method can be applied and controlled under field conditions. Last, but not least, any choice of methods should take into full consideration the cost of accomplishing the required control.

The choice of method should consider first those methods herein referred to as basic (use of a minimum of cement, the use of either Type II or Type IV cement and the placing of limits on the construction procedure). The first two of these basic controls should be a part of any control scheme. The value of the use of a minimum of cement from the technical standpoint of temperature control is unquestioned.

The economic value of the use of low cement factors is sometimes debated, particularly where aggregate specifications are written to provide close control of grading and particle shape so that a minimum of cement can be used. It is not difficult to see that, with cement at approximately $20.00 per ton and aggregates meeting a rigid specification at not in excess of about $3.00 per ton, appreciable savings can be made by replacing cement with aggregate. The difference in cement requirement of mass concrete made with aggregate having desirable qualities and that made with poorly graded, widely variable grading and poorly shaped aggregate can easily amount to as much as one-half bag per cubic yard.

Where concrete is measured by the hundreds of thousands of cubic yards, the saving which can be realized by the use of aggregate having the most desirable grading and particle shape characteristics as a result of reduction in cement used becomes a matter worth considering. This is of particular interest because there exists a common misimpression that the strict specifications necessary to get aggregates having these desirable characteristics always result in an increase in cost of the work. Admittedly, the cost of the aggregates is increased, but a very positive and sizeable net decrease in cost of the concrete inevitably results.

Limits on construction procedure should include the limiting of lift thickness to a maximum of 5 ft. whether this limit is necessary as a control measure or for the practical reasons previously stated. Whether or not the use of thin lifts is included as a control measure should be influenced by the necessity for the use of the special control measures and the influence of the special measure on the effectiveness of the thin lifts on the control.

Recognizing advantages and disadvantages . . .

Where there are a number of means or combination of means available for achieving an end, it is well to recognize what their advantages and disadvantages are. The advantages of using a minimum of cement and a type of cement having favorable heat generating properties are obvious. What may be considered a disadvantage in the use of Type II or Type IV cement is the increase in cost over Type I cement. In recent years, however, it has been possible to purchase Type II cement at no increase in cost over Type I in many localities. Type IV cement has always been more costly. Where conditions warrant its use, the increased cost should be carefully weighed against the advantages to be gained.

The principal advantages in placing limits on construction procedure are the ease and positiveness of field application and control. The obvious disadvantage in limiting the thickness of lifts is the increased cost of cleanup. Limiting construction procedure is sometimes considered a disadvantage by contractors. However, in actual practice the placing of concrete in successive layers and the attendant construction operation of form preparation and cleanup usually require almost the entire specified minimum exposure time. This apparent disadvantage then becomes secondary in importance to the contractor as far as scheduling and prosecuting the work is concerned.

The principal advantages of precooling are ease and positiveness of field application and control. Once it has been determined that a given maximum allowable placing temperature will effect the necessary control when used in combination with the basic control procedures, this can be stated in the specifications. With this figure as a guide and by properly analyzing the other influencing factors, such as climatic conditions, construction schedule, and the thermal properties of the concrete and concrete materials, an adequate cooling plant can be designed and constructed prior to the start of concreting operations. With adequate cooling capacity, the field control becomes a routine matter. The greatest disadvantage to the precooling process is its obvious limitations. The only control over the temperature cycle which can be effected by its use is control of the maximum temperature. Once the maximum temperature has been reached, the temperature changes within the structure are influenced entirely by outside forces over which there is no control.

Forced cooling offers two theoretical advantages. First, flexibility of applications; second, control of the entire temperature cycle. The latter is of particular value in regulating interior temperatures so that the differences in temperature between interior concrete and relatively thin exterior portions of the structure, as effected by sharp drops in air temperature, are kept to a safe minimum. The disadvantages in the use of forced cooling are largely practical but can act to nullify to a great degree the desirable theoretical advantages of the method.

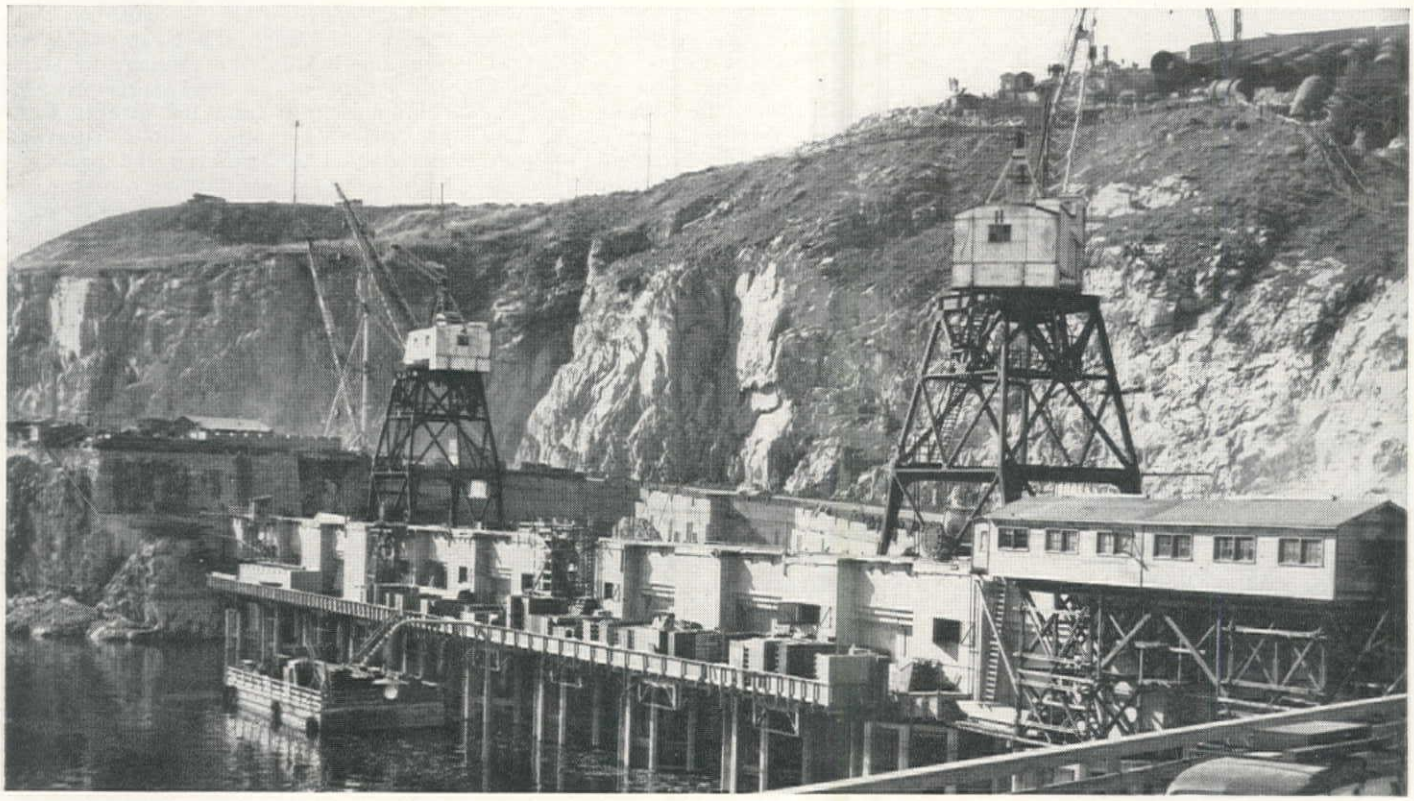
The application of the method under field conditions is complicated and difficult. In addition to the installation of the cooling coils it is necessary to install and operate a plant for the handling of the cooling water which consists of pumps and a distribution system. A refrigeration plant may also be required. Control of the circulation of a uniform amount of cooling water through several hundred coils of varying length and at varying distance from the source of supply is a complex problem in hydraulics. The difficulty of maintaining continuous, adequate and uniform flow of cooling water is complicated by:

a. The removal and addition of coils.
b. The extension of distribution facilities.
c. Equipment breakdown.
d. Interruption due to other construction operations such as form removal and resetting.

In addition to the basic control difficulties, the use of forced cooling must be regulated within safe limits in certain parts of a structure to prevent damage to the structure due to the cooling operation. This requires very rigid, careful and intelligent inspection of the cooling operations.

The challenge to contractors . . .

The two methods of cooling aggregate already described are examples of the ingenuity which is typical of the construction industry in answer to the challenge of a new problem. It is expected that improvement in the ways and means of accomplishing the temperature control measures will be continuous with resulting decreases in cost for the work. Invariably, the contractor's reaction to any new idea for the improvement of the quality of mass concrete structures is that such improvements will increase the cost. It is the engineer's responsibility, however, to determine what is necessary and once this has been determined, the contractor is faced with the problem of meeting the requirements at the lowest possible cost to the builder. Contractors are nearly always able to find economical means of accomplishing a required end at a decreased cost once a new idea is put into general use.



Placing 80,000 Cu. Yd. of Concrete in a Confined Area for the—

Giant Grand Coulee Pumping Plant

In the narrow area between a wing dam and a high wall of rock, crews of Morrison-Knudsen Co. and Peter Kiewit Sons' Co. are solving intricate problems for placing a large volume of heavily reinforced concrete

By JOHN W. LEONARD
Pumping Plant Engineer
Morrison-Knudsen Co., Inc., and
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Coulee Dam, Wash.

ABOUT 80,000 cu. yd. of heavily reinforced concrete is being placed to form the giant pumping plant which will lift water out of the reservoir behind Grand Coulee Dam and deliver it into the first section of the irrigation system for the Columbia Basin Project. The twelve pumps (ultimate) will each be driven by a 65,000-hp. motor and are designed to handle 720,000 gpm. at the 280-ft. lift. They will be installed in separate bays along the 660-ft. length of the plant. Located in a narrow area between a wing dam and a high wall of rock, the structure presented serious construction problems in forming, placing reinforcing steel and handling concrete.

The work is being carried out by Morrison-Knudsen Company, Inc., and Peter Kiewit Sons' Co., a joint venture. The plant itself represents a $8,000,000 job and is part of about $16,500,000 worth of work being done by the two companies at this general location. Work was started on the plant in November, 1948, but extremely cold weather curtailed the work on the job through the period from December 15 to March 1. First concrete was placed March 4, 1949 and the second winter saw work curtailed again from about December 15 to February 15. Despite these delays the work is well ahead of schedule and the setting of the first pump will be started in the near future. According to present schedule, the first pumping will be done during the summer of 1951, and water will be delivered to the first land of the project in 1952.

General arrangement

This pumping plant represents the key link between the Grand Coulee Dam and Powerplant, and the ultimate irrigating of 1,000,000 acres in the Columbia River Basin. Since the Columbia River has its high flow during the summer season, both water and power are available for the irrigation needs of the project. The dam raises the level of the water from the river channel up toward a discharge into its old channel through the Grand Coulee, but pumps are necessary to lift it the last 280 ft. From the pump lift the flow will enter a short section of canal leading to the Equalizing Reservoir which is being formed by damming the upper section of the Grand Coulee. From this reservoir, water will be distributed by main canals toward the area to be irrigated. The readers of *Western Construction* are assumed to be familiar with the general features of the project.

This article will describe the problems and methods involved in constructing the pumping plant.

PICTURED ABOVE—

VIEW from main dam of panel repair yard located on a deck cantilevered from the top of the wing dam over trashrack structure. The temporary deck provided badly needed storage space for forms.

Size and dimensions

The plant has a total length of 660 ft. with a height of 140 ft. and a width of about 100 ft. There are twelve pump bays with a thirteenth added to serve during erection of pumps and motors. Contraction joints separate the bays, making them independent structural units. Some of the quantities of concrete involved are indicated as follows:

Sub-structure including pump bays and foundation	22,000 cu. yd.
Intermediate structure including walls and columns	31,000 cu. yd.

Superstructure including warehouse office building and tourist facilities	3,000 cu. yd.
Backfill around pipes in tunnels	10,000 cu. yd.
Concrete facing on rock wall	8,000 cu. yd.
Embedment around six pumps	6,000 cu. yd.

The two main longitudinal walls of the pumping plant building represent major units in the construction program, running the entire length of the building and including heavy columns and crane beams. The wall nearest the wing dam ("B" wall) is 58 ft. high and the opposite wall ("E" wall) is 112 ft. tall to the first roof slab which ties the two walls together.

Cramped working area

Site of the pumping plant is a narrow area just wide enough for the installation between the wing dam and the portals of the tunnels which will carry the discharge from the pumps. This wing dam (see illustration) was built as part of the original project and extends at about right angles from the west abutment of the main dam. It included the 12 trash-racks for the pump intakes and 14-ft. diameter openings ready to connect with the pumps at the base of the dam.

Discharge from the pumps is directly into 12-ft. steel pipes which extend up through tunnels about 400 ft. long on a 47-deg. grade. At the upper portals of these tunnels the pipes continue up and over the side of the hill into the Feeder Canal.

Between the dam and the rock wall the pumping plant is situated in what amounted to a narrow canyon. It presented a difficult location for building a large and complicated reinforcing concrete structure. Working space at this site was a serious problem from the start. The lumber and panel yard took up all of the available room. A deck was cantilevered out over the reservoir from the top of the wing dam and provided some badly needed space to store and repair wall and column forms. In addition, barges were moored along the face of the dam and used for storing these reconditioned forms before reuse. The general stock of materials and supplies was maintained at the Bureau of Reclamation's storage yards until actually needed at the site. Only a week's supply was maintained in bins at the pumping plant.

Equipment and handling

Key units in the erection program were two 40-ton revolving type gantry cranes with 110-ft. booms. These cranes traveled on a track laid on top of the wing dam and were able to handle 90% of all forms and concrete.

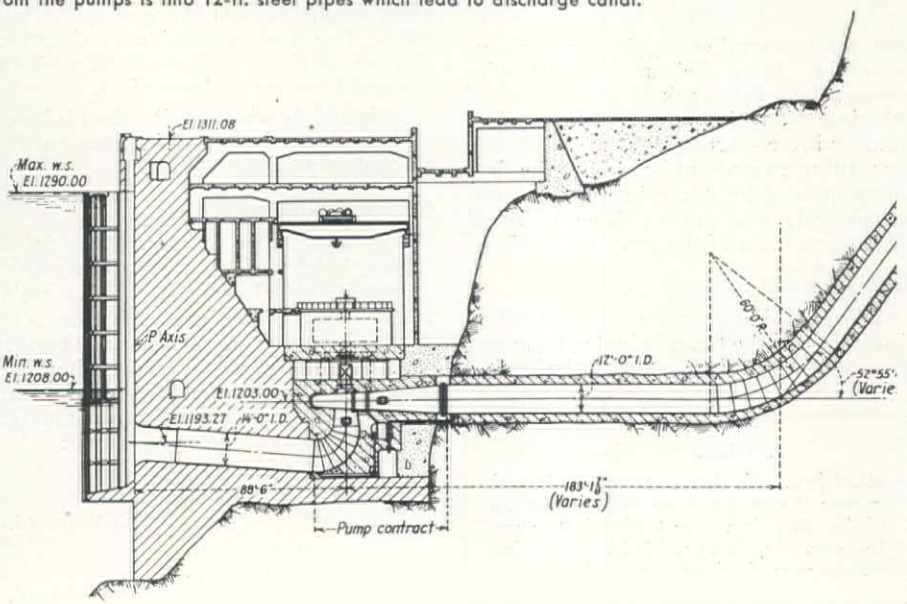
These two cranes and their operations represented the controlling factor in prosecution of the work. The main hook with the 4-yd. concrete bucket had to be lowered about 230 ft. to make initial pours in the lowest part of the foundation. In order to reduce this vertical distance in handling the lower lifts of concrete 30-ft. lengths of elephant trunk and hoppers were attached to the buckets. As the work progressed upward the pressure on the two cranes diminished. In 1949 a stiffleg derrick was erected on the south end of the job to serve the panel yard and to build the office wing for the plant.

Reinforcing steel

Practically all concrete at the plant is heavily reinforced with steel averaging about 130 lb. per cu. yd. In many of the structural members the reinforcing runs up to 300 lb. per cu. yd. Reinforcing steel is being handled by Soule' Steel Co. of San Francisco under a subcontract. C. H. Boulware is directing these operations.

The bulk of the reinforcing was standardized on 1¼-in. sq. bars. Steel was cut and bent in the Soule' shop near Electric City because of the small storage space at the site. Aided by design changes made by the Denver and the Grand Coulee offices of the Bureau, the contractor was able to prefabricate more than one-half of the tonnage of steel. For example, the steel cages for 400 column sections and 100 girders were prefabricated in 5-ton units in the yard and hauled by truck to the pumping plant site. These units were placed by the cranes and the stiffleg. Normally, steel placing was carried out two shifts a day.

TYPICAL SECTION through pumping plant. Wing dam at left is 600 ft. long, extending from the west abutment of the main dam. It includes 12 trashrack structures for the pump intakes. Discharge from the pumps is into 12-ft. steel pipes which lead to discharge canal.



Concrete

Although the primary problems involved form work and reinforcing steel, the preparation and placing of 80,000 cu. yd. of concrete was a major construction operation in itself. Aggregate is produced on the east side of the river under subcontract and is trucked across the dam to the MK-PK batching plant on the west side. Stockpiled at this location, it is recovered with a tunnel consisting of a 90-in. corrugated steel pipe. The aggregate sizes include sand, ¾-in. and 1½-in. maximum. Aggregate moves by conveyors to the Noble batching plant and then into two 2-yd. mixers. These fixed mixers discharge into a 4-cu. yd. hopper.

Cement is delivered by the Bureau's railroad up Grand Coulee in bulk cars. It is unloaded into a bucket conveyor and stored in two 3,250-bbl. silos. From here a Robinson conveyor moves the cement pneumatically through a 6-in. pipe to a 500-bbl. silo at the batcher. Water is pumped from the reservoir by a unit operating on a raft.

From the mixer the concrete is handled in Dumpcretes of 4-cu. yd. capacity. Concreting is usually carried out on the swing and graveyard shifts, except for extra large pours which are started on the day shift.

All construction joints are wet sandblasted. MK-PK operates a compressor house with a capacity of 9,000 cfs. Two sand-blast units are used for this operation.

Sequence and organizing crews

Work was started on the wall nearest the wing dam ("B" line) as early as possible to spread out the work for the gantrys and to make available some of the lower floors between the wall and the dam for working space. The wall and columns were carried up with a "high-low" block sequence of construction. The low blocks were not started until the high blocks were completely clear of the reinforcing steel for the columns. This provided a 45-ft. vertical difference between adjoining blocks.

Four carpenter crews were normally used on this wall; one setting shores for the slabs, another setting column forms, the third setting forms for the crane beam and the fourth setting slab forms. With the blocks maintained at staggered elevations the crews were able to function efficiently in this sequence. Six sets of shoring were used at each elevation for the three intermediate slabs. These were left in place until the adjacent low blocks were ready and then were moved into them.

Carpenter work on the opposite wall was handled in much the same manner

with crews specializing in different operations. All wooden forms were standardized with 1-in. sheeting, 2 x 6-in. ribs studs on 12-in. centers and 2 x 6-in. walers with rods on 2½-ft. centers.

During active concreting, the work schedule provided fifty places for crews to be working in any 24-hr. period. The activity of these crews is indicated in the following table:

Activity	Number of places where activity is in progress
Form stripping	5
Setting steel reinforcing	10
Setting conduit	3
Cleaning up and setting forms proper	15
Concrete pour	2
Waiting to age	5
Sandblasting	5
Waiting to be worked	5
	50

Big girders

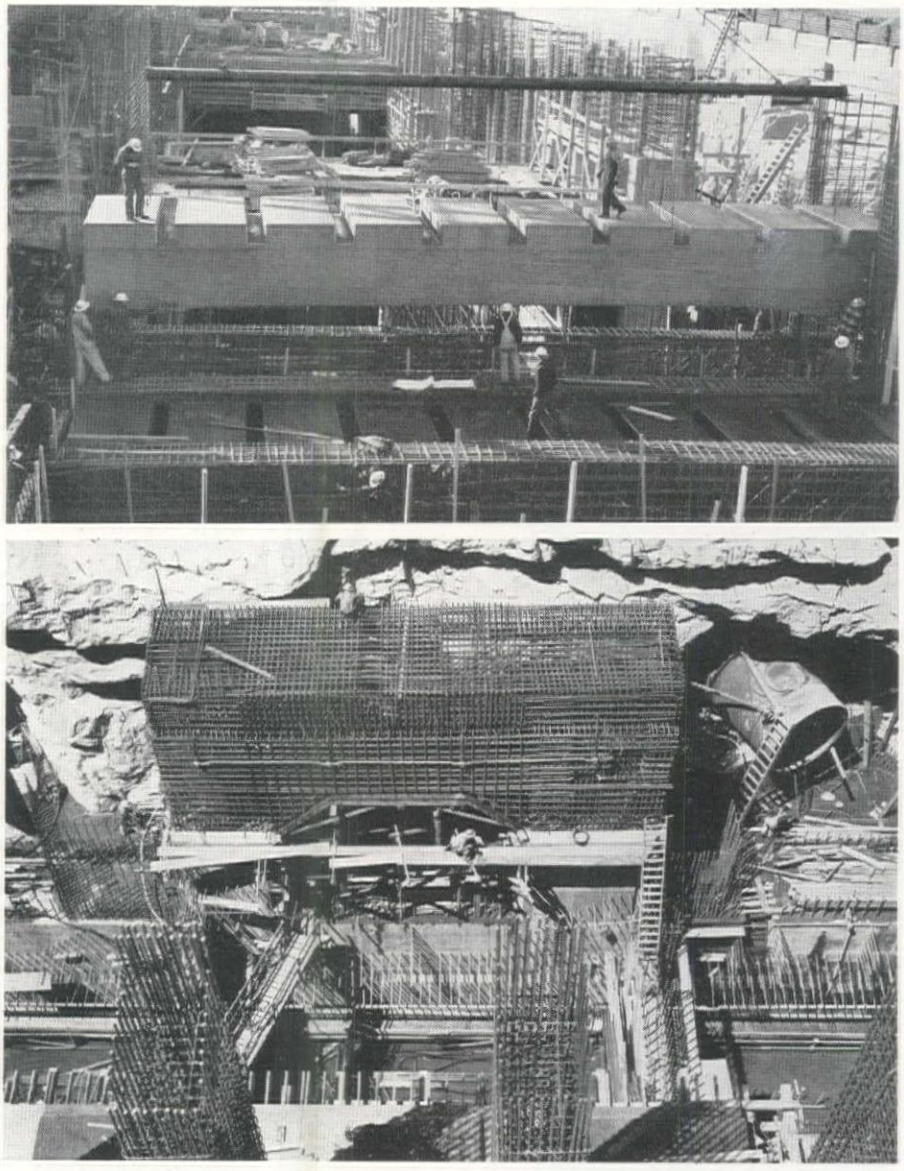
A major construction problem was the supporting of the large girders which span between the two side walls. These girders support the roof slab 120 ft. above the floor at motor level. The beams, which will ultimately carry the two traveling cranes, were not available to use as temporary supports because the tight construction schedule required the cranes to be installed simultaneously with the pouring of the roof slab.

Shoring up from the floor was considered and the idea discarded because of the height involved. The span between the crane beams was 52 ft. and about 270 cu. yd. of concrete had to be supported during the pouring of the girder. A 36-in. steel girder spanning between the walls as falsework would have required a 2¼-in. camber, and beams of this size were not readily available.

The method finally selected was to use two smaller beams without camber, supported on the outside ends by the crane beam, with two intermediate steel bents resting on the cross walls between the pump bays.

Safety record

The contractor placed great stress on the matter of safety, because the hazards involved in this type of work were obvious and ever present. These included the height at which the crews worked, the cramped quarters, the heavy loads, the work going on at different elevations and the fast schedule. Wooden 2-plank scaffolds were built around each block as the work progressed. These scaffolds, the handling of all rigging and other hazards were watched closely to insure as much safety as possible for all workmen. Regular safety meetings were held, attended by superintendents, walkers and foremen. The effectiveness of this safety program resulted in a record of 156 days during the summer months of last year, when 340 men worked 468,000 man-hours without a lost-time injury. This record has received considerable recognition in construction circles throughout the West. The safety program was carried out under the direction of Frank White.



LARGE PREFABRICATED form section, top, was used for supporting the long girders under the plant's roof slab. Span between traveling crane beams is 52 ft. and about 270 cu. yd. of concrete had to be supported during pouring of the girder. View at bottom is of reinforcing steel required to carry load of columns over the tunnel entrances.

Miscellaneous

One of the unusual problems involved the building of forms for the three elevator shafts. These were 90, 110 and 140 ft. high and were required to stay within 1/16-in. of plumb. Engineers of the Bureau placed permanent reference points at the bottom of each elevator shaft and checked the forms with a 2-lb. plumb bob for each pour.

The rock wall behind the pumping plant was required to be covered with concrete as a safety measure. This concrete was designed to follow the rock surface as closely as possible, maintaining a 2½-ft. minimum thickness. It was poured behind wooden panels held in place by welding rods to hairpins which had been grouted in holes drilled in the rock. Specifications called for 1-in. anchor dowels on 5-ft. centers in both directions.

Personnel

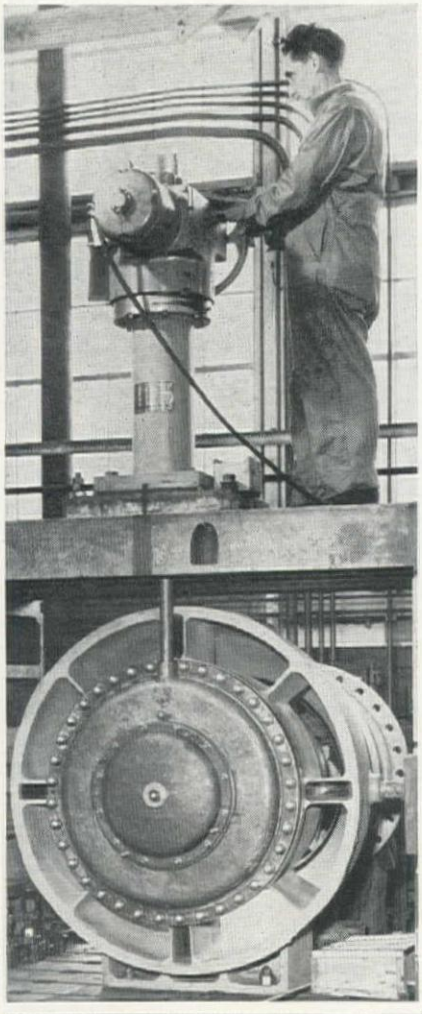
A. O. Strandberg is project manager for MK-PK. R. H. Madsen is assistant project manager. M. J. Howard is general superintendent; C. H. Pittman, office manager; Art Moren, master mechanic; Herb Fischer, rigging superintendent; L. P. Williams, purchasing agent; Harold Mendenhall, in charge of the warehouse; Duke Grkovic, office engineer, and Al Smith is concrete and field superintendent.

At the pumping plant, Metz Pachosa is pumping plant superintendent and D. T. Lind is carpenter superintendent. James Graves is panel yard superintendent. Tom Hooper is swing shift superintendent. Bob Young and Ray Faust are carpenter walkers. The author and Hikmet Erenyol are pumping plant engineer and assistant engineer.

C. H. Jackson is resident engineer for the Bureau of Reclamation. Stan Bohman is office engineer; David Kime, chief inspector, and R. K. Tiffany is chief of survey parties. At the pumping plant, R. D. Livingston is chief shift inspector. R. W. Murphy is in charge of survey crews. John Karcher is in charge of mechanical and electrical inspection work.

Hollow Jet Valve Aerates Discharge To Cushion Force on Stilling Basin

SEVERAL important improvements in the design of free discharge valves are incorporated in a hollow jet valve recently completed at the Sunnyvale, Calif., plant of Westinghouse Electric Corp. This 30-in. valve was built especially for Pacoima Dam, under the jurisdiction of the Los Angeles County Flood Control District. Advantages of the new design are—freedom from cavitation at high heads, no vibration, simple design and easy control, and dissipation of a large part of the discharge energy and resulting spray.

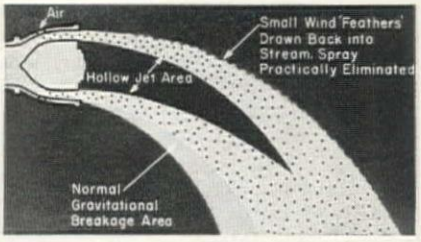


The valve has a 30-in. diam. opening that admits the water and passes it around an egg-shaped needle. The needle controls the flow and aerates the discharge into a "soft jet." Thousands of small bubbles trapped in the stream cushion the force of the water when it strikes the main basin below. The aerated stream operation is created by the design of the valve. The force of the water creates a sufficient suction to draw air through apertures on the outlet face.

Discharge jet always hollow

Unique feature of the hollow jet valve is that the discharge jet is always hollow, regardless of the degree to which the valve is opened, or the height of the head behind it. Also, both the outside diameter of the jet and the length of horizontal fall remain constant, regardless of valve openings. Since the water always lands on the same spot, it is possible for engineers to know in advance where the force of the water must be absorbed at all times during operation.

Little force is needed to regulate the valve. Six holes placed in the needle allow a balance of pressure on the needle mount. Water enters the inside of the movable needle through the holes, and presses against the inside front discharge face. This pressure acts to balance the external pressure of the water discharge. By using the force of the water to aid in closing the valve and keeping it water tight, a minimum of activating power is required to close the valve under flow. There is actually zero pressure against the needle when in full closed position; however, the electrically-powered regulating screw locks when in closed position.



Outwardly simple in design, the valve is machined, nevertheless, to tolerances down to .001-in., much closer than is normal. It was developed by the Bureau of Reclamation primarily to solve a major problem in dam engineering; that is, the effective control of the force of water spilling out in the stilling basin.

The 30-in. hollow jet valve at Pacoima Dam is the first one in use in the area. It was recently tested by the Flood Control District under a static head of 150 ft., and no vibration whatsoever was noticed at any valve opening. The discharge at full opening was 280 c.f.s. under a total head of 102.4 ft. The valve coefficient, based on a 30-in. diam. orifice, is .702. The maximum head for which this valve will be used is 300 ft.

Use at Pacoima Dam

The flood regulation at Pacoima Dam is of particular significance, because Pacoima Wash, until its diversion to the Big Tujunga channel, led directly through the City of Van Nuys without adequate flood channel improvements. The District's spreading grounds on the wash are located about 4 mi. to the north of the city. The combined operation of the dam and the spreading grounds serves to control the flow in the channel within limits, except during major floods, when such control is no longer possible.

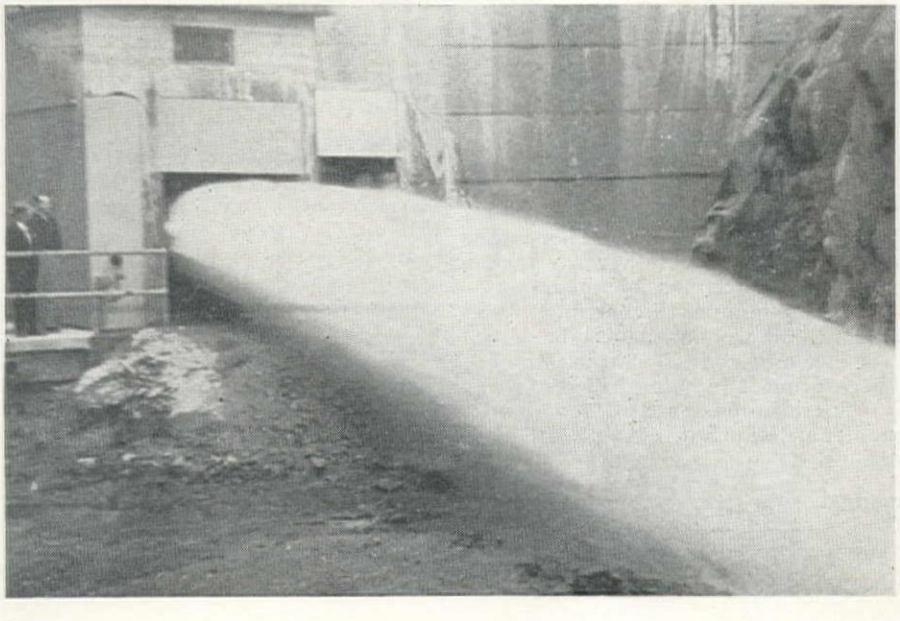
Pacoima Dam is one of the fourteen major flood regulating and water conservation dams forming the "first line of defense" in the District. It is an arch dam of the constant-angle type, and at the time of its completion in February, 1929, was the highest dam in the world, standing at 372 ft. above the foundation. Three 30-in. outlets were provided. At the upper two outlets, 30-in. gate valves and Larner-Johnson needle valves had been installed for the past 15 years. The lowest outlet had been controlled by two gate valves only, since it was plugged by debris in 1936.

The installation of the 30-in. hollow jet valve at the lowest outlet is designed to increase the flood regulating facilities at Pacoima to a marked degree. Its discharge at full opening, with the reservoir surface at the spillway lip, is expected to be 360 cfs., which is about 40% of the total outlet capacity.

The general silt level in the reservoir at the dam is about 50 ft. above the hollow jet valve.

Pacoima Dam is under the supervision of H. E. Hedger, Chief Engineer, Los Angeles County Flood Control District. Paul Baumann is his assistant.

THE VALVE, left, in the plant of Westinghouse Electric Corp. at Sunnyvale, Calif. W. R. Wright is checking mechanism which moves the egg-shaped needle in the center to open and close valve. Below, testing valve at Pacoima Dam.



Contractor-Engineer Coordination Lowers Highway Construction Costs

EXPERIENCES of the Colorado State Highway Department in solving highway construction problems were discussed by W. J. Walsh, staff construction engineer, before the recent highway conference at the University of Utah. Particularly, Mr. Walsh cited cases where contractor-engineer cooperation resulted in improved procedures. Some of his observations are reviewed in this article.—*Editor.*

COOPERATION on highway construction between the Colorado State Highway Department and the Colorado Contractor's Association is relieving many problems, especially those concerning compaction equipment, required density, roller methods, and specifications and payments. And lower costs result from the appreciation of field methods gained by the engineers who write specifications.

For instance, immediate attention was given by the Colorado Highway Department to a complaint made by the Contractors' Association, where the contractors complained that engineers were too conservative in estimating quantities of work to be performed for payment on intermediate monthly estimates. As a result, only 10% is now being retained on the payment due, but an additional percentage is retained on the quantities. Such a practice in the past posed an unfair situation, and state investigation showed that in many cases the contractor's complaint was justified. The entire practice has been labeled bad policy, and has been corrected.

