

WESTERN CONSTRUCTION

SAN RAFAEL, CALIF. 2A-A-
1711 LINCOLN AVE.
D. WARREN KNUTE

FEATURED THIS ISSUE

The West's first major
prestressed concrete bridge

•
31-ft. forms leap-frogged
in lining Arizona tunnel

•
Aggregate production plant
ready to go at Folsom Dam

•
Districts plan \$48,000,000
Tri-Dam storage project

NOVEMBER 1952

ENGINES DO MORE WORK



...COSTS
COME
DOWN

..when you lubricate with
TEXACO URSA OIL X**

Don't let excessive engine repairs and overhauls delay work and cut into profits. Lubricate with *Texaco Ursa Oil X*★. Depend on it to keep engines out of the shop and on the job. And you'll save not only on maintenance costs but on fuel consumption, too.

Texaco Ursa Oil X★ is fully detergent and dispersive, with high resistance to oxidation. It keeps both heavy duty gasoline and Diesel engines clean... rings free, valves active. Keeps harmful deposits from forming, stands up in severe service, protects against wear and corrosion. With *Texaco Ursa Oil X*★ you can count on longer parts life... better all-around performance.

For chassis lubrication, use *Texaco Marfak*. The best evidence that it gives longer lasting protection, reduces maintenance costs, is this fact: *More than 400 million pounds of*

Texaco Marfak have been sold!

For wheel bearings, use *Texaco Marfak Heavy Duty*. It seals out dirt and moisture, seals itself in. Won't leak onto brakes. No seasonal change required.

For crawler track mechanisms, use *Texaco Track Roll Lubricant*. It guards against dirt and moisture, wear and rust for long periods; assures longer parts life.

Follow the Texaco simplified lubrication plan

With the Texaco Simplified Lubrication Plan, all your major lubrication can be handled with only six Texaco Lubricants! Here's true simplicity, greater economy. A Texaco Lubrication Engineer will gladly give you full details. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York, 17, N. Y.

TEXACO Lubricants and Fuels
FOR ALL CONTRACTORS' EQUIPMENT

TUNE IN: Tuesday nights on television—the TEXACO STAR THEATER starring MILTON BERLE. See newspaper for time and station.



where

SMOOTH HANDLING

is a
requirement!

IT is when smooth handling is a requirement that you find out about crane operation. When you have to balance 50 ft. of 60 in. pipe and shove it into the next section—when you have to lower a cage down a pier face for the inspector to look the concrete over—when you have to hold steel for welding or riveting, set stone or balance a concrete bucket six stories up and hit the elephant trunk, that is when you appreciate the value of smoothness of operation.

The Northwest "Feather-Touch" Clutch Control gives easier operation with freedom from the complications of delicate parts such as pumps, valves, compressors and tubing. Uniform Pressure Swing Clutches give smooth swing, reduce the danger of whipping and give increased accuracy in setting. Throttle control permits minute movements in handling the load and there is a Northwest Boom Hoist to fill every operating requirement. These Northwest advantages mean time saved on the job and greater safety for the setters! They mean money! Why not plan to have a Northwest? Talk to a Northwest Man. It will pay you to place an order.

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COMPANY**

135 South LaSalle St., Chicago 3, Ill.



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BUTTE, MONT., Hall-Perry Machinery Co.

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Contractors
Stay Successful
with
Proved Equipment

WESTERN CONSTRUCTION

Volume 27

NOVEMBER 1952

Number 11

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FRONT COVER

"FULL FACE" DRILLING with eight drift drills mounted at four different levels on a jumbo mounted on half of an old truck chassis features the job of punching a highway tunnel through a granite mountain top in Colorado. Cover view shows an Ingersoll-Rand drill working from the jumbo top level. See story on pp. 66-68.

Photo by Frank H. Spicer

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B.F. Goodrich



Tires roll over razor-sharp rock —defy cuts and bruises

LEAD and zinc come from rock that shatters into countless sharp, jagged splinters. Trucks hauling these metallic elements roll over roads filled with this abrasive, razor-edged rock—rock that slashes and chews tires to shreds in a matter of weeks.

Not so with the tires pictured above. They are B. F. Goodrich tires, designed to carry giant loads in just such operations. The Universal tread is compounded to resist rock bruises and cuts. Husky, wedge-shaped lugs give positive two-way traction, protect against side slippage even on soft ground.

Like all B. F. Goodrich off-the-road tires of 8 or more plies, Universal tires

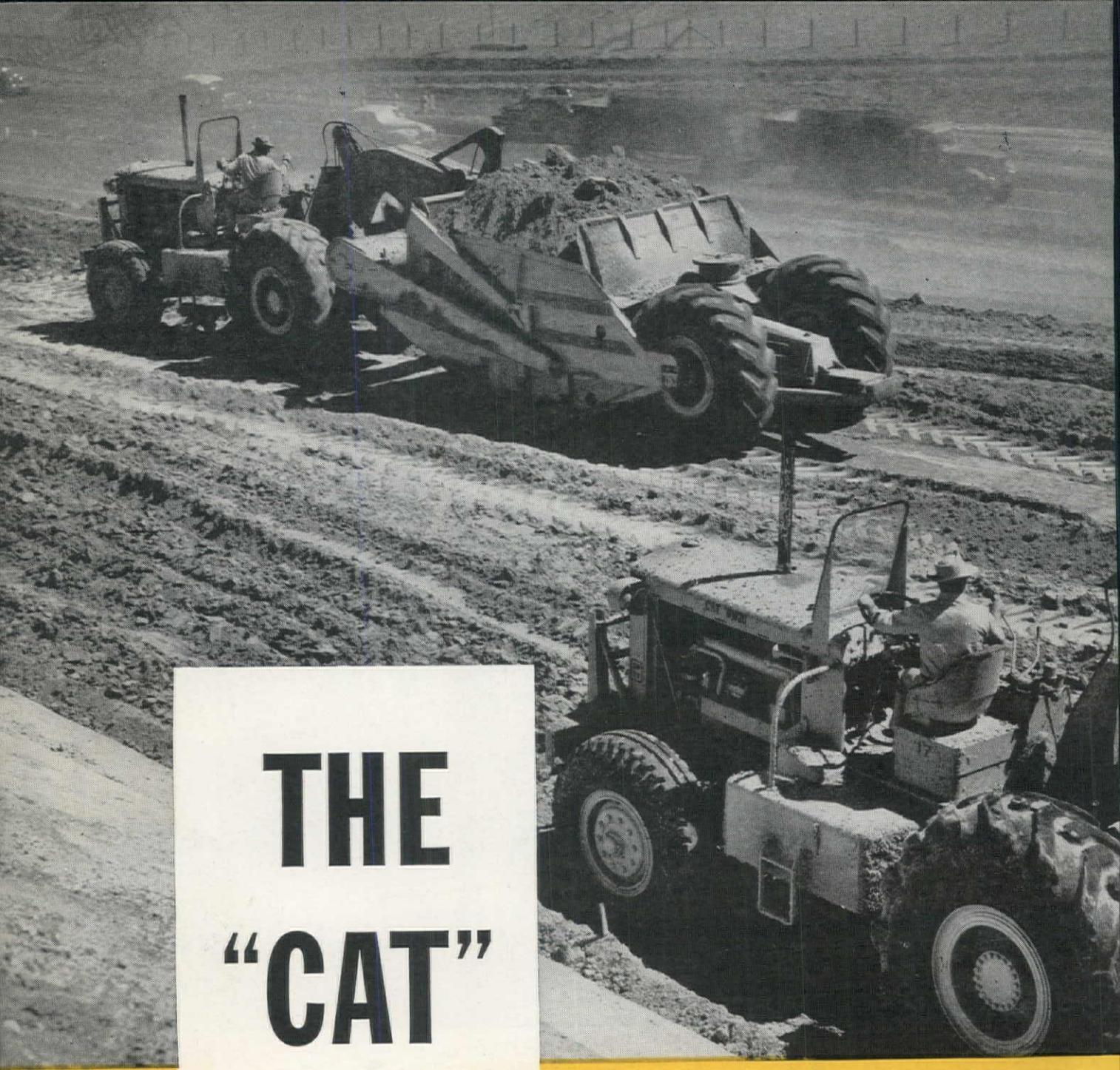
are built with the exclusive nylon shock shield. Layers of rubber-coated nylon cords under the tread rubber stretch together under impact, protect the tire body from the smashing shocks of off-the-road work.

This shock shield gives you the added savings of greater tire mileage, increased bruise resistance, more recyclable tires and less danger of tread separation. All these advantages, yet the nylon shock shield costs nothing extra. In sizes 12.00 and larger, Universal tires have *double* nylon shock shield—twice the protection for even the roughest work. No wonder operators across the country report more

hours of service with B. F. Goodrich tires.

B. F. Goodrich builds on or off-the-road tires to meet all your needs. See your local dealer—he'll be glad to show you how to save money and get longer tire life—or write direct to: *The B. F. Goodrich Co., Akron, Ohio.*





**THE
“CAT”
DW20**



**ITS RECORD
SPEAKS
FOR ITSELF!**

3



SKILL - HONESTY
RESPONSIBILITY

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GENERAL CONSTRUCTION

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OAKLAND 3, CALIFORNIA

July 22, 1952

Caterpillar Tractor Co.
Peoria,
Illinois

Gentlemen:

Although our experience with "Caterpillar" equipment dates back to 1924 when we had two Best 30 Tractors, the most gratifying of all is the performance of our "Caterpillar" DW20s. When these new machines were announced early in 1951 we decided to try them. In June 1951 we took delivery of four of these DW20s and put them to work on the Eastshore Freeway. They performed so well that we purchased three more in August, 1951. Again, in April, 1952, we added three more to our fleet, making a total of ten DW20s.

The Dublin Canyon Freeway on Highway 40 was a particularly good place to give these tractors and scrapers a real test. This job consisted of almost a million yards of a wide variety of material with several sizeable cuts and fills. Our average haul was approximately two miles one way. In spite of the rough terrain and one of the wettest winters recorded in this area, we finished the grade work well ahead of schedule. The DW20s really made this job.