An important improvement in the business relations between the highway department and contractors came about four years ago through the operations of a Joint Committee, consisting of ten members split between the State Highway Department and the Colorado Contractors' Association. The committee meets once each month for the express purpose of discussion and action on pertinent matters. Such matters frequently include policy, payment, and specifications. All specifications or any revisions are submitted to the contractors for review and comment, and any differences in opinion are worked out by the Joint Committee.

Rectifying mistakes in earth roller practice . . .

Serious mistakes in earth roller practice in recent years include the overloading of tamper feet. Some contractors have reduced the number of feet from 120 to 80 on each drum. This increases unit pressure up to the maximum specified and demanded by some engineers. This may be desirable under certain soil conditions needing high pressures. But when the roller is moved to another job, the contractor is hindered if lower contact pressures are required. When the number of roller feet per drum is reduced, the per cent of coverage per drum is also reduced as long as the contact area is unchanged. If the contact area is reduced as well, then a greater number of passes is necessary to get complete coverage. The efficiency of remodeling is doubtful, and the additional costs involved make it a questionable practice.

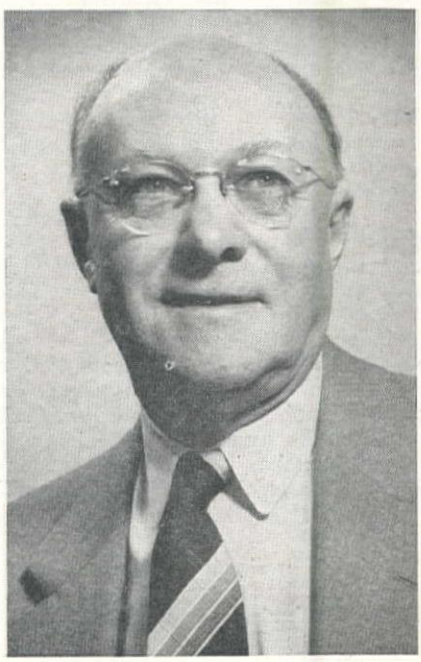
Considerable difficulty has been experienced in obtaining required densities on some jobs. Usually there is no trouble in getting 90% densities (AASHO T 99-38, modified), however, many times a considerable additional compactive effort is necessary to raise densities to 95%. This is not always so, but Colorado in many cases must spend a great deal of extra money to boost density to 95%. The economy of this has been questioned, and on some jobs specifications have been relaxed. It appears more economical for the State to accept 90% densities on the sub-grade and to provide an additional thickness of sub-base or base course material.

Changing of design to meet field conditions . . .

The State Highway Department has found that there is little to be gained by increasing the number of passes above 10. If satisfactory densities are not obtained with 10 passes when the roller is loaded to maximum weight, it might be well to study the contact pressure and experiment by reducing the load. In this case, it is quite likely that the contact pressure is greater than the bearing value of the soil. This may not be so, but it is a point too often overlooked, assuming, of course, that the moisture is optimum and uniformly distributed. Specifications were revised in January, 1950, to state:

> "the greatest practicable density shall be obtained. Every effort shall be made to obtain a minimum field density of ninety (90) per cent. If field densities do not reach ninety per cent in conformity with procedures specified it will be necessary for the field engineer to re-design the subbase thickness during construction on the basis of actual construction densities."

W. J. WALSH



By giving the resident engineer the power to change design to meet field conditions, the State hopes to overcome any deficiency in the subgrade bearing value by increasing base course thickness.

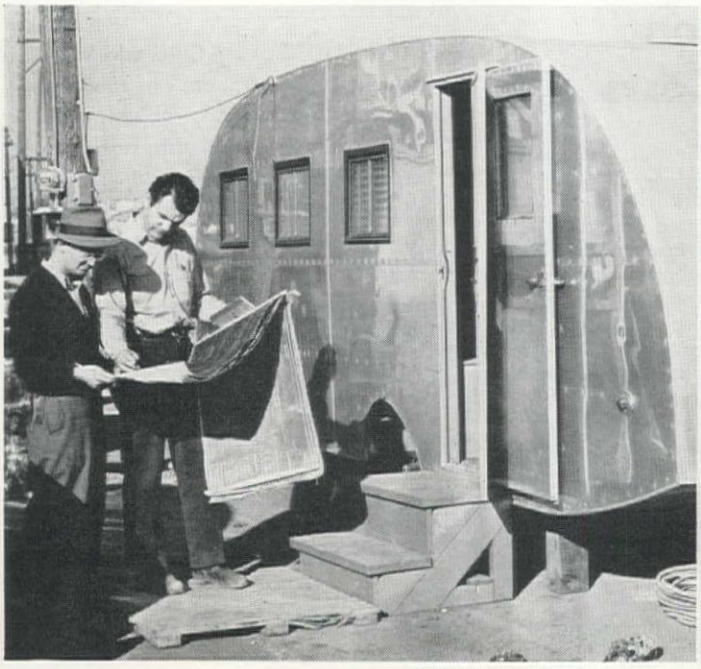
On many jobs the State is able to simulate supercompactive effort on subgrades. This is done in an incidental manner, just by routing heavily loaded trucks over the completed grade. Contractors have been most cooperative in this, and the truck drivers have been instructed to vary their route, so as not to travel in the same tracks. This gives almost complete coverage. If there are any soft spots or clay lenses below grade, they will be discovered this way. Unless there is some evidence of poor workmanship or carelessness on the part of the contractor in building grade, the State pays for the extra cost of removing unsuitable material. This is fair, and contractors are whole-hearted in their help to discover any weak spots in grade. The result is a much better construction road with subsequently reduced cost of maintenance.

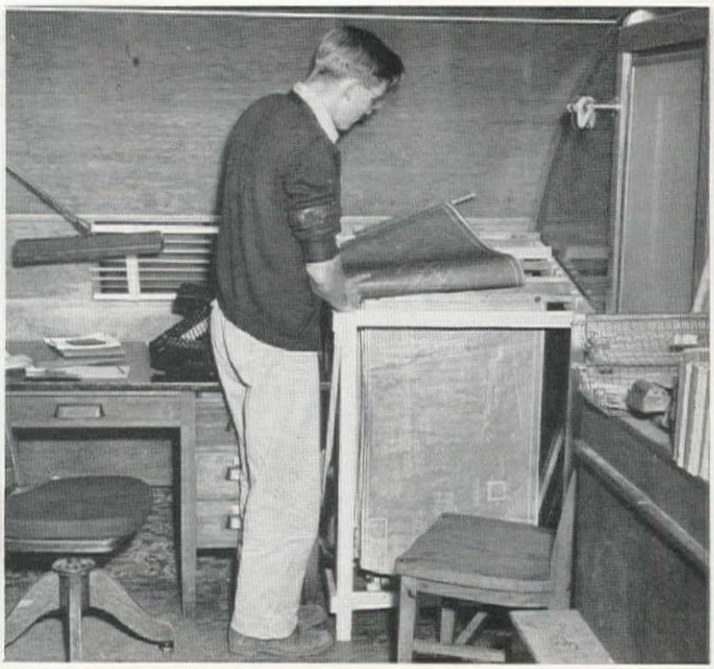
Arranging of bid units to prevent controversy . . .

During the latter part of the 1949 construction season, the State compiled data on the cost of wetting and compacting embankments. These costs varied greatly, ranging from 3¢ to 16¢ per cu. yd. On eleven projects, the cost ranged from 3¢ to 9¢ per cu. yd., with an average of 6¢. On three other jobs, the cost was 10¢, 11¢, and 12¢. On one, the cost was 16¢. The data were not extensive enough to draw comparisons between the predominant types of soil, or the amount of the reduced unit cost with the increase in job size.

Water for wetting embankments is paid for at the contract bid price per M gal. in place. There is no payment for developing water, since the State has experienced no difficulty in this. Usually streams or irrigation ditches are near, and water can be hauled economically. Uniform distribution of water is required, but the method is not specified. Processing the water with the soil is not paid for as a separate item. Some contractors use blade graders and some

Continued on page 109





House Trailers Outfitted as Field Offices Cut Costs on Smaller Jobs

ONE OF THE PROBLEMS that has come along with increased highway construction in the West is that of building individual job offices for each project. Especially on the smaller highway jobs, which are often remote from any permanent settlement where available office space could be rented from existing facilities, the cost of building individual field offices becomes prohibitive.

To reduce this high expenditure, many of the Western highway construction agencies are using house trailers fitted out as field offices. Two examples of the use of the trailers are described in this article—by the California Division of Highways, and by Division 8 of the Bureau of Public Roads at Boise, Idaho.

California's mobile offices

The California Division of Highways recently bought a number of bare house trailers and fitted them out as field offices (see illustration above). The trailers proved to be so convenient that they are now used almost exclusively for the smaller highway jobs.

The bare trailers were fitted with a drafting table across one end and with one or more desks. Filing cases, plan racks, and racks for surveying gear were built in. Many other special conveniences were added as dictated by experience. An oil heater was provided for cold weather. Where electricity is available, the lighting system is arranged so that it may be either plugged into a convenient outlet, or a meter box may be installed so that power may be received directly from a pole.

In smaller towns where housing is difficult to secure, the trailers have worked out especially well. Finding a house for a short assignment is frequently an impossibility, whereas the trailers may be brought in with little delay.

In practice the pick-up and delivery of trailers is handled with a minimum of delay. As a trailer is ordered for a particular job, the Equipment Department of the California Division of Highways sends a tractor unit, picks up the trailer and delivers it to the new location ready for use, usually in one day's time. The wheels are removed and the trailer is mounted on blocks for the duration of its stay.

Idaho trailers

During the 1949 construction season, Division 8 of the Bureau of Public Roads (Idaho) had 5 office trailers and 6 bunk trailers located on projects in the more remote areas of the state—at Priest Lake, Golden, Island Park, Mink Creek and Galena Summit. The offices are 22-ft. house trailers, the living room-kitchen of which has been converted to contain a large built-in writing table across the extreme front end of the room and a typewriter table fastened to the wall directly across from the entrance.

A large drafting table is so arranged along the wall in the rear portion of the office trailers to occupy the area which had previously been the kitchen. This table is so constructed that it has not been necessary to remove the stove, cupboard and sink, and can be dismantled to permit use of these facilities if necessary. There is ample storage space for blank forms, books and supplies. The rear compartment has been left intact, contains a bed and clothes closet, and will accommodate one man very comfortably.

The bunk or sleeper trailers are converted 28-ft. house trailers, and are so arranged to include 4 bunk beds and a sofa bed in the large room, and a pullman convertible table-bed in the rear compartment, as well as individual clothes closets and storage drawers. These trailers accommodate 5 men under normal conditions and can accommodate 6 men under crowded conditions.

The office trailers proved to be very satisfactory for the smaller projects but are too small to accommodate the required office personnel on the larger fast moving jobs. The bunk trailers proved to be very satisfactory because of mobility and ability to exclude insects. They are especially satisfactory when compared to the tent camps of former years.

Reservoir Area Sagebrush Killed by Airborne Spray

A RAPID air application of a spray to kill sagebrush on 20,000 ac. in the Coulee storage reservoir in Washington was accomplished last month by contractor J. W. Hardison of Yakima, Wash. Hardison accomplished in 20 days what months of ground dragging could have accomplished. He holds a $348,962 contract from the Bureau of Reclamation for the clearing work.

The contract called for removal of all trees, stumps, sage, bushes, fences, buildings and trash to an elevation of 1,575 ft., which is the approximate level high water will reach when the Grand Coulee is filled as an equalizing reservoir. Preliminary work on fence posts, stumps, etc., was accomplished by ground crews. Then two planes sprayed the area with a combination of 4-D and 245-T mixed with aromatic oil, which destroys broadleafed plants. The pilots sprayed from an altitude of 12 to 20 ft., and carried 60 to 90 gal. of spray for each trip. Approximately 4 gal. of mix is used per acre. Temporary landing strips in the area were provided.

The spray kills the sagebrush and other plants within ten days. Then the entire area is to be burned in one operation with fire strips previously set up.

Speedy Air Freight Service Helps Contractors Cut Down-Time Losses

ONE MORNING last October the superintendent for Bechtel Corp. at Big Creek, Calif., found himself in a jam; six big transformers were late on the job, and every hour of delay meant hundreds of dollars in idle-time pay for his construction gang. But the superintendent had been in jams like this before, and he knew what to do. A quick telephone check disclosed that the nearest transformers were in Westinghouse's Sharon, Pa., plant. So the superintendent made another telephone call to Los Angeles, thereby starting a chain reaction which got his six transformers to the Fresno airport 34 hr. later. Normal shipping time: 3 weeks.

This kind of happy ending to what formerly would have been a hard luck story is becoming more and more frequent among Western heavy construction firms. Costly breakdowns and sudden change-orders can, and often do, mean the difference between profit and loss on a job. As one Oregon contractor recently put it, "I'd rather spend $100 extra to keep a construction gang busy than $100 to watch them sit on their hands waiting for missing equipment." When the figures run into several hundreds and often thousands of dollars, it is easy to see why.

Lessons learned in Navy

Secret of how these transportation miracles can be performed is a new type of air courier service developed by the Navy during the war and since perfected for civilian use. Simply stated, the idea is to provide speed on the ground to match speed in the air on the theory that air speed alone is not enough. Anyone who has fiddled away exasperating hours to and from airports will get the point. Any shipper who has bitten his fingernails up to his elbows awaiting arrival of an air shipment which was still on the ground at the other end will also understand.

The U. S. Navy recognized this missing link in air transportation early in the war and took steps to do something about it. So it was then that the Navy organized the Transportation Division, Bureau of Supplies and Accounts, with a long experienced transportation man as C. O. His orders were to "get it there fast" without regard for previous transportation business precedents. The net result after months of trial and error combined the fastest elements of both air and ground facilities.

This new theory of transportation was introduced into the American industrial scene about 4 years ago with the inauguration of a civilian service that duplicated the basic essentials of all-out war time transportation . . . pickup at any time of the day or night, 24 hr. a day, 365 days a year; wired reports of the progress of each shipment; transfer from one airline to another in case of delay or grounding; direct, personalized handling from consignee's desk or shipping room to the nearest airport and the fastest plane. Result was to lop off days, and even weeks, from coast to coast schedules and many hours from shorter hauls.

Naturally, special handling of any kind is never cheap. Rates are more competitive with ordinary air express than they are with air freight. The personal nature of this kind of service makes it higher on light weights and short hauls, but they average out much less on heavy weights and long hauls. But regardless of cost many Western construction firms have found that it is cheaper to get spare parts and missing equipment to the job this way than to maintain idle crews at higher rates.

Eliminates nail biting

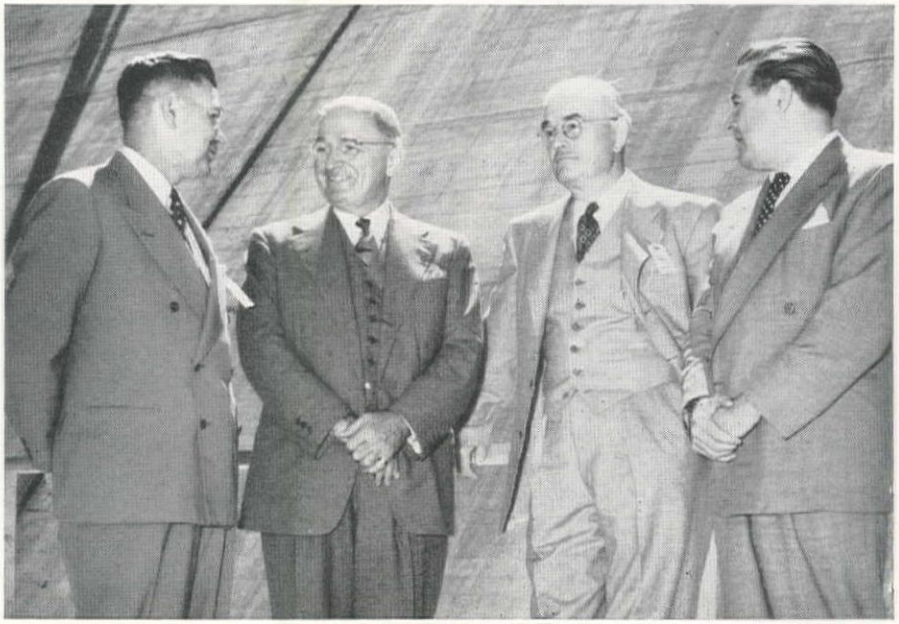
There was the case of the Mike Miller Construction Co. of Montebello, Calif. At approximately 2 p. m. on the day before an important job was to start, Miller found a broken worm shaft on his ditching machine. With work scheduled to begin at 6 a. m. the next day, the agent for Emery Air Freight Corp., the carrier offering this new high-speed service, arranged for the pickup of a replacement part from Gar Wood Industries in Richmond, Calif. It was then rushed to San Francisco, where it arrived at 8:30 p. m., in time to catch a flight to Los Angeles. Arriving there at 11:30 p. m., another Emery truck got it directly to the job shortly after midnight with more than enough leeway to get it installed by the 6 a. m. deadline. This case history is interesting not only because of the speed and coordination of facilities involved but because, for approximately $10, the consignee saved himself several hundred dollars in unproductive time. Moreover, he was not left biting his nails . . . every step of the shipment was a matter of record for his information, and he could make his plans accordingly.

Even in cities where the high-speed freight service does not have its own branch offices, similar feats have come to be more or less routine. For example, breakage of a 400-lb. casting used by Dragline Rentals in Prineville, Ore., threatened the company with costly stand-by time. The nearest replacement part was at the Lima-Hamilton plant, Lima, Ohio. Fifteen minutes after Dragline's SOS, Emery's Los Angeles office had telephoned pickup instructions to Lima . . . Lima to Toledo by fast truck in time to catch a 7:30 Toledo to Chicago flight. At Chicago, Emery's agent transferred the 400-lb. unit directly to a Portland-bound ship which laid it down at the Portland airport the following morning, (which happened to be a Sunday). Nevertheless, an Emery agent again was on hand to transfer the casting to his waiting truck which delivered it the last 100-mi. leg to Prineville before midnight with time to spare before the beginning of operations Monday morning.

The firm frequently makes deliveries "on the job" and under almost any circumstances. "If there is nothing else around," they say, "we'll even use dog teams!" We have never seen any case history involving dog teams or pogo sticks, but there actually are cases in which a shipment has traveled its last few miles via horseback.

FRANK A. BANKS GIVEN GOLD MEDAL AT GRAND COULEE DEDICATION

FRANK A. BANKS, Bureau of Reclamation engineer who directed construction of Grand Coulee Dam and other features of the Columbia Basin Project in Washington and now District Manager at Grand Coulee, was presented the Department of Interior gold medal for distinguished service by President Truman on the occasion of the President's recent dedication of the dam. On the transformer deck of the dam's west powerhouse after the award and dedication are: *A. F. Darland*, supervising engineer at Grand Coulee; *President Truman*; *Banks*; and *Senator Magnuson* of Washington.



Construction Design Chart

CXXI... Allowable Loads on Steel Pipe Columns

By JAMES R. GRIFFITH
Dean of Engineering
University of Portland
Portland, Ore.

I HAVE BEEN working with charts for about twenty-four years, and one would assume that all problems would fall into a well organized pattern for me. However, every once in awhile one will have me stopped for an appreciable period. I spent about ten hours on the problem of the pipe columns before becoming convinced that I was on an impossible method of approach.

The problem involved obtaining the allowable loads in terms of the pipe inside diameters and lengths. Basically the allowable load would be

$$P = f A$$

where f = allowable unit stress

A = sectional area of the pipe.

Since the area A is a function of the pipe diameter and the thickness, that variable gave no trouble. The allowable stress f is a function of both the unsupported length L and the radius of gyration r which in turn depends upon the diameter and the thickness of pipe. Since the diameter occurred in two variables, f and a, the usual three-variable alignment chart became an impossibility.

The 1947 edition of Steel Construction[1] recommends obtaining the allowable unit stress in compression members by use of the following formulae:

Main and secondary members

When the ratio $\frac{L}{r}$ is not over 120

$$f = 17{,}000 - 0.485 \left(\frac{L}{r}\right)^2$$

Secondary members

When the ratio $\frac{L}{r}$ varies between 121 and 200

$$f = \frac{18{,}000}{1 + \frac{L^2}{18{,}000\, r^2}}$$

As noted, the accompanying chart has been designed for standard weight pipe varying in diameter from 3 in. to 12 in. Solution lines should be drawn tangent to the curves for maximum capacity. I have drawn on the chart a solution line for column composed of a 4-in., 10.79-lb. pipe having an unsupported height of 10 ft. Such a column, as will be noted on the load capacity scale, apparently has a maximum capacity of 44 kips. This size pipe has the following properties:

Area, $A = 3.174$ sq. in.

Radius of gyration, $r = 1.51$ in.

We then have

$$\frac{L}{r} = \frac{10 \times 12}{1.51} = 79.47$$

$$\left(\frac{L}{r}\right)^2 = 79.47^2 = 6315.48$$

Since the value of $\frac{L}{r}$ is less than 120

$$f = 17{,}000 - 0.485 \left(\frac{L}{r}\right)^2$$

$$= 17{,}000 - 0.485 \times 6315.48$$

$$= 13{,}937 \text{ p.s.i.}$$

The allowable concentric load would then be

$$P = A f = 3.174 \times 13{,}937 = 44{,}270 \text{ lbs.}$$

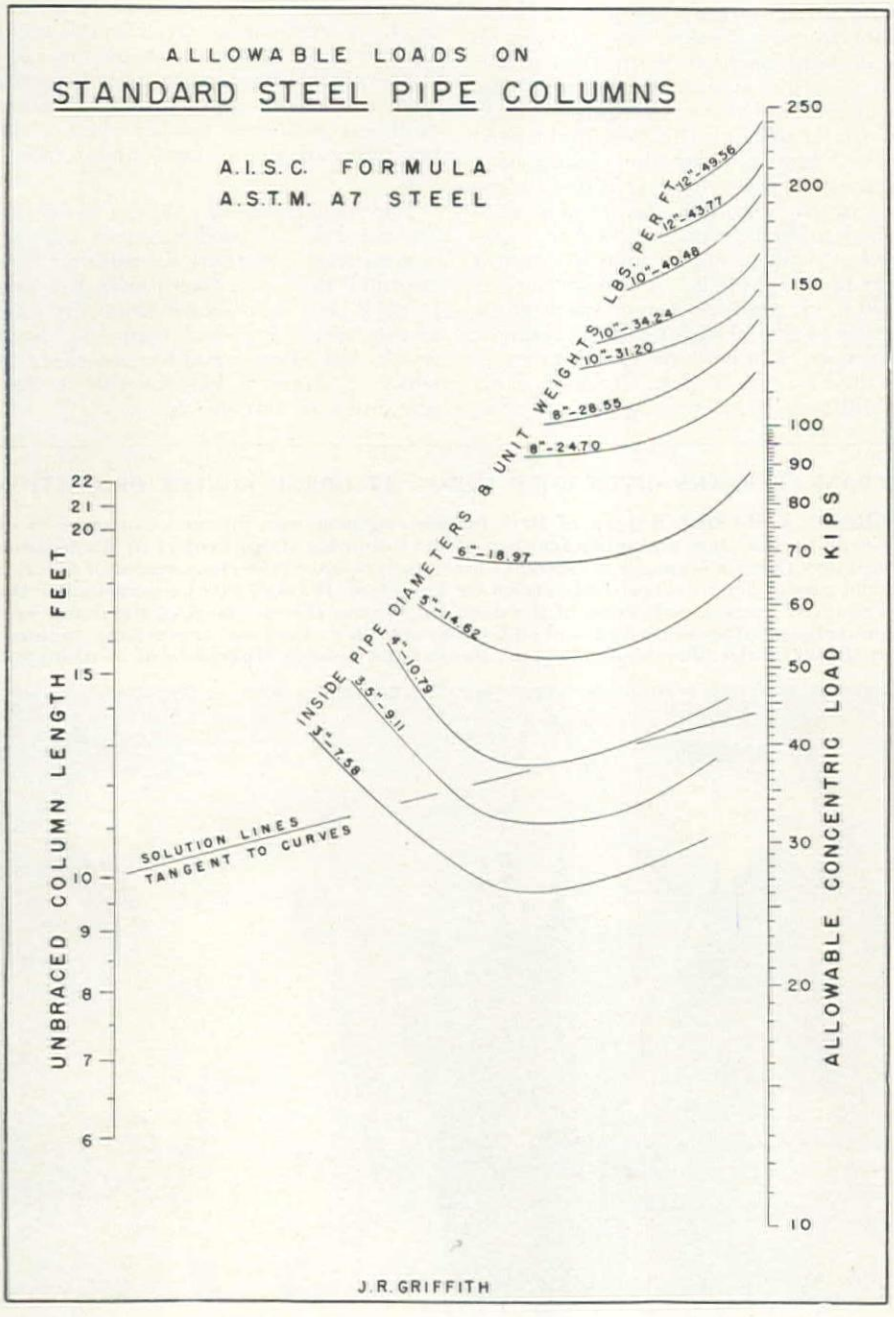
$$= 44.27 \text{ kips}$$

Attention is called to the fact that in four of the pipe sizes included in the chart, it is possible to exceed a value of $\frac{L}{r} = 120$ with the ranges of L given. They are:

3-in. pipe above 11.6 ft. long
3½-in. pipe above 13.4 ft. long
4-in. pipe above 15.1 ft. long
5-in. pipe above 18.8 ft. long.

If used for a main member within such ranges, the allowable load as obtained from the chart would have to be further reduced by the factor $\left(1.6 - \frac{L/r}{200}\right)$. A secondary member, for the benefit of those who may have forgotten their structural theory, is one which carries stress only under special loadings. Wind and sway bracing members come under such category.

[1] American Institute of Steel Construction.



WASHO Convention at Reno Features a Session on—

Problems of Truck Transportation

Position of truckers outlined before Western highway engineers—Committee presents recommendations on sizes, weights and axle loads—W. L. Anderson of Utah elected president

HIGHLIGHTED by a session covering the problems relating to truck transportation, the Western Association of State Highway Officials' meeting in Reno, June 12-15, brought together representatives from all the Western States and the Federal agencies for their annual consideration of technical and administrative highway problems of the West. Under the able direction of W. T. Holcomb, State Highway Engineer of Nevada, the convention moved through a highly successful program of technical sessions and social activities.

Following the usual opening formalities, the delegates and guests convened in a general session conducted by W. A. Bugge, Director of Highways for the State of Washington, and heard a helpful review of public relation problems by Robert W. Bruce, District Manager, Bell Telephone Company of Nevada. Mr. Bruce reviewed the employee and public relations program of the telephone company, and pointed out similarities which were applicable to highway organizations. He emphasized the fact that employee relations must come first, because these individuals provide the immediate contact between the general public and the interested organization. If these employees have the proper attitude toward their company, are interested in their jobs and are trained to meet the public with the proper attitude, the matter of public relations is a long way toward solution. In making the comparison, Mr. Bruce reminded the state highway officials that the men of their organizations out on the roads of the states provide the contact with the general public. In turn, the public develops its attitude and appraisal of any state highway department from these contacts in the field.

The position of the general contractor in the building of our highway system was reviewed by A. N. Carter, Highway Division Manager, AGC, Washington, D. C. Mr. Carter indicated the many ways in which contractors can be of assistance to state highway engineers not only in carrying out construction projects, but also in many other situations. He concluded his remarks with an illustrated talk showing some current highway projects.

Truck transportation problems

D. C. Greer, State Highway Engineer of Texas, presided over the general session devoted to reviewing the general problems relating to truck transportation on the highways of the West.

The first paper was presented by John L. Springer, Managing Director and President, Western Highway Institute. Mr. Springer expressed his appreciation at being invited to speak before the WASHO, stating that it was the first time that the truckers had reviewed their position and problems before this group. After outlining the history of the trucking organization he discussed in some length the problem of taxation as it relates to freight carriers. The remainder of his discussion reviewed the recommendations proposed by the Institute and sizes and weights of truck units. These recommendations were reviewed in detail in an article by Edwin L. Mills, Highway Traffic Engineer of the Institute in the last issue of *Western Construction News* (pg. 70).

The effect of truck loadings as they apply to highway surfaces and structures was demonstrated by George M. Williams, Construction and Maintenance Engineer, Bureau of Public Roads. Mr. Williams used the elaborate models which have been developed by the Bureau for testing and demonstrating the effect on roads produced by trucks. The models he used and the method of demonstration were reviewed in the last issue of *Western Construction News* (pg. 72).

Glenn S. Paxson, Bridge Engineer, Oregon State Highway Commission, presented the report of a special committee which has been studying during the past year the sizes and weights of

TYPES of Western trucks which were extensively discussed at the WASHO convention. Characteristics of Western hauling units are the long length and maximum 18,000-lb. axle load, as compared to Eastern trucks which are shorter with heavier axle load combinations.

Officers of W.A.S.H.O. for 1951

President: **W. L. Anderson,** Chief Engineer, Utah.

Vice-President: **A. M. Nash,** District Engineer, California.

Secretary: **J. A. Elliott,** Division Engineer, Bureau of Public Roads, Texas.

Executive Committee: **W. A. Bugge,** Director of Highways, Washington; **P. G. Poore,** Assistant State Highway Engineer, Montana, and **Mark Watrous,** State Highway Engineer, Colorado.

trucks in relation to existing laws in the Western States and the modifications which have been proposed by the trucking interests.

The principal features of this important report are abstracted in the following:

Width

The width of 96 in. recommended in the national policy is supplemented by recognition of the need of additional axle length for larger brakes, and it is recommended that highway widths capable of accommodating vehicles 102 in. in width be eventually provided. This 96-in. width is still the standard of the great majority of the states. The 96-in. width was established as the maximum advisable for highways having pavement widths of 20 ft. There are still thousands of miles of such highways on the system, and until these roads can be widened, 96 in. should remain the general recommended policy. In view of the safer operation with increased brake capacity, every effort should be made to widen or replace existing highways and bridges so that 102 in. at the wheels can be generally allowed.

Height

Much greater variation from the height standard is found. Logically height is limited by two principal factors: Clearance through structures and tunnels, and stability, especially on super-elevated curves. The national design standard for structures calls for 14 ft. of vertical clearance. This clearance will not safely permit the passage of 13½-ft. or higher vehicles. Several of the Western States have adopted a 15-ft. clearance as a design standard, which is adequate for the passage of 13½-ft. vehicles. However, there are many structures on the existing system, built prior to the adoption of the 14-ft. standard, which make it physically impossible to pass the higher vehicles. It would seem that any increase in the height limitation should await the reconstruction of substandard structures and the adoption of a design standard giving greater vertical clearance. The increased clearances increase structural costs, and additional data as to the increased economy that results from higher vehicles should be studied before these added costs are accepted. As a general regional recommendation, height above the national standard of 12½ ft. should be deferred, at least until the roadway and structure widths permit the increased height and the 102-in. vehicle width.

Length

Length enters into highway operation as an element of safety. This is primarily due to the off-tracking of the rear axles on curves. Many tests have been made to determine the amount of off-tracking on curves of different radii and with different vehicles or vehicle combinations. The data shown in the report of the Transport Committee of the A.A.S.H.O. adopted April 1, 1946, are as good as any available.

Length limitations are considered under the three types of vehicles using the highways: single units, tractor-semi-trailer combinations and truck-trailer combinations. The 35-ft. length for single units, recommended by the W.A.S.H.O. policy and adopted by the A.A.S.H.O. in 1946, is not generally accepted in the West.

There is little pressure from freight truck operators for any increase in the single-unit length, and it is probable that but little use would be made of additional length in this type of vehicle even if allowed.

There is an economic need for buses longer than 35 ft. This has been recognized by several of the states in this region in the framing of their motor-vehicle codes. This committee is not in favor of changing the existing recommendation of 35 ft. for single units at the present time.

The W.A.S.H.O. policy did not differentiate between tractor-semi-trailer combinations and truck-trailer combinations; in so far as length is concerned, the limiting length for both is set at 60 ft. Under the A.A.S.H.O. policy, the recommended length for semi-trailer rigs is 50 ft. By reason of this recommendation in the W.A.S.H.O. policy, or for other reasons, the majority of the Western States have, by law, allowed the longer length.

The Western States are in fair agreement in length limitations on truck-trailer combinations. There seems no urgent reason to change the present length limitation of 60 ft.

Weight

Weight restrictions fall into three categories: axle load, group-axle loading, and total load. The Western States are in complete accord on the 18,000-lb. limitation on single axles, and in fair agreement on the 32,000-lb. limit for tandem axles. The experience of the last 30 yr. proves conclusively that 18,000 lb. on a single axle is as high as can be carried with any reasonable maintenance cost by the types of pavement in use. It shows further that many repetitions of 18,000-lb. axle loads will break up ordinary pavements unless supported by exceptionally good subgrades or bases. This axle-load limitation is probably the most important of all the limitations imposed and must be retained.

The group-axle limitation is probably the most controversial of all the limitations recommended in the W.A.S.H.O. or the A.A.S.H.O. policies. It is also the limitation from which state laws deviate most widely. The net result is a state of complete confusion.

This committee has attempted to determine the approximate effect of trucks now legally operating under existing state laws on typical bridges. Because of the varying ratio of dead load to live load, varying span length and other features peculiar to each bridge, wide variations in stress are to be expected. In general the maximum increase in stress above the design figure is in the range of 20 to 25%. These stresses are not within the danger range when considered alone, but they do reduce the factor of safety that good engineering practice requires. Another effect which must be considered is the fatigue of the materials.

It has been repeatedly pointed out in conferences with truck operators that maximum gross loads for the longer lengths can not be reached with practical equipment without violating either the single-axle or group-axle limits. It is this fact that has, in a large measure, caused the pressure for more liberal group-axle limits and resulted in the state codes discussed above.

The axle-group and total-load limitations of the A.A.S.H.O. policy were set up after careful study to protect the H-15 bridges on the highway system. These bridges are still in service and must continue to serve for many years. The need for the limitations is as great now as it was in 1946, when the policy was adopted. This committee feels that the association should not recommend any increase in the limitations until such time as at least the great majority of the existing bridges have been replaced by heavier structures.

The policy is admittedly drawn to protect the highway facilities, and perhaps too little consideration to the needs of truck operators has been given. If this is true, it is because the economic operating data are not known. The greatest apparent need at the present time is for the assembling, study and interpretation of facts and figures relative to this side of the problem. This association should encourage cooperation with responsible truck operators to this end.

Compaction discussion

Of special interest to highway contractors and engineers concerned with field construction methods, a discussion of "Compaction of Embankments" was led by George N. Miles, District Engineer, Colorado State Highway Department. The subject was reviewed in considerable detail by W. S. Maxwell of the California Division of Highways, who presented information similar to that reviewed in his article published in *Western Construction News*, May 1950, pg. 64.

W.A.S.H.O. Resolutions

INCLUDED among the W.A.S.H.O. resolutions adopted June 15 were the following:

That consideration be given until the next annual meeting of the request that Alaska be included in the W.A.S.H.O. territory.

That each member state initiate a vigorous and sustained program of law enforcement to prevent vehicles carrying excessive loads from using public highways.

That the Appropriations Committee of the Senate be requested to appropriate immediately not less than $35,000,000 for the construction of needed forest highways which are already authorized.

That the standards set forth by the A.A.S.H.O. for truck sizes and weights continue to be the guiding criteria, and a study made of the recommendation to invite motor carrier organizations in the West to participate with the highway departments in assembling data on the economic considerations.

That the cost should be borne by the several states in direct proportion to the amount of Federal aid received by each state for the proposed research project by the Highway Research Board on the effect of varying axle loads on pavements.

That a fact-finding study relating to highway finance, taxation and regulation be made under the general administration of the Western Interstate Committee of The Council of State Governments in cooperation with representatives of the several state highway departments.

That careful consideration be given to a bill similar to H.R. 7941 as the Federal Highway Act of 1950 since this bill is well balanced and would constitute a progressive program, although insufficient in total funds.

NEWS OF WESTERN CONSTRUCTION

JULY 1950

Work Starts on Largest Hotel in Twenty Years

THE GENERAL CONTRACT for the largest hotel structure to be built anywhere during the last 20 years has been awarded to Robert E. McKee of Glendale, Calif., and Los Alamos, N. Mex. The contract is for the 1,275-room Statler Hotel and office building at Wilshire Blvd. and Seventh and Figueroa Streets in downtown Los Angeles. Amount of the award figure is reported to be more than $15,000,000. Equipping and decorating work, etc., will bring the entire investment to more than $20,000,000.

The first steam shovel is going to work at the site on July 5. The construction is expected to require two years.

Two U. S. Steel Corporation subsidiaries, Consolidated Western Steel Corp. and the American Bridge Co., have been awarded the job of fabricating and erecting steel. Cost of the steel, included in the general contract, will be about $1,500,000. According to officials of the Consolidated Western Steel Corp. in Los Angeles, the American Bridge Co. will erect the lower level of the building which will include a 475-car garage and large ballroom. Remainder of the height limit of the building, into which will go some 7,200 tons of steel, will be erected by Consolidated. Start of the steel erection will be in about three months.

Representing Statler as construction proceeds will be the architectural firm of Holabird & Root & Burgee, Chicago, and William Tabler of New York, associate architect who designed the structure.

Mehring & Hanson of Los Angeles, Chicago and Washington, D. C., obtained the contract for providing and installing heating, ventilating and plumbing equipment at $3,000,000. Stetson Electric Co. of Los Angeles will do the electrical work under a $1,100,000 contract.

Survey Party Investigates Site for Hells Canyon Dam

A SEVEN-MAN Bureau of Reclamation survey party has begun a reconnaissance study for the proposed Hells Canyon Dam in the spectacular Snake River Canyon on the Idaho-Oregon border as part of a program to gather additional data on the project now before Congress for authorization. The men will investigate routes of all possible access roads to the deep gorge in which the dam, the highest in the world, would be constructed. Both the Oregon and the Idaho sides of the rim are to be surveyed.

The surveyors, headed by Ivan M. Teuscher, engineer-in-charge, is headquartered at Halfway, Ore. Much of the survey work covers areas inaccessible by roads, forcing the engineers to use pack horses. Aerial inspection of the rough terrain will also be undertaken this summer.

The proposed dam, which will provide 900,000 kilowatts of hydroelectric energy for the Pacific Northwest, will be situated in a steep-sloped gorge 6,000 ft. deep, virtually unsettled and almost inaccessible, about midway between Weiser and Lewiston, Idaho. The structure will be 740 ft. high, slightly higher than Hoover Dam, contain 6,200,000 cu. yd. of concrete, and create a reservoir of 4,400,000 ac. ft. capacity.

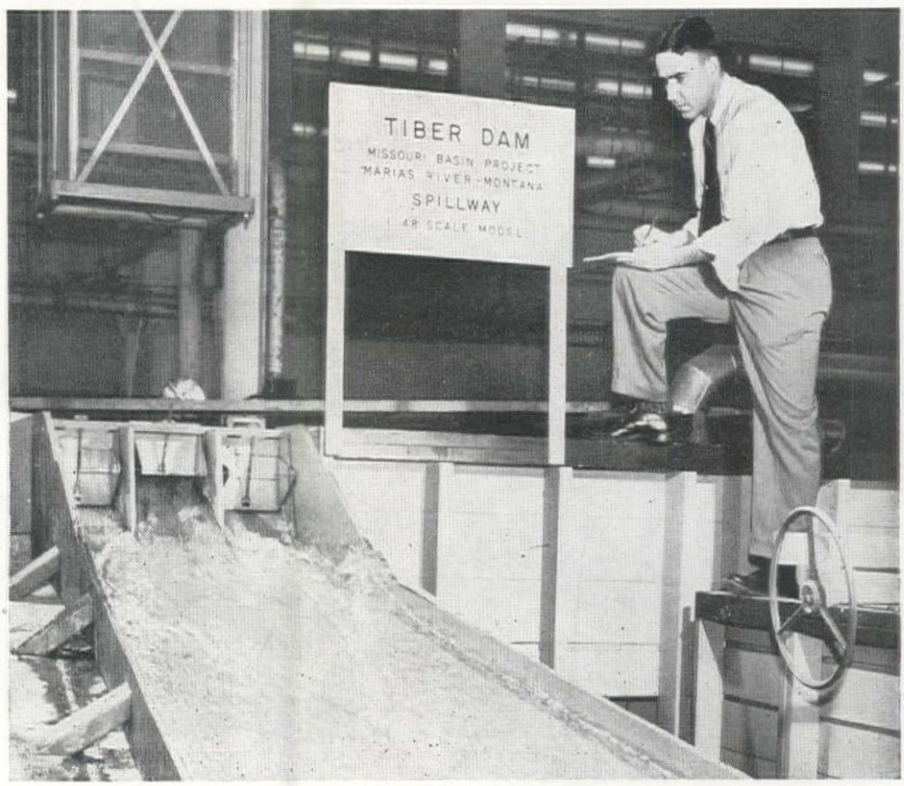
In addition to power production, the project will make a substantial contribution to the upstream storage needed to control devastating Columbia River floods. It will also improve navigation in the downstream Snake and Columbia through river regulation and provide financial assistance to irrigation projects in the Columbia River Basin, either under the proposed Columbia Basin pooling plan or as an individual project.

Colorado Hires Engineering Firm for Toll Road Project

THE STATE of Colorado has signed a contract with Howard, Needles, Tammem & Bergendoff of Kansas City for construction engineering of the $5,000,000 Denver-Boulder toll road. The contract provides: (1) that 80% Colorado labor be used throughout the job; (2)

MODEL DISPLAY AT BUREAU OF RECLAMATION LABORATORY DEDICATION

VISITORS to the USBR's laboratories during the dedication of the Reclamation Engineering Center at Denver, Colo., on July 20 and 21, will see displays of hydraulic models of Bureau structures. In this photograph, Hydraulic Engineer *A. S. Reinhart* records data on the flow pattern in the spillway chute of a model for Tiber Dam, planned for construction on the Marias River in Montana. The equivalent of 18,000 cfs. of water is discharging through one of three 20 x 30-ft. gates planned for the dam. Open house will be held for both notables and the public at the Center.



that the highway department assume full responsibility for finishing the work on time and according to specifications; (3) that the engineering firm be paid a sum constituting 4.1% of the construction costs of the completed project but not to exceed $205,000; (4) that the State shall acquire the right-of-way for the toll road. It will be 18.3 mi. long and run between a Denver suburb and the Boulder city limits.

Map of Reclamation Projects Available

A NEW location map of Bureau of Reclamation water conservation projects, completed or under construction, has been made public. Copies of the map, revised in a 1950 edition, may be obtained upon request from Reclamation Bureau offices in Washington or from the Regional Directors in Boise, Idaho; Sacramento, Calif.; Boulder City, Nev.; Salt Lake City, Utah; Amarillo, Texas; Billings, Mont.; or Denver, Colo.

In addition to "spotting" the 84 projects completed or under construction by the Bureau, including the 24 units in the Missouri River Basin Project, the map carries an alphabetical listing of the projects, the nearest town, and statistical data on the water and hydroelectric power potentialities of each.

Low Bidder for Keyhole Dam Under Estimate by $500,000

AWARD of contract to the Knisely-Moore Co. of Douglas, Wyoming, for construction of Keyhole Dam, on the Belle Fourche River near Moorcroft in northeastern Wyoming, has been authorized on a low bid of $1,677,724.50. Engineer's estimate for the project was $2,147,251.

Due to the favorable bids received on the construction of the dam and related works, it is estimated that the present Belle Fourche project cost estimate of $5,980,000 will be reduced by approximately $1,000,000.

Keyhole Dam will serve primarily to control floods, retain silt, and provide supplemental irrigation water for the existing Belle Fourche Project and other areas in western South Dakota, and as a potential supply of municipal water for Belle Fourche, South Dakota. Keyhole Dam is a unit of the Department of Interior's Missouri River Basin Project —a comprehensive program for the conservation, control, and use of the water resources of the Missouri River basin.

The dam, 164 ft. high and 3,420 ft. long, including a dike section, will make possible the control of run-off from a drainage area of 1,950 sq. mi. The reservoir will impound about 340,000 ac. ft. of water. All preconstruction studies for

Constructing San Francisco's Broadway Tunnel

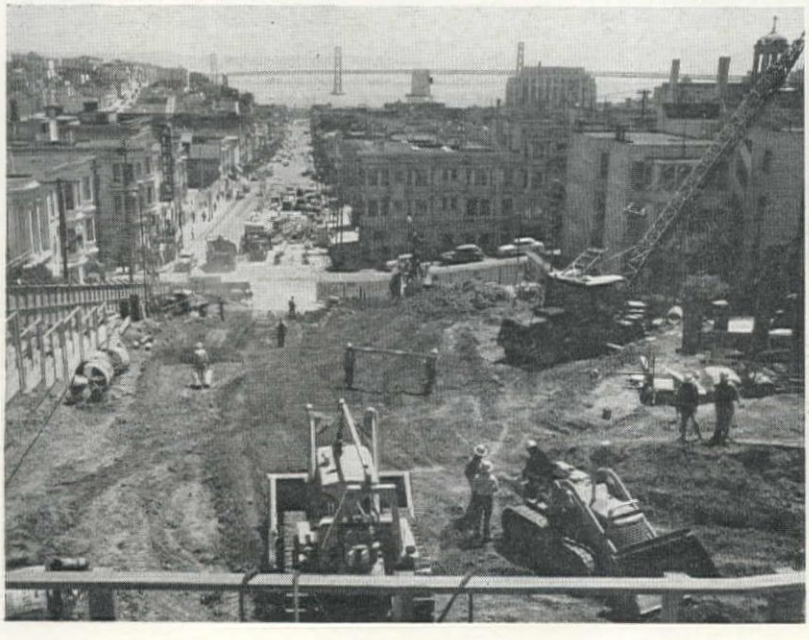
TWO MONTHS after getting crews on the job, Morrison-Knudsen Co., Inc., holder of a $5,243,535 contract from the San Francisco Department of Public Works, is well started on portal construction for the Broadway Tunnel in San Francisco. When completed, the 1,616-ft. long twin bore will carry motorists under Russian Hill between Mason and Hyde St., relieving the heavy peak-hour congestion between the downtown and Marina districts of the city.

Work now is nearly in full swing, and four rigs are drilling holes to hold soldier beams for retaining walls. The largest of the beams used at the portal is 36 in., 230 lb., and 67 ft. deep. It is set in a 40-in. diam. well, with a casing extending down for 20 ft. Over 200,000 bd. ft. of timber lagging will eventually be set between the soldier beams at the portals. The diagonals braced between the beams and top face of the portal are 14 in. deep, and will be followed by 27-in. beams beneath when the excavation has progressed down 20 ft. The grade at this point is 55 ft. below the surface. A total of 360 tons of construction steel beams and shores is to be used at the portals.

The completed tunnels, each 28 ft., 6 in. wide and 22 ft., 9 in. high, will be lined with 2 ft. of concrete when holed through rock, or 3 ft. when in sand. The completion is scheduled in two years.

The contractor had a skeleton crew on the job April 1, and a full crew by May 1. Louis Wheeler is superintendent for M-K. George Partridge is resident engineer for the Department of Public Works.

LEFT—Preliminary work at the tunnel's east portal; Bay Bridge in background. RIGHT — Three Ingersoll-Rand 150-hp. compressors will force clean air into tunnels during construction.



the dam and investigations of possible sources of riprap, embankment and concrete aggregate materials have been completed. An access road has been constructed to the dam site and work is well under way on the Government camp. Camp features completed include 17 residences, camp utilities, office building, bunkhouse, laboratory, and warehouse and shop. Seven portable dwellings are also in place at the camp. Work is to be started on the dam within 30 days after the contractor receives the notice to proceed, and the dam is scheduled to be completed within 850 days after receipt of the notice.

California Leads Again in Value of New Construction

CALIFORNIA ranked first among the States in the total value of new construction during the first quarter of 1950 retaining a lead which it has held since 1941, according to a report released today by the Construction Division, U. S. Department of Commerce. New York was second in the volume of new construction and Texas ranked third.

The Department of Commerce Composite Index of Production of Selected Construction Materials stood at 140.0 in March 1950 (1939 average = 100), just slightly below the March 1948 record of 142.0. Principal materials registering increases in output over March 1949 were lumber and wood products, gypsum board, roofing materials, and plumbing and heating materials.

It's a "Cinch" to Connect Circular Pipe to Concrete

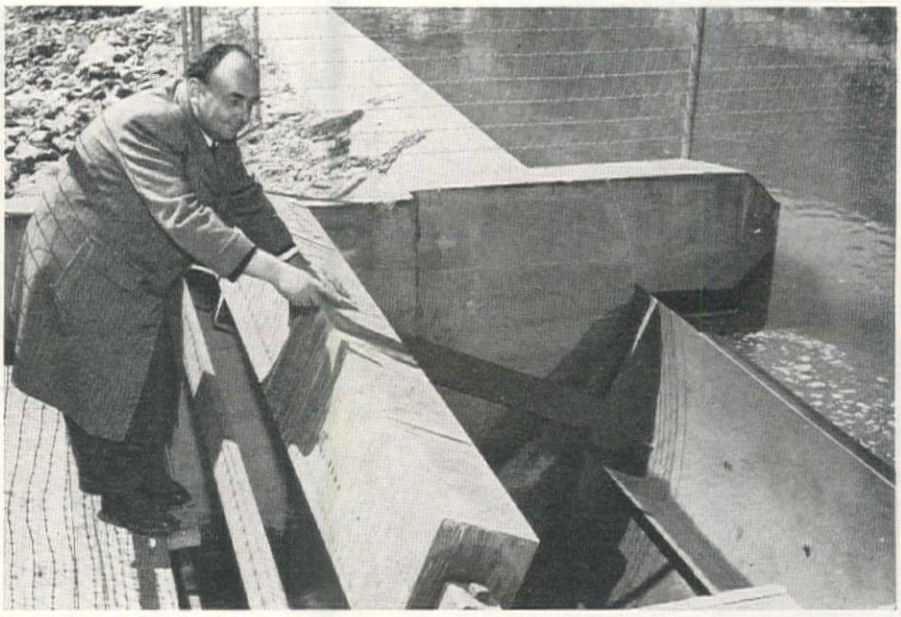
A DEVICE which promises to lick the age-old contractors' problem of connecting circular pipe to concrete has been developed by Ray M. Moorhead, materials engineer for the Bureau of Reclamation at Grand Coulee Dam in Washington. Moorhead has received a Certificate of Honorable Mention and a $50 cash award from the Department of the Interior for the invention.

The device employs two eyebolts and a hemisphere to "cinch" the concrete or tile pipe against the form which is prepared for concrete pouring. Moorhead estimated that it saved up to three hours in each installation at the Yakima Project, Roza Division, where the idea was first developed.

Initial forms for several sizes of pipe may cost as high as $300, but used over and over again, they save two or three hours of carpenter's time for each old form, and they also eliminate the need for finishing the completed pour of concrete.

Engineers' 175th Birthday

THE U. S. ARMY Corps of Engineers celebrated its 175th anniversary last month. The Corps was founded on June 16, 1775, when the then Continental Congress passed a resolution calling for appointment of a chief of engineers to aid the Revolutionary Army.



Automatic Radial Gate Installed in Colorado

FIRST installation in North America of a French-designed automatic radial gate to control the flow of water from rivers, streams and reservoirs into canals and ditches, has been made by Thompson Pipe & Steel Co., Denver, its manufacturers. The equipment, located near the mouth of Clear Creek Canyon in the mountains near Golden, Colo., was inspected and approved during the month by Pierre Danel, director of research for NYRPIC, one of the world's largest hydraulic laboratories, at Grenoble, France. Present at the inspection were representatives of the U. S. Bureau of Reclamation and irrigation engineers interested in the development.

The gate gives automatic control of stream or canal water level under all conditions, including flood, and maintains an even flow of water.

In the Clear Creek installation, the equipment was ordered by the Farmers Reservoir & Irrigation Co. to regulate the flow of a ditch, alongside the stream, to cope with the rising of the creek during cloudbursts or because of rapidly melting snow. The installation eliminates the need for a watchman at the intake to regulate the flow.

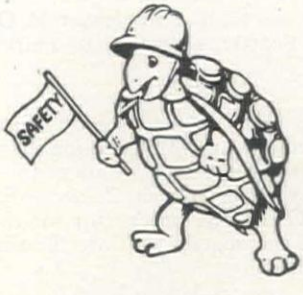
The gate consists of a steel face plate, structural steel channel arms, ball bearing supports, steel counterweight box, walkway support beams which also serve as a stop for the gate during maximum discharge, seals and pin assemblies.

In the photograph above, Pierre Danel demonstrates the radial gate which is in normal position allowing no water flow. His hand is on the float which controls the teeter-totter action of the gate.

Are You Qualified to Join the Exclusive New "Turtle Club"?

A LIFE SAVING club of an unusual nature was formed in British Columbia recently. Known as the "Turtle Club," its purpose is to encourage the wearing of head protection among all workers exposed to falling objects. Motto of the club explains the name: "Shell on Head, We're Not Dead."

The only requirement for active membership is proof in the form of a printed application completed and signed by responsible people that the applicant's life was definitely saved by wearing a hard hat. Those qualifying will be presented with a lapel pin in the form of a turtle, and a scroll setting forth the history of their case. Eventually, the Turtle Club will become international in its scope of operations and memberships. Constitution and by-laws of the Turtle Club were originally drawn up by Rusty Rustmeyer, safety director of the Canadian Forest Products Co., Ltd., and



Ralph Fuller of Fleck Brothers, Ltd., Vancouver, B. C.

For complete information about membership requirements, purpose, duties of members and Turtle Club privileges, and a copy of the constitution and by-laws, write *Western Construction*, 609 Mission St., San Francisco 5, Calif., or E. W. Bullard of E. D. Bullard Co., 275 Eighth St., San Francisco 3.

CONTROLLING stock of the H. K. Ferguson Co., industrial engineers and builders of Cleveland, New York and Houston, has been purchased by Morrison-Knudsen Co., Inc., Boise, Idaho.

PERSONALLY SPEAKING

Troy Carmichael, former city engineer of Helena, Mont., has taken office as state highway engineer of Montana. **George Poore,** acting state highway engineer, resumes his position as assistant state highway engineer.

* * *

SEYBOLD

Colonel John S. Seybold, Civil Engineer, has taken over the duties of Division Engineer, South Pacific Division of the Corps of Engineers, with headquarters at the Oakland Army Air Base, Oakland, Calif. He comes to California from the Missouri River Division office at Omaha, Neb. After 1945, he was District Engineer at Syracuse, New York, and Baltimore, Maryland. Transferred to Bismarck, North Dakota, in 1947, he headed the new Garrison District. As Division Engineer of the South Pacific Division, he will be in charge of Corps of Engineers' activities in the territory covering the states of California, Arizona, Nevada and Utah, and portions of New Mexico, Colorado, Wyoming, Idaho and Oregon, and he will supervise the work of the San Francisco, Sacramento and Los Angeles Districts. This is the largest area of all Army Engineed Divisions. It embraces about 566,000 sq. mi.

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Professor Thomas Campbell is the newly-elected chairman of the Pacific Northwest Conference of the American Society of Civil Engineers. Other officers include: **Guy H. Taylor,** Portland, vice-president, and **Professor R. O. Sylvester,** Seattle, secretary-treasurer.

* * *

Julius Irion, former county engineer of Maricopa County, Arizona, has been appointed road superintendent for Maricopa County District 2, according to **James O. Lecky,** supervisor for the district. He succeeds the late **Thomas C. Menard.**

* * *

C. W. Nash has been named vice-president and general manager of the newly-formed general contracting firm of Gilpin-Nash Limited, Vancouver, B. C. He is a registered professional engineer in British Columbia and the State of Washington. The new firm is a tie-up of the General Contracting Co. of Seattle and Portland and its wholly-owned subsidiary, the Gilpin Construction Co. of Portland.

* * *

William C. Tait was elected president of the Western States Conference of the Associated General Contractors of America at the group's Reno, Nevada, meeting last month. Tait, long identified with the construction industry in San Francisco, is chairman of the Building Industry Conference Board, San Francisco. He is past president, a member of the advisory board and of the legislative committee of the Associated General Contractors of Central California. Other new officers are: **A. S. Horner** of Denver, vice-president; **John H. Sellen** of Seattle, second vice-president, and **Frank Corker** of San Francisco, secretary.

* * *

Two men have been appointed to the Colorado State Highway Advisory Board by Colorado's Governor Johnson. They are: **Roderick L. Downing,** Professor of Civil Engineering at the University of Colorado, Boulder, and **H. Farmer Benson,** businessman of Colorado Springs. The men replace **Walter B. Cooper** and **Dewey Carnahan.**

* * *

Fred W. Haselwood, District Engineer for the California Division of Highways for the past 24 years, retired May 31.

* * *

Two major promotions and a retirement in the top engineering staff of the Metropolitan Water District of Southern California have been announced. **Robert B. Diemer** was named to fill the newly-created office of assistant manager and chief engineer under **Julian Hinds.** He was raised to the position from his former post as chief operation and maintenance engineer of the Colorado River Aqueduct system and will continue to perform the duties of this office in addition to added responsibilities. **James M. Gaylord** retired from the office of chief electrical engineer. **Robert M. Peabody,** who has been with the District since 1933, replaces Gaylord.

* * *

Colonel William H. Mills becomes district engineer of the Walla Walla District of the Corps of Engineers, effective July 13, replacing **Colonel William Whipple,** who has headed the district since its activation in November of 1948. Colonel Mills, who went overseas in 1942 and served in the Southwest Pacific in command of the 46th Engineers, is now attending the Industrial College of the Armed Forces in Washington, D. C. On being relieved of his duties, Colonel Whipple will go to Washington, D. C., to attend the Industrial College before being assigned to a new post.

* * *

John H. Pattison, County Engineer of Kitsap County, Wash., is the newly-elected president of the Washington State Association of County Engineers. Other officers named at the 44th annual convention of the association held last month at Bellingham are: **Donald B. West,** Chelan County Engineer, vice-president, and **I. W. Pouttu,** Pacific County Engineer, secretary-treasurer.

OBITUARIES...

Robert A. Shaw, 65, assistant civil engineer in the plans and survey division of the Long Beach, California, City Engineer's office, died of a heart attack May 22.

* * *

Carlo P. Christensen, 65, director of the Hoover Dam Project of the Bureau of Reclamation, died June 15 at Boulder City, Nevada, of a heart attack. He had been head of the project since 1944. He joined the project in 1934 as assistant engineer installing generating equipment, in 1940 went to Grand Coulee Dam in Washington for similar work, and returned to Hoover Dam in 1944. He was also formerly a testing engineer for the Metropolitan Water District of Southern California.

* * *

W. Crosbie Pickering, engineer with Stone & Webster Engineering Corp., Los Angeles, died May 31. Formerly, he was a partner in the Pickering Bros. Construction Co. of Salt Lake City, Utah.

* * *

Nick Yanik, president of Tower Construction Co., Seattle, Wash., was drowned along with his wife when their light seaplane crashed during a take-off from the reservoir at Ross Dam. The plane sank in 80 ft. of water. Yanik's two sons escaped unharmed.

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E. Power Conway, 70, president of the Phoenix-Tempe Stone Co., Phoenix, Ariz., died June 6. Before moving to Arizona from Los Angeles, Conway was associated with the Fairchild-Gilmore-Wilton firm, predecessor of the present Griffith Co.

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Alexander James Barclay, 79, retired division constructon engineer for the Southern Pacific Railroad at Los Angeles, died recently.

* * *

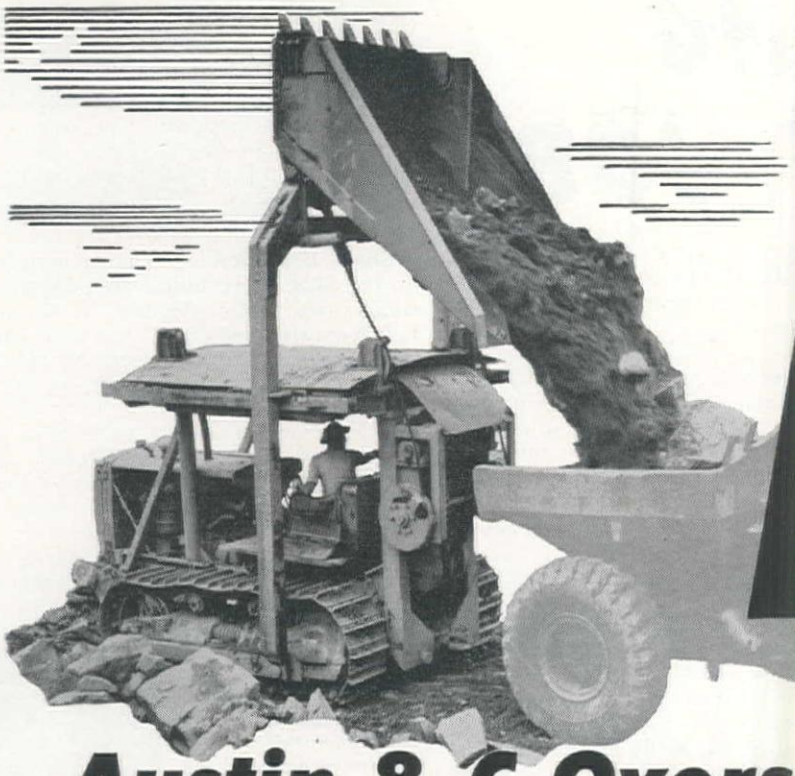
Paul J. Bell, 75, retired construction engineer of Los Angeles, died June 13.

* * *

Mark Amodei, former City Engineer of Carson, Nevada, died May 28.

* * *

Henry Rigby Watson, 43, engineer with the Bureau of Reclamation at Huron, South Dakota, died recently. He was chief of the irrigation practices and operations section at Huron. Previously, he was employed by the Utah State Planning Board and the Utah Canal Board.



Here's ONE-MAN Loading At 280 Cu. Ft. Per Min.

Austin 8-C Overshot Loader*

*For crawler tractors with 28,000 lbs. minimum drawbar pull.

On short runs you can make three loads a minute in bank run or stockpile material—more than 10 yards every 60 seconds. Simple one-man operation and utilization of the tractor engine for all power permit rock-bottom costs on every count. Fuel costs for overshot loading are about the same as for normal dozing operations.

- **Double Duty for Your Tractor.** The Austin Overshot Loader bucket is interchangeable with an 11-ft. Austin dozer blade for leveling, pushing, etc. Screw type adjustments give positive control of blade or bucket pitch, and the cable control system gives constant and easy control of blade height or bucket operation through the full cycle.

- **Easy to Use and Maintain.** The Austin Loader is powered through a Caterpillar Model 25 Cable Control Unit. A wrap-around laminated chain driving wrap-around cable sheaves is chain driven through a floating jack-shaft arrangement.

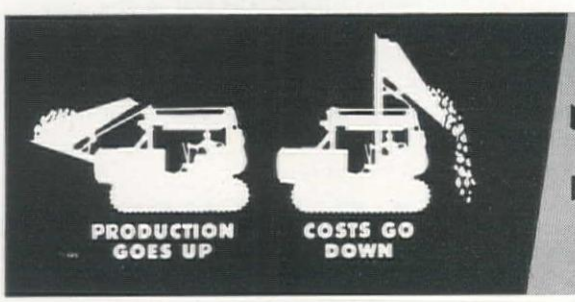
The result is maximum power on initial lift and maximum speed through the loading cycle, completed automatically while the tractor is in motion. Single lever control with automatic brake means easy operation. Simple and rugged construction gives long life and maintenance economy.

- **Also for Underground Mining.** The straight on-a-line loading possible with Austin Overshot Loaders is especially valuable where space is at a premium, as in underground mining. There is no swinging or blocking; overhead clearance is reasonable, and overall width is well under 10 ft. for the 8-C. (Less on smaller models.) For driving tunnels, for mucking, excavating, stockpiling and other duty, use an Austin Overshot Loader and save your more expensive equipment for other duty. An Austin has a place in any operation.

OTHER MODELS

1, 1½ and 2½ cu. yds. rated capacity

Write for Folder and Name of Your Nearest Dealer



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SUPERVISING THE JOBS

G. E. Lefler is project manager and **H. E. Gall** the general superintendent for the U. S. family dwelling housing project at Fort Richardson, Alaska. Patti-McDonald Construction Co. of St. Louis is building this project for $4,812,503.

* * *

Frank Spiegelberg and **A. G. Lane** are project manager and general superintendent on construction of the University of Wyoming stadium and fieldhouse at Laramie, to cost approximately $1,300,000 Spiegelberg Lumber and Building Co. is the contractor.

* * *

Fred Hoffman is job superintendent for the Anderson Company, Visalia, Calif., constructing the $96,000 concrete slab bridge and approaches in Imperial County, Calif. **Daryl Stokes** and **D. Foster** are pile driver foreman and bridge foreman, respectively.

* * *

O'Neil Jones is job superintendent, **Elmer Wuertz** is foreman, and **Carl Lowry** is crusher foreman on a 6-mi. highway project near Cut Bank, Glacier County, Mont. The $98,898 contract is for gravel surfacing and roadmix oiling.

* * *

For Munter Construction Company's Seattle, Wash., $297,900 project including construction of 5 bridges in Alaska, **Phil Siekawitch** has been named job superintendent. **Bill Sonneband** is carpenter superintendent; **John Siekawitch,** excavation foreman, and **Al Roles**, office manager.

* * *

For its $178,473 contract for installation of sanitary sewers and pavement construction in Vista Hermosa Improvement District, Pima County, Ariz., San Xavier Rock & Sand Co. of Tucson has named **D. M. Kelly** as job superintendent. **George Nofwell** is assistant superintendent; **Troy Jones** is grade foreman, and **Bud Barrett,** concrete foreman.

* * *

L. C. Brown is job superintendent on the Gila Project Wellton-Mohawk Canal construction, in Arizona, awarded to Western Construction Corp., Newman, Calif., for $2,412,645.

* * *

Wes Widmer is job superintendent for Morrison-Knudsen Co., Inc., for construction of the $942,560 concrete addition to St. Joseph's Hospital at Fairbanks, Alaska.

* * *

Shelly L. Killion is job superintendent on the $429,065 technical area construction project at Los Alamos, N. M., now being constructed by R. J. Daum Construction Co., Albuquerque, N. M.

* * *

J. M. Cranmer is now working as job superintendent for the $100,569 construction of 5.5 mi. of roadway in Utah County, Utah. Whiting & Haymond of Springville, Utah, is the contractor. **A. H. Cranmer** is job superintendent for the same company on the construction

LOUIS WHEELER is the superintendent for Morrison-Knudsen Co., Inc., on the 1,616-ft. twin Broadway tunnels for traffic in downtown San Francisco. The job is under a $5,243,535 contract from San Francisco's Department of Public Works. Excavation work has started.

of 4 mi. of roadway west of Salina Canyon summit in Sevier County, Utah, to cost $163,039.

* * *

Earl Shannon is job superintendent for Henry Thygesen & Co., Albuquerque, N. M., on the reconditioning of 47 mi. of highway surface, to cost $192,123, between Gallup and Albuquerque, N. M.

* * *

C. J. Houck is superintendent for Reliance Truck Co. and A. L. Snuffer Construction Co., contractors on the Bureau of Public Roads highway construction for 7.5 mi. between Williams and Grand Canyon, Ariz. Foremen include **J. E. Williams,** trucks, and **Maurice Massey,** crusher.

* * *

The Del E. Webb Construction Co., Phoenix, Ariz., has several large jobs under way. In the West, it's **Cornelius "Neil" Drinkward** superintending construction of the 500-bed, multi-million dollar hospital in Denver, Colo. **J. E. "Joe" Salmon** is completing work on the new W. & J. Sloane store building on Wilshire Blvd., Beverly Hills, Calif., and setting up the field crews for expansion of Howard Hughes' aircraft plant at Culver City, Calif. **H. L. Germain** took over as chief of construction on the Phoenix Veterans Hospital when **J. N. "Jack" McPhee** was shifted to the new 500-bed Veterans Administration Hospital in Kansas City, Mo. Germain is assisted by **Fred L. McDowell,** just transferred from the construction of a Paraffine Company warehouse at Redwood City, Calif. **Ervie A. Leedham** is directing construction of the new Boy Scouts headquarters building in Phoenix, and **H. C. Hill** is completing work on the Veterans Hospital at Portland, Ore.

* * *

Corbette Jarnagin is superintendent for Harry J. Hagen, Globe, Ariz., holder of the $460,000 contract for Gila County Hospital at Globe. **Bob Wenzel** is master mechanic.

* * *

L. S. Spaulding is office manager for Bressi & Bevanda Constructors, Inc., North Hollywood, Calif., on the Tujunga Wash improvement construction.

* * *

Ralph B. Wood is superintendent and **R. K. Harris** is project manager for Winston Bros. Company of Minneapolis on the $2,000,000 contract for outlet works and service bridge at Belton Dam, Belton, Texas. The project is being built by the Fort Worth District, Corps of Engineers, and will probably end during March, 1952. **C. J. Kocian** is resident engineer, assisted by **E. F. Cirkal.**

* * *

Homer Parks is superintendent for Harry Campbell, holder of the $1,300,000 relocation contract for the State Highway Department on route 80, through Callahan County, Texas.

* * *

Working for Guy F. Atkinson Company at Longview, Wash., on a $810,310

highway reconstruction project are: **Jack Smith**, project manager; **Ted Wiegman**, general superintendent; and **R. L. Henderson**, office manager.