In addition to the ten DW20s we have a fleet of twelve "Caterpillar" DW10s, fourteen "Caterpillar" Motor Graders, and twenty-one "Caterpillar" track-type Tractors.

We have been "Caterpillar" users all through the years and have found that "Caterpillar" performance speaks for itself, and "Caterpillar" dealer service is always ready when needed.

Very truly yours,

FREDRICKSON & WATSON CONSTRUCTION CO.

O. Fredrickson, President

OF:mb



JUNE, 1951
Fredrickson & Watson
Construction Co. bought four
"Cat" DW20 Tractors with
No. 20 Scrapers.

AUGUST, 1951
Fredrickson & Watson
Construction Co., satisfied with
their first four, bought three more.

APRIL, 1952
Fredrickson & Watson
Construction Co., satisfied with
their first seven, bought three more.

TOTAL 10

This is the repeat-purchase record of one
company. It is typical of countless more. It will
pay you to see your "Caterpillar" Dealer now.

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

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

 **SNAPPY swing**
 **QUICK control**
 **EASY operation**
 **FINE balance**

**add up to accurate spotting of
buckets with a BAY CITY**

Whether you are loading bins and trucks or dumping on a spoil bank, the balanced design and easy flow of power of a BAY CITY will speed your materials handling and excavating operations . . . increase your profit possibilities.

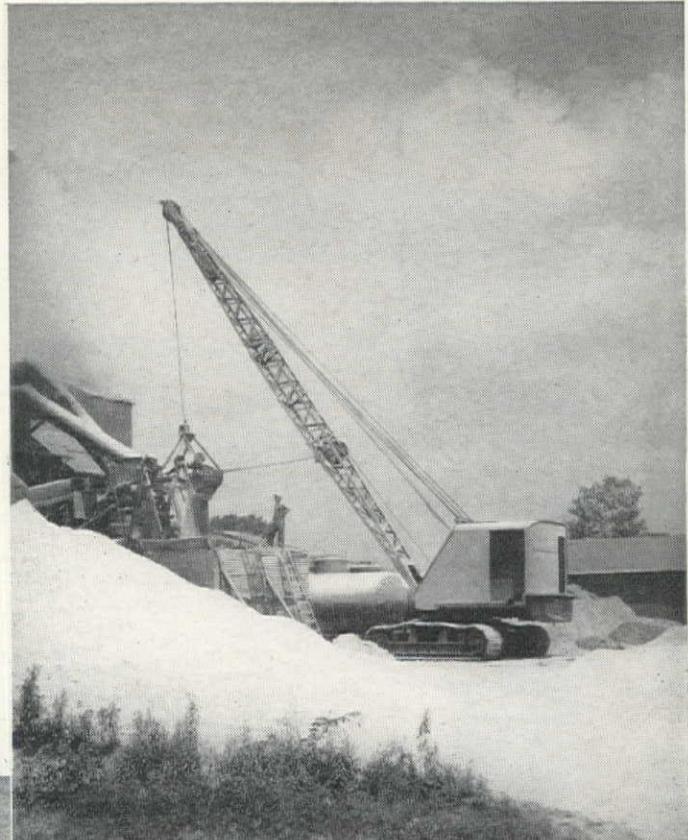


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- ✓ Fully Convertible
- ✓ Power Booster Clutches
- ✓ Long, Wide Crawlers
- ✓ High Line Speeds
- ✓ Alloy Cast Bases
- ✓ Wide Vision Cab
- ✓ Tandem Drums
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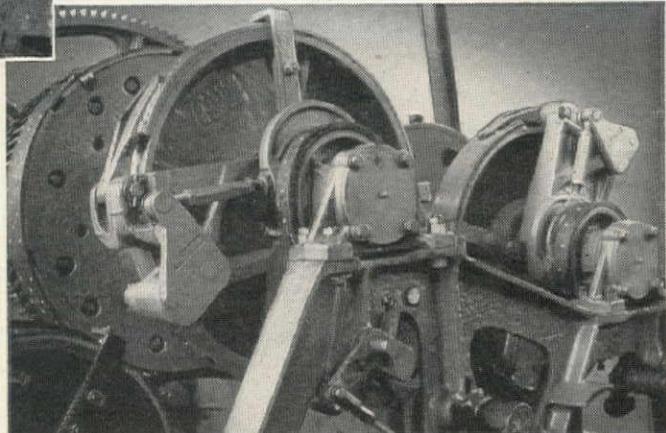
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Power booster clutches—single adjustment ▶



With shovel, dragline or clamshell, the snappy swing, quick control, easy operation and fine balance of a BAY CITY make it easy to spot the bucket accurately and speed the digging cycle. No single factor makes the BAY CITY so long-wearing . . . so long lasting. It is a combination of heavy-duty design, construction and operating features which have made so many BAY CITY owners *repeat buyers* for up to 35 years. See your BAY CITY dealer for the full story or write today for catalog.

BAY CITY SHOVELS, INC.
BAY CITY, MICHIGAN



BAY CITY

SHOVELS • CRANES • HOES • DRAGLINES • CLAMSHELLS



GM DIESEL

CASE HISTORY No. 526-25

USER: Aurora Limestone Products Co.,

Aurora, Iowa, producers of road
stone and agricultural lime.

INSTALLATION: GM 3-71 Diesel powers a
½ yd. Unit shovel, replacing a ¾ yd.
shovel powered by a gasoline engine.

PERFORMANCE: GM Diesel powered
shovel works faster, feeding
crusher about 17% more per day.

Fuel consumption averages
4 gallons per hour, saving 33%
on operating costs.



THIS DIESEL LOADS FASTER and costs 1/3 less to operate

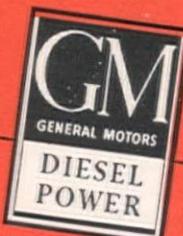
A few days after Aurora put this shovel to work, they rented a 2-cycle General Motors 6-110 Diesel for their portable crusher while the old 4-cycle Diesel was in for overhaul. Production increased from 680 tons per day to 800 tons. Fuel costs dropped from \$14.00 per 10-hour day to \$9.80. Needless to say, the 6-110 now powers the crusher. With power on every piston down-stroke, fast accelerating GM Diesels enable

equipment to do more work each day. They're quick starting—easy to service and cost less to maintain. That's why users tell us "any machine with GM Diesel power is a better machine." Specify GM Diesels for your equipment.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
SINGLE ENGINES...32 to 275 H.P. MULTIPLE UNITS...Up to 840 H.P.

It pays to Standardize on

Write for booklet, "A 50,000,000 Horsepower
Insurance Policy" that tells you why.



Signs that speed western progress

An important factor in the rapid progress of the western building industry is Kaiser Steel's large-scale production of structural shapes—the most complete line produced by any mill in the West.

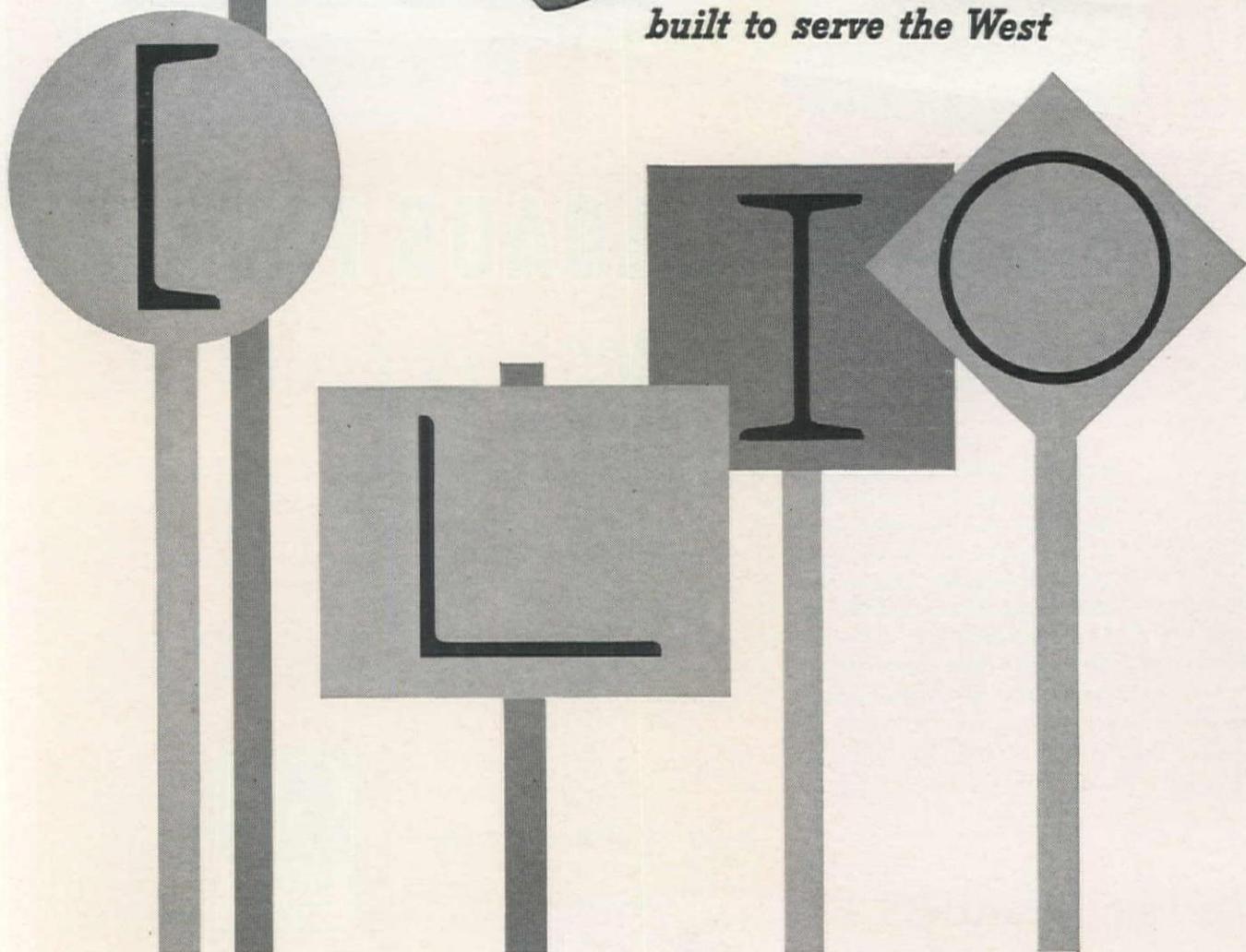
This means that western engineers and fabricators have a *nearby* source for standard beams, channels, angles, column sections and wide flange beams, as well as steel pipe, increasingly used as a structural member.