* * *

Working for Sully-Miller Contracting Co., Long Beach, on its $446,000 Santa Ana Freeway project between Anaheim and Los Angeles County line, are: **E. L. White**, superintendent; **Harold Placey**, general foreman; **William Robinetti** and **George Hall**, grade foremen; and **Merle Shaffer**, office manager.

* * *

Doug Fife is project manager and **Lee Monson** superintendent on the $293,629 Yellowstone Park highway project in Bannock County, Idaho, for Parsons & Fife, Brigham City, Utah. Other key men on the job are: **Lott Adams**, excavation superintendent; **Bob Phillips**, bridge foreman; **Don Jackson**, grade foreman; and **Wendell Fife**, crusher foreman.

* * *

Working on the Edgemont Connection Road, a $168,139 project in Niobrara County, Wyoming, for H. R. Emme, Rapid City, S. D., is **R. E. Trent**, who is job superintendent.

* * *

Paul Carney of Williams, Ariz., is job superintendent for Pioneer Construction Co., Memphis, Tenn., on its $319,698 project for grading and surfacing part of the Grand Canyon-Old Trails highway in Coconino County, Arizona.

MIKE SAPORETTI, left, is the general superintendent for Parish Bros., Benicia, Calif., on the $815,000 construction of a state highway near Pittsburg, Calif. BILL MADSON, right, is superintendent. CARL W. HENSEL, center, is subcontractor on the job.

* * *

Morrison-Knudsen Co., Inc., has appointed **W. J. Darkenwald** as area manager and **M. D. Muller** as office manager on the construction of the $865,965 Farmington dam and spillway in San Joaquin County, Calif.

* * *

Working on a $289,715 project on State Highways 17 and 20 in North Dakota are **Charles E. Bulman** and **Don A. Boyd**, who are job superintendent and engineer, respectively.

* * *

V. M. "Chick" Dwyer is job superintendent for the grading and surfacing of 1.4 mi. of State highway in Lake County near Tule Lake. M. W. Brown, Redding, Calif., is contractor on the $191,432 job.

* * *

Don Jackson and **Bill Rasmussen** are job superintendent and job engineer, respectively, for the $209,925 dredging job of five harbors in Alaska. Contractor is M. P. Munter, Seattle.

* * *

F. L. "Chet" Oliver is job superintendent for 6.1 mi. of highway construction in Musselshell County, Montana. Stanley H. Arkwright Co. of Billings was awarded the $298,257 job.

* * *

Working for Stanley H. Arkwright on the St. Xavier-Hardin highway in Big Horn County, Montana, a $95,000 project, are: **Howard Walter**, who is job superintendent; **Rollin Adams**, drainage foreman, and **Al Weber**, grade foreman.

* * *

N. L. Basich is project manager for the widening and surfacing of 16 mi. in San Bernardino County, Calif. Basich Bros. Construction Co. of San Gabriel, Calif., is contractor for its $191,600 bid.

* * *

L. C. Shelman is job superintendent for construction of 15 mi. of U. S. Highway 81 south of Fargo, N. D., a $772,787 project of Western Contracting Co., Sioux City, Iowa. Project accountant is

Frank Newbowers; **Mat Zittrische** is concrete foreman; **Roy MacArthur** is grading foreman.

* * *

Working on the Strong Company's $440,209 project for surfacing 22 mi. of highway in Juab and Millard Counties in Utah are: job superintendent **Lyman Robbins**; **Grant Richins,** truck foreman; and **Carl Peterson,** gravel foreman.

* * *

Glenn D. Veater is superintendent for Allison & Haney, Albuquerque, on the $322,000 contract for hot mix paving and curb and gutter work for the City of Clovis, New Mexico.

* * *

C. E. Jones is superintendent for Robert E. McKee General Contractor, Inc., on the $2,227,000 contract for Providence Memorial Hospital, El Paso, Texas.

* * *

Ray Robinson is superintendent for the construction company bearing his name on the $10,000 contract for construction of a ½-mi. oval auto race track at Carlsbad, New Mexico. The track is of compacted clay and salt brine, and has curves banked to 19-deg. superelevation.

* * *

A. E. Mortensen is superintendent for the General Construction Co. on the $360,000 contract for bulkhead and fill on the Salmon Bay Terminal, Seattle, Wash.

* * *

Superintendents for Henry Shore, contractor on the $240,000 grading and paving contract at Pueblo, Colo., are **Nate Shore,** grading, and **Arlie Bailey,** structures. The work is on state highway 96, from Pueblo to 5 mi. west.

* * *

Joseph Vidasek is superintendent and **Jack Philippe** is office manager for P. & J. Artukovich, Inc., Los Angeles, on the $286,000 contract for four sewage pumping stations on the north end of Lake Tahoe, Nevada County, Calif.

* * *

John Bradarich is superintendent and **Phil Philippe** is office manager for P. & J. Artukovich, Inc., Los Angeles, holders of the $417,956 contract for construction of a pumping plant and sewer system at Ballona Creek, Calif.

* * *

I. D. Robbins is superintendent and **A. E. Pay** is office manager for Morrison-Knudsen Co., Los Angeles, for the $158,490 construction of right wing dikes numbers 1, 2, 3, 4, 6 on the Folsom Reservoir Project, Sacramento County, Calif.

* * *

Earthwork, concrete work, and utility relocation is proceeding at San Angelo Dam, San Angelo, Texas, under various contracts let by the Fort Worth District, Corps of Engineers. **J. P. Andrews** is superintendent for Allhands & Briley, contractor on 9½ mi. of track relocation for the Gulf Colorado and Santa Fe

Railways. Nolan Bros., Inc., holds a $3,000,000 contract for the outlet works, and has in the field **B. H. Shirley**, general superintendent, and **W. L. Nolan**, project manager. **Harold Hansen** is assistant superintendent. The spillway was subcontracted from Winston Bros. & Taylor-Wheles Co. Concho Constructors, holder of the $6,300,000 dam contract, has placed **R. H. Taylor** as project manager and **E. G. Libert** as assistant project manager. Superintendents include **Fred Turnipseed, Russell T. Colbert,** and **J. McLemore.** San Angelo Dam involves over 18,000,000 cu. yd. of earth fill and is 37,540 ft. long. It is 128 ft. high, and has a flood control pool capacity of 277,200 ac. ft. on the North Concho River.

* * *

Mike Saporetti is general superintendent and **Bill Madson** is job superintendent for Parish Bros., holder of the $815,000 contract for state highway construction at Pittsburg, Calif. **R. Hesse** is general foreman and **Paul Lukasko** is master mechanic.

* * *

Les Boren is superintendent for W. S. Ford, Kingman, Ariz., contractor and holder of the million dollar contract for a gymnasium at Flagstaff College, Ariz. Foremen include **Bob Stout,** carpentry, and **Felix Rocha,** labor.

* * *

Jim Green is general superintendent for J. A. Terteling & Sons, Inc., on construction of the extension to the East Low Canal, Columbia Basin Project, Wash. On the Winchester Wasteway, **N. P. Cushing** is job superintendent.

* * *

K. E. McDougal is general superintendent for Canyon Constructors, builders of Canyon Ferry Dam near Helena, Mont. He replaces **E. W. Simpson,** superintendent during the past year. **L. S. Sowles** is project manager.

* * *

B. J. "Irish" Allphine is superintendent for General Construction Co., Seattle, holder of the $1,244,000 contract for a highway bridge over the Snake River at Pasco, Wash. The bridge replaces the span burned last September.

* * *

George Tucker is superintendent for Ruby and Barnes, holder of the $132,000 contract for state highway work at Sterling City, Colorado.

* * *

E. H. Hamdorf is job superintendent and **Marc Woolstenhulme** is master mechanic for construction of a portion of State highway in Lincoln County, Nevada. Foster & McHarg of Riverside, Calif., is the contractor for the $184,359 project.

* * *

A. O. Strandberg has been named job manager, and **R. H. Madsen,** assistant job manager, by joint venturers Morrison-Knudsen Co. and Peter Kiewit Sons' Co. for the extension of the right switchyard, a $97,864 project, for the Grand Coulee Dam power plant.

Contracts . . .

A Summary of Bids and Awards For Major Projects in the West

Arizona

$514,440——**Fisher Contracting Co.,** Box 4035, Phoenix——Award for 4⅓ mi. of grading, draining, and surfacing on the Ashfork-Prescott highway.

$241,965——**Pioneer Constructors, Inc.,** Box 2768, Tucson——Award for widening and resurfacing 5¾ mi. of existing pavement with base material and bituminous plantmix on the Tucson-Nogales highway.

$289,859——**M. M. Sundt Construction Co.,** 440 S. Park, Tucson——Award for construction of an outfall sewer and treatment plant for a sanitation project at Nogales; by International Boundary and Water Commission, El Paso.

California

$1,062,742——**S. J. Amoroso Construction Co.,** 2100 Oakdale Ave., San Francisco——Award for the interior and exterior remodeling of a plant at 21st and Harrison Sts. into a Trade and Industrial Institute; by City of San Francisco.

$891,613——**P. & J. Artukovich, Inc.,** 13305 S. San Pedro, Los Angeles——Award for construction of joint outfall "I" trunk sewer, units 2 to 4 inclusive, Long Beach; by Los Angeles County Sanitation District project.

$428,657——**Guy F. Atkinson Co.,** Box 593, South San Francisco——Award for 4.1 mi. to be graded and paved with Portland cement concrete on cement-treated subgrade, plantmix surfacing to be applied to an untreated rock base, north of Berenda in Madera County.

$758,513——**Guy F. Atkinson Co.,** Box 593, South San Francisco——Award for construction of a reinforced concrete slab bridge and a reinforced concrete box culvert; and 6.5 mi. of grading and surfacing in Merced County between Dutchman Creek and Lingard.

$434,705——**Baldwin Straub Corp.,** 26 Francisco Blvd., San Rafael, and **Industrial Construction & Maintenance Division** of **California Steel Products Co.,** Barrett and A Sts., Richmond——Award as joint venture for constructing a water treatment plant of reinforced concrete in Eureka, Humboldt County.

$1,662,724——**N. M. Ball Sons,** 685 Delaware St., Berkeley——Low bid for construction of reinforced concrete bridge and drainage structures, and 1.4 mi. of paving and grading, south of Fort Tejon in Los Angeles and Kern Counties.

$701,211——**Fredrickson & Watson Construction Co.,** 873 81st Ave., Oakland——Award for 5.9 mi. of new roadway to be graded and surfaced, bridges and drainage structures to be constructed to provide a 4-lane divided highway near Livermore in Alameda County.

$419,199——**Fredrickson & Watson Construction Co.,** 873 81st Ave., Oakland——Award for 9.4 mi. of grading and surfacing with plantmix surfacing on cement-treated imported base material in San Benito County between Hollister and the Santa Clara County line.

$702,362——**Mervin L. Gardner,** 750 E. 5th St., Reno, Nev.——Award for construction of a high school 1½ mi. west of Truckee; by the Tahoe-Truckee Unified School District.

$1,050,000——**Ben C. Gerwick, Inc.,** 112 Market St., San Francisco——Award for construction of a wharf connecting Piers 30 and 32 on the San Francisco Embarcadero; by Board of State Harbor Commissioners.

$524,584——**Ed Green** and **Robert Vlacich,** 3001 Coolidge Ave., Los Angeles——Award for construction of joint outfall "B" trunk sewer adjacent to Wilmington Ave. in Los Angeles County; by the County Sanitation Districts.

$1,500,000 approximately——**Haddock Engineers, Ltd.,** Box 390, Montebello——Award for construction of a 2-story, brick and concrete store building at Victory Blvd. and Laurel Canyon Dr. in Van Nuys; by Sears, Roebuck & Co.

$269,800——**M. A. Jenkins** and **R. E. Hertel,** 4251 15th Ave., Sacramento——Award for construction of a structural steel and reinforced concrete bridge about 1½ mi. north of Anderson on the Sacramento River in Shasta County.

$319,776——**Chas. MacClosky Co.,** 112 Market St., San Francisco——Award for construction of 2 reinforced concrete bridges as overcrossings for the Harbor Freeway at Third St. in Los Angeles.

$1,297,000——**Robert McCarthy Co.,** 1050 Kirkham St., San Francisco——Award for construction of a 4-story and basement reinforced concrete hospital at Greenbrae, Marin County; by the Marin County Hospital District.

$20,000,000 approximately——**Robert E. McKee, Inc.,** 4700 San Fernando Rd. West, Los Angeles——Award for building a 13-story, 4-basement hotel and office building on Wilshire Blvd. in Los Angeles; by Hotels Statler Co., Inc.

$311,668——**Oberg Bros. Construction Co.,** Box 640, Inglewood——Award for construction of a reinforced concrete box girder bridge and grading and paving of road connections on the Hollywood Freeway at Fountain Ave. in Los Angeles.

$1,035,424——**Parish Bros.,** Box 6, Benicia——Award for construction of 5 bridges and the grading and surfacing of 6 mi. of state highway with Portland cement concrete and plantmix surfacing, between Cordelia Underpass and Ledgewood Creek in Solano County.

$644,190——**George Pollock Co.,** Box 903, Sacramento——Low bid for construction of earthwork, floodgate structure, highway bridge and a railway bridge on the Delta Cross Channel near Walnut Grove, a portion of the Central Valley Project; by Bureau of Reclamation.

$646,200——**Reed and Tuttle,** Redwood Valley——Award for .04 mi. to be graded, and field assembled metal plate culvert to be furnished and installed in Richardson Grove State Park at Durphy Creek, Humboldt County.

$292,993——**A. Teichert & Son,** Box 1113, Sacramento——Award for 6.6 mi. of levee construction along Georgiana Slough near Isleton in Sacramento County; by Corps of Engineers.

$1,027,690——**United Concrete Pipe Corp.** and **Vinnell Co.,** Box 425, Baldwin Park——Award as joint venture for construction of earthwork, concrete lining and structures, Schedule II of the Delta-Mendota Canal, Newman Wasteway, a portion of the Central Valley Project; by Bureau of Reclamation.

$314,412——**N. P. Van Valkenburgh & Co.,** Box 1192, Sacramento——Low bid for construction of a sewer system in Santa Rosa, Sonoma County.

$2,000,000 approximately——**Del E. Webb Construction Co.,** 5101 San Fernando Rd. West, Los Angeles——Award for additions to the factory of Hughes Aircraft Co., Culver City.

Colorado

$4,500,000——**Hutchinson & Carey, Inc.,** 2750 So. Colorado Blvd., Denver——Work has started on 468 homes, located in southeast Denver.

$2,389,350——**Winston Bros. Co.,** 401 N. Irwindale Ave., Azusa, Calif.——Low bid for construction of the Carter Lake reservoir, to include the building of 3 earthfill dams in gaps on the eastern rim of a natural basin 7 mi. west of Berthoud, part of the Colorado-Big Thompson Reclamation Project; by Bureau of Reclamation.

Idaho

$320,943——**Roy L. Bair,** 1220 W. Ide Ave., Spokane, Wash.——Award for constructing roadbed, drainage structures and bituminous surface treatment of 1.8 mi. of approaches to Lewiston Bridge on the Lewis and Clark Highway in Nez Perce County.

$297,494——**Morrison-Knudsen Co., Inc.,** Box 450, Boise——Award for construction of the roadbed, drainage structures and bituminous surface treatment of 2.3 mi. of the Boise-Stanley highway in Ada County.

Montana

$245,036——**S. Birch & Sons Construction Co.,** 314 Ford Bldg., Great Falls——Award for grading, gravel, drainage and surfacing of 17.8 mi. on the Rogers Pass-Simms highway.

$252,695——**Haggerty-Messmer Co.,** Box 334, Bozeman——Award for building an 8,000-ac. ft. storage reservoir near Winnett in Petroleum County; by the State Water Conservation Board.

$450,845——**McLaughlin Construction Co.,** 12th and Clark Sts., Livingston——Low bid for construction of tunnel outlet protection works at Fort Peck Dam.

$378,741——**Morrison-Knudsen Co., Inc.,** Box 450, Boise, Idaho——Award for 10 mi. of road widening, building new retaining

walls, and installing new culverts in Glacier Park on the road from Logan Creek to Logan Pass; by Bureau of Public Roads.

$223,284——**Thomas Staunton,** Box 1745, Great Falls——Award for 8.7 mi. of grading, drainage, roadmix oiling, and construction of a 38 ft. timber bridge in Pondera County.

Nevada

$351,233——**Silver State Construction Co.,** Fallon——Award for overhaul, grading and surfacing of 12.3 mi. on the state highway from Oasis to Silver Zone Overpass in Elko County.

$279,744——**F. E. Young,** 599 Colusa Ave., Berkeley, Calif.——Low bid for grading and base course surfacing of 2.7 mi. on U. S. 50 between Spooners and Glenbrook; by Bureau of Public Roads.

New Mexico

$232,542——**Armstrong and Armstrong,** Box 873, Roswell——Low bid for the rebuilding of 11.8 mi. of State Highway 20 between Fort Sumner and Roswell in De Baca County.

$290,944——**O. D. Cowart,** Lordsburg——Low bid for the rebuilding of 16.7 mi. of State Highway 24 in Oter County between Cloudcroft and Weed.

$552,161——**R. J. Daum Construction Co.,** 1005 W. Coal Ave., Albuquerque——Low bid for construction of 8 reinforced concrete buildings in the technical area at Los Alamos.

$2,062,589——**R. J. Daum Construction Co.,** 1005 W. Coal Ave., Albuquerque——Low bid for construction of 31 reinforced concrete buildings in the South Mesa technical area, an Atomic Energy Commission project.

$1,113,214——**Morrison-Knudsen Co., Inc.,** 411 W. Fifth St., Los Angeles, Calif.——Low bid for construction of the outlet works for Jemez Canyon Dam and Reservoir, a portion of the Rio Grande Flood Control program; by Corps of Engineers.

$230,428——**Sharp and Fellows,** 533 Central Bldg., Los Angeles, Calif.——Low bid for construction of a bridge across the Rio Grande on U. S. 380 near San Antonio in Socorro County.

$704,781——**Vinson Construction Co.,** Box 930, Phoenix, Ariz.——Award for construction of an open spandrel steel arch bridge, 44 ft. wide, 820 ft. total length, over Los Alamos Canyon.

Oregon

$239,859——**J. C. Compton Co.,** Box 86, McMinnville——Award for 10.5 mi. of roadbed widening; 12.7 mi. of rock base; and 13.2 mi. of paving on the Cave Junction-California state line section of the Redwood Highway in Josephine County.

$246,570——**Lee Hoffman,** 535 S.E. Water St., Portland——Award for constructing 5 piers for the Marion Street Bridge over the Willamette River, in Marion and Polk Counties.

$234,261——**McNutt Bros.,** 351½ E. Broadway, Eugene——Award for placing surfacing and oil on 10 mi. of highway between Corvallis and Waldport; by Bureau of Public Roads.

$333,999——**Montgomery Electric Co.,** 2375 N.W. Thurman, Portland——Low bid for construction of 154 steel towers and 20 steel structures for the Lebanon-Goshen 230-kv. transmission, 40 mi. in length, from Lebanon to Goshen.

$243,894——**Parker-Schram Co.,** Builders Exchange Bldg., Portland——Low bid for the grading and paving of 5.6 mi. on the

Brookings-California state line section of the Oregon Coast Highway in Curry County.

$242,079——**Utah Construction Co.,** 1 Montgomery St., San Francisco, Calif.——Low bid for construction of 2 railroad and 2 highway bridges over the Columbia River at Juniper Canyon and Spring Gulch; by Corps of Engineers.

South Dakota

$2,280,717——**Guy H. James Construction Co.,** Oklahoma City, Okla.——Award for the earthwork project, known as Stage I, of the main-stem Oahe Dam on the Missouri River near Pierre.

$1,092,509——**Northwestern Engineering Co.,** Box 1392, Rapid City——Low bid for construction of Cold Brook Dam and outlet works, Fall River Basin, 2 mi. north of Hot Springs; by Corps of Engineers.

Utah

$137,000——**Peter Kiewit Sons' Co.,** 1024 Omaha National Bank Bldg., Omaha, Neb.——Low bid for the grading and base course surfacing of 6.1 mi. on the Provo River-Haydens Fork Highway in Summit County.

$131,300——**Wheelwright Construction Co.,** Box 109, Ogden——Award for construction of a 20-ft. concrete bridge and 1 mi. of hard surfaced road on U. S. 40 at Myton, Duchesne County.

Washington

$237,555——**Fred J. Early, Jr. Co., Inc.,** 369 Pine St., San Francisco, Calif.——Low bid for construction of a sewage lift plant and a pumping plant in connection with the levees, at Richland; by Corps of Engineers.

$1,446,980——**Max J. Kuney,** Box 4008, Sta. B, Spokane——Low bid for building a 7-story addition to the present building of Spokane and Eastern Branch of the Seattle First National Bank in Spokane.

$1,487,043——**Morrison-Knudsen Co., Inc.** and **Peter Kiewit Sons' Co.,** 603 Hoge Bldg., Seattle——Low bid as joint venture for the construction of a machine shop, completion of 2 warehouses and other buildings, laying of underground pipe and conduit in the industrial area of Coulee Dam.

$3,500,000——**Nelse Mortenson,** 1021 Westlake N., Seattle——Award for construction of 400 homes for the Federal Housing Administration at Moses Lake Air Force Base.

$341,424——**Osberg Construction Co.,** 1132 North 128th, Seattle——Award for the grading and draining of 6.3 mi. of state highway between Monroe and Sultan in Snohomish County.

$561,730——**John H. Sellen Construction Co.,** 228-9th St. No., Seattle——Award for conversion of 46 buildings to family quarters at Fort Lewis; by Corps of Engineers.

$348,283——**Smith Bros.,** 20 Algona Drive, Vancouver——Award for the grading, draining, and surfacing of 3.3 mi. on State Highway 12 in Pacific County.

$1,352,381——**Sound Construction & Engineering Co.,** 1403 W. 25th, Seattle——Award for construction of a dormitory at Washington State College, Pullman; by the Board of Regents of the college.

$818,089——**J. A. Terteling & Sons,** Box 1428, Boise, Idaho——Low bid for construction of earthwork, asphaltic membrane lining, pipe lines and structures in Area W-4 of the Columbia Basin Project, east of Quincy and Winchester; by Bureau of Reclamation.

Wyoming

$375,000——**J. J. Dooling,** 5015 East 17th Ave., Denver, Colo.——Low bid for the grading and base course surfacing of 8.3 mi. in Teton County on the Moran-Yellowstone Approach road; by Bureau of Public Roads.

$372,905——**Peter Kiewit Sons' Co.,** Omaha National Bank Bldg., Omaha, Neb.——Award for the construction of 4 continuous I-beam spans over the Little Powder River, and grading, draining, base course surfacing on the Gillette-Broadus road, in Campbell County.

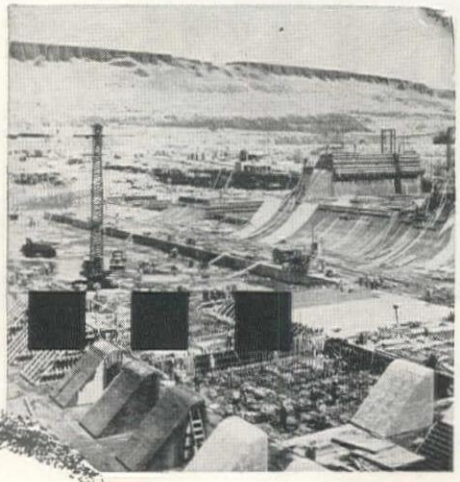
$1,667,724——**Knisely-Moore Co.,** Box 77, Douglas——Award for construction of Keyhole Dam on the Belle Fourche River near Moorcroft; by Bureau of Reclamation.

Alaska

$2,450,000——**Haddock Engineers, Ltd.,** Box 390, Montebello, Calif.——Low bid for construction of a military installation including buildings, roads, and drainage at Cape Newenham, 25 mi. from Platinum; by Corps of Engineers.

Proof...

Dorena Dam
U. S. Corps of Engineers
Dorena, Oregon
Proof . . . that you use less Protex!

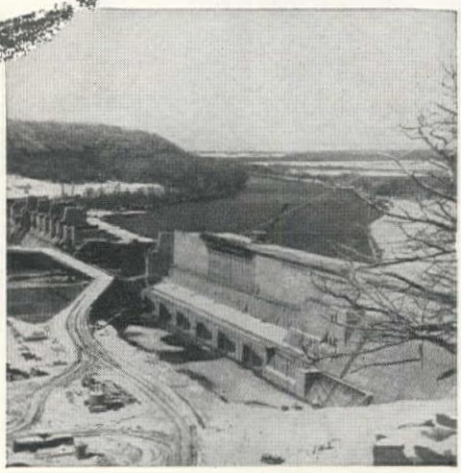


Walla Walla Dist. Corps of Eng. Photo
McNary Dam
U. S. Corps of Engineers
Plymouth, Washington
Proof . . . that the larger projects specify Protex!

...that Protex AIR ENTRAINING AGENT costs less to use!

Angostura Dam
U. S. Bureau of Reclamation
Hot Springs, South Dakota
Proof . . . of Protex leadership in Air Entraining Agents!

When you're pouring millions of yards of concrete, every penny saved means a lot. That's why Protex Air Entraining Agent is used in so many large dam projects . . . proof of the quality of Protex . . . proof that it actually takes less Protex AEA than other admixtures! Protex AEA meets the requirements of Specifications SS-C-192, ASTM Spec. C-175-48T, is widely used by Bureau of Reclamation, U. S. Corps of Engineers, Bureau of Public Roads. Write, wire or phone for complete information!



Ft. Gibson Dam
U. S. Corps of Engineers
Muskogee, Oklahoma
Proof . . . that Protex gives consistent control!

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NEWS of DISTRIBUTORS AND FACTORY BRANCHES

According to a recent announcement by RICHARD C. NOEL, JR., Western district manager of *Hercules Steel Products Corp.* of Galion, Ohio, the *Monarch Truck Equipment*, 999 Seventh St., Oakland, Calif., has been named to handle the new Hercules cement spreader in the northern California and western Nevada territory. This new unit was recently introduced by Hercules for use in the construction of soil stabilized roads.

☆ ☆ ☆

Marion Power Shovel Co., Marion, Ohio, recently named two new district sales managers to serve sections of the Far West and Mountain States. W. D. CALLAND succeeds EDWARD R. DALEY as district sales manager with headquarters in San Francisco. He represents Marion in

CALLAND

RIGGS

a territory covering the entire State of California; the counties of Washoe, Humboldt, Pershing, Churchill, Storey, Ormsby, Lyon, Douglas, Mineral, Esmeralda, Nye and Clark in Nevada, and Yuma County in Arizona. ERNEST J. RIGGS, with offices in Phoenix, Ariz., is handling an area embracing the whole of Utah; the entire State of Arizona with the exception of Yuma County; the counties of Elko, Eureka, Lander, White Pine and Lincoln in Nevada; and Oneida, Franklin and Bear Lake Counties in Idaho; Lincoln and Uinta Counties in Wyoming, and Grant County in New Mexico.

☆ ☆ ☆

A. H. Cox & Co. of Seattle, Wash., announces the appointment of NORMAN VILES as resident salesman in the Yakima territory. Viles will work out of the Wenatchee branch, and will confine his work to shovels and tractors.

☆ ☆ ☆

The San Francisco sales office of the *Chicago Bridge & Iron Co.* was moved from 22 Battery St. to Room 617, 200 Bush St., on June 17. L. A. ELSENER is manager of the San Francisco office. He is assisted by K. W. LANGE, contracting engineer.

☆ ☆ ☆

KERSHAW

WALTER W. KERSHAW, former vice president and industrial equipment division manager of the *Lang Co.* in Salt Lake City, has purchased a substantial interest in the *Robison Machinery Co.*, also of Salt Lake City. Effective June 1, Kershaw assumed his duties as vice president and general manager of the company, which will be known as the *Robison-Kershaw Co.* DON A. ROBISON, former president and sole owner of *Robison Machinery Co.*, which he founded in 1943 when he acquired the *Landes Tractor & Equipment Co.*, will continue as president of the new company.

☆ ☆ ☆

VERL A. DESPAIN has joined the *C. H. Jones Equipment Co.*, Salt Lake City, Utah. He has valuable experience in office and parts procedure with *Firestone Tire & Rubber Co.* and a Utah dealer in tractors and implements. RUSSELL STEWART, vice-president of the firm, announces that the firm has moved from its old location at 236 West South Temple St., Salt Lake City, to a new location at 1595 South 2nd St. At the new location, the firm has a new building, more yard room, ample parking space and better facilities all around.

☆ ☆ ☆

In the furtherance of its three-way service policy, *Union Wire Rope Corp.*, Kansas City, Mo., has established offices and warehouses at 903 Del Paso Blvd., No. Sacramento, Calif., and at 155 Howell St., Dallas, Tex. These make a total of twelve strategically located, fully stocked and staffed branches functioning as distributor links between factory, hundreds of Union Wire Rope distributors and thousands of users, and "bringing an always adequate source of supply close-at-hand to every possible wire rope user," according to L. G. SCHRAUB, vice president and sales manager.

☆ ☆ ☆

Rasmussen Equipment & Supply Co., Salt Lake City, has been appointed *Marion Power Shovel Co.* distributor for Utah, eastern Nevada, three counties in southern Idaho and two counties in southwestern Wyoming. Established about three years ago, the firm is owned by FRANK RASMUSSEN, who has been active in the equipment business for some two decades. With the addition of the Marion line of excavators, Rasmussen now represents thirteen major equipment manufacturers. GOLDEN WALDRON is Rasmussen's sales manager and ROBERT HERNON is office manager.

☆ ☆ ☆

Western Pine Association, Portland, Ore., recently appointed JESSE F. PRESLEY as field representative in Texas, Oklahoma and New Mexico. As of July 1, he will make regular calls on Western Pine dealers and users throughout this area.

☆ ☆ ☆

DIEPENBROCK

Marlow Pumps, Ridgewood, N. J., recently announced the appointment of J. B. DIEPENBROCK as West Coast district sales representative. He will be in charge of Marlow construction pump sales in California, Oregon, Washington, Idaho, Nevada, Arizona and western Montana and Utah. He will headquarter with *George M. Philpott Co.*, San Francisco, Marlow distributor for northern California.

☆ ☆ ☆

The *Gumout Division of Pennsylvania Refining Co.* of Cleveland, Ohio, has announced the appointment of two new sales representatives for Gumout in the West. *R. Howard Chamness Co.*, 6725 Snider Plaza, Dallas, Texas, will cover the Southwest territory: Texas, Oklahoma, Arkansas and Louisiana. *Dirks and Company*, 416 N.W. 14th St., Portland, Ore., (and Seattle, Wash.) is the new Gumout sales representative for Washington, Oregon and Idaho.

☆ ☆ ☆

S. R. GOLDING

Acme Machinery Co., 16 Kensington Ave., Salt Lake City, Utah, has acquired the business of *Hamilton Equipment Co.*, Minneapolis - Moline dealer in the Salt Lake area. The new owner and head of the company is S. R. GOLDING, well known in Salt Lake as the operator of the Golding Welding & Steel Fabricators. RAY GOLDING, son of S. R., is in direct charge of Acme Machinery Co., assisted by BOB HENDERSON, GLEN DAVIDSON and WILSON WAGGENER as sales representatives.

☆ ☆ ☆

The appointment of *Contractors Machinery Co.*, San Antonio, Texas, as distributor for Bucyrus-Erie excavators is announced by *Bucyrus-Erie Co.*, South Milwaukee, Wis. Contractors Machinery Co. will sell and service the popular line of ⅜ to 4-yd. gasoline, diesel and single motor electric excavators in south central Texas. Its territory is bounded by and includes these counties: on the east—Aran-

24 Tons of Cement Where and When Wanted

FRUEHAUF TRAILERS play a major role in helping Permanente make good its slogan: "On the job—on time." Loaded with 24 tons of cement, each of these four sets (8 units) of Fruehauf Hopper Dump Trailers haul from Permanente to any point in California north of the Tehachapi-Obispo Divide.

In regular, routine operations such steep grades as Pacheco and Cuesta Passes must be descended. Fruehauf 18" x 7½" brakes function perfectly with no semblance of "fade." They insure safe operation under difficult conditions.

With the largest cement plant in the world showing such confidence in Fruehauf Trailers, you should be convinced that Fruehauf really IS the name that carries weight . . . more weight longer and for less.

The Fruehauf Trailer line includes End Dumps, Side Dumps, Hopper Dumps, Low-Beds, Tilt-Decks and "specials" in capacities as desired. Your nearest Factory Branch will gladly supply all details.

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Salt Lake City • Phoenix • Albuquerque • El Paso • Denver

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Continued from page 102

sas, San Patricio, Bee, Karnes, Gonzales, Caldwell, Travis and Burnet; on the north —Llano, Mason, Menard, Schleicher and Crockett; on the west—Val Verde.

☆ ☆ ☆

DONALD H. GOTT has been appointed manager of dealer sales of the Building Products Division of the *Great Lakes Carbon Corp.*, Los Angeles, Calif., according to a recent announcement by T. C. CARTER, vice president of the company. Gott will be in complete charge of sales for Permalite plaster, concrete and acoustical aggregates, as well as other building products, in the entire United States. He will headquarter at the company's executive offices in New York City.

☆ ☆ ☆

E. F. SCHAEFER has been appointed factory sales representative for *Federal Motor Truck Co.* in the Seattle region. CARL LOUD, general sales manager of this Detroit manufacturer, announced that Schaefer would supervise dealer programs and sales and advertising activities for the company in Washington and northern Idaho. He brings a background of more than a decade in sales work to his new post.

☆ ☆ ☆

ANDRE' RUBEN, sales manager of *Marlow Pumps*, Ridgewood, N. J., was a recent visitor to the West Coast. He was accompanied by JOE DIEPENBROCK, newly appointed West Coast district sales representative.

☆ ☆ ☆

The appointment of FREDERICK L. BRUCKNER as Los Angeles district manager of *United States Steel Supply Co.* is announced by CLIFFORD W. LORD, vice president in charge of Pacific Coast warehouses of this subsidiary of U. S. Steel. Bruckner assumed his new post July 1, succeeding PAUL VAN CLEAVE, recently named as sales vice president of this U. S. Steel subsidiary.

☆ ☆ ☆

LOYD E. WILLIAMS, a submarine veteran with wide experience in the diesel engine field, has been appointed Rocky Mountain regional manager for the *Cummins Engine Co.* of Columbus, Ind. His headquarters are in Denver for the seven-state region, embracing Utah, Colorado, Wyoming, South Dakota, Nebraska, and parts of Montana and Idaho.

☆ ☆ ☆

J. DWIGHT MCCLURE, previously Los Angeles division sales manager for Permalite lightweight aggregates, has been promoted to manager of ore sales, a newly created position, according to an announcement by T. C. CARTER, vice president of *Great Lakes Carbon Corp.* In this new position McClure will contact perlite

Continued on page 107

UNIT BID SUMMARY

Dam . . .

Wyoming—Carbon County—U.S.B.R.—Repairs

Sharrock and Pursel, Casper, Wyoming, with a bid of $234,900, was low before the Bureau of Reclamation for tailrace repairs on Seminoe Dam, Kendrick Project. Unit bids were submitted as follows:

(1) Sharrock and Pursel.....$234,900
(2) Northwest Engineering Co..... 343,985
(3) Knisely-Moore Co. 405,115
(4) Long Construction Co., Inc.....$431,170
(5) Engineer's estimate 179,385

	(1)	(2)	(3)	(4)	(5)
1,250 cu. yd. excav., all classes, for gravity wall and cut-off.....	10.00	15.00	25.00	30.00	5.00
20,000 cu. yd. excav., all classes, for channel improvement.....	2.50	5.00	4.25	5.00	1.75
15,400 cu. yd. rock fill for power-plant access road.....	1.00	2.00	3.00	2.00	.75
130 cu. yd. gravel surfacing for roadway.....	5.00	5.00	5.00	4.00	3.00
280 lin. ft. drilling holes for anchor bars and grouting bars in pl.	.50	10.00	5.00	5.00	2.50
560 cu. yd. conc. in cut-off for gravity wall.....	37.00	50.00	53.00	75.00	25.00
3,470 cu. yd. concrete in gravity wall	37.00	43.00	58.00	60.00	30.00
16,000 lb. furn. and placing reinforcement bars.....	.15	.15	.15	.20	.15
4,000 lb. furn. and installing 6-in. std. zinc-coated steel pipe drains	.20	1.00	.25	.30	.35
75 lin. ft. furn. and laying 24-in. diam. corrugated-metal pipe	6.00	5.00	5.00	6.00	4.60
3,000 lb. installing pipe handrails	.15	1.00	.30	.30	.25
1,000 lin. ft. furnishing and erecting beam-type guardrail	3.00	4.00	5.00	5.00	2.50

Bridge and Grade Separation . . .

California—Sonoma County—State—Concrete

G. M. Carr & Bati Rocca, Santa Rosa, Calif., with a bid of $75,679, was low before the California Division of Highways for construction of a reinforced concrete slab bridge and approaches across Hobson Creek at Hacienda. Unit bids were as follows:

(1) G. M. Carr & Bati Rocca.....$75,679
(2) Dan Caputo 79,908
(3) Lew Jones Construction Co..... 80,930
(4) John Rocca 83,255
(5) Erickson, Phillips & Weisberg..... 84,410
(6) Al Erickson & Co.....$89,001
— R. G. Clifford & C. O. Bodenhamer..... 89,263
— C. B. Tuttle Co. 89,798
— Charles MacClosky Co..... 91,693
— William D. Rapp..... 94,804

	(1)	(2)	(3)	(4)	(5)	(6)
Lump sum, removing exist. bridge	$1,000	$2,000	$3,000	$8,000	$3,500	$1,575
Lump sum, clearing and grubbing.....	750.00	400.00	400.00	$1,500	$2,250	$1,500
1,100 cu. yd. roadway excav.	.70	.90	.85	.60	1.00	1.40
6,500 sta. yd. overhaul	.02	.05	.05	.01	.03	.01
10 cu. yd. ditch and channel excav.	5.00	5.00	5.00	5.00	3.84	3.00
900 cu. yd. struct. excav.	3.00	4.00	4.00	.90	3.00	4.50
1,470 sq. yd. prepar. Cl. "C" subgrade	.20	.20	.20	.25	.70	.31
Lump sum, dev. wat. supply and furn. wat. equip.....	350.00	300.00	250.00	175.00	500.00	150.00
250 M gal. applying water	1.50	2.00	2.00	2.00	2.00	2.00
6 sta. finishing roadway	20.00	25.00	25.00	18.00	30.00	25.00
450 cu. yd. imp. base material	2.00	2.00	1.70	1.25	1.00	4.00
58 lin. ft. timber railing	4.50	5.00	5.00	3.00	5.00	6.75
330 cu. yd. P.C.C. pavement	22.00	22.00	17.00	17.00	25.00	27.50
300 ea. pav't tie bolt assemblies	1.00	1.00	.65	1.00	1.00	.60
734 cu. yd. Cl. "A" P.C.C.	42.50	41.00	45.50	43.20	46.00	45.00
441 lin. ft. conc. railing	6.00	8.00	7.00	15.00	6.00	5.90
6,200 lb. miscl. steel	.35	.30	.30	.30	.30	.30
2,536 lin. ft. furn. conc. piling	3.10	3.00	3.60	3.00	3.00	3.00
63 ea. driving piles	95.00	135.00	93.00	90.00	100.00	176.00
10 ea. guide posts and clearance markers.....	5.00	6.00	5.00	5.00	6.00	4.00
2 ea. spillway assemblies	25.00	35.00	30.00	50.00	35.00	62.10
76 lin. ft. 8-in. C.M.P. downdrains (16 ga.).....	2.00	2.00	2.00	3.00	2.10	1.77
24 lin. ft. 12-in. C.M.P. culv. (16 ga.).....	2.50	3.00	3.00	3.50	2.50	2.18
120,000 lb. bar reinforcing steel	.08	.08	.075	.085	.08	.075
Lump sum, Engineer's office	650.00	$1,000	$1,900	250.00	$1,000	$2,000

California—El Dorado County—State—Steel Girder

Thomas Construction Co., Burbank, Calif., with a bid of $188,891, was low before the California Division of Highways for construction of a structural steel girder bridge with reinforced concrete deck over South Fork American River, near Lotus, and 1 mi. of grading and surfacing approaches. Unit bids were submitted as follows:

(1) Thomas Construction Co. $188,891
(2) Fredrickson Bros. 189,590
(3) Al Erickson & Co. and Huntington Bros. 192,584
(4) H. W. Ruby 193,631
(5) M. A. Jenkins & R. E. Hertal..... 197,754
(6) Chittenden & Chittenden & B. S. McElderry 201,917
(7) Fredrickson & Watson Construction Co. 207,962
— Erickson-Phillips & Weisberg.....$208,000
— Granite Construction Co. 208,032
— Lord & Bishop 215,045
— Piombo Construction Co. 204,962
— G. M. Carr & Bati Rocca..... 220,856
— Elmer J. Warner 225,539
— O'Connor Bros. 230,780
— Charles MacClosky Co. 234,732

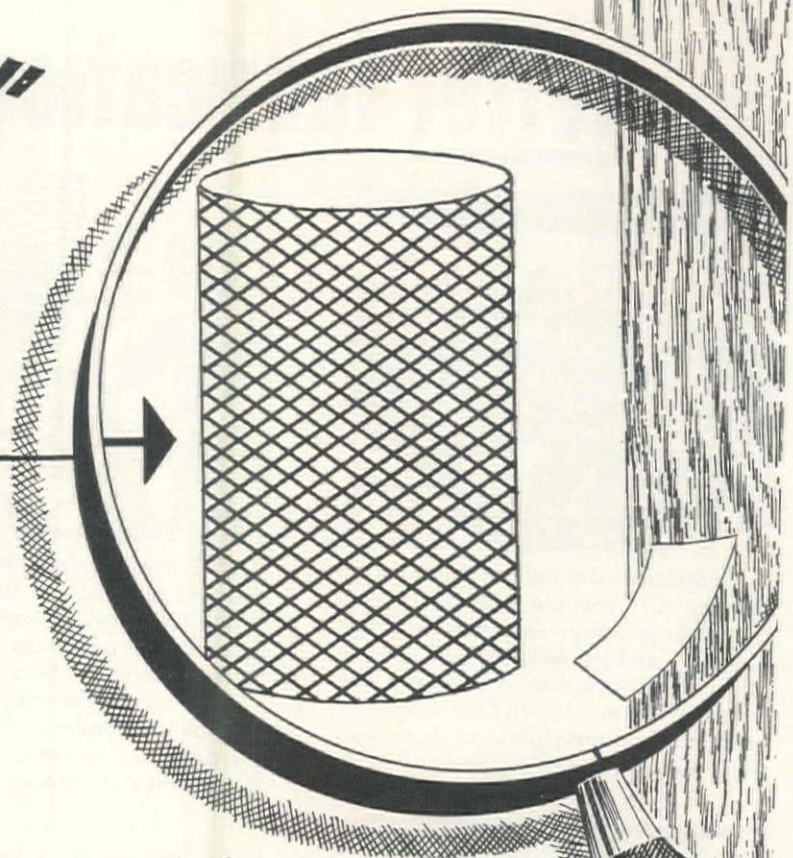
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
40 cu. yd. remov. rubble masonry.....	1.50	2.00	1.00	4.00	5.00	3.00	1.20
Lump sum, clearing and grubbing	$9,400	$1,800	$4,150	$3,000	$1,200	$12,000	$3,800
43,000 cu. yd. roadway excav.	.35	.32	.37	.35	.35	.50	.52
810 cu. yd. struct. excav., Type A.....	15.00	8.00	4.00	14.00	18.00	2.50	13.60
250 cu. yd. struct. excav., Type B.....	2.50	3.50	2.00	4.50	3.00	2.50	2.65
810 cu. yd. struct. excav., Type C.....	3.50	3.00	2.00	1.60	4.00	2.50	2.50
3,000 cu. yd. imp. base matl.	.65	.60	1.20	.80	.80	.60	.65
98,000 sta. yd. overhaul	.01	.006	.01	.01	.01	.01	.01
Lump sum, dev. wat. sup. and furn. wat. equip.....	$2,156	700.00	$1,000	$5,000	750.00	$4,000	$2,600
1,000 M gal. applying water	1.75	1.40	1.50	1.60	2.00	1.00	2.00
48 sta. finishing roadway	10.00	10.00	10.00	10.00	15.00	10.00	16.00
8 ton liq. asph. SC-1 or SC-2 (pen. tr.).....	25.50	33.00	35.00	26.00	40.00	26.00	33.00
127 ton liq. asph. SC-3 (B.S.T.).....	24.50	24.00	24.00	22.00	25.00	23.50	24.75
14,100 sq. yd. prep., mix. & shap. surf. (B.S.T.)	.13	.12	.10	.12	.18	.13	.12
6 ton asphaltic emuls. (sl. ct.).....	32.00	42.00	43.00	37.00	40.00	30.00	50.00
1,247 cu. yd. Cl. "A" P.C.C. (struct.)	39.00	48.00	48.00	43.00	47.00	50.00	50.00
280 cu. yd. Cl. "A" P.C.C. (footing blocks)	28.00	32.00	40.00	27.00	25.00	28.00	37.00

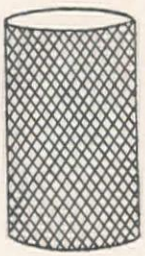
(Continued on next page)

See an entirely new construction of rayon braided and molded hose made by PIONEER RUBBER MILLS

"54-40"

See the new angle of braiding rayon reinforcement—54 degrees, 40 minutes. Adds strength, reduces weight, increases flexibility.





Other angles of braid are too long or too short. Longer braid angle causes contraction in length and expansion in diameter when subject to pressure. Shorter braid angle causes a reverse effect.

"54-40" offers maximum service at minimum cost

PIONEER RUBBER MILLS' new method of braiding rayon yarn reinforcement into a balanced 54-degree, 40-minute angle, plus its High-Pressure Method of vulcanizing, insures the user the greatest hose value on the market.

"Optimo" or Perfect Angle

That's what "54-40" means. The angle of lock that provides hose with the braided reinforcement needed to give maximum strength, reduced weight, and increased flexibility. Add to this the fact that PIONEER hose is vulcanized in polished steel presses under pressure as much as 5 times greater than that possible with conventional methods and you can see why the new "54-40" line is worth investigating.

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How to reduce your grease inventory and get better lubrication

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1. Contractors throughout the West are proving that you can actually concentrate your grease inventory to *one* single product—and get *better* over-all lubrication performance than ever before! The answer is UNOBA, Union Oil Company's great multi-purpose lubricant that resists *both* heat and water.

2. For example, UNOBA not only reduced material and inventory costs for one California contractor* but eliminated a lot of serious bearing trouble in track rollers on D8 cats. And this equipment operated in temperatures up to 130 degrees F., under such severe dirt conditions that drivers could *not* see the instruments. **Name available upon request*

3. Just what is UNOBA? It's a *barium* base grease that assures proper lubrication under the most *severe* conditions. It sticks to metal surfaces with a tenacity that boiling water can't break! And it gives thorough protection at temperatures from below freezing to over 300 degrees F.

4. Because of this flexibility, multi-purpose UNOBA *simplifies* lubrication. It performs on jobs formerly requiring *many* different types and brands of grease. And this results in reduced inventories, smaller storage space, less chance of using the wrong lubricant, and *lower* maintenance costs.

Let your Union Oil Representative tell you the complete UNOBA story, or write Sales Dept., Union Oil Company, Los Angeles 17, Cal.

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995 lin. ft. concrete railing	5.50	5.00	6.25	6.50	7.00	6.00	5.40
446,000 lb. structural steel	.11	.12	.115	.11	.115	.11	.1144
Lump sum, cleaning and painting steel bridge	$4,730	$5,400	$4,500	$4,200	$4,460	$4,000	$5,200
127,300 lb. bar reinforcing steel	.075	.085	.0768	.075	.08	.07	.08
34 cu. yd. rubble masonry	15.00	22.00	12.00	30.00	30.00	25.00	36.00
275 cu. yd. light stone riprap	8.00	6.00	6.25	8.00	10.00	10.00	5.00
33 ea. right-of-way monuments	6.00	5.75	7.00	7.50	5.00	5.00	6.00
120 lin. ft. metal plate guard railing	3.50	3.50	3.00	4.00	3.00	5.00	3.40
42 ea. instal. culv. mkrs., guide posts and clear. mkrs.	4.00	5.00	4.00	5.50	5.00	5.00	5.00
6,430 lin. ft. new propty. fence, Type A	.25	.29	.20	.28	.20	.30	.27
730 lin. ft. new propty. fence, Type B	.40	.30	.20	.28	.25	.35	.29
135 lin. ft. new propty. fence, Type C	.30	.29	.20	.28	.25	.50	.35
5 ea. drive gates	50.00	50.00	50.00	50.00	50.00	50.00	40.00
444 lin. ft. 18-in. C.M.P. (16 ga.)	3.00	3.30	3.00	3.00	3.00	3.50	3.35
102 lin. ft. 24-in. C.M.P. (14 ga.)	4.00	4.75	4.25	4.00	4.00	4.40	4.75
3 ea. spillway assemblies	30.00	28.00	30.00	30.00	30.00	30.00	33.50
108 lin. ft. 8-in. C.M.P. drown drs. (16 ga.)	2.00	1.70	1.90	1.50	2.00	2.00	2.00
2 ea. spillway assemb. down dr. slip joints	20.00	22.00	20.00	20.00	20.00	20.00	23.00
1 ea. cast steel frame and cover for drop inlet	60.00	58.00	32.00	75.00	60.00	100.00	120.00
Lump sum, remov. exist. bridge	$3,000	$2,500	$5,000	$7,250	$2,700	$2,500	$1,800

Railroad . . .

Oregon—Lane County—Corps of Engineers—Relocation

McNutt Bros., Eugene, Oregon, with a bid of $337,700, was low before the Portland District, Corps of Engineers, for construction of a shoofly and a section of permanent Southern Pacific Co. Railroad, including necessary Forest Service road relocation on the north bank of the Middle Fork, Willamette River. The work is in connection with Lookout Point Reservoir, Willamette River Basin. Unit bids were submitted as follows:

(1)	McNutt Bros.	$337,700	
(2)	Morrison-Knudsen Co., Inc.	364,561	
(3)	G. D. Dennis & Sons	381,744	
(4)	The Utah Construction Co.	389,354	
(5)	Leonard & Slate and E. C. Hall Co.	410,902	
—	Natt McDougall Co.		$432,559
—	C. F. Lytle Co. and Amis Constr. Co.		469,963
—	Peter Kiewit Sons' Co.		478,233
—	Dragline Rentals Co.		550,868
(6)	Engineer's Estimate		300,309

	(1)	(2)	(3)	(4)	(5)	(6)
1 lump sum, credit to govt. form merchantable timb.	25.50	50.00	225.00	.....	1.00	50.00
30 acre clearing	600.00	700.00	800.00	$1,175	600.00	560.00
12 acre grubbing	300.00	500.00	525.00	625.00	400.00	350.00
30,000 cu. yd. excav., solid rock	1.43	1.10	1.00	1.40	.45	.91
620,000 cu. yd. excav., common	.31	.32	.37	.31	.45	.30
90,000 cu. yd. compaction of embankment	.06	.08	.05	.05	.10	.04
30 M gal. sprinkling	5.00	3.60	3.00	3.00	3.00	2.50
12 hr. rolling, addtl. roller hours	1.00	13.50	15.00	14.00	12.00	8.00
150,000 yd. mi. overhaul	.25	.30	.25	.36	.30	.20
500 cu. yd. foundation excav.	5.00	5.50	5.00	7.00	6.00	3.50
165 cu. yd. concrete, in place	50.00	60.00	60.00	72.00	55.00	40.00
250 bbl. Portland cement	6.00	6.00	6.50	7.50	5.00	5.00
30,000 lb. reinf. steel	.11	.15	.11	.17	.12	.10
100 lin. ft. 8-in. perf. track drain, in place	4.00	4.00	3.00	4.50	4.00	3.00
160 lin. ft. 24-in. corru. metal culvert pipe, in place	10.00	13.00	12.00	13.00	11.00	9.00
184 lin. ft. 36-in. corru. metal culvert pipe, in place	15.00	19.00	16.00	19.00	16.00	14.00
50 lin. ft. 60-in. corru. metal culv. pipe jacked under railroad, in place	75.00	90.00	100.00	100.00	60.00	58.00
1 job temp. extension to culv. at Carpet Hill Creek	$1,000	$4,000	$3,200	$4,900	$2,500	$1,800
1 job. temp. road drainage struct. at Hospital Creek	$1,312	$1,800	$2,750	$2,250	$2,500	$1,450
1 job temp. shoofly drain. struct., at Hospital Creek	$2,741	$5,200	$4,400	$4,500	$2,500	$1,970
100 cu. yd. hand placed riprap	10.00	12.00	10.00	12.00	12.00	9.00
510 rod right-of-way fence, barbed wire, in place	6.00	7.50	5.50	7.00	5.00	4.70
1,350 cu. yd. gravel surfacing, in place	3.00	5.50	5.50	2.00	3.00	2.50
100 cu. yd. foundation backfill	5.00	5.50	4.00	2.00	5.00	3.00
100 sq. ft. removal of danger trees	2.00	5.75	5.00	?.00	5.00	2.50

Highway and Street . . .

Washington—Stevens County—State—Grade and Surf.

Roy L. Bair & Co., Spokane, Washington, with a bid of $217,419, was awarded the contract by the Washington Department of Highways for grading and surfacing 3.4 mi. of the Loon Lake to Springdale highway. Unit bids were submitted as follows:

(1)	Roy L. Bair & Co.	$217,419	
(2)	F. R. Hewitt Co.	232,917	
(3)	Erickson Paving Co.	233,264	
(4)	Sather & Sons	246,224	
(5)	C. E. Oneal	246,911	
(6)	C. H. Grimstad, T. Vanderveldt and Heavy Hauling Co.		$253,692
—	Max J. Kuney Co.		281,473
—	Parker-Shramm Co.		286,150
—	Natt McDougall Co.		289,563
—	Lyons Construction Co.		292,952

	(1)	(2)	(3)	(4)	(5)	(6)
45.1 acres clearing	150.00	150.00	90.00	225.00	190.00	309.00
30.8 acres grubbing	150.00	150.00	30.00	100.00	140.00	259.00
208,030 cu. yd. com. excav. incl. haul of 600 ft.	.31	.20	.21	.41	.41	.41
77,650 cu. yd. solid rock excav. incl. haul of 600 ft.	.31	.87	.85	.41	.41	.41
50 cu. yd. com. trench excav. incl. haul of 600 ft.	2.00	1.00	2.00	1.00	2.00	2.00
103,610 sta. yd. overhaul	.01	.02	.01	.01	.01	.01
2,319.01 M sta. yd. overhaul	5.00	4.00	5.00	4.00	3.90	5.00
190 cu. yd. structure excav.	2.00	1.00	2.00	2.00	2 00	2.00
20 day mechanical tamper	30.00	40.00	27.00	30.00	15.00	30.00
16,400 lin. ft. slope treatment Class A	.08	.08	.15	.15	.08	.15
182.4 sta. (100 ft.) finishing roadway	8.00	8.00	10.00	10.00	8.00	8.00
515 M gal. water	2.00	2.00	2.50	1.00	3.00	3.00
1,040 cu. yd. cr. stone filler, in place, incl. haul	1.40	1.00	1.45	1.00	1.23	2.20
16,950 cu. yd. selected roadway borrow in place	.60	.65	.42	.60	.60	.55
10,560 ton cr. stone surf. top course, in place	1.30	1.20	1.45	1.30	1.45	1.10
12,970 ton cr. stone surf. base course, in place	1.30	1.15	1.40	1.30	1.25	1.10
8,410 ton cr. stone surf. top course in stockpile	1.10	.95	1.15	1.15	1.25	1.20
4,920 ton cr. stone surf. base course in stockpile	1.10	.90	1.15	1.15	1.20	1.20
460 ton cr. stone filler in stockpile	1.25	.75	1.15	1.00	1.00	1.20
2,030 ton cr. cover stone in stockpile	1.10	.95	1.15	1.15	1.30	1.20
MINERAL AGGREGATE FOR NON-SKID SINGLE SEAL TREATMENT SCHEDULE A IN STOCKPILES						
6,100 ton crse. cr. screenings ⅝-in. to ¼-in. in stkple.	1.25	1.15	1.25	1.30	1.50	1.20
2,280 ton fine cr. screenings ¼-in. to 0-in. in stockpile	1.25	1.15	1.25	1.30	1.50	1.20

(Continued on next page)

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Continued from page 104

processors throughout the country to make long-term arrangements for supplying them with prepared perlite ore. He will maintain headquarters at the company's executive offices in New York City.

☆ ☆ ☆

RENE D. WASSERMAN, president of *Eutectic Welding Alloys Corp.*, New York, manufacturers of Eutectic low temperature welding alloys and fluxes, announces a series of field force promotions headed by appointment of DON RASMUSSEN as Western sales supervisor. Other advances are: HERMAN GREIF and DANIEL WETMORE to regional managers; HUGH HURLEY and ROY WALDROP to assistant regional managers; DON GARRETT, LEE WADE, and ALEX FREDERICK to district managers. These men will now supervise the activities of the group of Eutectic district engineers in their various areas.

NEWS of MANUFACTURERS

LILLENGREEN

Appointment of MANFORD R. LILLENGREEN as sales manager of *Baer Steel Products, Inc.*, Auburn and Renton, Wash., was recently announced by JOSEPH BAER, general manager. Lillengreen will maintain his close personal contact with contractors in all parts of the United States, and in addition will franchise new dealers to better serve the firm's national market. Products offered include a complete foundry line of contractor's equipment, including "Fibraloy" dragline, shovel, and hoe buckets and accessories for all makes of excavating buckets. Lillengreen was for many years manager of the Portland, Ore., branch of *H and L Tooth Co.*, and later in national dealer organization work.

☆ ☆ ☆

Broderick & Bascom Rope Co., St. Louis, Mo., has acquired the entire stock interest of the Broderick family, and JOHN K. BRODERICK and ARTHUR L. BRODERICK have retired as president and vice president, respectively, and as directors. CHARLES E. BASCOM has been elected president of the company and JOSEPH H. BASCOM has been elected first vice president and secretary-treasurer. These officers and J. F. HEDDING of Pittsburgh constitute the new board of directors. The Bascoms will continue in active management of the rope company, which will celebrate its 75th

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NEWS of MANUFACTURERS

Continued from page 107

anniversary next year. In addition to the home plant in St. Louis, Broderick & Bascom Rope Co., an important independent in the wire rope industry, has factories in Seattle, Houston and Peoria. Branches and warehouses are also located in New York, Chicago, Los Angeles, San Francisco, and Portland, Ore.

☆ ☆ ☆

With its new $500,000 addition completed, and new steel fabricating equipment in use, the *Structural Steel Division of Pacific Car & Foundry Co.*, 120 West Hudson St., Seattle, Wash., is operating at close to its 1,000 tons a month capacity, according to CLARENCE STYER, works manager. Pacific Car serves a market for steel fabrications and erection work covering Washington, Oregon, Idaho and Alaska. The company is headed by PAUL PIGOTT, president. Managing the Structural Steel Division is PAUL JACOBSEN.

☆ ☆ ☆

HOWERTON

RAYMOND L. HOWERTON is now in charge of tractor equipment promotion for the *Hyster Company*, according to a recent announcement from PHIL HILL, general sales manager for the Portland, Ore., manufacturer of auxiliary tractor tools and industrial trucks. Howerton has a varied background in industry, including two years with the *Vega Aircraft Co.*, service as Northwest representative for *Hartwell Engineering Co.*, and in the sales division of *Great Northern Tool & Supply Co.* Most recently he has been associated with the *Lincoln Electric Co.* as dealer manager in the Pacific Northwest.

☆ ☆ ☆

Iowa Manufacturing Co., Cedar Rapids, Ia., has acquired the complete inventory, manufacturing rights and patents on the line of Double Impeller Impact Breakers, vibrating screens, roll crushers and feeders, formerly made by *New Holland Mfg. Co.* of Mountville, Pa. These products will now be manufactured at Cedar Rapids and sold and serviced by the worldwide Cedarapids distributor organization. In welcoming the New Holland line into the Cedarapids family, Iowa also welcomed a number of the New Holland personnel, including V. R. DESPARD, JR., former vice president and general manager of New Holland, and J. D. PFAHL, assistant to the sales manager.

☆ ☆ ☆

V. H. DIETERICH, vice president and director of *Joseph T. Ryerson & Son, Inc.*, Chicago, steel warehousing concern, has retired after more than 45 years' service

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MISCELLANEOUS ITEMS						
240 lin. ft. pl. conc. culv. pipe 12-in. diam. in place	1.60	2.50	1.45	2.00	1 60	2.00
516 lin. ft. std. reinf. conc. culv. pipe 18-in. dia. in pl.	3.25	4.00	2.60	3.25	2.85	3.00
210 lin. ft. std. reinf. conc. culv. pipe 24-in. dia. in pl.	4.50	5.50	3.80	4.50	4.00	4.75
165 lin. ft. std. reinf. conc. culv. pipe 48-in. dia. in pl.	15.00	15.00	12.00	13.00	14.00	14.00
148 lin. ft. pl. corr. metal culv. pipe No. 8 ga. 84-in. d.am. in pl.	40.00	45.00	33.50	40.00	34.00	35.00
7,291 lin. ft. std. beam guard rail Type No. 1 ( ) or 2 ( ), design No. 6, in place	2.50	2.60	2.60	2.40	2.25	2.50
53 only reinf. conc. r/w markers in place	4.00	6.00	4.95	5.00	5.00	4.50

California—Orange and Riverside Counties—State—Grade and Surf.

Peter Kiewit Sons' Co., Arcadia, California, with a bid of $444,857, was low before the California Division of Highways for construction of 4.9 mi. of highway between 1.7 mi. west of Orange County line and Corona. The work involves grading and plant mixed surfacing on cement-treated base. Unit bids were submitted as follows:

(1) Peter Kiewit Sons' Co. $444,857
(2) Griffith Co. 446,879
(3) R. A. Erwin 450,497
(4) R. P. Shea Construction Co. 465,108
(5) E. L. Yeager Co. 466,125
(6) A. Teichert & Son, Inc. 478,665
— Basich Bros. Construction Co. and Basich Bros. $486,013
— Cox Bros. Construction Co., J. E. Haddock, Ltd. 497,142
— N. M. Ball Sons 597,536

	(1)	(2)	(3)	(4)	(5)	(6)
210 cu. yd. remov. conc.	3.15	8.00	3.00	5.00	13.50	5.00
1,800 cu. yd. remov. exist. surf.	.68	.80	1.00	1.00	.82	1.50
257 sta. clearing and grubbing	22.50	17.00	30.00	80.00	16.50	30.00
140,000 cu. yd. roadway excav.	.43	.46	.35	.35	.55	.45
3,480 cu. yd. struct. excav.	2.00	2.00	2.00	2.50	2.00	3.00
2,300 cu. yd. ditch and channel excav.	.65	.80	.50	.40	.85	.80
5,000,000 sta. yd. overhaul	.003	.002	.003	.002	.002	.004
38,000 sq. yd. compact. orig. ground	.05	.035	.05	.03	.05	.05
35,500 cu. yd. imp. base matl.	1.15	1.48	1.00	1.60	1.40	1.00
55,000 sq. yd. cultiv. (eros. cont.)	.04	.04	.07	.04	.02	.06
3,400 lb. seed (eros. cont.)	.25	.40	.40	.21	.21	.20
65 ton straw (eros. cont.)	45.00	55.00	40.00	45.00	55.00	50.00
Lump sum, dev. wat. supp. and furn. wat. equip.	$6,450	$9,000	$13,500	$11,350	$5,000	$6,000
13,000 M gal. applying water	1.00	1.00	1.10	1.00	1.00	1.00
253 sta. finishing rdwy.	12.00	7.00	7.00	10.00	10.00	10.00
12,000 bbl. P. C. (C.T.B.)	3.30	3.40	3.35	3.50	3.54	3.60
142,000 sq. yd. mix. and compact. (C.T.B.)	.12	.12	.20	.12	.18	.20
152 ton asph. emuls. (cur. sl. and pt. bdv.)	30.00	42.00	30.00	35.00	28.00	26.00
58 ton liq. asph. MC-2 (pr. ct. and pen. tr.)	25.00	27.00	20.00	17.00	18.00	21.00
45 ton liq. asph. SC-4 (B.S.T.)	16.00	15.00	18.00	13.00	14.50	21.00
1,000 sq. yd. prep. mix. and shap. surf. (B.S.T.)	.09	.11	.10	.06	.12	.15
57,000 sq. yd. scarify. exist. surf.	.07	.05	.06	.09	.21	.15
31,200 ton min. aggr. (P.M.S.)	2.70	2.65	2.35	2.40	2.00	2.60
1,560 ton pav. asph. (P.M.S.)	14.50	15.00	14.00	15.00	14.00	15.00
138 ton asph. emuls. (sl. cts.)	30.00	27.00	30.00	26.25	27.00	30.00
1,350 ton screenings (sl. ct.)	4.50	3.70	4.00	3.50	4.25	4.00
85 lin. ft. raised traffic bars	1.00	1.00	1.00	1.50	1.00	1.00
9,600 lin. ft. placing P.M.S. (dikes)	.15	.17	.10	.10	.15	.10
3,000 sq. yd. placing P.M.S. (median strip gutter)	.30	.85	1.00	.50	.42	.40
180 sq. yd. paved spillways	1.65	1.50	2.00	2.25	1.37	1.00
34 lin. ft. timber br. rail.	7.00	4.00	8.00	3.60	5.00	5.00
605 cu. yd. Cl. "A" P.C.C. (struct.)	42.00	35.00	52 00	43.45	61.00	50.00
71,500 lb. bar reinf. steel	.09	.09	.10	.11	.09	.09
1,170 cu. yd. Cl. "A" P.C.C. (curbs and gutters)	35.00	28.50	35.00	38.00	29.00	37.00
20 ea. curb dowels	.75	1.00	2.00	1.10	1.15	1.00
90 ea. right-of-way monuments	8.00	6.00	6.00	6.70	6.00	6.00
13 ea. centerline monuments	20.00	6.00	6 00	9.50	19.00	15.00
213 lin. ft. metal plate grd. rail.	3.00	3.50	7.00	3.00	3.00	3.00
200 lin. ft. salv. exist. grd. rail.	1.00	1 75	1.00	1.65	1.35	.50
200 lin. ft. reconst. salv. grd. rail.	1.85	2.25	2.00	2.25	2.00	2.00
260 ea. install. culv. mrkrs. and guide posts	4.00	3.00	3.00	4.15	3.00	4.00
30 ea. horiz. reflector units	7.50	8.00	7.50	3.35	7.25	6.00
9 mi. new prop. fence	850.00	800.00	900.00	900.00	900.00	800.00
44 ea. 10-ft. drive gates	45.00	45.00	40.00	45 00	45.00	30.00
1 ea. 14-ft. drive gates	50.00	60.00	50.00	56.00	75.00	40.00
7 mi. salv. exist. prop. fences	250.00	250.00	300.00	255.00	260 00	300.00
210 lin. ft. 18-in. C.M.P. (16 ga.)	2.50	2.25	3.50	2.45	2.85	3.00
1,090 lin. ft. 24-in. C.M.P. (14 ga.)	3.25	3 30	4.00	3.75	4.00	4.00
124 lin. ft. 36-in. C.M.P. (12 ga.)	6.00	6.00	8.00	7.00	8.25	7.00
424 lin. ft. 8-in. C.M.P. dn. drns. (16 ga.)	1.75	1.50	3.00	1.35	1.75	1.50
15 ea. down drn. slip. jts.	9.00	10.00	15.00	25.00	8 00	30.00
232 lin. ft. salv. exist. pipe culv.	1.00	1.00	2.00	1.10	1.25	1.00
304 lin. ft. salv. exist. spillway assem. dn. drns.	.40	1.00	1.50	.85	.50	1.00
9 ea. salv. spillway assemblies	8.00	6.00	10 00	5.60	10.00	5.00
304 lin. ft. relay. salv. 8-in. C.M.P. dn. drns.	1.00	1.00	2.00	.35	1.25	1.00
202 lin. ft. relay. salv. C.M.P. culv.	1.00	1.00	1.50	1.10	1.50	1.00

New Mexico—San Miguel County—State—Grade and Surf.