The nearby location of Kaiser Steel insures minimum carrier delivery time and prompt, dependable service.

It's good business to do business with

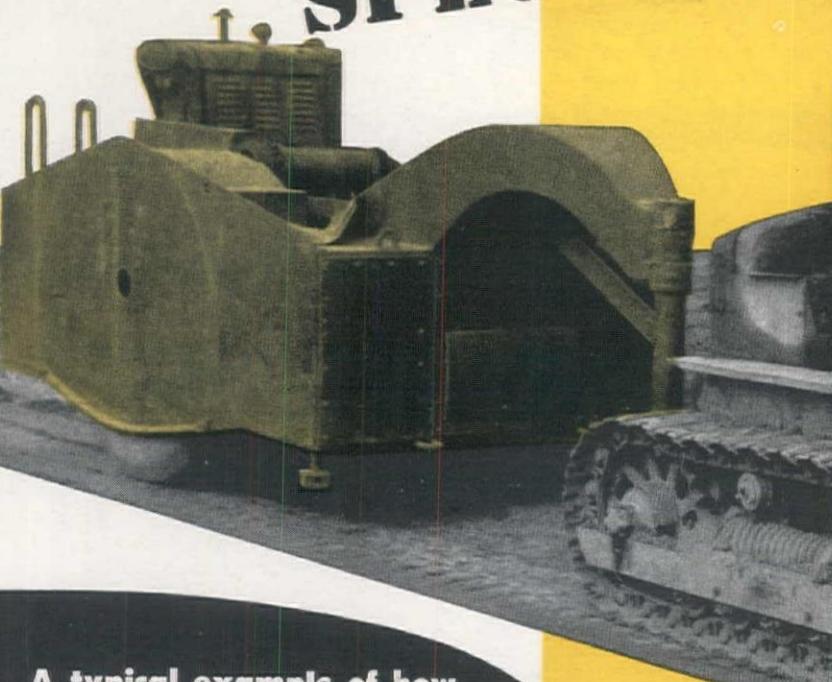


built to serve the West



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 • special bar sections • semi-finished steels • pig iron • coke oven by-products
For details and specifications, write: **KAI SER STEEL CORPORATION, LOS ANGELES, OAKLAND, SEATTLE, PORTLAND, HOUSTON, TULSA, NEW YORK**

Now YOU CAN OBTAIN
SPECIFIED DENSITY
IN FEWER PASSES
WITH THE



A typical example of how
CEDARAPIDS COMPACTORS
save time and money

Before a Cedarapids Vibratory Compactor was used on a California highway job which was almost entirely new location construction, the contractor had to remove two fill areas and then replace them, as he was unable to get the required 90% density with another type of roller. By using the Compactor in the new fills, he was able to reach 90% density in one to two passes over 4" lifts. The only time the contractor had previously been able to reach this density was when more than 16 passes were made over each lift! As he was being paid only his bid price, and no premium for compaction, his savings with the Cedarapids Compactor were substantial.

Cedarapids Vibratory **COMPACTOR**

UNEXCELLED FOR
MAXIMUM SOIL COMPACTION

- ✓ on highway subgrades and bases
- ✓ airport runways
- ✓ any soil and graded aggregate construction

IMAGINE a 60,000-lb. weight being slammed against loose soil by a powerful vibratory thrust 600 to 1,400 times a minute! Man, that's an impact-compacting action you can't beat for reaching specified densities fast, with less labor and lower cost.

That's what you get with the Cedarapids Vibratory Compactor. It operates on an entirely new principle... the flotation of heavy loads without lateral soil displacement, aided by a powerful compacting vibratory thrust through the pneumatic tires.

This positive, directed vibratory action does more than just press the soil down. It actually rearranges the soil particles, forcing out moisture and eliminating air voids to increase cohesion and mechanical bond. It assures greater structural strength, higher shear strength and increases subgrade support. And you're not restricted to putting in your fill in 3" or 5" lifts. You can spread from 12" to 36", depending on material, and compact it right down to a firm foundation, usually in one or two coverages.

The vibrating mechanism on Cedarapids Compactors is a newly designed, heavy-duty style built for long-lasting service. Vibration is transmitted to the axle and tires only... there's no vibratory wear on the rest of the machine. With vibratory impact-compaction, you can obtain and often exceed specified densities other rollers cannot reach, and in fewer passes.

Cedarapids Compactors, both Model 60 and Model 25, can be adapted to a wide variety of soil and moisture conditions simply by varying the rate of vibration (over a range 600 to 1400 cycles per minute), and by changing tire pressure and adding or reducing weight.

There are so many outstanding features in this improved machine we can't begin to list them all here. See your Cedarapids distributor today for complete details.

There's Nothing Like It
ON THE MARKET

It's the only vibratory, rubber-tired compacting unit available. Its entirely new principle of operation... weight plus vibration... permits more compaction than ever before possible, in fewer passes! Write for details and specifications, plus many typical job test reports described in Bulletin COMP-3.



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

NOW...

Fast Smooth Cycle

COUNTS MORE
THAN EVER



SPEED is a traditional characteristic of Bucyrus-Erie excavators . . . and speed in the individual dig, swing, and dump operations only tells part of the story.

In Bucyrus-Erie machines, working speed starts on the drawing board, where cycle functions are balanced with one another (as well as being designed fast in themselves) . . . and co-ordinated with proper weight distribution. Adding smooth, steady power . . . liberally used anti-friction bearings . . . easy-filling dippers . . . and direct-action mechanical control gives them the overall production speed that has made them the standard of the industry.

Eliminating lost time and waste motion is one big way to boost output wherever excavators are used. Now . . . when that counts more than ever, you can count on Bucyrus-Erie excavators to "deliver the goods." 59E52

BUCYRUS-ERIE COMPANY, South Milwaukee, Wisconsin

**¾ to 4-yd. Gasoline,
Diesel, Single-Motor
Electric Excavators**

**Hydrocrane
Hydrohoe**

most Compared
BUCYRUS-ERIE
most Preferred

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STANDARD ENGINEER'S REPORT

LUBRICANT	RPM DELO Oils
UNIT	50 diesel engines
JOB	"Super Inch" gas pipeline
LOCATION	From Arizona to California Pacific Coast
FIRM	Bechtel Corp., San Francisco

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



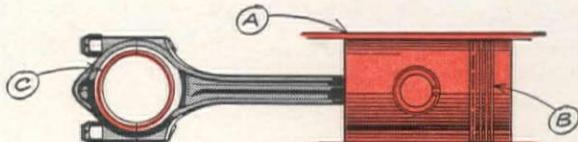
LUBRICATED WITH RPM DELO OILS, only three of the 50 heavy-duty diesel engines, used by Bechtel Corporation in building the great "Super Inch" pipeline, required ring replacements in 1½ year's work. No bearings were replaced.

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



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

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



- A. Contain special additives that provide metal-adhesion qualities...protect parts whether hot or cold, running or idle.
- B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent piston scuffing.
- C. Special compounds stop corrosion of any bearing metal and foaming in crankcase.

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.

NOW...

You can cut engine wear rate as much as 85%.

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

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



STANDARD OIL COMPANY OF CALIFORNIA

Three stories up!

SLANT your eye up that boom! That will put your concrete up three stories. Note the bucket. Spout feed—as much or as little as you need at a time. Pour right to the forms or feed it to a hopper or concrete buggies. No ramps, no chuting towers, no elevators, no crane—save money, pour direct and have absolute control of your mix.

The MultiFoote is a multi-purpose machine. It reduces the concrete buggy crew on the job. Crawler traction negotiates ground that bog wheels and when using the shorter standard Highlift boom the MultiFoote will work in headroom too low for crane clearances. Finally the MultiFoote is quickly converted to a standard paver which both increases the range of jobs and the value of resale over wheeled equipment.



*Don't buy a one purpose unit.
Ask for more details.*

THE FOOTE COMPANY, INC.
Subsidiary of Blaw-Knox Co.
1940 State Street
Nunda, New York

MULTIFOOTE PAVER
FOR EVERY PLACE CONCRETE MUST BE POURED



A BIG NEW 30 TON MPH Moto-Crane



LORAIN MC-524



30 TONS lifting capacity—built "king-size" to do bigger jobs.

30 MILES PER HOUR—built fast to go farther, quicker and cover more scattered jobs.

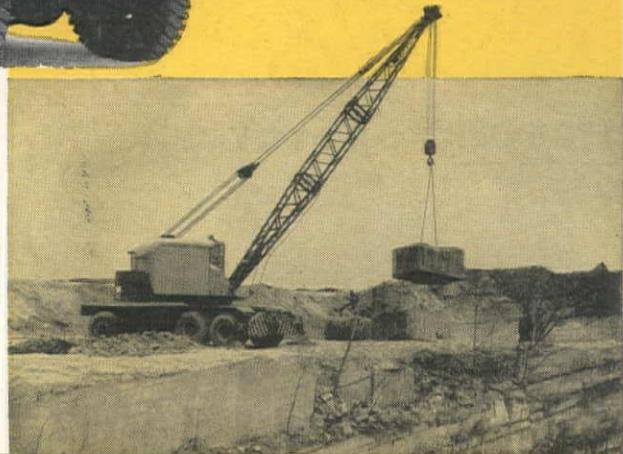
FULLY CONVERTIBLE—as a crane, 1 yd. shovel, clamshell, dragline or hoe to serve more different jobs.