Floyd Haake, Santa Fe, New Mexico, with a bid of $235,270, was awarded a contract by the New Mexico State Highway Department for grading and surfacing with hot plant asphaltic surfacing of 2.5 mi. of highway in the City of Las Vegas on U. S. 85. The bid includes a concrete and steel bridge. Unit bids were submitted as follows:

(1) Floyd Haake $235,270
(2) Fulton & Hamilton 239,213
(3) Brown Contracting Co. 241,088
(4) W. T. Bookout 250,281
(5) Armstrong & Armstrong $272,703
(6) Lee Noor Contracting Co. 279,230
(7) Engineer's estimate 270,737

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lump sum, removal of old structs.	$2,000	500.00	$4,000	$1,000	$5,000	$4,500	$3,000
Lump sum, removal of obstructions	200.00	200.00	100.00	500.00	150.00	400.00	300.00
100,479 cu. yd. unclass. excav.	.25	.27	.20	.28	.43	.40	.35
605 cu. yd. excav. for structs.	2.00	2.00	2.00	3.00	2.00	2.00	5.00
809 cu. yd. excav. for pipe culverts	2.00	2.00	2.00	3.00	2.00	2.00	2.00
207,658 sta. yd. overhaul	.015	.02	.02	.02	.02	.02	.02
30,990 ¼ mi. yd. haul	.07	.06	.07	.06	.05	.07	.06
161,025 ton mi. haul	.01	.07	.08	.08	.06	.12	.07
219 hr. mechanical tamping	4.00	4.00	4.00	5.00	4.50	4.00	4.00
282 hr. rolling—steel tired roller	6.00	4.00	6.00	6.00	6.00	6.00	4.00
959 hr. rolling—sheepsfoot roller	4.00	4.00	4.00	5.00	4.00	4.00	4.00
1,047 hr. rolling—pneumatic tired roller	4.00	3.50	4.00	5.00	3.50	4.00	4.00
38,840 ton ballast	.66	.58	.53	.50	.79	.65	.50
12,250 ton leveling course	.75	.68	.65	.60	.70	.70	.65
4,269 M. gal. watering	1.00	1.00	.50	1.25	1.00	1.00	2.00
285.94 cu. yd. Class "AE-AR" conc. (curb, gutter and median)	32.00	35.00	40.00	35.00	35.00	36.00	40.00

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Colorado Highways

. . . Continued from page 81

use harrows or combinations. Where there is excessive moisture, aeration is sometimes necessary to reduce moisture to optimum. Usually the contractor can so control his operations that the material containing excess moisture is spread out and aerated naturally. Contractors are cooperative in this phase of construction, and it helps considerably in keeping costs low.

Rollers are paid for at the contract bid price for furnishing roller units, and operation is paid for at the bid price per hour per unit. In the case of sheepsfoot rollers, the State takes bids per hour on two and four-unit operation. This has eliminated a point of controversy between the engineer and contractor, since prior to this practice the contractor thought he was being penalized when only permitted to pull two units.

Colorado requires that the weight of the tamping type roller shall be such that the load on the face of the feet shall be not less than 250 p.s.i., with provision for an increase to at least 500 p.s.i. The weight of the roller must be the maximum unless otherwise ordered by the engineer. This requirement is relaxed, however, when four units are used, and 350 p.s.i. is specified. The State has found that standard power equipment cannot pull four units efficiently when loaded to maximum weight.

A standard for computing unit pressure of tamping feet is needed. The Colorado method is perhaps somewhat arbitrary and probably not strictly accurate, but serves to evaluate rollers furnished to the job in accord with the specifications. This method assumes that 5% of the total area of all tamping feet is in contact with the soil and exerting pressure. Actually, this is not true as only the bottom row of feet produces maximum pressure. This assumption merely provides a means for writing a specification, and provides the field engineer with a means for checking bearing capacity, and eliminates all arguments between the inspector and superintendent. The need is for laboratory tests that will give a more positive answer and a formula for determining unit pressures.

The highway engineer should standardize on some type of roller. Manufacturers and contractors alike would appreciate the engineer making up his mind as to just what is required. It is unreasonable to ask the contractor to remodel his roller to suit varying soil types from job to job not to mention different soils on the same job. It appears that some practical conclusion should be reached for the maximum total weight and a standard area for roller feet. The contact pressure for the feet is highly important, and must be varied to conform with the bearing value of the soil. Adjusting the contact pressure of the feet by varying the total weight—the present method used—is practical, but greater emphasis is needed on the desirability for such variation. Another method varies unit pressure by using interchangeable roller feet and leaving the total weight unchanged.

NEWS of MANUFACTURERS

Continued from page 108

with the company. He resigned his office in 1949 for reasons of health and for the past year acted in a consulting and advisory capacity.

☆ ☆ ☆

Announcement of the appointment of GENE D. SICKERT as works manager of the Indianapolis plant of the *Peerless Pump Division, Food Machinery & Chemical Corp.*, Los Angeles, was recently made by G. F. TWIST, general manager of the corporation's pump division. Sickert succeeds L. H. STERMER, resigned.

☆ ☆ ☆

HENRY W. BECK has been named advertising manager of *Airco Company International*, it was recently announced. He was formerly assistant manager, advertising department, for *Air Reduction Pacific Co.* Both companies are divisions of *Air Reduction Co., Inc.*, New York City. According to G. VAN ALSTYNE, advertising manager, Beck's functions will be divided between WILLIAM C. BETTES and GEORGE M. WORDEN. Bettes will be responsible for trade paper advertising and Worden for publicity. Beck will be located at Airco International in New York City.

☆ ☆ ☆

According to a recent announcement by ROBERT A. OLEN, general manager of *The Four Wheel Drive Auto Co.*, Clintonville, Wis., LLOYD PERNOT has become manager of national accounts. JOHN THOMPSON, formerly specialized markets manager, was named director of the service division, Pernot's former position. Pernot has been with the company since 1931, and Thompson joined the FWD organization in 1947.

☆ ☆ ☆

J. M. FLOYD, who has been vice-president in charge of manufacturing for the *A. O. Smith Corporation*, has been named executive vice-president of the company by action of the board of directors, president W. C. HEATH announced. In his new position he will take over general operating supervision of the company under the general direction of the president.

☆ ☆ ☆

News of the appointment of W. J. ALLABACK to the position of production manager was recently released by A. W. SMYTHE, vice-president and general manager of *The Thew Shovel Co.*, Lorain and Elyria, Ohio. Allaback joined the Thew organization as head of the planning department for the "TL" Division. Prior to his present appointment, he later assumed charge of the planning department for Plant No. 1, of the standards department, of tool design and of warehousing.

☆ ☆ ☆

Recently announced by *Chain Belt Co.*, Milwaukee, was the appointment of MARSHALL E. CUSIC as a district sales engineer, with headquarters at the Pittsburgh dis-

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103.45 cu. yd. Class "AE-AR" conc. (drainage structs.)	50.00	42.00	40.00	50.00	50.00	50.00	50.00
1,251 sq. yd. waterproofing	.80	1.00	1.00	1.50	.85	1.00	1.00
73,033 lb. reinforcing steel	.10	.10	.10	.09	.11	.10	.12
732 lin. ft. std. reinf. conc. pipe—24-in. diam.	5.00	5.50	5.50	5.25	5.10	6.00	5.50
332 lin. ft. std. reinf. conc. pipe—30-in. diam.	6.50	6.40	7.00	7.00	6.75	7.00	6.50
136 lin. ft. std. reinf. conc. pipe—36-in. diam.	9.50	9.00	9.00	9.00	9.00	9.50	8.00
140 lin. ft. std. reinf. conc. pipe—60-in. diam.	24.00	22.00	22.00	22.50	20.00	20.00	22.00
1 ea. cattleguard—12-ft. roadway	$1,200	$1,200	$1,500	800.00	900.00	$1,100	$1,000
4 ea. monuments and markers	25.00	15.00	50.00	100.00	50.00	50.00	50.00
12,265 lin. ft. galvanized barbed wire fence	.12	.13	.15	.15	.13	.20	.15
22 ea. gates—Texas type	5.00	10.00	10.00	10.00	8.00	10.00	10.00
69 ea. bracing	6.00	8.00	2.00	5.00	5.00	6.00	7.00
13 ea. tr. timb. warn. posts reflect. (6-in. diam.)	7.00	5.00	6.00	7.00	7.00	10.00	7.00
40 ea. right-of-way markers	6.00	5.00	6.00	7.00	5.50	6.00	5.00
0.634 mi. obliterating old road	200.00	100.00	200.00	700.00	200.00	800.00	200.00
26 cu. yd. rock and wire check dams	15.00	20.00	15.00	12.50	15.00	20.00	12.00
1,003 bbl. cutback asphalt—Type RC-2	6.00	6.00	6.20	6.00	6.00	6.50	6.00
3,825 ton hot plant asphaltic surfacing	5.60	5.00	6.00	5.50	5.00	6.00	6.50
1,117 bbl. 85-100 asphalt (for hot plant asph. surf.)	6.00	6.00	6.20	7.00	6.60	6.50	6.00
2.483 mi. asphalt processed base	500.00	600.00	500.00	700.00	750.00	500.00	800.00
1,500 ton stockpiled surf. matl.	.70	.80	.75	1.10	.70	1.00	.75
BRIDGE ITEMS							
773 cu. yd. excav. for structs.	6.00	5.00	5.00	5.00	8.00	6.00	5.00
184.29 cu. yd. Cl. "AE-AR" conc. superstruct.	60.00	55.00	60.00	65.00	67.50	65.00	55.00
411.02 cu. yd. Class "AE-AR" conc. substruct.	60.00	60.00	60.00	60.00	57.50	60.00	60.00
215,000 lb. structural steel	.12	.13	.13	.12	.13	.12	.16
471 cu. yd. wire enclosed riprap	7.00	7.00	5.00	4.00	6.00	8.00	8.00
1,260 cu. yd. excav. for riprap	2.00	1.00	2.00	2.00	2.00	2.00	2.00
500 lin. ft. steel stakes	1.00	1.00	2.00	2.00	1.50	1.50	1.50
10,000 lb. wire fabric	.20	.20	.20	.27	.23	.25	.20

Utah—Juab and Millard Counties—State—Surf.

Strong Co., Springville, Utah, with a bid of $440,209, was low before the State Road Commission of Utah for construction of 22 mi. of plant mixed bituminous surfaced road on U. S. 91 between Scipio and Levan. Unit bids were as follows:

(1) Strong Co.	$440,209	(5) Peter Kiewit Sons' Co.	$519,883
(2) Gibbons & Reed Co.	446,233	— Parson & Fife Construction Co.	534,085
(3) W. W. Clyde & Co.	446,345	(6) Engineer's Estimate	470,785
(4) Reynolds Construction Co.	479,216		

	(1)	(2)	(3)	(4)	(5)	(6)
84,800 ton plant mixed bituminous surfacing	1.85	1.93	1.70	1.80	2.15	1.85
1,047,500 gal. bituminous material, 120-150 pen	.10	.11	.113	.12	.12	.115
296,500 gal. bituminous material, Type MC-1	.11	.115	.13	.12	.13	.135
36,700 gal. bituminous material, Type RC-2	.12	.115	.13	.125	.13	.135
86,800 gal. bituminous material, Type RC-4	.12	.115	.13	.125	.13	.135
4,300 ton cover material	2.50	3.20	2.50	3.00	2.80	2.50
3,000 ton cover material (place in stockpile)	1.75	2.20	1.50	2.00	2.30	2.25
96,200 ton cr. rk. or cr. grav. surf. course	.52	.55	.52	.60	.65	.55
10,000 ton cr. rk. or cr. grav. surf. crse. (pl. in stkpl.)	.45	.49	.42	.50	.65	.45
74,400 ton gravel or cr. rock base course	.45	.47	.47	.50	.60	.50
1,700 M gal. watering	2.00	2.10	2.00	2.50	2.00	2.00
560 hr. rolling	6.00	5.15	5.00	5.00	6.00	5.00
182 ea. guide posts	5.00	5.25	4.00	7.00	5.60	5.00
6,490 lin. ft. guard rail	3.00	2.85	2.75	3.50	2.60	2.70

Washington—Mason County—State—Grade and Surf.

Northwest Construction Co., Seattle, Wash., with a bid of $288,327, was awarded a contract by the Washington Department of Highways for the clearing, grubbing, grading, draining, and bituminous surfacing of 2.491 mi. of the Lilliwaup to Eagle Creek Highway. Unit bids were submitted as follows:

(1) Northwest Construction Co.	$288,327	(6) Paul Bocek & Son	$338,892
(2) J. P. Surage Construction Co.	288,683	— Bay Construction	359,639
(3) Osberg Construction Co.	293,830	— S. S. Mullen Inc. & Herman Kathman	379,817
(4) Erland & Blickle	299,513	— Thomas Scalzo Co.	416,440
(5) Hugh Govan	321,954		

	(1)	(2)	(3)	(4)	(5)	(6)
39.55 acres clearing	425.00	600.00	600.00	420.00	500.00	800.00
36.83 acres grubbing	425.00	400.00	300.00	420.00	300.00	300.00
216,010 cu. yd. unclass. excav. incl. haul of 600 ft.	.34	.35	.42	.40	.46	.55
160 cu. yd. com. trench excav. incl. haul of 600 ft.	1.50	2.50	1.00	1.20	2.00	2.00
3,320 cu. yd. stripping, incl. haul	1.00	.50	.50	.40	.50	.75
7,000 cu. yd. strip. bor. and surf. pits, incl. haul	.30	.25	.50	.70	.40	.45
97,540 cu. yd. sta. overhaul	.01	.02	.02	.006	.02	.02
700.51 M. cu. yd. sta. overhaul	5.00	5.00	5.00	6.00	5.00	5.00
700 cu. yd. structure excav.	3.00	3.00	2.00	2.70	3.00	2.00
32 day mechanical tamper	35.00	35.00	30.00	40.00	45.00	35.00
7,400 lin. ft. slope treatment Class A	.15	.20	.15	.20	.15	.20
130.7 sta. (100 ft.) finishing roadway	15.00	15.00	15.00	10.00	12.00	12.00
125 M. gal. water in place	2.50	3.00	2.00	1.80	3.00	2.00
1,000 cu. yd. cr. stone filler in place, incl. haul	2.60	2.50	2.50	3.00	2.80	2.30
30 cu. yd. gravel backfill for foundtns. in place	7.50	5.00	4.00	1.80	3.00	6.30
51,770 ton selected roadway borrow in place	.70	.65	.60	.77	.75	.50
6,750 ton cr. stone surf. top course in place	2.60	2.40	2.50	2.80	2.70	2.75
10,050 ton cr. stone surf. base course in place	2.60	2.40	2.50	2.70	2.60	2.55
550 ton cr. stone surf. top course in stockpile	2.30	2.20	2.50	2.10	2.00	2.20
1,210 ton cr. cover stone in stockpile	2.30	2.20	2.50	2.10	2.00	2.20
MIN. AGGREGATE FOR NON-SKID SINGLE SEAL TREAT. SCHED. A IN STOCKPILE						
610 ton crse. cr. screenings ⅝-in. to ¼-in. in stkpl.	2.60	3.00	2.50	3.00	2.80	3.10
140 ton fine cr. screenings ¼-in. to 0-in. in stkpl.	2.60	3.00	2.50	3.00	2.80	3.10
MISCELLANEOUS ITEMS						
430 lin. ft. special open wood flume (spillways) complete in place	2.50	1.75	3.00	1.00	1.30	2.25
2,850 lin. ft. special berm in place	.45	.35	.50	.15	.50	.20
1.1 cu. yd. concrete Class C in place	75.00	60.00	100.00	27.00	90.00	60.00
369 lin. ft. place conc. culv. pipe 12-in. diam. in place	1.90	2.00	1.25	1.60	1.43	2.00
1,029 lin. ft. place conc. culv. pipe 18-in. diam. in place	3.70	3.50	3.00	2.75	2.50	3.50
216 lin. ft. std. reinf. conc. culv. pipe 24-in. diam. in pl.	6.50	6.00	6.00	5.25	5.33	6.00
78 lin. ft. std. reinf. conc. culv. pipe 36-in. diam. in pl.	10.50	11.00	10.00	8.65	11.20	12.50
81 lin. ft. std. reinf. conc. culv. pipe 48-in. diam. in pl.	16.00	16.00	20.00	13.20	20.00	18.00
80 lin. ft. c'td. corr. met pipe Type 2, 16 ga., 8-in. diam. in pl.	2.40	2.25	1.50	2.30	2.00	2.25
42 lin. ft. relaying conc. culv. pipe 12-in. diam.	1.40	2.25	1.00	.50	1.00	1.25

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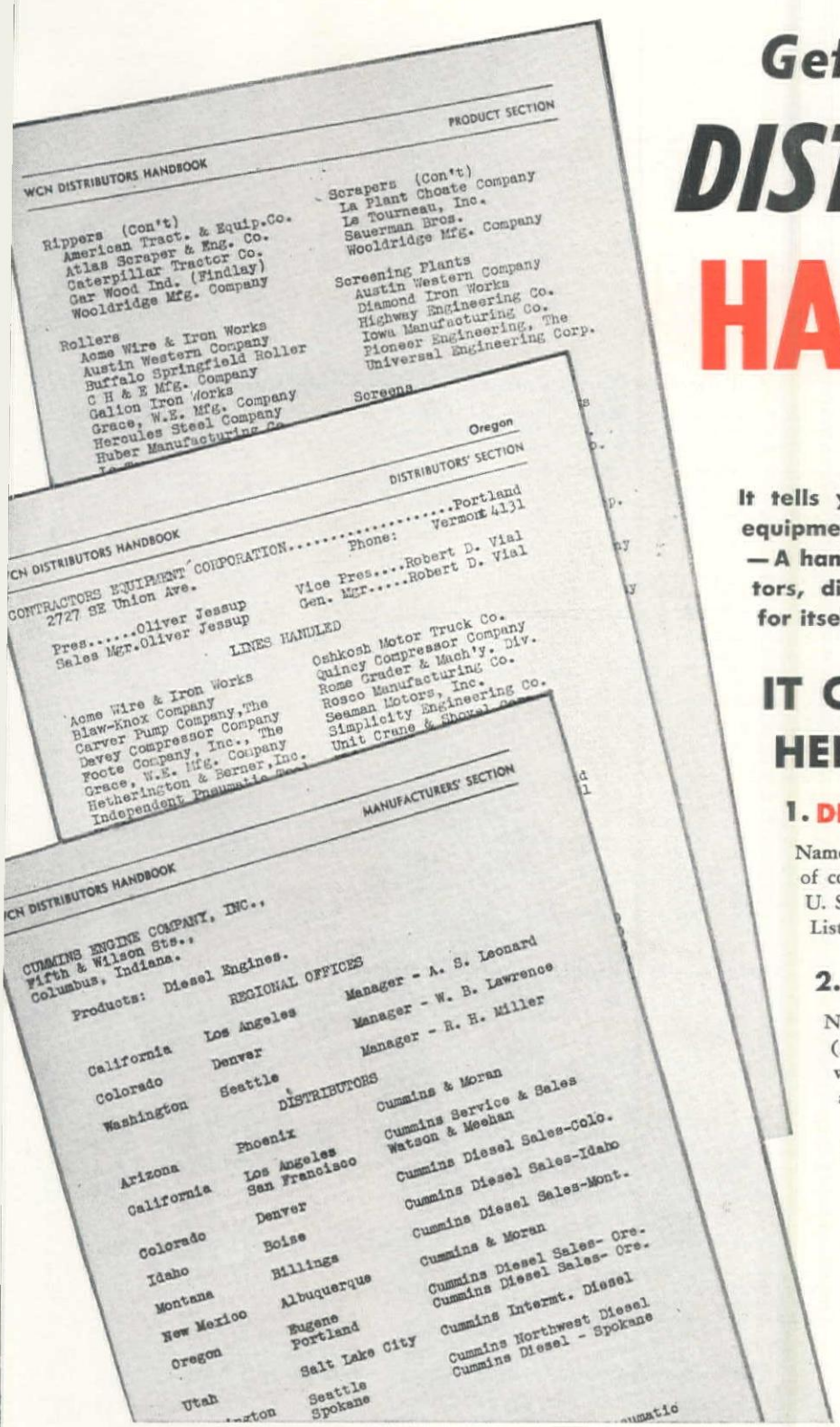

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NEWS of MANUFACTURERS

Continued from page 110

trict office in Pittsburgh, Pa. Cusic joined the Chain Belt organization in 1937. In 1941 he left the company to enter the U. S. Army and has been back with the company since 1945.

☆ ☆ ☆

Organizational changes in the mechanical goods sales division of *Goodyear Tire & Rubber Co.*, Akron, Ohio, were made recently, according to announcement of H. D. FOSTER, manager of the division. R. C. STEIN has been promoted to manager of molded goods sales at the St. Marys, Ohio, Goodyear plant. R. E. CHAPMAN was appointed manager of hose sales, Akron, succeeding R. W. SANBORN, who is now representing the mechanical goods division in the Akron territory.

☆ ☆ ☆

H. R. COMSTOCK was recently appointed manager of the Central Division of *Goodyear Tire & Rubber Co.*'s mechanical goods sales, replacing H. E. LANGDON, who moves to other duties yet to be assigned. The announcement was made by H. D. FOSTER, manager of the Akron rubber firm's mechanical goods sales. Comstock has been with the company since 1929.

☆ ☆ ☆

R. G. GLASS has retired as director and vice president and assistant to the president of *Geneva Steel Co.* and *Columbia Iron Mining Co.*, Utah subsidiaries of *United States Steel Corp.*, it was recently announced by DR. WALTHER MATHESIUS, President. LOREN J. WESTHAVER, manager of operations for the two companies, has been elected to succeed Glass as director and vice president and manager of operations of *Geneva Steel Co.*

☆ ☆ ☆

Election of O. L. PRINGLE and MARCUS J. AURELIUS to two top executive positions, effective July 1, was announced by ALDEN G. ROACH, president of *Columbia Steel Co.* Pringle remains vice president and director, and will be a special assistant to Roach. Aurelius, formerly vice president of *U. S. Steel Supply Co.*, another United States Steel subsidiary, succeeds Pringle as vice president—sales.

☆ ☆ ☆

E. F. FISHER, president of *Gar Wood Industries, Inc.*, Wayne, Mich., announced recently the purchase by his company of the *National Truck Equipment Co.*, Waukesha, Wis. This property will be owned and operated by a newly formed and wholly owned subsidiary of Gar Wood, to be known as the *National Lift Co.* Long a leader in the field of supplying equipment for larger trucks, 1½-ton capacity and over, Gar Wood, through its new subsidiary, now makes available cost-saving equipment especially designed for trucks of 1 ton and under. Also added to the established Gar Wood line by the National Lift

Continued on page 114

54 lin. ft. relaying conc. culv. pipe 24-in. diam.	3.00	6.00	3.00	1.90	3.00	3.00
120 lin. ft. remov. and relay. galv. iron water pipe ¾-in. diam.	.85	1.00	.50	.25	.30	.50
138 lin. ft. remov. and relay. galv. iron water pipe 1½-in. diam.	1.10	1.75	1.00	.75	.50	.60
60 lin. ft. remov. and relay. galv. iron water pipe 2-in. diam.	1.25	2.00	1.00	1.00	.50	.75
73 only reinf. conc. right-of-way markers in place	5.00	5.00	5.00	5.30	3.00	5.00
157 only reinf. conc. spot posts in place	10.00	10.00	10.00	14.00	8.50	10.00
15,500 cu. yd. loose riprap Class A in place	2.00	2.00	2.00	2.20	3.00	2.25
8 cu. yd. hand placed riprap in place	25.00	20.00	10.00	8.50	12.00	10.00
860 lin. ft. removing existing guard rail	1.50	.80	.25	.20	.30	.30
BRIDGE						
20 cu. yd. structure excavation	5.00	10.00	5.00	3.00	5.00	11.00
175 cu. yd. concrete Class A in place	62.00	65.00	63.00	70.00	60.00	77.00
172 lin. ft. reinf. conc. bridge railing in place	13.00	9.00	9.00	10.00	11.00	10.00
41,000 lb. steel reinforcing bars in place	.12	.11	.12	.08	.12	.12
1,050 lin. ft. furn. precast concrete piling	6.50	7.00	3.75	2.40	5.00	7.75
1 only furn. and driv. precast conc. test pile	900.00	$1,000	700.00	250.00	500.00	$1,100
35 only driving precast concrete piles	85.00	75.00	73.00	90.00	50.00	88.00

California—Mono County—State—Grade and Surf.

Westbrook & Pope, Sacramento, Calif., with a bid of $24,371, was low before the California Division of Highways for construction of 1.5 mi. of highway between 1 mi. north of Grant Lake and junction with route 23, to be graded and surfaced with road-mixed surfacing. Unit bids were as follows:

(1) Westbrook & Pope $24,371
(2) Ken Lowe 25,278
(3) Steel & Easton 26,730
(4) Browne and Krull 28,847
(5) Halloran & Gill $29,758
(6) Dix-Syl Construction Co., Inc. 31,526
— Bishop Engineering and Construction Co. 32,957
— Downer & Eckley 38,846

	(1)	(2)	(3)	(4)	(5)	(6)
Lump sum, clearing and grubbing	$1,000	450.00	700.00	$1,500	500.00	$1,200
11,700 cu. yd. roadway excav.	.36	.41	.27	.40	.52	.35
230 cu. yd. struct. excav.	2.50	2.25	2.50	3.00	2.50	2.50
55 cu. yd. ditch and channel excav.	2.50	1.00	1.00	1.00	4.00	1.00
30,000 sta. yd. overhaul	.01	.02	.015	.01	.01	.02
3,700 cu. yd. imp. base matl.	.50	.83	1.20	1.40	.60	1.30
Lump sum, dev. wat. supply and furn. wat. equip.	300.00	500.00	500.00	900.00	350.00	$1,200
600 M gal. applying water	1.40	1.75	1.50	1.00	2.00	1.50
78 sta. finishing roadway	6.00	5.00	4.00	4.00	5.00	10.00
31 ton liq. asph. SC-2 (pr. ct. and pen. tr.)	28.50	36.00	34.00	25.00	29.50	28.00
2,200 cu. yd. min. aggr. (R.M.S.)	.88	1.00	1.20	1.70	1.40	1.50
150 ton liq. asph. SC-3 or SC-4 (R.M.S.)	26.00	20.00	30.50	20.00	22.37	24.50
18,300 sq. yd. mix and compact R.M.S.	.09	.08	.11	.07	.08	.13
16 ton asphaltic emuls. (sl. ct.)	39.00	46.00	45.00	40.00	43.60	40.00
210 ton screenings (sl. ct.)	9.40	9.00	6.00	7.00	15.90	15.00
12 cu. yd. rubble masonry	44.00	54.00	50.00	40.00	135.00	40.00
14 ea. right-of-way monuments	6.00	7.50	6.50	5.00	2.50	6.00
27 ea. instal. culv. mkrs. and guide posts	4.50	2.50	2.50	2.00	5.00	5.00
0.7 mi. new property fence	$1,250	700.00	$1,056	$1,500	472.00	900.00
2 ea. drive gates	44.00	60.00	35.00	60.00	158.62	50.00
96 lin. ft. 18-in. C.M.P. (16 ga.)	4.00	3.45	3.00	3.00	5.86	4.00
174 lin. ft. 24-in. C.M.P. (14 ga.)	5.60	4.70	4.75	5.00	6.92	5.00
88 lin. ft. 36-in. C.M.P. (12 ga.)	8.75	9.80	7.90	9.00	9.83	7.00

Oregon—Washington County—State—Grade and Surf.

Porter W. Yett, Portland, Oregon, with a bid of $18,865, was low before the Oregon State Highway Department for grading and paving the Cornelius Pass Road Connection section of the Sunset Highway. Unit bids were submitted as follows:

(1) Porter W. Yett $18,865
(2) G. D. Dennis & Son 19,005
(3) Erland & Blickle $19,283
(4) United Contracting Co. 21,760

	(1)	(2)	(3)	(4)
Lump sum, clearing and grubbing	$1,100	500.00	300.00	$1,500
65 cu. yd. structural excav., unclassified	6.00	3.00	2.00	7.50
5,600 cu. yd. general excav., unclassified	.85	.80	.95	1.00
800 lin. ft. rounding cutbanks	.20	.12	.15	.25
30 lin. ft. 8-in. sewer pipe	1.50	1.25	.80	2.00
200 lin. ft. 18-in. concrete pipe	3.40	3.00	3.00	4.00
1 only concrete catch basins	70.00	60.00	100.00	90.00
1 only Type "B" manholes	340.00	225.00	150.00	400.00
15 cu. yd. concrete curbs	60.00	46.00	45.00	65.00
850 cu. yd. 2½-in. - 0-in. material in base	3.30	3.65	4.50	4.00
230 cu. yd. ¾-in. - 0-in. material in base and shoulders	3.50	3.65	4.80	4.25
20 M-gal. sprinkling	3.00	4.00	4.00	3.00
350 lin. ft. asphaltic concrete traffic markers	1.00	2.00	1.30	1.40
800 tons Class "B" asphaltic concrete	8.00	9.25	8.00	8.40

Nevada—Lincoln County—State—Grade and Surf.

Foster & McHarg, Riverside, Calif., with a bid of $184,360, was awarded a contract by the Nevada Department of Highways for clearing, grading and gravel and road-mix bituminous surfacing 11.57 mi. from 5 mi. south of the Comet Coalition Mine and The Caselton Mill in Lincoln County. Unit bids were submitted as follows:

(1) Foster & McHarg $184,360
(2) Phoenix Construction Co. 208,656
(3) J. M. Sumsion & Sons 231,352
(4) Dodge Construction Co. 235,182
(5) Hoops Construction Co. $239,176
(6) Silver State Construction Co. 277,285
(7) Isbell Construction Co. 299,989

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lump sum, signs	400.00	$1,000	500.00	500.00	300.00	500.00	500.00
61 acres clearing	100.00	100.00	60.00	100.00	100.00	50.00	115.00
132 lin. ft. remove fence	.50	.10	.10	.25	2.00	.10	1.00
128 lin. ft. remove culvert pipe	1.50	1.00	1.50	1.50	1.36	1.00	2.00
151,540 cu. yd. roadway excav.	.59	.70	.87	.93	.96	1.20	1.17
1,150 cu. yd. drainage excav.	1.00	2.00	1.00	1.00	.75	1.20	2.00
191 sta. V-type ditches	8.00	5.00	6.00	10.00	6.00	5.00	8.00
85,140 yd. sta. overhaul	.015	.02	.02	.02	.01	.02	.02
950 yd. mi. overhaul	.20	.20	.20	.20	.15	.25	.20
860 cu. yd. structure excavation	2.00	3.00	2.50	2.50	2.50	2.00	2.00
2,240 cu. yd. backfill	1.50	1.00	1.50	1.50	1.00	1.00	1.50
482 M. gal. water	2.00	1.00	2.50	1.50	2.00	5.00	3.00
730 ft. hr. tamping roller	.60	.50	.75	1.00	1.00	1.00	2.00
4,900 ton Type 1 gravel base	.80	.70	.80	.55	.60	.60	.70
54,610 ton gravel surface	.80	.85	.80	.75	.74	.85	1.15

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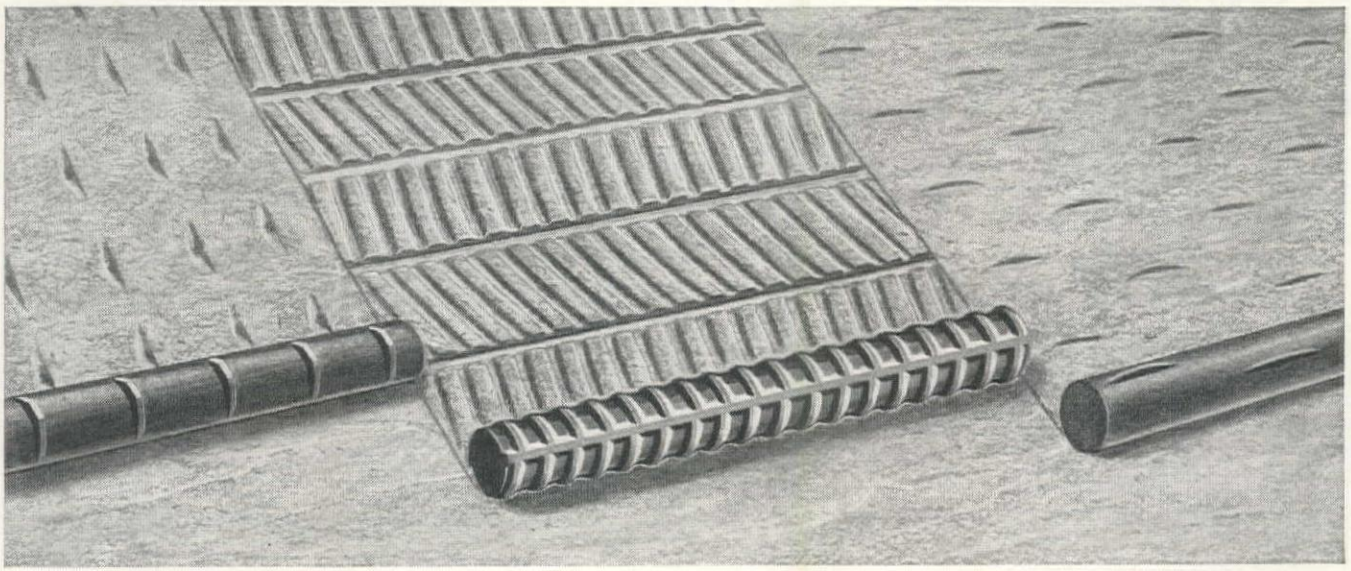
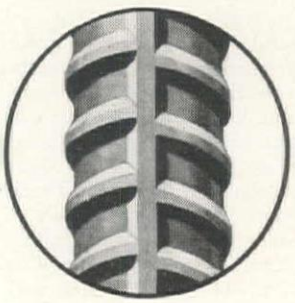


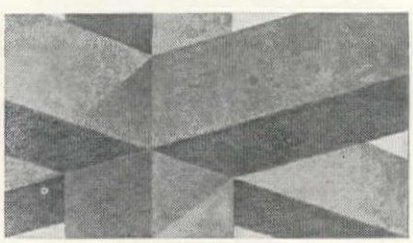
Which bar has the greatest grip?

THE one in the middle, of course. It's a Kaiser Hi-Bond bar . . .

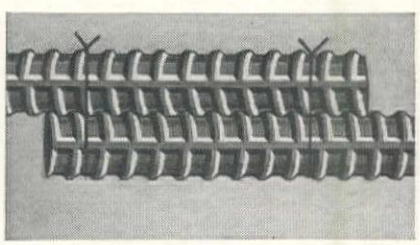
And the pattern it makes when rolled in wet cement *proves* it has a more effective mechanical grip with concrete than any ordinary bar.

The reversed double-helical ribs that you see in the circles actually give Kaiser Hi-Bond bar the greatest bond of any reinforcing bar ever developed—regardless of position in which bars are cast or the direction in which they are pulled!

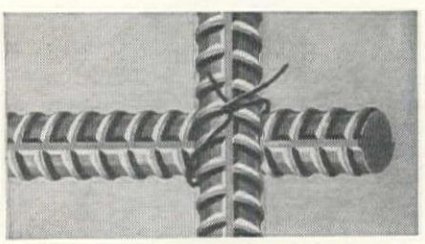




PROVED BONDING EFFICIENCY of Kaiser Hi-Bond reinforcing bars—result of reversed double helical ribs—helps keep concrete strong, smooth and free of tensile cracks.



MORE EFFICIENT transfer of stress at splices —plus higher tensile strength with shorter overlap—comes from dovetailed helical ribs in Kaiser Hi-Bond bars.



LOWER CONSTRUCTION COSTS result from gear-like contact of Kaiser Hi-Bond bars when crossed—because the simplest tie makes them hold firmly.

But those aren't all the advantages you get with Kaiser Hi-Bond bars! They give you better construction through reduced need for hook anchorage, reduced deflections of beams, less columnar deformation, more efficient use of labor!

Kaiser Hi-Bond reinforcing bars are made from new billet steel—and competitively priced.

Make sure *your* next job gets all the advantages of Kaiser Hi-Bond bars!

Kaiser Hi-Bond reinforcing bars—produced in the West by

Kaiser Steel

built to serve the West

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

NEWS of MANUFACTURERS

Continued from page 112

Co. are the Dump-O-Matic twin hydraulic hoist, Hydra-Clutch pump and the Jumbo twin hydraulic hoist.

☆ ☆ ☆

C. F. CLARKSON, office manager of the *Gardner-Denver Co.*, Quincy, Ill., recently attended the Refresher Sales Course at the Quincy factory. This course is given each month and is attended by personnel from the company's factory branches throughout the United States.

☆ ☆ ☆

GEORGE H. WHITE has recently joined the *Maxon Construction Co., Inc.*, of Dayton, Ohio, as equipment engineer. For the next few months he will be located at Tell City, Ind., concerned with the design, development, and manufacture of construction equipment.

☆ ☆ ☆

Pressed Steel Car Co., Inc., of Chicago, Ill., recently purchased the *C. R. Jahn Co.*, Savanna, Ill., a leading maker of heavy-duty trailers. The manufacturing operations will be moved to Pressed Steel Car's Mount Vernon, Ill., plant, while sales and executive offices will be located in Chicago. The name of the Jahn organization has been changed to *Jahn Trailer Division, Pressed Steel Car Co., Inc.* C. R. JAHN, president of the C. R. Jahn Co., will be manager of sales of the new company and his son HERBERT JAHN will remain in charge of trailer design.

☆ ☆ ☆

STANLEY K. ROBINSON of F. Hyde & Co., Montreal, Canada, was elected president of *Vermiculite Institute*, Chicago, at the annual meeting held in Washington, D. C. Re-elected were W. J. BEIN and E. R. MURPHY, treasurer and executive secretary, respectively.

☆ ☆ ☆

According to a recent announcement by A. B. JACKSON, III, *Electric Steel Foundry Co.* of Portland, Ore., has a new addition to its melting equipment of two Moore Rapid Lectroment furnaces. This is the initial step in a plant-wide program which is designed to increase the efficiency and production capacity of all departments. The company manufactures dragline buckets, dippers and hoe buckets, and is headed by C. F. SWIGERT, JR., president.

☆ ☆ ☆

ROBERT H. MORSE, JR., president of *Fairbanks, Morse & Co.*, Chicago manufacturer, announced the appointment of GORDON R. ANDERSON as general manager of its Freeport Works, Freeport, Ill. He succeeds LEE MADDEN who is now retired. Since 1946 Anderson has been manager of engineering, and his successor to this post is J. F. WEIFFENBACH who has been chief engineer of the company's Diesel Locomotive Division. With his new appointment Weiffenbach will retain his headquarters at Beloit, Wis.

8 ton liquid asphalt, Type MC-2 (seal)	75.00	50.00	45.00	50.00	100.00	40.00	65.00
92 ton liquid asphalt, Type SC-2 or SC-3 (roadmix)	28.00	27.00	40.00	30.00	40.00	30.00	35.00
1.08 mi. roadmix	$1,000	700.00	$1,000	$1,000	$1,000	$1,000	$1,000
1,290 lin. ft. 18-in. corr. metal pipe	2.50	3.00	3.00	2.75	3.00	2.50	3.00
2,004 lin. ft. 24-in. corr. metal pipe	3.50	4.00	4.00	3.75	4.00	4.00	4.00
56 lin. ft. 30-in. corr. metal pipe	4.50	6.00	6.00	4.50	4.69	5.00	5.00
1,196 lin. ft. 36-in. corr. metal pipe	6.50	7.00	7.50	7.00	7.20	7.00	7.00
330 lin. ft. 48-in. corr. metal pipe	9.50	10.00	11.00	10.00	10.00	9.50	10.00
22 ea. culvert markers and guide posts	5.00	10.00	7.00	7.50	5.00	6.00	6.00
182 ea. right-of-way markers	6.00	10.00	6.00	7.50	6.00	6.00	8.00
Lump sum, railroad grade crossing	$1,000	$2,000	$1,800	$1,000	$1,000	500.00	$1,500
Force account, miscellaneous work	600.00	600.00	600.00	600.00	600.00	600.00	600.00
Lump sum, special cattle guard	$1,500	$2,500	$2,500	$1,500	$2,000	$1,500	$2,500

Montana—Broadwater County—State—Grade and Surf.

Nilson Smith Construction Co., Great Falls, Montana, with a bid of $199,160, was awarded the contract by the State Highway Commission of Montana for 10.2 mi. grading and surfacing of the Three Forks-Townsend highway. Unit bids were submitted as follows:

(1) Nilson Smith Construction Co. $199,160
(2) McLaughlin, Inc. 206,502
(3) Stanley H. Arkwright, Inc. 207,500
(4) Peter Kiewit Sons' Co. 208,997
(5) S. Birch & Sons $212,176
(6) Glenn Geery 215,195
— S. J. Groves & Sons Co. 219,916
— F. & S. Construction Co. 231,514

	(1)	(2)	(3)	(4)	(5)	(6)
115,948 cu. yd. unc. exc. and borrow	.29	.27	.35	.22	.29	.38
427 cu. yd. culvert excavation	1.00	2.50	2.00	2.00	2.00	.75
119,568 sta. yd. overhead	.015	.01	.01	.02	.01	.02
26,346 ton Type A top ¾-in. gr.	1.34	1.40	1.375	1.60	1.33	1.43
106,496 ton sel. borrow base course	.74	.80	.74	.84	.90	.68
124,362 gal. app. emuls. asphalt	.20	.17	.21	.18	.17	.23
850 unit rolling surf. courses	10.00	8.00	6.66	8.00	7.00	8.50
100 hr. blading work	10.00	12.00	7.50	12.00	8.00	7.50
4,515 M gal. watering	1.50	3.00	2.00	2.00	1.60	2.95
504 lin. ft. 18-in. reinf. conc. pipe culv.	4.25	4.00	3.90	4.50	5.50	3.93
216 lin. ft. 24-in. reinf. conc. pipe culv.	6.25	6.00	5.75	6.00	7.80	5.79
64 lin. ft. 36-in. reinf. conc. pipe culv.	10.00	11.00	10.80	11.00	13.00	10.80
34 lin. ft. 48-in. reinf. conc. pipe culv.	16.00	16.50	17.35	20.00	21.00	17.63
28 lin. ft. 60-in. reinf. conc. pipe culv.	23.00	25.00	25.35	30.00	33.00	26.38
68 lin. ft. 72-in. reinf. conc. pipe culv.	32.00	35.00	34.85	40.00	43.00	36.13
2 ea. conc. proj. markers	20.00	20.00	23.60	25.00	25.00	17.88
54 ea. conc. station markers	7.00	6.00	9.60	9.00	10.00	9.00
29 ea. conc. right-of-way markers	5.00	5.00	5.00	6.00	8.00	6.72

Oregon—Baker County—State—Grade and Surf.

Allen E. Sackett, Hood River, Oregon, with a bid of $78,585, was low before the Oregon State Highway Department for construction of the Salisbury Junction to Poker Creek section of the Sumpter Valley secondary highway. Unit bids were as follows:

(1) Allen E. Sackett $78,585
(2) Stevenson Construction Co. 82,059
(3) F. L. Somers 82,302
(4) J. C. Papin 84,401
(5) Durbin Bros. ..... $ 88,578
(6) Lloyd Graham Construction Co. 96,741
— J. N. and M. J. Conley 98,017
— Newport Construction Co. 102,845

	(1)	(2)	(3)	(4)	(5)	(6)
All specified, clearing and grubbing	$5,800	$3,000	$5,000	$3,000	$5,000	$4,500
690 cu. yd. trench excav., unclassified	1.00	2.00	2.00	2.00	4.00	3.00
2,600 cu. yd. special borrow excav., unclassified	.32	.25	.22	.38	.24	.40
51,000 cu. yd. general excav., unclassified	.28	.34	.26	.38	.36	.47
75,000 yd. sta. short overhaul	.01	.015	.02	.01	.015	.02
660 yd. sta. long overhaul	.40	.40	.50	.50	.40	.40
370 cu. yd. rock slope protection	4.00	1.25	2.00	1.50	2.50	5.00
4.05 mi. finishing roadbed and slopes	300.00	300.00	500.00	400.00	625.00	450.00
370 lin. ft. 18-in. corrugated metal pipe	3.50	3.25	3.50	3.25	3.50	4.50
90 lin. ft. 24-in. corrugated metal pipe	5.00	4.50	5.00	4.70	5.45	6.00
230 lin. ft. 36-in. corrugated metal pipe	9.00	10.00	11.50	8.70	9.65	10.50
100 lin. ft. 72-in. corrugated metal pipe, uncoated	25.00	25.00	25.00	24.00	26.00	28.00
20 lin. ft. 24-in. concrete pipe	7.50	3.00	5.00	3.60	3.60	7.00
190 lin. ft. salvaging culvert pipe	1.00	2.00	2.00	4.00	3.50	3.00
20,200 cu. yd. selected roadbed topping	.32	.40	.55	.40	.50	.45
25,000 yd. mi. hauling roadbed topping	.10	.12	.15	.12	.12	.16
5,200 cu. yd. 1-in. - 0-in. rock in leveling crse. and shldrs.	2.60	2.65	2.70	2.60	2.60	2.60
550 M gal. sprinkling	2.00	2.00	2.00	1.50	2.00	4.00
4.05 mi. preparation of base	200.00	200.00	100.00	200.00	150.00	200.00
2,700 cu. yd. furn. and placing aggregates	4.25	4.40	3.60	4.65	4.10	4.25
250 ton furn. and placing 150-200 asphalt	43.00	44.50	40.00	43.00	41.00	42.00

California—Mendocino County—State—Grade and Surf.

Arthur B. Siri, Inc., Santa Rosa, Calif., with a low bid of $104,198, was awarded a contract by the California Division of Highways for construction of about 1 mi. of highway at Salmon Creek about 20 mi. south of Fort Bragg. The section will be graded and a road-mixed surface placed on cement-treated imported base material and seal coat applied. Unit bids were submitted as follows:

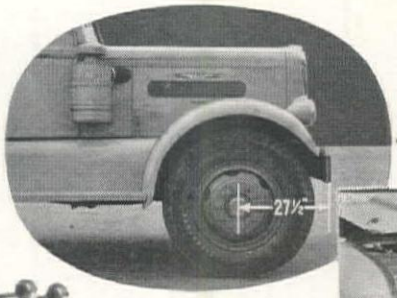
(1) Arthur B. Siri, Inc. $104,198
(2) Harold Smith 106,045
(3) Close Building Supply 107,648
(4) Harms Bros. & C. M. Syar 109,603
(5) Chittenden & Chittenden 112,498
(6) O'Connor Bros. 115,314
(7) John Burman & Sons $116,390
— Eugene G. Alves 121,786
— R. B. Guerin & Co. 126,446
— Fredrickson & Watson Construction Co. 129,878

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
10 acres clearing and grubbing	300.00	100.00	150.00	125.00	200.00	100.00	200.00
68,000 cu. yd. roadway excav.	.36	.40	.42	.45	.39	.45	.46
750 cu. yd. struct. excav.	2.50	2.50	3.00	2.50	3.00	2.50	3.00
300 cu. yd. ditch and channel excav.	1.50	2.00	2.00	2.50	1.50	2.00	3.00
330,000 sta. yd. overhaul	.01	.005	.01	.01	.005	.015	.01
900 cu. yd. imp. borrow	.75	2.00	1.60	1.25	1.00	1.50	.50
2,400 sq. yd. obliterating exist. rdwy.	.04	.06	.10	.12	.05	.10	.10
Lump sum, dev. wat. sup. and furn. wat. equip.	$2,900	$1,500	$4,000	$1,300	$3,500	$1,500	$2,000
2,300 M. gal. applying water	1.10	1.60	1.50	1.90	1.10	1.50	1.50
52 sta. finishing rdwy.	5.00	14.00	10.00	13.00	10.00	8.00	20.00
10,100 ton imp. base matl.	1.95	2.30	1.65	2.00	2.90	2.40	2.30
19,000 sq. yd. mix. and compact. (cem. tr.)	.30	.25	.40	.20	.20	.27	.30
670 bbl. Portland cement (cem. tr.)	4.25	5.00	5.50	6.20	4.50	5.20	5.50
16 ton asphaltic emuls. (sl. ct.)	40.00	45.00	35.00	51.00	39.00	45.00	50.00
165 ton screenings (sl. ct.)	4.00	7.00	6.50	6.20	6.00	5.45	5.00
18 ton liq. asph., SC-2 (pr. ct.)	30.00	40.00	30.00	50.00	33.00	35.00	50.00
110 ton sand (pr. ct.)	3.00	6.00	6.50	5.00	6.00	4.65	2.00
3,100 ton min. aggr. (R.M.S.)	3.00	2.60	1.65	2.50	2.90	2.80	2.50

(Continued on next page)

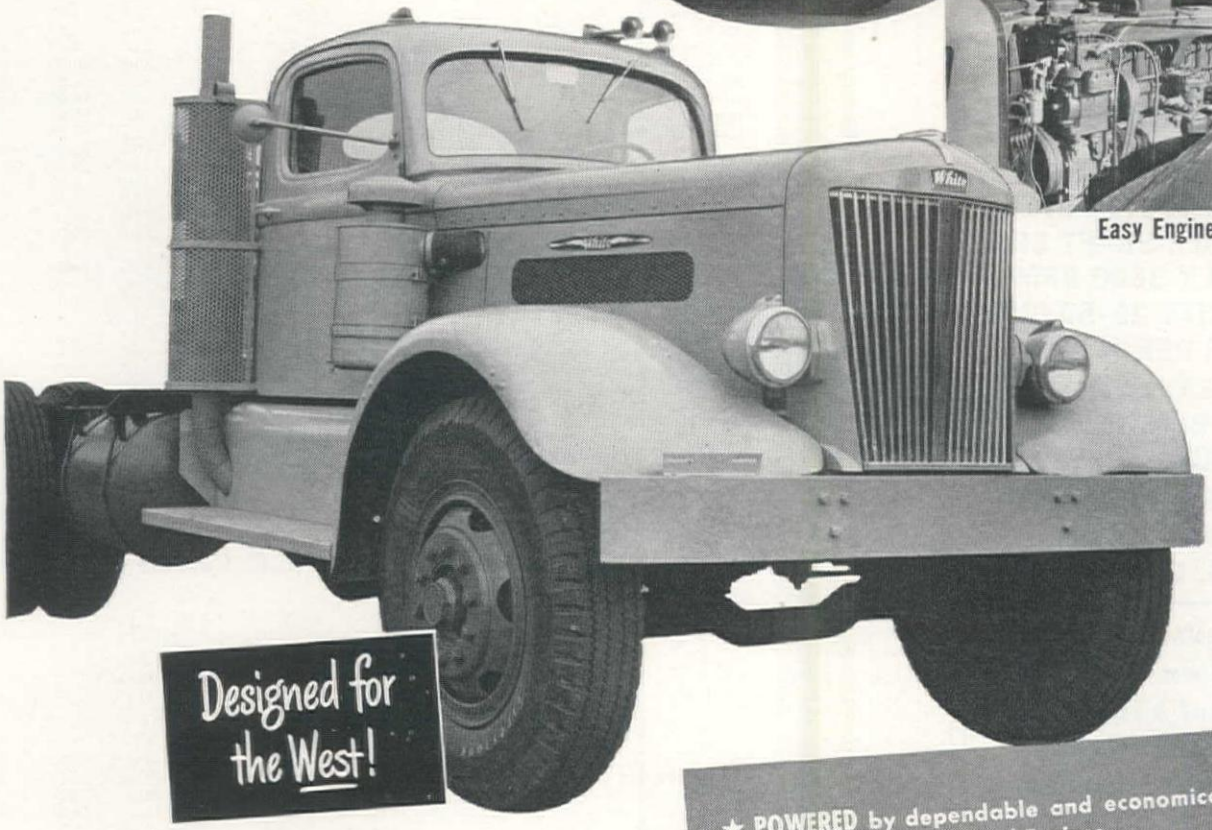
LIGHTNESS *with* DEPENDABILITY

White Diesel Trucks are Miles Ahead!



27½" from Front Axel to Bumper

Easy Engine Accessibility



Designed for the West!

White's traditional use of light-weight high alloy steels and *proven* aluminum units gives you the ideal combination that assures more profitable high pay-load capacities!

White's "Western" Diesels feature special transmissions and auxiliary transmissions that provide additional gear reductions to fit the special requirements of the eleven Western states.

This complete new line of "Western" Diesel Power Trucks, tractors and six-wheelers, have all the quality and proven dependability that has made White's WC Models and 3000 series famous for low operating cost . . . longer truck life . . . low maintenance for EXTRA earning power.

★ POWERED by dependable and economical Cummins Diesel Engines

★ MORE PAYLOAD because of *lighter* weight—better weight distribution

★ POWERFUL and RUGGED for the really BIG JOBS

★ WHITE QUALITY in every feature

White

THE WHITE MOTOR COMPANY

CLEVELAND 1, OHIO, U.S.A.

Pacific Coast Branches and Dealers in all important cities

FOR 50 YEARS THE GREATEST NAME IN TRUCKS

160 ton liq. asph. SC-3 or SC-4 (R.M.S.)	27.00	35.00	28.00	24.75	29.00	30.00	40.00
18,500 sq. yd. mix. and compact. (R.M.S.)	.10	.10	.12	.20	.12	.15	.15
67 cu. yd. P.C.C. (struct.)	100.00	70.00	75.00	60.00	60.00	85.00	75.00
24 ea. right-of-way monuments	4.00	6.00	5.00	5.00	5.00	7.00	5.00
100 lin. ft. metal plate guard railing	3.00	4.00	4.00	4.30	5.00	4.00	3.00
34 ea. guide posts	5.00	6.00	5.00	6.00	5.00	6.00	5.00
22 ea. culvert markers	4.00	6.00	5.00	6.00	5.00	4.50	5.00
1.7 mi. new property fence	$1,250	$1,500	$2,725	$2,220	$2,000	$1,584	$2,000
5 ea. drive gates	27.50	30.00	45.00	50.00	50.00	25.00	30.00
498 lin. ft. 18-in. R.C.P. (std. str.)	2.95	3.00	3.50	3.60	3.75	3.25	3.50
940 lin. ft. 8-in. perf. metal pipe underdrains	2.00	1.80	2.00	2.50	1.50	1.70	1.20
810 cu. yd. filter material	4.80	3.00	3.00	2.50	4.50	3.50	4.00
5 ea. spillway assemblies	32.00	25.00	50.00	25.00	32.00	35.00	30.00
224 lin. ft. 8-in. C.M.P. downdrains (16 ga.)	1.60	2.00	1.60	2.20	1.50	2.00	1.30
60 lin. ft. 18-in. C.M.P. downdrains (16 ga.)	2.90	3.40	4.45	3.70	3.00	3.75	3.00
3 ea. spillway assemb. downdrains slip jts.	32.00	20.00	25.00	25.00	15.50	20.00	20.00
4 ea. redwood covers for drop inlets	7.00	15.00	25.00	31.00	30.00	10.00	12.00
9,000 lb. bar reinforcing steel	.12	.11	.15	.12	.10	.12	.12

California—Los Angeles County—State—Steel

Macco Corp., Paramount, Calif., with a bid of $242,593, was low before the California Division of Highways for construction of a structural steel beam bridge on concrete and treated timber pile bents across Rio Hondo Channel, on Anaheim-Telegraph Road. Unit bids were as follows:

(1)	Macco Corp.	$242,593	
(2)	Oberg Bros. Construction Co.	244,629	
(3)	E. G. Perham	244,997	
(4)	J. E. Haddock, Ltd.	247,786	
(5)	C. B. Tuttle Co.	250,798	
(6)	Griffith Co.	254,153	
—	K. B. Nicholas	257,112	
—	W. J. Disteli	$257,629	
—	Byerts & Sons and Geo. K. Thatcher	259,014	
—	Chas. MacClosky Co.	259,878	
—	Ralph A. Bell	262,350	
—	Guy F. Atkinson Co.	264,524	
—	Carlo Bongiovanni Construction Co.	270,763	

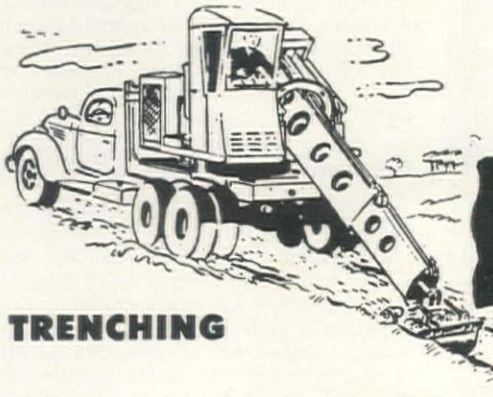
	(1)	(2)	(3)	(4)	(5)	(6)
270 cu. yd. removing concrete	3.50	3.00	4.00	4.25	3.00	3.50
32 sta. clearing and grubbing	14.75	20.00	15.00	30.00	16.00	11.50
9,000 cu. yd. roadway excav.	.45	.40	.40	.57	.59	.55
1,300 cu. yd. struct. excav.	1.15	3.00	5.00	1.50	2.00	2.20
4,000 cu. yd. imp. borrow	.55	.40	.80	.47	.99	.85
5,300 ton imp. subbase material	1.20	2.00	1.75	1.30	1.90	1.26
Lump sum, dev. wat. supply and furn. wat. equip.	175.00	500.00	$1,000	$1,000	300.00	450.00
700 M gal. applying water	2.50	2.00	1.50	1.50	1.00	1.75
32 sta. finishing roadway	6.00	20.00	10.00	10.00	10.00	11.50
3,600 tons untreated rock base	1.60	2.00	1.75	1.60	1.60	1.60
4,800 sq. yd. prepar. mix. and shap. surf. (B.S.T.)	.14	.15	.12	.15	.15	.14
60 ton liq. asph., SC-3 (B.S.T.)	21.00	18.00	17.00	15.00	20.00	15.00
12 tons liq. asph., SC-2 (pr. ct. and pen. tr.)	24.00	30.00	24.00	35.00	30.00	29.00
3,100 ton min. aggr. (dense graded P.M.S.)	3.50	3.25	3.40	3.00	3.10	3.00
370 ton min. aggr. (open graded P.M.S.)	3.50	3.25	3.40	3.40	3.10	3.50
190 ton paving asph. (P.M.S.)	13.50	18.00	17.50	17.50	16.00	14.00
15 ton asphaltic emuls. (pt. bdr. and sl. ct.)	33.00	40.00	38.50	45.00	35.00	42.00
121 M.f.b.m. Douglas fir tim. (brac'g, caps, sheathing and deck	230.00	190.00	175.00	210.00	224.00	210.00
17 M.f.b.m. timber railing	373.00	450.00	400.00	435.00	395.00	430.00
880 cu. yd. Cl. "A" P.C.C. (struct.)	36.00	42.00	35.90	40.00	31.00	36.00
996,000 lb. structural steel	.08	.08	.0713	.085	.085	.088
5,720 lin. ft. furn. tr. timber piling	1.05	1.10	.90	1.12	1.00	1.15
4,080 lin. ft. furn. conc. piling	3.25	2.40	3.50	2.60	3.30	2.65
250 ea. driving piles	30.00	32.00	60.00	33.00	37.00	34.00
1,052 lin. ft. metal plate bridge railing	7.15	6.50	3.00	5.60	6.80	6.50
120 lin. ft. metal plate guard railing	4.00	3.00	2.85	2.50	3.00	3.50
4 ea. instal. metal culv. mkrs. and clear. mkrs.	6.90	5.00	5.00	2.75	5.00	5.00
20 lin. ft. 18-in. C.M.P. culv. (16 ga.)	2.75	8.00	5.00	2.65	2.80	2.60
480 lin. ft. 36-in. C.M.P. culv. (12 ga.)	6.50	7.00	10.00	6.00	7.40	6.70
480 lin. ft. salv. exist. pipe culv.	.60	1.00	1.00	.70	.50	.90
116,000 lb. bar reinforcing steel	.08	.075	.075	.075	.08	.083
Lump sum, remov. exist. bridge	$8,700	$5,000	$12,000	$9,000	$9,000	$12,800

California—Kern County—State—P.C.C. Pavement

N. M. Ball Sons, Berkeley, California, with a bid of $753,794, was low before the California Division of Highways for construction of 5.6 mi. of highway between 0.6 mi. south of McKittrick Road and Hoskins Road, to be graded and paved with P.C.C. pavement on cement treated subgrade. Unit bids were submitted as follows:

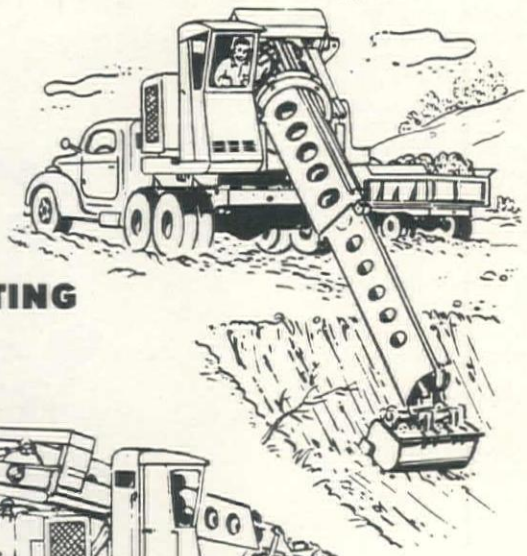
(1)	N. M. Ball Sons	$753,794	
(2)	Guy F. Atkinson Co.	786,122	
(3)	Griffith Co.	788,570	
(4)	Fredrickson & Watson Const. Co.	$841,385	
(5)	Matich Bros. and K. & H. Co.	874,458	
(6)	J. E. Haddock, Ltd.	877,195	

	(1)	(2)	(3)	(4)	(5)	(6)
75 cu. yd. remov. conc.	6.00	4.30	6.00	5.00	10.00	5.00
28,000 cu. yd. remov. pavement	.50	1.45	1.50	2.00	2.25	2.00
Lump sum, clearing and grubbing	$2,000	$1,875	$2,000	$13,000	$5,000	$5,000
130 each removing trees	120.00	52.00	40.00	70.00	58.00	30.00
82,000 cu. yd. roadway excav.	.45	.42	.50	.42	.55	.45
200 cu. yd. struct. excav.	2.00	2.20	2.25	2.90	2.50	1.75
300,000 sta. yd. overhaul	.006	.005	.0025	.005	.005	.004
175,000 sq. yd. compact. orig. ground	.04	.025	.025	.05	.04	.03
60,000 sq. yd. imported borrow	.63	.71	.75	.70	.70	.74
Lump sum, dev. wat. sup. and furn. wat. equip.	$1,000	$3,250	$6,000	$6,000	$9,500	$7,000
13,250 M gal. applying water	1.20	1.25	1.35	1.00	1.60	1.25
297 sta. finishing roadway	10.00	9.25	9.00	10.00	15.00	15.00
174,000 sq. yd. mix. and compact. (cem. tr. subgrade)	.19	.17	.20	.18	.28	.175
7,000 bbl. Portland cement (cem. tr. subgrade)	3.62	2.80	3.24	3.83	4.00	3.25
2,300 ton untreated rock base	2.00	1.75	2.65	2.00	2.00	3.60
60 ton liq. asph. SC-2 (pr. ct.)	18.00	17.50	20.00	16.00	20.00	25.00
185 ton asph. emuls. (sl. ct. and cur. sl.)	33.00	37.00	40.00	30.00	37.50	50.00
11,500 ton min. aggr. (P.M.S.)	3.00	3.85	3.45	4.00	4.10	4.10
600 ton paving asph. (P.M.S.)	16.00	15.50	13.75	15.00	15.75	19.00
2,050 cu. yd. P.C.C. base	11.00	10.25	11.25	11.30	13.90	13.50
36,750 cu. yd. P.C.C. pavement	11.00	10.85	10.65	11.55	10.90	12.40
26,000 ea. pavement tie bolt assemblies	.50	.46	.55	.48	.60	.60
75 cu. yd. class "A" P.C.C. (struct.)	50.00	76.00	35.00	69.00	70.00	60.00
4,100 lb. bar reinf. steel	.09	.09	.12	.11	.14	.12
1,850 cu. yd. P.C.C. (curb and gutters)	30.00	40.00	35.00	31.50	35.00	31.00
310 ea. curb dowels	.32	1.00	.60	.60	1.00	1.00
40 ea. right-of-way monuments	5.50	6.00	6.00	5.00	6.00	7.00
22 ea. centerline monuments	8.00	6.00	6.00	5.00	12.00	9.00
11 ea. manhole frames and covers	15.00	20.00	32.00	23.00	20.00	22.00
44 ea. instal. met. culv. markers and monu. markers	2.50	5.00	3.00	5.00	3.00	1.50
225 ea. instal. met. guide posts	3.25	4.00	3.50	5.00	4.00	1.85
54 ea. horizontal reflector units	7.50	10.00	7.00	10.00	9.00	7.25
348 lin. ft. 24-in. x 6⅜-in. part circle cor. metal culv. (8 gauge)	3.00	2.80	2.50	3.50	5.00	2.65
440 ea. Parkinsonia trees	3.00	1.50	2.25	3.00	3.00	2.00



TRENCHING

DO IT ALL WITH GRADALL!



EXCAVATING

SNOW REMOVAL

GRADING

PAVEMENT REMOVAL

Several machines in one!

Little wonder that this versatile machine is called the *Multi-Purpose* Gradall Construction Machine! It does the work of several one-purpose machines. For instance, in pipe line work it digs the trench, lays the pipe and backfills to complete the job.

Operated by power hydraulics, the boom can be extended or retracted, lowered or raised, tilted each way from horizontal, and rotated on a horizontal plane. The rotating platform is mounted on a pneumatic tire engine-driven chassis.

Tools for various applications are attached to the boom, and are quickly interchangeable . . . only a few minutes to change over.

So whatever your jobs in the construction field may be, chances are you can handle them with a Gradall! See your Gradall distributor for full details.

Read this City Engineer's Comments About the Gradall!

"We have had a Gradall since February of last year and have been very much pleased with it. We have found it to be the most versatile machine that the City has, and we have kept it busy practically all the time. We have used it digging ditches, cutting grades for curbs and gutters, digging up trees, and numerous other types of work.

"It is my honest opinion that this machine will do more different things than any machine I have ever seen."

J. G. BEACHAM
City Engineer
City of Athens, Georgia

Gradall®
DIVISION OF
WARNER & SWASEY
Cleveland

GRADALL—THE MULTI-PURPOSE CONSTRUCTION MACHINE

NEW EQUIPMENT

MORE COMPLETE INFORMATION about any of the new equipment or products briefly described on the following pages may be obtained at no charge. Send your request to Equipment Service, Western Construction, 609 Mission St., San Francisco 5, Calif. For quicker service, designate items by number.

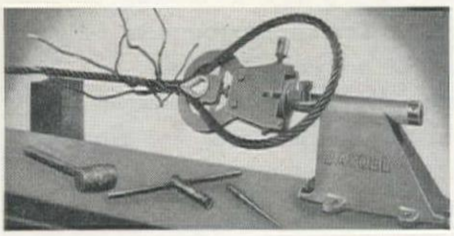
701

Wire Splicing Machines

Manufacturer: Quay Industries, Washington, D. C.

Equipment: Wire rope splicing machine, Jacoel No. 9 tool.

Features claimed: A saving of plant space and man hours is effected with the use of



this tool, due to the simplicity of design, light weight and ease of operation compared to the standard riggers' vise. Weight of the standard riggers' vise is approximately 300 lb., as compared to 75 lb., the weight of the Jacoel No. 9. Splicing operations for ½ to 1-in. cable, using the standard riggers' vise, require 3 to 4 employees, as compared to 2 employees operating Jacoel tools in less time. The No. 9 splicer can be adapted to handle from ⅜ to 1¼-in. wire rope. All these machines are fitted with a resistance regulator which aids them in overcoming cable torque.

702

Mobile Tractor Loader

Manufacturer: Mixermobile Manufacturers, Portland, Oregon.

Equipment: Wagnermobile Duo-Way Scoop, with hydraulically controlled track and dozer blade.

Features claimed: The heavy duty Duo-Way has an 84-in. dozer blade at one end and a 1-cu. yd. scoop at the other. Side saddle seating arrangement serves as a means of providing unobstructed visibility for operations at either end. Powered by an industrial 114-hp. engine, it has 4 speeds in either direction, and highway speeds up to 20 m.p.h. A special tilt control tract tilts 10 deg. backward or forward for easier loading and better balance. The top section of the tract folds down for low road clearance.

703

Concrete Cutter

Manufacturer: Felker Manufacturing Co., Torrance, Calif.

Equipment: DI-MET Standard Model Concrete Cutter, powered by a 7.5-hp. Wisconsin air-cooled gasoline engine.

Features claimed: This machine uses a 12-in. diamond wheel, mounted on either the right or left end of the spindle, which cuts to a depth of 3½ in. The diamond

wheel can be lowered readily to proper cutting depth by means of a manually operated worm and gear, or when cutting is not required, the worm gear lifts the diamond wheel completely clear of the work. A 15-gal. tank supplies water to the blade when other sources are unavailable. Pressurized water may be supplied from mains or tank trucks through a hose to an independent water connection. Valves are provided which shut off the 15-gal. tank supply when water is furnished through a hose. Jets force the water stream against the blade sides to insure proper cleansing and cooling.

704

Light and Medium Duty Trucks

Manufacturer: Federal Motor Truck Co., Detroit, Mich.

Equipment: The Style Liner, equipped with outstanding features for comfort and accessibility.