Now you can do more—as well as go farther, faster—because the MC-524 brings greater capacity, greater liftability and greater profit possibilities to scores of jobs which never before could benefit from the advantages of a fast-stepping rubber-tire crane. This bigger MC-524 is an additional reason your Thew-Lorain Distributor can best meet your job needs. See him first for the facts!

NEW TOO! 30-TON SELF-PROPELLED SP-524

A companion to the MC-524 Moto-Crane—a new single-engine Lorain SP-524 Self-Propelled Crane with bigger capacity for a greater field of operations. 7-1/2 m.p.h. travel speed for localized mobility. Check it today!

THE THEW SHOVEL CO., LORAIN, OHIO



THE LORAIN
MC-524
IS BIG NEWS
AT YOUR
DISTRIBUTOR

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Missoula and Kalispell, Mont.

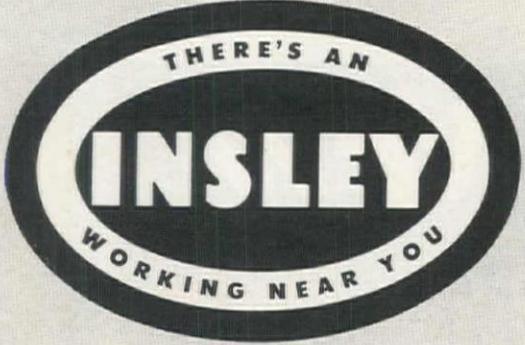
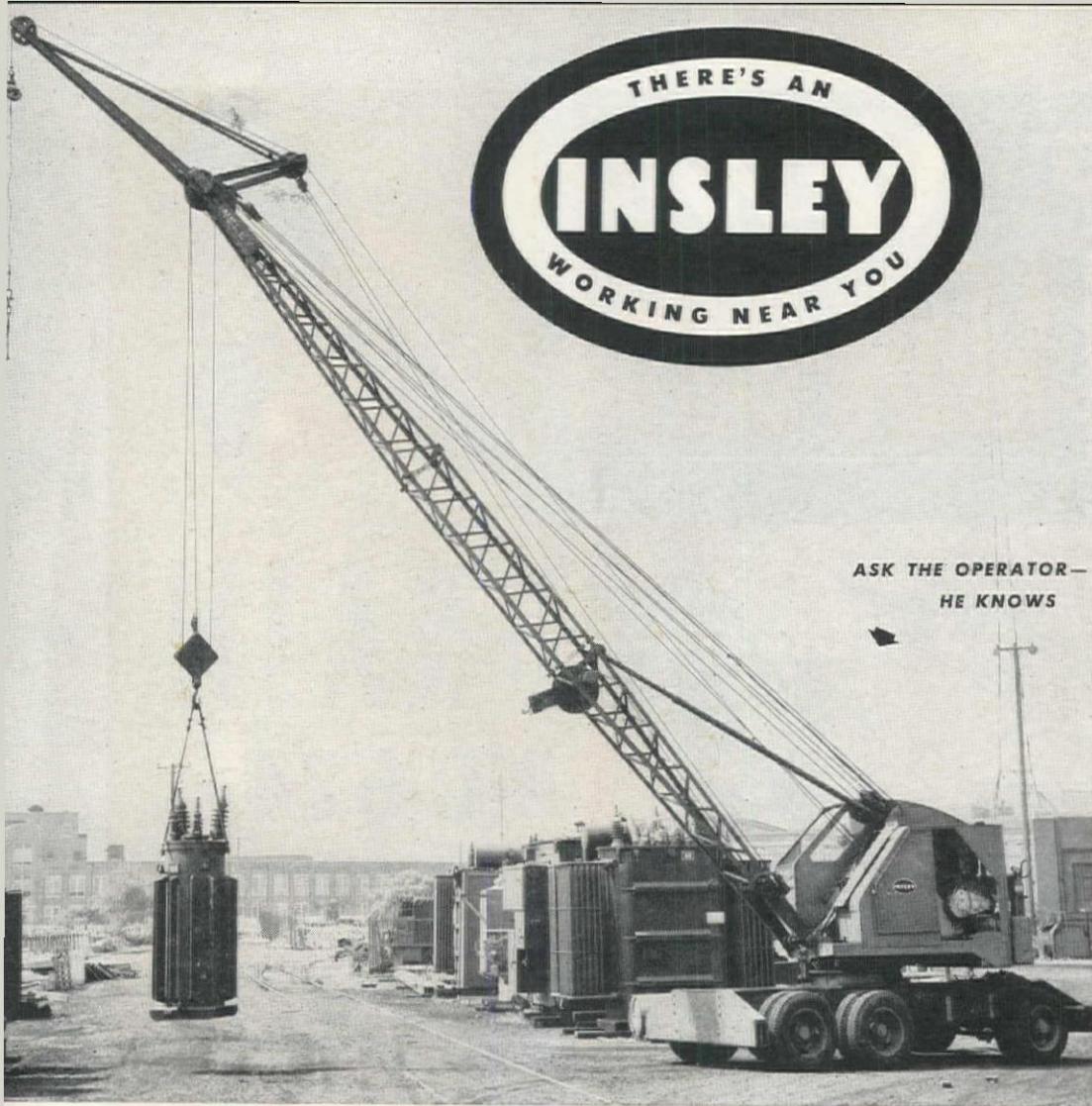
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WORTHAM MACHINERY CO.
Cheyenne, Wyo. Branches: Casper and Rock Springs, Wyo.

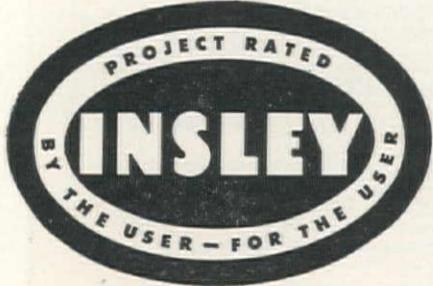
YUKON EQUIPMENT CO. (for Alaska)
Seattle, Wash. Branches at Fairbanks and Anchorage, Alaska



ASK THE OPERATOR—
HE KNOWS



The **INSLEY** operator **knows...**



that Insley equipment can be rated-for-the-project...he knows that specification alternates make it possible to buy the exact equipment to do his job best.

INSLEY MANUFACTURING CORPORATION • INDIANAPOLIS 6, INDIANA

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TRACTOR CO.**

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with Murphy's
gang since
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YOUR "gang" will break up more concrete faster, too . . . with Thor "25" Paving Breakers—for years the outstanding performers in the 80-pound demolition class! See them described—with Thor's 30, 60 and 70 pound breakers—in the new Thor 1952 construction tool Catalog 43. Write today for free copy, or see your local Thor distributor.





MARLOW MUD HOG PUMPS HELP SPEED CONSTRUCTION OF VITAL DEFENSE PLANT

When Darin & Armstrong, Inc., general contractors, wanted "dry digging" insurance on a highly important defense plant construction job, they chose multiple units of Marlow Mud Hog Pumps, supplied by Michigan Tractor and Machinery Co. of Detroit as distributors.

"We use Marlow Pumps," says Mr. Duncan Cain, Equipment Superintendent of Darin & Armstrong, "because we have found them extremely satisfactory for our type of work."

Construction men all over America and all over the world know the simple,

rugged and trouble-free construction of Marlow Mud Hogs. These famous time-tested pumps will handle mud, sand, slime and solids in suspension with ease and speed, sucking up muck almost thick enough to shovel.

The Mud Hog's patented ball valves are virtually clogproof. All liquids pass under the diaphragm to avoid unnecessary wear and cutting hazards.

When messy digging confronts you, Marlow Mud Hogs will work fast and dependably to make the job easier. Write for new free bulletin No. C-52.

MARLOW PUMPS

RIDGEWOOD,
NEW JERSEY

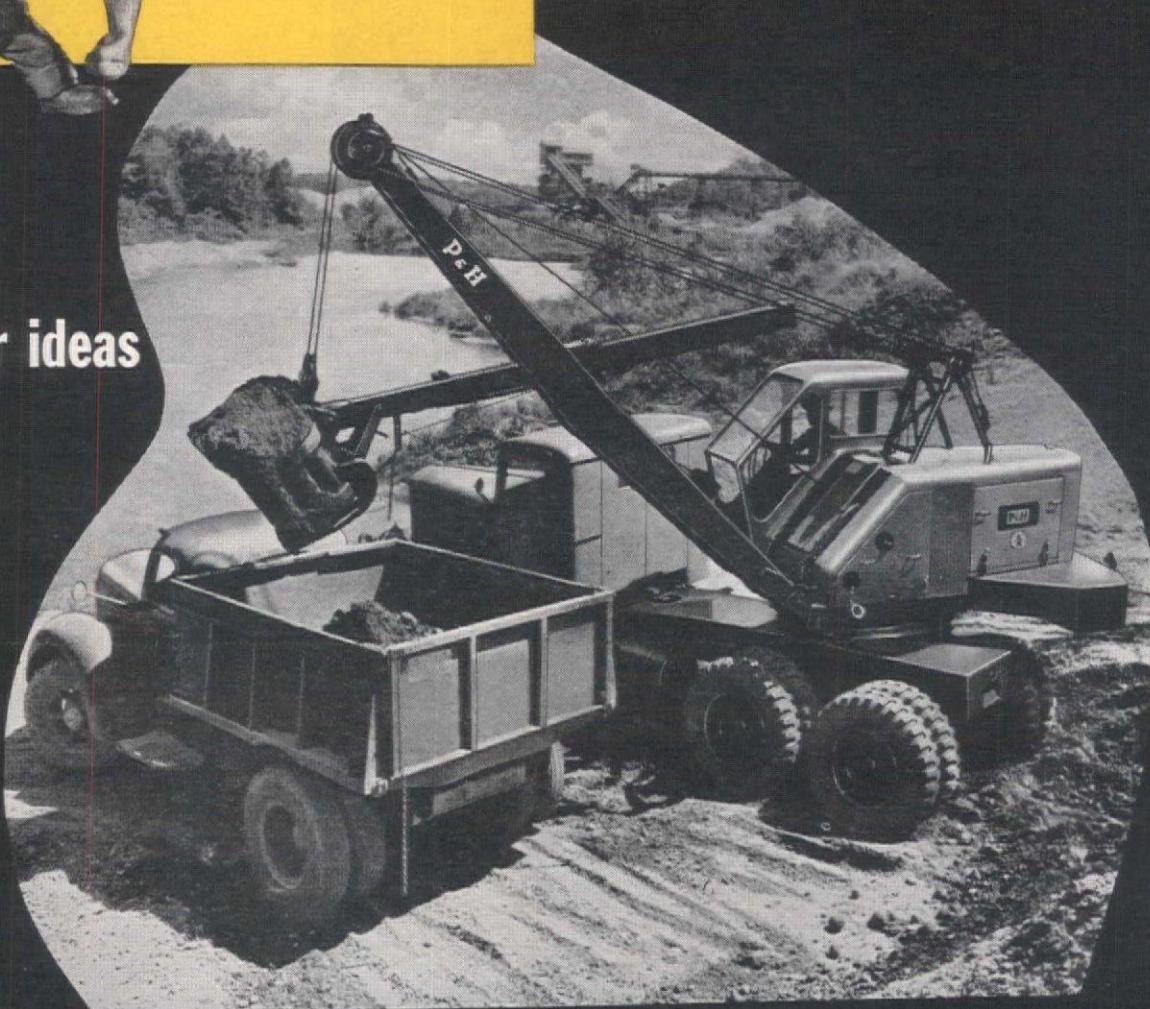
Manufacturers of the World's Largest Line of Contractors' Pumps Including the Famous Marlow Mud Hogs

P&H

MITI- MITE

(MODEL 55)

will change your ideas
about what a
truck crane
can do!



If you want a *better* way to handle 101 jobs — faster, at less cost — then the Miti-Mite is for you!

Here's power . . . strength . . . and stability to let you work at full capacity — put more on the hook — dig faster — swing faster.

And here's amazing simplicity! The entire machine is built around a rugged power box. It's the automotive idea of a large transmission case with all parts running in oil. It operates for long periods with little or no attention — requires far less lubrication and servicing than any machine of this type you've ever known.

Mount Miti-Mite on any make of truck with suitable capacity. Convert it quickly for service as shovel, crane, dragline, clam shell, trench hoe or magnet. See it now, or ask for literature.

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See your **P&H** Dealer!





*Another town is
thrifty in choosing
"CENTURY"
asbestos-cement pipe*

This scene—showing a "Century" Pipe installation—could have been made in any of a hundred municipalities throughout the nation. For each year, more and more cost-conscious communities are laying water mains of "Century" Asbestos-Cement Pressure Pipe.

The reasons are as plain as the "one" on a dollar bill. "Century" Pipe is light in weight, easy to handle, yet inherently strong. It can be laid quickly and efficiently. "Century" Simplex Couplings make short work of the joints, too. With these couplings, curves up to 5° deflection per pipe length are taken easily, fewer special bends are necessary, and flexural strains due to settlement or trench loading are minimized.

But the best part comes later! After years and years of service, "Century" Pipe retains its original carrying capacity—because it never tuberculates, rusts or corrodes. It is non-metallic and highly resistant to corrosive soils.

In fact, a "Century" water main actually increases in strength over the years.

You just can't beat such long-lasting economy! For your next water main, specify "Century" Asbestos-Cement Pressure Pipe.

FREE BOOKLET—*Mains without Maintenance*, gives valuable data, specifications, and reference material on water main pipes. Write for your copy today.



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"... I know because I've tried them all. It costs a lot of money to take equipment off the job to change an edge. But I've found with CF&I Cutting Edges it's a lot longer between changes, whether I'm cutting, shaping or grading. Every piece of equipment working for me has a

CF&I Edge or Blade. Yes sir, I'm sold on CF&I."

CF&I Cutting Edges are available to fit dozers, scrapers, graders and snow-plows. They are furnished in standard widths, lengths and thicknesses; flat or curved; with beveled or square edges.

THE CALIFORNIA WIRE CLOTH CORPORATION, OAKLAND
THE COLORADO FUEL AND IRON CORPORATION, DENVER

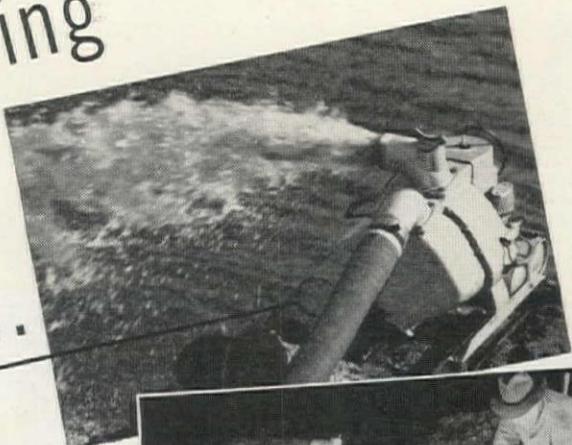


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THE COLORADO FUEL AND IRON CORPORATION

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Everywhere with a

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When you need pumping, you *get* pumping fast with a Homelite Carryable Pump. And that means fast pumping *any place*. No trucking problems. No planking requirements. No crew of men needed. One man simply picks up your Homelite and carries it right to the spot where you need the pump.

With the fastest possible self-priming a Homelite will out-pump many big, heavy, cumbersome pumps. It handles up to 15,000 gallons per hour. Keeps seepage at strainer level automatically. Has a 28 foot suction lift. And it is non-clogging, dustproof, weatherproof, foolproof.

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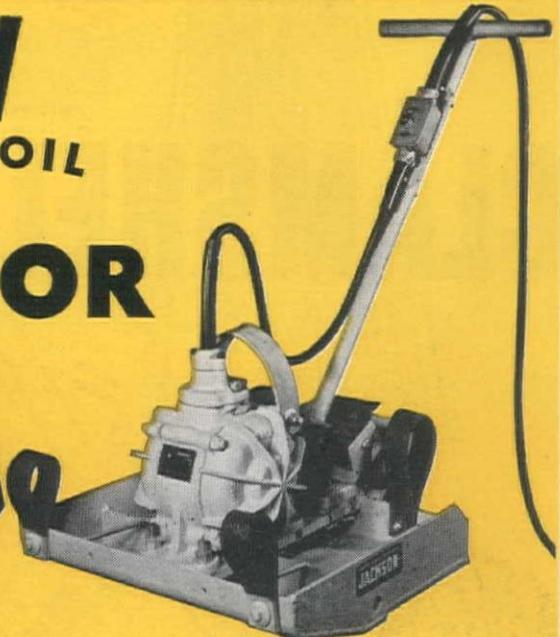
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THE JACKSON ASPHALT-GRANULAR SOIL COMPACTOR

NOW
VASTLY MORE POWERFUL,
FASTER

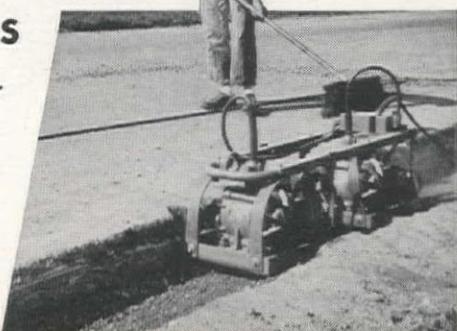


Quickly INTERCHANGEABLE BASES
OF 12" TO 24" WIDTHS

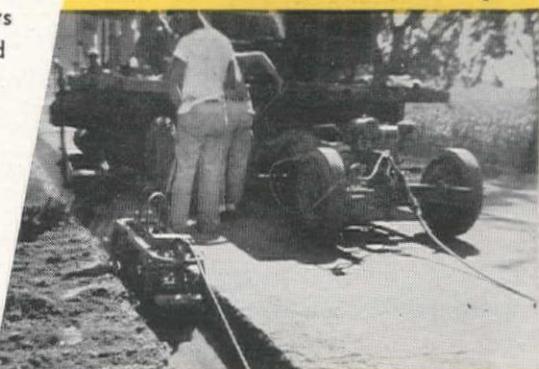
The new, heavy-duty, exceedingly powerful vibratory motor now incorporated in the JACKSON COMPACTOR has stepped up its walking speed and power greatly. It will compact granular soils at optimum moisture to specified density in depths of 8 to 12" at the rate of 2400 sq. ft. per hour.

For compacting granular soil in sub-bases of concrete floors, in bridge approaches, close to abutments, and for compacting blacktop mixtures in pavement widening and patching, paving drives, walks, railway platforms and crossings, this machine with its quickly interchangeable bases, is the most convenient, mobile and efficient time and money saver on the market. A tandem version utilizing two heavy-duty compactor motors mounted on bases of proper width is amazingly efficient and economical for compacting granular fill in trenches, in pavement widening operations, to provide a stabilized base for the blacktop widening strip.

Operated by a Jackson Power Plant mounted on auto trailer with means of quickly picking up and lowering the compactor. See it at your Jackson Distributor, who has it both for sale and for rent, or write for complete details.