Features claimed: The cab, 66½ in. wide at shoulder height and 77 in. wide at the bottom, is of all-steel welded construction with a 1-piece top. A 1-piece, bent safety plate glass windshield increases driver vision 60%. Corner support posts are stronger and narrower. Cab seats are 59 in. wide. The cab has two screened top ventilators and double seal insulation for all-weather protection. Sheet metal is constructed as an integral unit and rubber mounted on the frame to prevent transmitting of frame shocks into the structure. Floating ride construction of the cab, cowl, fenders, hood and radiator as a single unit

eliminates distortion from frame twisting and road shocks. Federal's swing-lift fenders offer greater accessibility to the engine. Front fenders are designed to raise on a concealed hinge simply by releasing a clasp. Elimination of fender obstruction and large side-lift hood permits the operator or mechanic to get at working parts without special tools or appliances. Fender splash shields can be easily removed in minutes. The radiator core can be removed in less than 10 min. The Style Liner series feature a wider track front axle and shorter wheelbases for shorter turning radius. All radiator units are assured ample cooling under severe operating conditions, and quick warmup is assured for cold weather operation.

705

Portable Crusher

Manufacturer: Austin-Western Co., Aurora, Ill.

Equipment: Austin-Western 61 portable crushing and screening plant, single-pass type.

Features claimed: The Austin-Western 61 is designed for fast, economical production of crushed rock or gravel where ex-

treme accuracy in grading to size is not required. This compact, adaptable unit is specially suited to the maintenance needs of town and county road departments. The lightweight and readily portable model 61 can be quickly moved to any location to simplify hauling problems. Simple design and sturdy construction keep operating and maintenance costs at a minimum.

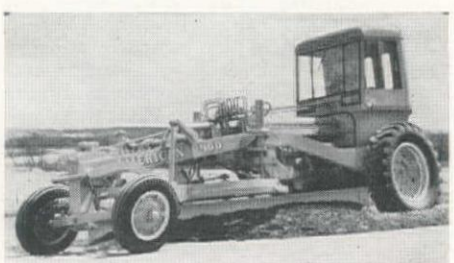
706

Motor Grader

Manufacturer: American Road Equipment Company, Omaha, Neb.

Equipment: American Model 900 hydraulically-operated grader powered by a 50-hp. Minneapolis-Moline gasoline engine.

Features claimed: This machine has power and speed enough to perform every maintenance job. A large 12-ft. blade de-



signed for greater angularity and pitch makes it possible to cut 3-ft. ditches with proper slicing, not bulldozing, action. A 16-ft., 4-in. wheelbase, plus large hydraulically controlled circle, gives rigid support and holds blade to a smooth, steady cut that eliminates "washboarding." Every operation of the American 900 can be instantly and accurately controlled by self-

centering control levers in the cab. Optional equipment may be installed to increase the versatility of Model 900: a 9-tooth scarifier, material handling buckets, bulldozer, V-type snow plow, reversible snow plow, hi-lift loader, and snow bucket. The No. 900 was designed for township, municipal, and county road construction and maintenance. It meets maintenance requirements of state highway departments.

707

Form Stake

Manufacturer: Rockford Bolt & Steel Co., Rockford, Ill.

Equipment: Saber Stake, made of 1⅛-in. round steel, measures 48 in. in length and has a forged steel point.

Features claimed: Saber Stakes can be driven into rocky, hard frozen ground, macadam or black top paving to any desired height. The 2 x 4-in. carrier located near the top of the stake has a hole in the handle so that a 2 x 4 can be spiked into a firm, solid position.

708

Two-Way Mobile Radio

Manufacturer: Motorola, Inc., Chicago.

Equipment: Uni-Channel Sensicon Dispatcher, an FM 2-way mobile radio unit.

Features claimed: Available for operation in the 25-50 megacycle or the 152-174 megacycle land mobile service bands, the Uni-Channel was designed to provide full adjacent channel operation as well as economic protection in the event of FCC split-channel allocations, for which the unit offers easy and inexpensive adaptation. Primary power sources range from 6-volt DC or 117-volt AC.

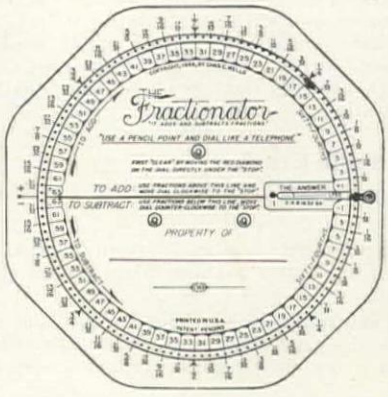
709

Pocket Adding Machine

Manufacturer: Charles E. Wells, Montrose, Calif.

Equipment: The "Fractionator," which automatically adds all fractions up to 32nds whose denominators are divisible by 4, and converts results directly into decimals.

Features claimed: It is merely necessary to select the fractions to be computed on



the outer edge of the calibrated circle and dial the answer as one would a telephone number. The Fractionator, which is made of cardboard and fits in the palm, is accurate up to 6 figures.

710

Electrodes with AC-DC Coatings

Manufacturer: Stoody Co., Whittier, Calif.

Equipment: Stoody hard-facing electrodes with AC-DC coatings with graphite-type base.

Features claimed: These additions to the Stoody electrode line are differentiated from the old type by the term AC-DC. The graphite type base of the new coatings eliminates slag interference and produces an exceptionally stable arc. The rods impart unmatched wear resistance to earth-working and scraping equipment, particularly on thin or small sections.

711

Building Block

Manufacturer: Hydro-Forged Stone Associates, Inc., Cleveland, Ohio.

Equipment: Interlocking building block made entirely from waste materials.

Features claimed: The building block resembles cut stone, granite or marble, and is made in a patented tongue and groove design with tolerances of five one-thousandths of an inch. When laid, these molded stones lock snugly into each other to form a wall of high strength. In order to insure against seepage of moisture, a mastic material, applied with a hand-operated gun, is spread on the grooves as the blocks are assembled.

712

Non-metal Valve

Manufacturer: United States Rubber Co., New York, N. Y.

Equipment: Rubber pinch valve, with mechanism, retaining rings and pinch valve body in one unit.

Features claimed: This valve will outwear metal when installed in pipelines carrying abrasive or corrosive mixtures. Its flexibility will offset misalignment in pipes. No packing or repacking is required. It absorbs vibration, eliminates "water hammer," and affords a positive seal in the

closed position. Its metal parts can be refitted to new valve bodies thereby reducing replacement costs, and it will break up galvanic action in metal lines.

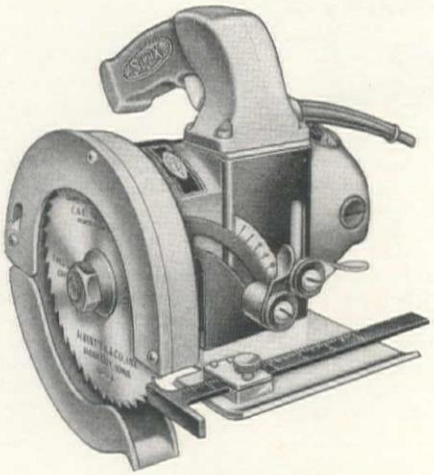
713

Hand Saw

Manufacturer: Albertson & Co., Sioux City, Iowa.

Equipment: Electric hand saw of 2-in. capacity.

Features claimed: Included in the saw's aluminum alloy steel body are helical gear



drive, permanent lubrication, perfect balance, light weight, angle and depth adjustments. The saw blade is of 6¼-in. diameter; base adjustment, vertical 0 to 2-in.; bevel cuts, 0 to 45 deg., with a depth of 1⅜ in. The 115-volt motor (8 amperes, AC-DC) has a free speed of 5300 r.p.m. Other features include a blower which keeps the cut free of sawdust, and an adjustable rip scale guide graduated to fractions of an inch.

714

Scaffolding Clamps

Manufacturer: Acrow, Inc., New York City, N. Y.

Equipment: Four types of aluminum alloy scaffold clamps and pipes, known as Acrominum.

Features claimed: Although of lightweight aluminum, these scaffolding clamps have a load capacity at least equal to that of steel. Scaffolding erection costs are reduced by 30%; transportation costs by 65.2%. Maintenance costs are reduced, due to the rust-proof quality of the clamps.

715

Electrode Holder

Manufacturer: The Lincoln Electric Co., Cleveland, Ohio.

Equipment: Lincoln LJ-1 insulated electrode holder.

Features claimed: This small size holder combines the advantages of both tong and hole type holders in providing a strong, lock-jaw electrode grip, yet easy thumb pressure electrode release. The tip of the jaw end of the holder is covered with a new, high temperature-resistant, asbestos base compound which is highly flexible. The tip cannot be broken by the impact or shock of dropping or crushing. The tip will also resist the abrasion of rubbing against metal as well as the wear caused by weld spatter. Weld spatter will not adhere to it. Because of its flexibility, the molded tip can be formed to cover the end of the holder completely, thus giving full insulation. The electrode is held close to the end

of this tip so that the holder can be worked in close quarters without danger of grounding. The handle and jaw lever arm are also completely insulated, covered with a tough, high temperature fibre.

716

Pick-up Dump Conversion

Manufacturer: Hercules Steel Products Corp., Galion, Ohio.

Equipment: Engine-driven low-mount Tipster, an accessory for converting ½-ton, ¾-ton, and 1-ton pickups into dump trucks.

Features claimed: Main elements of the Tipster are: a clutch-type, fan-belt powered, Hydra-Clutch pump, operated only when dumping; steel understructure for mounting under the pickup body; and twin cylinder hydraulic hoist rams. Rapid unloading can be handled from the cab of the truck since the Hydra-Clutch is operated by a single finger-tip dashboard control. The entire unit weighs about 400 lb. and can be inexpensively and quickly installed.

717

25-Ton Cranes

Manufacturer: Thew Shovel Co., Lorain, Ohio.

Equipment: Two Moto-Cranes, operating on Lorain 50 Series turntables and capable of working with 130 ft. of boom.

Features claimed: The turntable of these machines has hydraulic coupling power take-off which includes a plate type disengaging clutch which permits disengaging and stopping all mechanism for lubrication or adjustment without stopping the engine. The hydraulic coupling permits smooth and precision throttle control of hoisting and lowering. Both carriers have carrier frames which are designed specifically for shovel and crane use. They are powered by 6-cylinder, 200-hp. gasoline engines. The engines have 10 forward speeds, 2 reverse. A through drive between axles provides maximum traction at all times, as torque is always transmitted to the axle having tractive effort. There is complete interchangeability of booms on the Moto-Cranes. Various center sections available permit extension of the main boom to 100-ft.

718

Portable Crushing Plant

Manufacturer: Universal Engineering Corp., Cedar Rapids, Iowa.

Equipment: Gravel-King addition to TwinDual crushing plant series.

Features claimed: The TwinDual Gravel-King features 3 stages of crushing with scalping screen feed. A pre-screening operation sizes and removes natural sand and gravel. Large boulders usually rejected in ordinary gravel operations are scalped to the large opening primary. Material requiring secondary reduction is by-passed to the TwinDual Roll Crusher for the second and third stages of crushing. Finished material from the scalping screen can either be blended with crushed material from the plant, or 100% chips can be produced. The plant is also designed for conversion to quarry operation in the field. An apron feeder is interchangeable with the scalping screen for quarry rock.

length. Tip extensions can further extend the boom to a maximum 130-ft. length. Two lengths of shovel booms of 21 ft. or 19 ft. in length are available. Each is equipped with a shovel dipper of 1 cu. yd. capacity. Turntables may be mounted on either of two carriers: a wide track model, with a 3-axle carrier, 118-in. overall width over rear tires, with driving power applied to the two rear axles as a 6 x 4, or an optional front driving axle to make the model a 6 x 6.

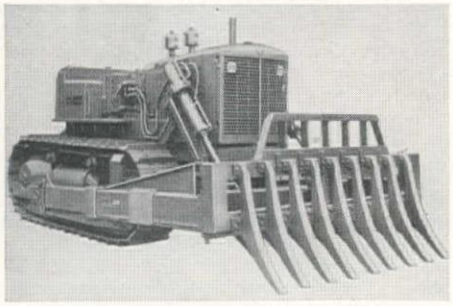
719

Bulldozer Attachment

Manufacturer: Baker Manufacturing Co., Springfield, Ill.

Equipment: The Root Ripper, consisting of nine teeth, securely bolted to horizontal cross members, which are rigidly tied together by brackets for quick attachment to the bulldozer or gradebuilder frame.

Features claimed: Designed for general land clearing operations, the Root Ripper



may be purchased as an interchangeable attachment for cable and hydraulic bulldozers and gradebuilders, or as a complete machine. It is recommended for removing and piling brush, roots, rocks or boulders. Teeth are one-piece steel castings, correctly curved to produce a rolling action to material handled so that dirt is shaken loose and filtered between the teeth.

720

Welding Transformer

Manufacturer: A. O. Smith Corp., Milwaukee, Wis.

Equipment: 400-Ampere welding transformer, Model 400E.

Features claimed: With a welding range of 70 to 585 amperes the Model 400E is the first welder in the low cost field to retain the full 75-volt open circuit voltage. Fan motor and capacitators of the 400E are easily accessible for maintenance through the hinged door at the front of the machine. An industrial type heavy-duty motor and fan blade provide high-velocity air to clean and cool the coils.

721

Generators for Remote Location

Manufacturer: Fairbanks, Morse & Co., Chicago, Ill.

Equipment: Generators, 3 and 5 kw., for belting to any power unit or tractor whenever power is needed.

Features claimed: These generators were designed for use in emergency service and service in remote areas. Type HF synthetic enameled wire is used in the winding of both the armature and field coils, and the wires are further impregnated with insulating varnish, oven-baked. All windings are finally covered with Glyptal to make them completely moisture-proof. Ventilation openings are screened against mice, rodents or snakes. Two Twistlock receptacles are furnished with the 3-kw. units and three with the 5-kw. units. A convenient slide rail also makes it possible to adjust the belt tension after the tractor or power unit has been spotted in place.

722

High Strength Electrodes

Manufacturer: Arcos Corp., Philadelphia, Pa.

Equipment: Three Tensilend low hydrogen welding electrodes.

Features claimed: Sound welds can be produced in less time by the elimination of preheat, even in below-freezing temperatures, through use of these high-strength steel electrodes. Three grades are being introduced: Tensilend 70 with a typical tensile strength of 70,000 p.s.i.; Tensilend 100 for steels in the 100,000-p.s.i. class; and Tensilend 120 for 120,000-p.s.i. steels. Tensilend 70 with its stainless type coating and high tensile weld deposits can also be used to weld high carbon steels.

723

V-Belts

Manufacturer: Goodyear Tire & Rubber Co., Akron, Ohio.

Equipment: Super-rated V-belts, named HY-T.

Features claimed: The HY-T belt contains a chemically produced fibre of extremely high strength, low-stretch and excellent shock absorbing qualities. The new synthetic cord is also water and mildew resistant. The fibre's strength enables this belt to handle 40% more horsepower than standard multi-v-belts without excessive stretch. Materials forming the outside

covering of the HY-T belt have been treated with a mildew inhibiting agent.

724

Saw Power Unit

Manufacturer: DeWalt, Inc., Lancaster, Pa.

Equipment: Model GS power machine and revamped cabinet unit.

Features claimed: The basic unit is mounted on a light but firm pressed steel cabinet, weighing 115 lb. Saw unit, table and table base can be removed from the cabinet, permitting the machine to be used as a portable power saw. Model GS DeWalt is equipped with a ½-hp. motor, can cut 2-in. thick material, cross-cut 12 in. wide and rip to the center of a 43-in. panel. It can perform straight and bevel ripping, ploughing, grooving, tenoning, sanding, dadoing, light metal cutting, mitering.

725

Safety Innersole

Manufacturer: Rubberhide Company, Inc., Trenton, N. J.

Equipment: Safety innersole, consisting of a leather innersole, a special spring steel plate and rubber frictioned cotton duck, fastened with a special cement under heavy pressure.

Features claimed: This innersole is puncture proof and is designed to fit into any conventional work boot or shoe.

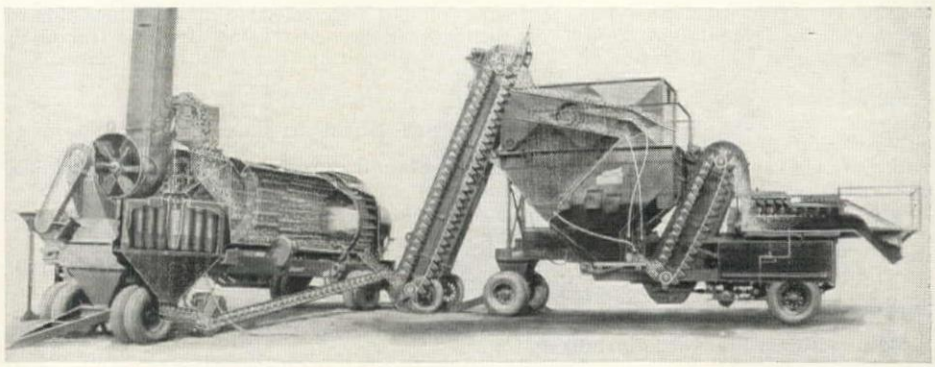
726

Motor Speed Control

Manufacturer: Stratton Equipment Co., Cleveland, Ohio.

Equipment: Stratton Hydro-Throttle Control, an automatic motor speed control for use on trucks equipped with power take-off.

Features claimed: This control mechanism is simple and foolproof in operation. Pressure from the P.T.O. pump, or its equivalent, automatically actuates the piston in the Hydro-Throttle control; thus, as pressure from the power source increases to lift a load, the piston is forced into action to speed the engine to the proper r.p.m. As the load is stopped or the pressure is reduced, due to varying conditions, the throttle instantly and automatically returns the engine to idling speed. Unnecessary racing of the motor is thus eliminated. The valve is preadjusted at



727

Portable Asphalt Plant

Manufacturer: Pioneer Engineering Works, Inc., Minneapolis, Minn.

Equipment: All-electric Model 51 Continuflo Central-Mix Asphalt Plant, consisting of two main units.

Features claimed: No erection work is involved in setting up this 50 to 70 ton-per-hour plant. Units are merely pulled or backed into place and are ready to go as soon as piping is attached. Either a steam atomizing or an air atomizing burner are available. With the latter, no steam is required at the drier. It is not necessary to shut down the mixer to allow the empty trucks to pull in for loading. All motors are controlled from two push-button stations, one on the mixer platform, the other at the base of the drier. Motors are all totally enclosed, fan cooled, ball bearing, high starting torque. Shaft, gear, sprocket and chain drives are reduced to a minimum. Where chain drive is used, sprockets are cut steel and chain is steel high speed roller type.

installation thus making it impossible to overpower or otherwise develop more motor speed than is actually required to produce sufficient power for the load being handled.

728

Cement Testing Table

Manufacturer: American Instrument Co., Inc., Silver Spring, Md.

Equipment: Motor-driven flow table, 10-in. diameter, for testing the consistency of Portland cement.

Features claimed: Meeting the latest specifications of the A.S.T.M., the complete apparatus consists essentially of the latest

design of flow table, motor drive, and bracket for mounting on a concrete pedestal. The motor drive and its mounting bracket may be purchased separately for attachment to manually-operated flow tables already in use, if the tables meet A.S.T.M. specifications. The motor drive transmits motion to the shaft of the flow table by means of a multi-jaw coupling which compensates for minor misalignment in set-up and provides a positive, torsionless drive.

729

Headrest Goggle

Manufacturer: American Optical Co., Southbridge, Mass.

Equipment: Headrest goggle with free-floating headgear and ventilated, indirect side shields.

Features claimed: With a twist of a knob the free-floating headgear adjusts the goggle to the wearer's head size. This goggle, which is designed for use by gas welders, cutters, burners, brazers and furnace men, may be obtained with either Noviweld or Noviweld-Didymium lenses in several shades.

730

Center Dump Semi-Trailer

Manufacturer: Omaha Standard Company, Council Bluffs, Iowa.

Equipment: Improved trailer with dump doors.

Features claimed: Light weight and compliance with bridge and axle laws are attributes of the Omaha Standard trailers. The equipment is used for spreading or dumping of bulk material. An adjustable latch mechanism, mounted in protected position on the side of the body, allows the operator to pre-set the opening of the dump doors anywhere from 4 to 36 in., to provide an even, metered flow of material while dumping. Main frame members pass outside the hopper, leaving it clear of obstructions and interior bracing, preventing any tendency of the load to bridge or clog.

Body side walls are braced with bridge-type trusses of angle iron the length of the trailer for maximum strength, rigidity, and light weight.

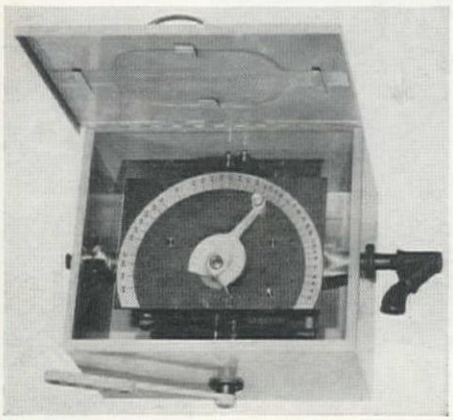
731

Air-Entraining Dispenser

Manufacturer: Techkote Co., Inglewood, Calif.

Equipment: Techkote Mach automatic dispenser for air-entraining agents.

Features claimed: The dispenser operates by passing the liquid agent through a bag



which is alternately opened and closed at top and bottom by a tripping mechanism. This release can be actuated either by hand, or by mechanical means in connection with the water discharge to the concrete mix. The quantity discharged can be easily dialed in units of ounces. It is significant that in the dispenser no internal moving parts are working in the air-entraining agent; there are no air vents, no pistons, no packing glands or nuts; there is no gumming, and no lubrication is required. Quantity desired is selected instantly and accurately with a range of 3 to 40 oz. The dispenser has a fast rate of discharge: it empties out 40 ounces in 5 seconds. All of the working parts are made of stainless steel. Other metallic parts are treated for prevention of corrosion and rust. The bearings are of Oilite Bronze.

732

Light, Small Fuel Pump

Manufacturer: Cummins Engine Co., Inc., Columbus, Ind.

Equipment: Double-disc fuel pump for Cummins diesels.

Features claimed: Lighter weight and smaller size facilitates the installation and maintenance of the new pump and further reduces the overall weight of Cummins diesels. Now offered as standard equipment on the 300-hp. model NHRS-600 and 275-hp. model NHS-600 Cummins diesels, the DD pump also is available as optional equipment on other Cummins models. Design of the DD pump enables unit replacement of the fuel pressure pumps, distributor discs, and governor assembly without removal of the pump from the engine. Alignment in the servicing of the pump is minimized since all parts and the bearings in which they rotate are included in the same housing. Design of the DD pump largely eliminates angular stress on governor and throttle linkage which, in turn, reduces excessive wear on bearings and bushings.

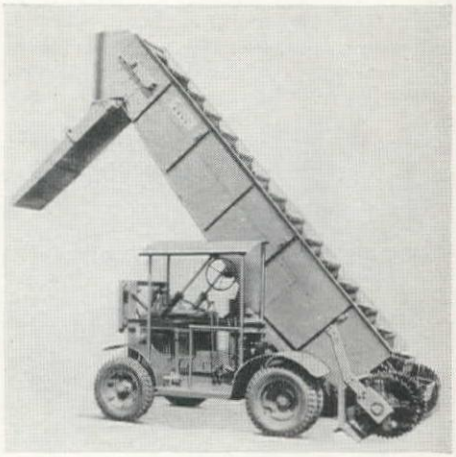
733

Bucket Loaders

Manufacturer: N. P. Nelson Iron Works, Inc., Clifton, N. J.

Equipment: Two heavy-duty bucket loaders: Model P-11, mounted on wheels; Model Q-11, on crawlers.

Features claimed: Both of these machines handle any loose material up to 3-in. cube,



either from stock piles or bank run sand and gravel pits. Rated loading capacity is 3 to 4 cu. yd. per minute, max. weight of 150 lb. per cu. ft. Supplementary features in the P-11 and Q-11 are wear-resistant manganese steel bucket chains, sprockets, bucket edges and spiral feeder edges; more powerful engine and larger Twin-Disc clutches with double roller chain transmis-

sion drive. The hoist has dual double-acting cylinders. The compact 2-in-1 transmission and differential is encased in a single oil-filled housing.

734

Hand Lamp

Manufacturer: U-C Lite Manufacturing Co., Chicago, Ill.

Equipment: Big Beam Junior, Model No. 111 portable electric hand lamp, powered by one standard 6-volt lantern battery.

Features claimed: A unique combination of 4-in. lamphead, parabolic reflector, bulb

and heavy glass convex lens gives a powerful brilliant spot or spread light anywhere at any time. Lamp-to-battery contacts are pressure type and permit battery replacement in 10 sec. The battery case with its hinged cover made of 20-gauge steel is weatherproof and rustproof. Weight of the lamp is 48 oz. with battery.

735

Tilting Platform Trailers

Manufacturer: La Crosse Trailer Corp., La Crosse, Wis.

Equipment: Three tandem-axle semi-trailers with tilting platforms, in 13, 16 and 20-ton capacities.

Features claimed: Easily loaded and unloaded quickly by one man, without use of skids or blocks, the new trailers are oper-

ated in the following manner: Unlock safety catch to tilt platform; drive equipment onto platform, which automatically returns to level position; lock catch; secure load. For unloading, the procedure is reversed. Two double-acting hydraulic cylinders cushion the 96-in. wide trailer platform, while it is being tilted with or without load. A pair of chains prevent the cylinders from becoming over-extended during

tilting. The new 13 and 16-ton tilting trailers come equipped with standard lunette for towing behind any heavy-duty truck with standard pintle hook. All three tandem axle tilt trailers are equipped with walking beam axle supports to provide maximum oscillation of each wheel, for equal load distribution on any type load.

736

Improved Tractor Shovel

Manufacturer: Frank G. Hough Co., Libertyville, Ill.

Equipment: Model HF ¾-cu. yd. Payloader tractor shovel.

Features claimed: Included in the improvements on the Model HF Payloader

are: greater engine horsepower, greater built-in tractor effort, more digging power, faster speed ranges and increased stability and balance. Four forward speeds, from 2.4 to 19.5 m.p.h., and four reverse speeds, from 3.5 to 28.7 m.p.h., are provided in the full-reversing transmission. The exterior has been restyled so that the entire unit has a cleaner, more efficient appearance.

737

Air-Cooled Generator

Manufacturer: Anderson-O'Brien Company, Los Angeles, Calif.

Equipment: New Power-Pack generator set.

Features claimed. This small air-cooled generator is an addition to the Power-Pack line of generator sets. The unit is being manufactured in 2 ratings, the 1,250-watt, designated at Model GAP 2361, and a 2,500-watt model designated as Model GAP 2363. The generator is powered by the Wisconsin line of engines.

738

Portable Air Compressors

Manufacturer: Worthington Pump and Machinery Corp., Holyoke, Mass.

Equipment: Air-cooled compressors with 30-cu. ft. capacity at 100-lb. pressure; maximum operating pressure, 150 lb.

Features claimed: These Blue Brute compressors are ideal for agricultural spraying and trenching as well as for large and small contractor use for light-weight digging, breaking, tamping and inflation of large tires. Powered by a hand-cranked, air-cooled gasoline engine, the compressors have Worthington's patented feather valve, suction valve unloading, and are designed for easy maintenance. They are equipped with airmaze oil bath cleaners and standard ASME air receivers.

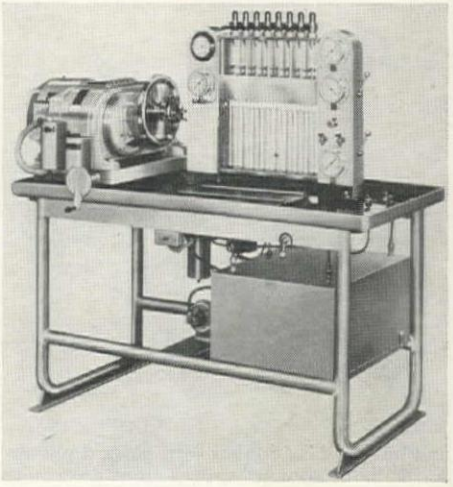
739

Fuel Pump Repair Stand

Manufacturer: Automotive Products, Inc., Portland, Ore.

Equipment: AP 3200 calibrating stand, a self-contained unit for calibrating, testing and adjusting fuel pumps.

Features claimed: With the use of adapters, nearly every pump made can be



accommodated by this calibrating stand. Pumps and governors can be completely set to exact factory specifications. It is used by fleet owners, repair shops and others who do extensive repairs and adjustments on diesel fuel injection pumps.

NEW LITERATURE

YOU MAY OBTAIN any of the publications reviewed below. Send your request to Western Construction, 609 Mission St., San Francisco 5, Calif. The literature is free, unless otherwise indicated. Please designate the desired items by number.

★★★★★★★★★★★★★★★★★★★★★★★★★★

740

COMBINATION TRACTOR-COMPRESSOR AND DRILL—**Le Roi Company,** Milwaukee, Wis., describes the 105 Tractair Mobildrill in its bulletin entitled "Drive Your Light Wagon Drill and Compressor." The bulletin shows the combination tractor-compressor and light wagon drill in action and gives complete specifications and dimension data. A table indicates the relative cost of the Tractair Mobildrill, compared with separate specialized pieces of equipment necessary to duplicate the work of the tractor-compressor-wagon drill. A separate case history write-up tells the story of "One Day's Drilling Completed In Just Two Hours," a sequence of operations in drilling a pattern for agricultural limestone quarry.

741

DIESEL TRACTOR — A complete story of the Caterpillar D8 Diesel Tractor is told in a 32-pg. illustrated booklet entitled "Caterpillar D8 Diesel Tractor," by **Caterpillar Tractor Co.,** Peoria, Ill. Featured in the booklet is the D8's ability to get things done effectively, efficiently, and with a minimum of time out for maintenance and repair. Quality features of this diesel track-type tractor are discussed and illustrated along with complete specifications.

742

CONCRETE WATER PIPE—Standard Specifications for Reinforced Concrete Water Pipe—Steel Cylinder Type, Prestressed, are published in a booklet by the **American Water Works Association, Inc.,** as another in its series intended to aid the cause of standardization in the water supply and allied fields. Available at 20¢ per copy, these specifications cover in scope the manufacture of circumferentially prestressed reinforced concrete water pipe with steel cylinder in sizes from 16 to 48 in., inclusive. They are designed for static heads ranging from a minimum of 100 ft. to a maximum of 600 ft.

743

WELLPOINT SYSTEMS—**John W. Stang Corp.** of New York City, Omaha, Neb., and Bell, Calif., is issuing a catalog on Wellpoints. It contains illustrations and descriptions of many dewatering jobs. The booklet shows the use of Stang methods and equipment employed in small and large projects.

744

PLYWOOD FORMS—A 14-page, well illustrated booklet has been published by

the **Symons Clamp & Mfg. Co.**, Chicago, featuring Symons plywood forms in magnesium frames, for those interested in new, modern methods of form construction. The booklet shows how the plywood panels in magnesium frames are readily interchangeable with all magnesium panels. General directions for setting up and caring for the forms are included.

745

FORM CLAMPS AND TIES—**Williams Form Engineering Corp.**, Grand Rapids, Mich., has revised and brought up to date its Specifications for Form Clamps and Ties, used for securing concrete forms, including architectural concrete. Given in these specifications are: the amount of disconnection advised for exposed and unexposed surfaces, types of spacers for architectural concrete, a new type of form aligner and anchor of the wall to the footing, waler supports and their use in holding forms to alignment, how to eliminate wooded cleats. These specifications give the factor of safety recommended for ties as compared to the actual estimated pressures due to (1) severe and unexpected conditions of impact and vibration of concrete, and to (2) an unusual head of concrete over the rate of fill for which it is designed.

746

PUMP POWER — "Pump Power," a booklet released by **Caterpillar Tractor Co.**, Peoria, Ill., will be found interesting by every city water commission and construction company. The 2-color publication contains 8 pages of testimonial facts and figures concerning irrigation, dredge, waterworks, repressuring, and water supply pumps driven by Caterpillar Diesel engines. Specifications for each Diesel engine and electric set are included.

747

CYLINDER MOLDS — Four simple steps are necessary to make a concrete test cylinder in a Moline mold, as unretouched photographs show in a 4-page bulletin published by **Moline Iron Works**, Moline, Ill. Meeting all pertinent ASTM requirements, the Moline molds are said to produce test cylinders that are always round with flat ends, always uniform as to dimensions.

748

TRACTOR TORQUE CONVERTER —A 24-page catalog, featuring **Allis-Chalmers'** HD-19 crawler tractor with torque converter drive, has been released by the company's tractor division. Entitled "A New Page in Tractor History," the catalog features a cutaway view of the 20-ton tractor, an easy-to-understand explanation of hydraulic drives, full specifications, and a full page devoted to operators and servicemen who will work with this machine. The conveniences which the HD-19 offers to operators include elimination of shock loads with the hydraulic torque converter, finger-tip steering, and self-energizing brakes.

749

WALL FORMS—"General Directions for Setting Up Symons Wall Forms" is the title of an 8-page booklet published by the **Symons Clamp & Mfg. Co.**, Chicago. Describing and illustrating the latest new development in the Symons forming system, the booklet explains how brace plates can be furnished for use on 2 x 4 braces and can later be used as horizontal supports on scaffolds. The horizontal support is connected to the vertical 2 x 4 by a scaffold clamp which eliminates nailing and saves lumber.

750

GRILLE AND REGISTER SELECTOR—Available at no cost from the **Barber-Colman Co.**, Rockford, Ill., this slide rule provides rapid sizing of ventilating and air conditioning grilles. Grille size is based on noise level, air volume, throw, and ceiling height. Printed on the face of the rule is a table of maximum allowable noise levels for different installations. The range of variables is great enough for the selection of a grille for any common application.

751

ONE-MAN TRAILER OPERATION —**Martin Machine Co.**, Kewanee, Ill., introduces its "Folding Gooseneck" Trailer, in

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(See ad on page 111)

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capacities of 20, 27 and 32 tons in a new 4-pg. bulletin. The one-man operation of this trailer does away with ramps. When the "folding gooseneck" is lowered to the ground, one man can load or unload equipment such as heavy tractors, motor graders and shovels in a fraction of the time ordinarily required. The bulletin illustrates the lower platform height which makes for increased roadability, greater clearance for viaducts, bridges and wires.

752

WATER SUPPLY PRE-TREATMENT—**The Dorr Co.**, Stamford, Conn., has published an 8-pg. 2-color bulletin entitled "Dorrco Flash Mixers and Dorrco Flocculators," which contains photographs, descriptions, and advantages of the use of these units. Both units are used primarily for the pre-treatment of municipal and industrial water supplies, but on occasion they are also used in sewage treatment. The bulletin covers the various types of Dorr sedimentation units and illustrates by photographs and drawings the ease with which the Dorrco Flocculator operates in combination with these units.

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