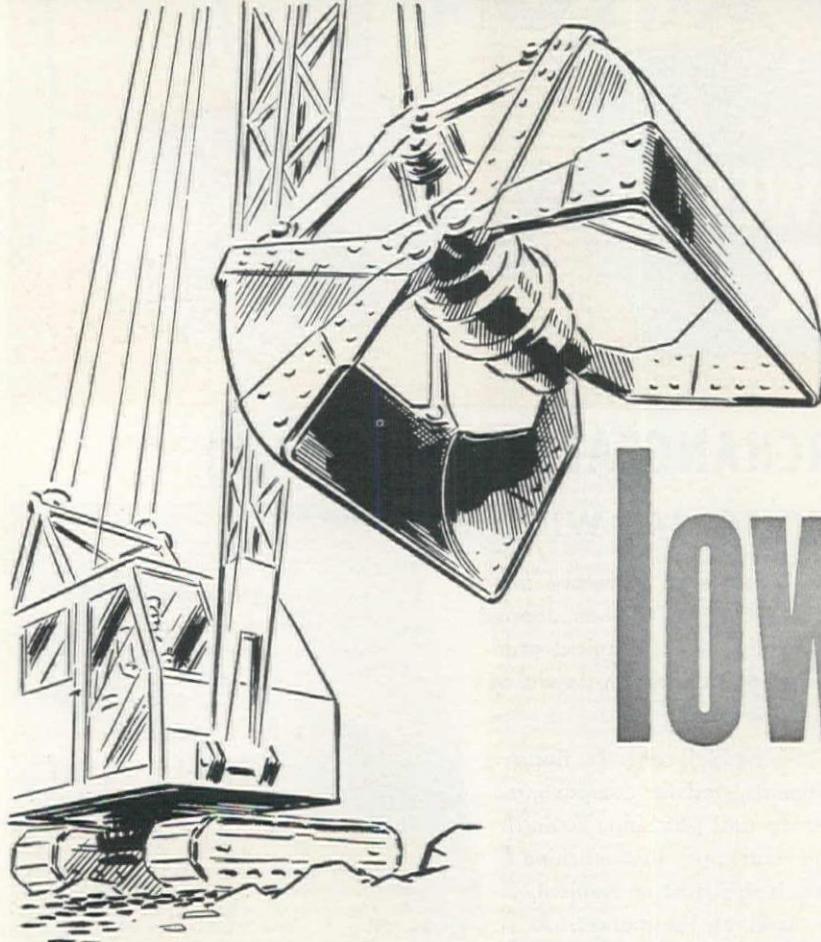


Tandem Compactor stabilizing granular sub-base for blacktop pavement widening strip.



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lower lips

Rock-picking packs a tough wallop for a pair of bucket lips. Whether the load is sludge or tight-grained granite, abrasion alone is enough to wear thin the toughest steel . . .

. . . But — when you throw in the almost continuous impact when the clam is in the hands of a high-grade operator — bucket lips are sure to curl back and quit . . .

. . . Unless you have taken the precaution to pre-

protect the life of your buckets — up to twice as long as the unprotected type — with one of the many Airco Hardfacing Alloys available to extend the life of all your equipment.

'Face' it. There are more than twenty Airco Hardfacing Alloys for you to choose from. Any Airco representative will be glad to give you complete information. Contact your nearest Airco Office today.

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In STATLER CENTER Byers Wrought Iron Pipe safeguards 13 vital services



The selective use of Byers Wrought Iron pipe in the new Statler Center, Los Angeles, owned and operated by Hotels Statler Company, Inc., New York, amply supports the careful planning that was given to maintenance control in this ultra-modern structure. Over 215 tons of this time-tested material was installed for steam returns, brine lines, chilled water lines 4" and larger, blow-down discharge lines, soil, waste and vents above ground, hot, cold and ice water piping 4" and larger, vacuum cleaning system, soap dispensing system and the air conditioning system.

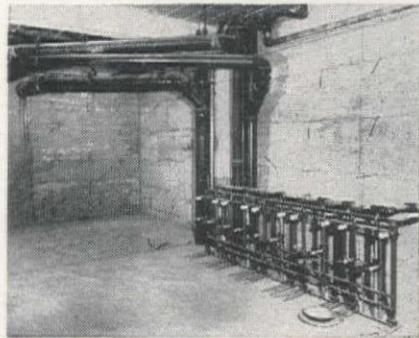
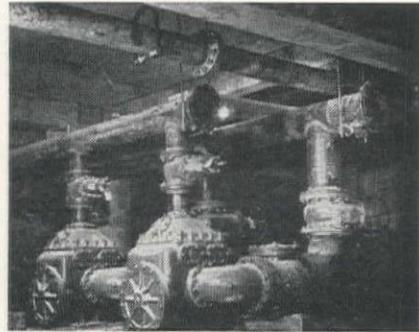
Every one of these services carry a corrosive threat . . . and every one represents a time-tried genuine wrought iron application. The material's proved ability to last longer, at lower cost per year, is providing an increasing number of

leading engineers with a reliable guide to material selection in today's modern building.

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

You'll find specific information in our bulletin, **WROUGHT IRON FOR PIPING SYSTEMS**. Write for your copy.

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



STATLER CENTER

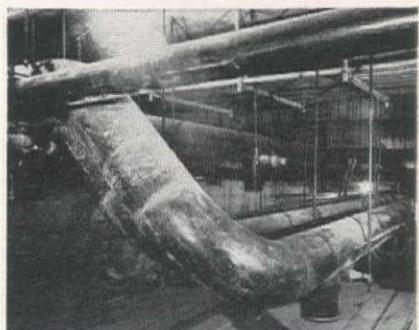
Los Angeles, California

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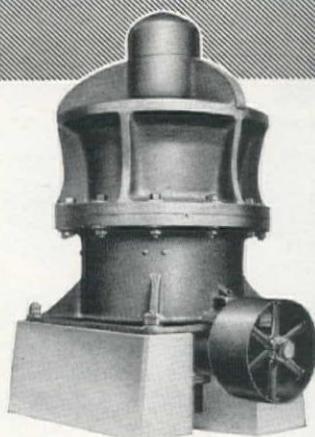


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CORROSION COSTS YOU MORE THAN WROUGHT IRON
WROUGHT IRON
TUBULAR AND HOT ROLLED PRODUCTS
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Construction methods . . .

have been "jacked up" to amazing heights of speed and proficiency since the days of these 18th century stone masons. Their crude tools served to teach the value of developing better, more efficient equipment.



The Traylor Ty Reduction Crusher combines rugged construction with simple design to give maximum efficiency and easy maintenance. Bulletin 6112 gives specifications and description.

In recent years, construction men have developed the valuable technique of producing aggregate on the job. Traylor has applied 50 years of experience in the rock crushing field to meet this new crushing requirement. Today, Traylor equipment has earned a world-wide reputation for producing a more uniform, cubical aggregate that meets the most rigid engineering specifications. It takes experience to solve the aggregate problems of the construction industry. Traylor has experience . . . half a century of it.



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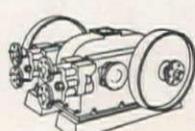
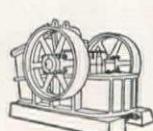
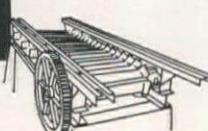
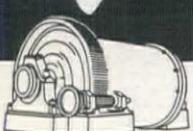
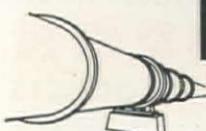
NORTHWEST DISTRIBUTOR

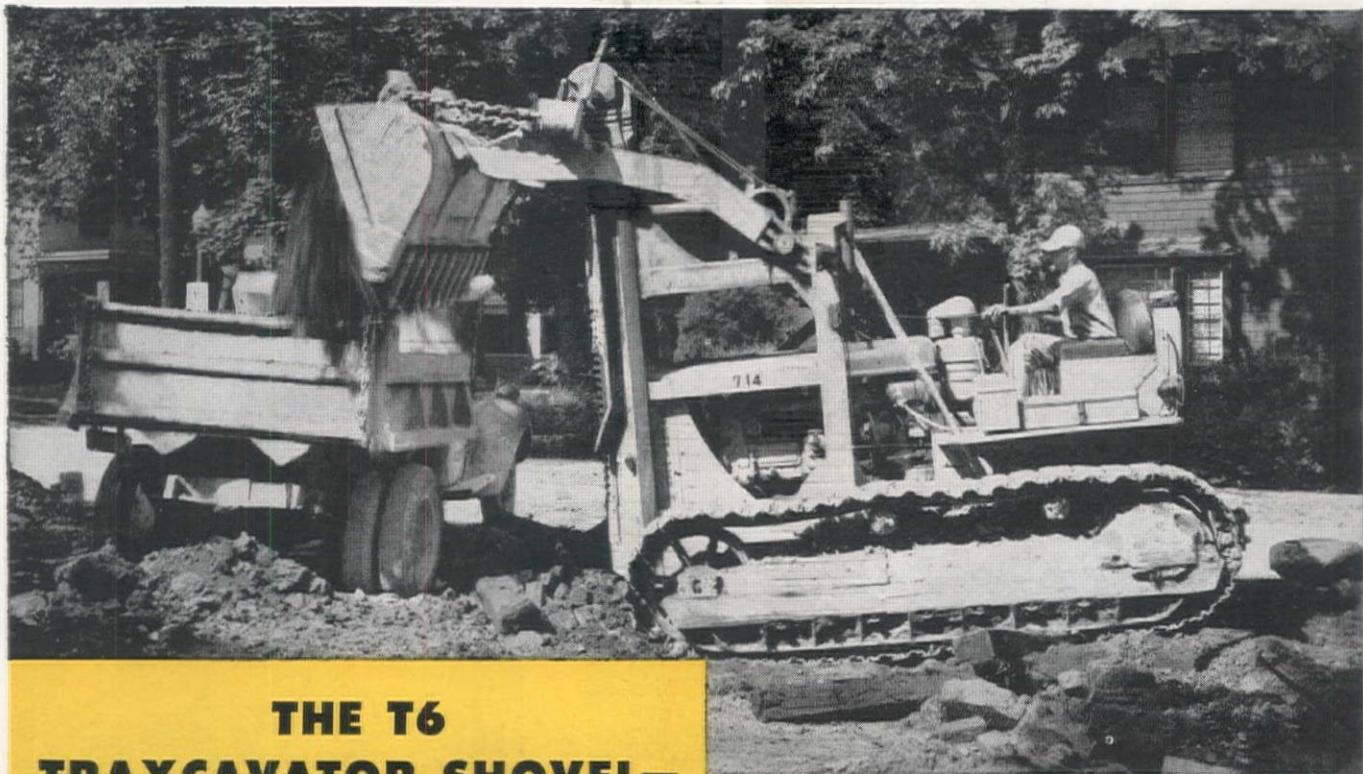
Balzer Machinery Co., 2136 Southeast 8th Ave.,
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Traylor

leads to greater profits





**THE T6
TRAXCAVATOR SHOVEL—[®]**
**“The Most Complete
Tool in Contracting”**

according to veteran contractor
PAUL N. GREENE



Paul N. Greene Co.'s T6 is here shown at work in Fort Wayne, removing old concrete and brick paving, crossties and other debris. The powerful lift and drawbar push tears up the old surfacing and puts a heaped 1½ yds. in the bucket each pass.

TRAXCAVATOR Shovel's ability to dig, load, bulldoze, lift, ditch, backfill and spread leads Paul N. Greene, Fort Wayne, Indiana, to say, "That T6 is the most complete tool ever owned."

And this veteran of 25 years of construction work knows what he's talking about. His T6 TRAXCAVATOR Shovel has served him on a variety of tough tasks. It has worked in nearly every material—sand, clay, rocky soil, frozen ground, debris, broken concrete—and it's done almost every job in the books.

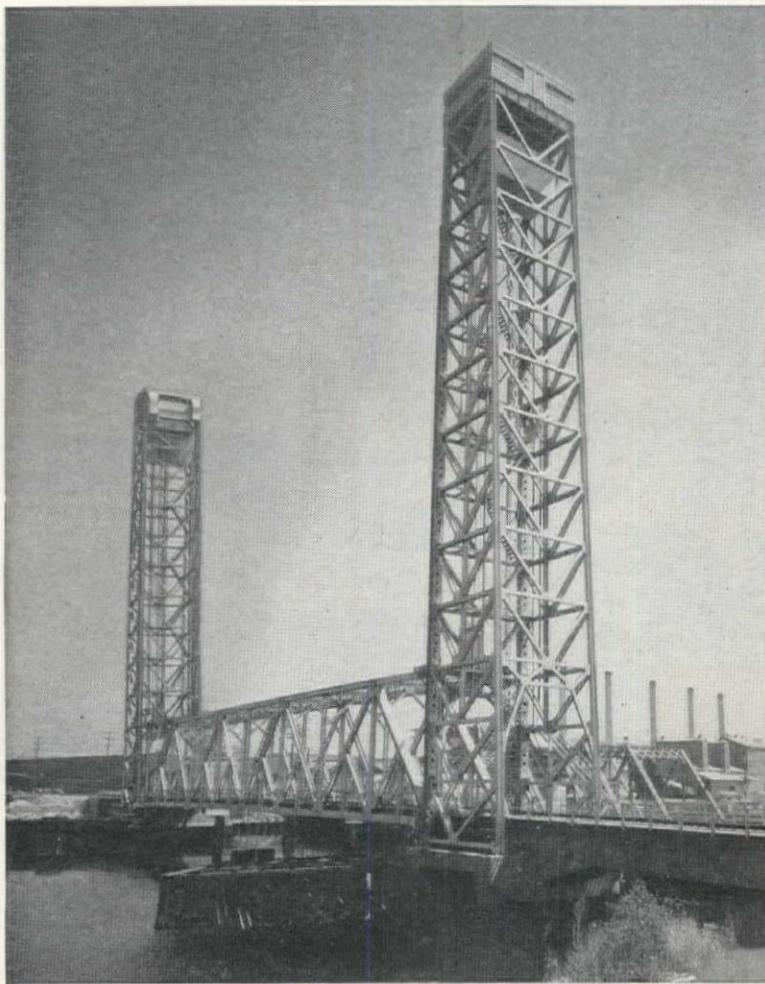
There's no one machine on the market today that can do as many jobs as a TRAXCAVATOR Shovel... and only one man is required to operate it. Be prepared to meet any task on your next contract. See your "Caterpillar" Dealer today about delivery of the TRAXCAVATOR Shovel that meets your needs... or write direct.

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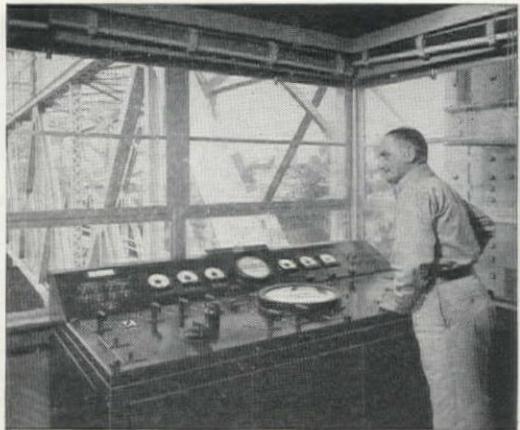
TRACKSON

REG. U. S. PAT. OFF.
A SUBSIDIARY OF CATERPILLAR

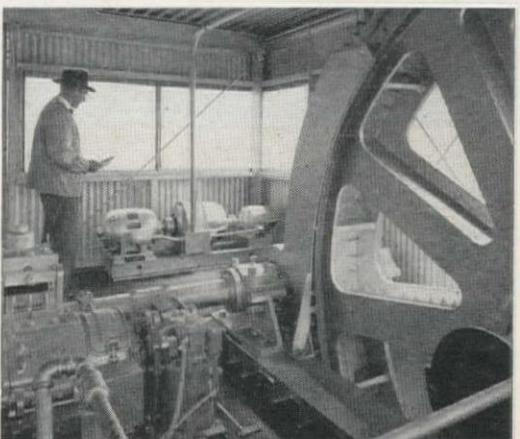
**TRAXCAVATOR SHOVELS
TRACLOADERS
PIPE LAYERS
ANGLEFILLERS**



AMPLIDYNE CONTROL—first applied to movable bridges by G.E.—permits raising and lowering Oakland's new Fruitvale bridge in a shorter time than by any other method. Amplidyne control responds instantly, provides faster acceleration and deceleration.



BRIDGE OPERATION is centered in operator's console. Amplidyne's closer control keeps ends of span aligned during operation, "seats" bridge accurately and smoothly.



REDUCED STRESS ON BRIDGE structure and machinery results from torque limiting, inherent in amplidyne control. Photo shows part of G-E drive equipment in east tower.

Smooth, pinpoint control speeds bridge operation

G-E amplidyne-controlled drive prevents skewing, seats span faster, protects structure from shocks

Key to precise control, faster operation, and better equipment protection of Oakland's new Fruitvale Avenue Lift Bridge is its General Electric amplidyne-controlled drive system. Working closely with Woodruff & Sampson, consulting engineers for the Corps of Engineers, Judson Pacific-Murphy Corp., general contractors, and Enterprise Electric Works, electrical contractors, G.E. has again engineered the versatile amplidyne into an outstanding movable-bridge system.

This is but one example of the help G-E engineers can provide *your* engineers or consultants on installed equipment for heavy construction projects. Contact your G-E Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y. 664-23

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

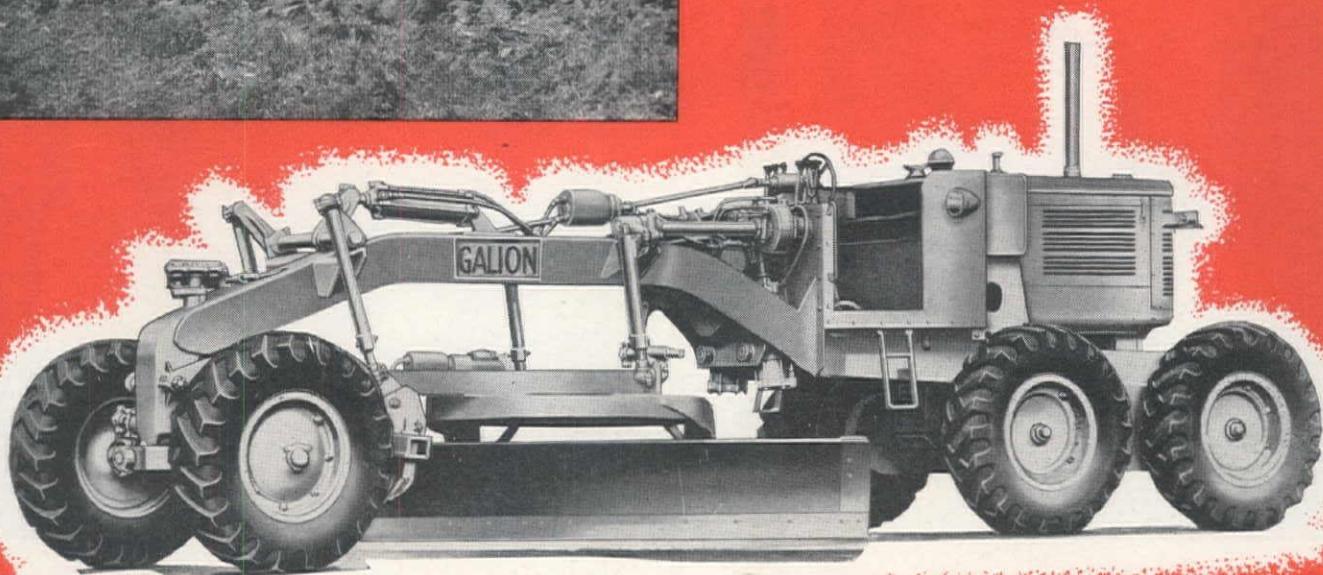


WORLD'S FIRST amplidyne-controlled lift bridge—pioneered by G.E.—is Stickel Memorial Bridge in New Jersey. Consulting engineers were Hardesty & Hanover.

GENERAL  **ELECTRIC**



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Galion Motor Graders have the power, drive, and weight to really make the dirt "boil" off the moldboard.

— And for PLUS value, you get as "Standard Equipment" —

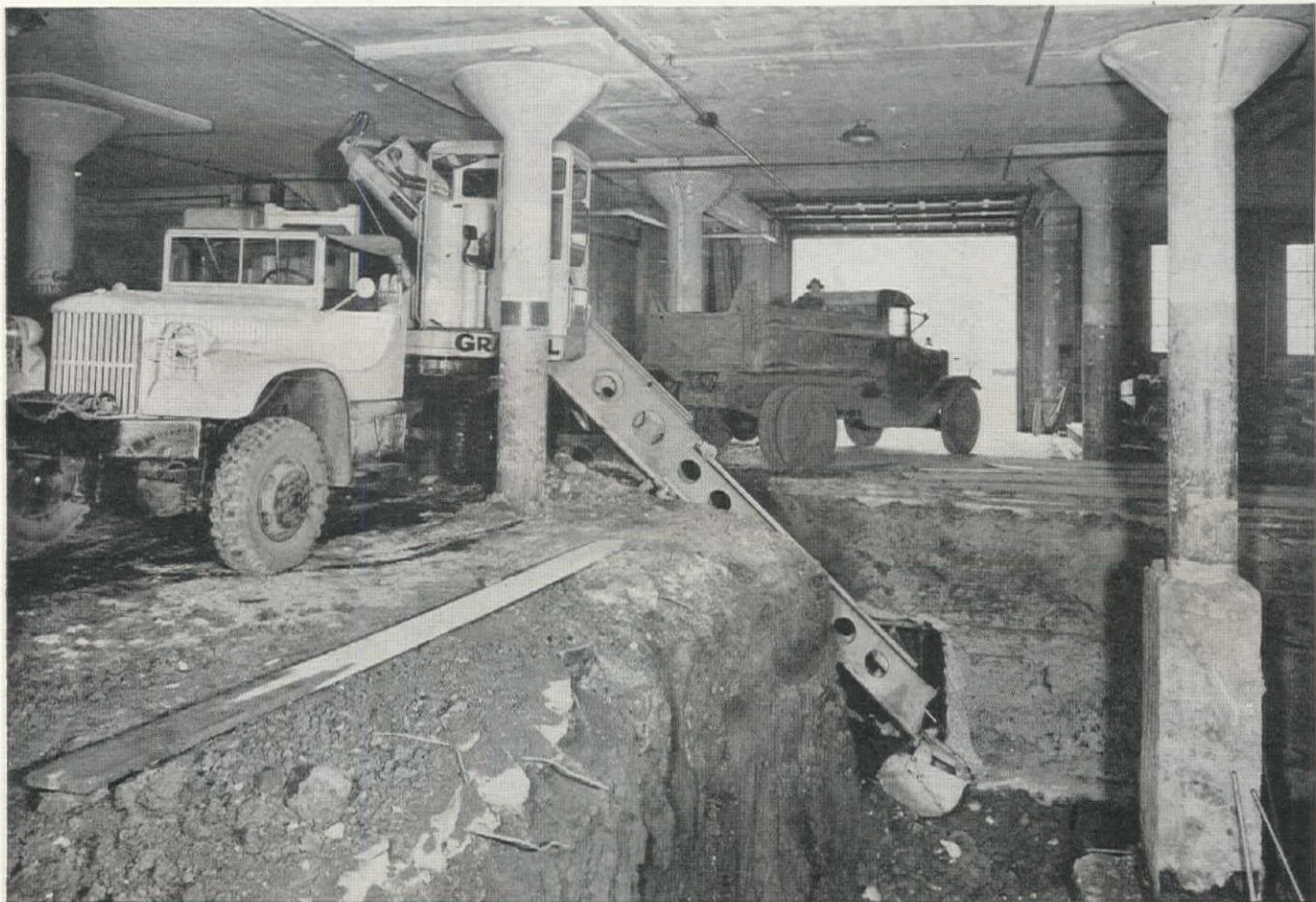
- Constant-mesh transmission for easy shifting — no clashing gears.
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The Gradall works easily in many a tight spot!

WHEN YOUR CONSTRUCTION WORK must be done in "tight" places such as this, there's one machine you can count on to do the job quickly—the Gradall.

Its "arm-action" boom actually reaches out, twists and turns, to do its work in areas very little larger than the machine itself. And the Gradall's powerful hydraulic "down pressure" and exacting tool control make it easy to dig excavations to blueprint specifications—with clean-cut vertical or sloping sides, precise square corners, and perfectly graded floors. It practically eliminates costly hand labor.

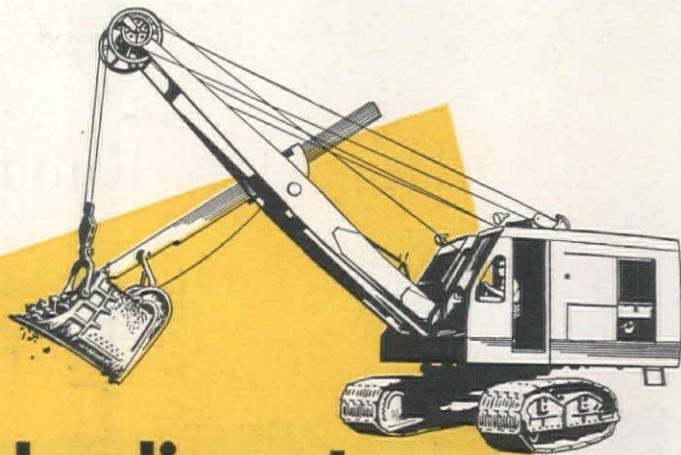
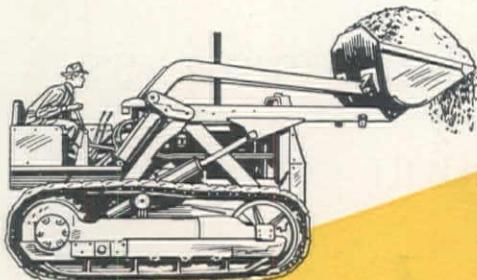
But take your own construction problems to your nearest Gradall Distributor. He'll be glad to show you how this versatile machine can cut costs for you, too.

SALES AND SERVICE:

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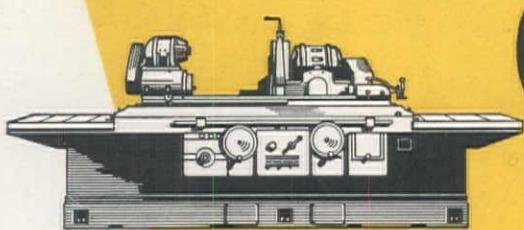
Gradall
DIVISION OF
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GRADALL—THE Multi-Purpose EARTH-MOVING AND CONSTRUCTION MACHINE



**Protect the hydraulic system
of your equipment...with**

SHELL TELLUS OIL



**The SUREST protection
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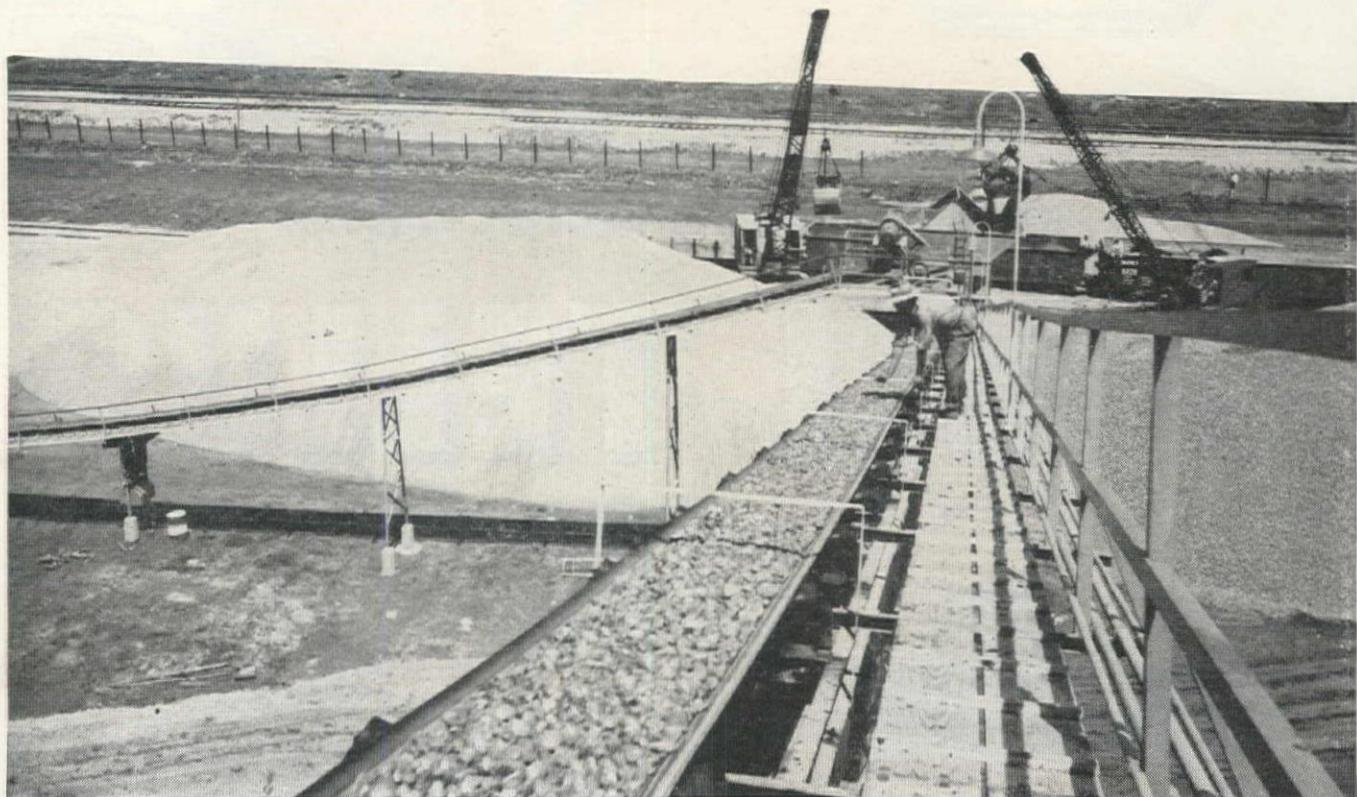
Shell has found a way to give hydraulic oil *all* of the protective qualities needed. *Rust prevention* comes from a completely new inhibitor. *Oxidation stability* from a special additive. *Anti-foam tendency* from still another agent.

Shell Tellus Oil also has the superior *demulsibility* required of a hydraulic oil. And due to its tenacious oil film, it keeps wear to a minimum.

Talk to your Shell representative about Shell Tellus Oil — the *surest* protection for hydraulic systems you can buy.



How U. S. Rubber belt engineers cut installation costs



View of 24" U. S. Giant Conveyor Belt carrying aggregate from mixing hopper to loading hopper in plant No. 2, Builders Supply Co., Houston, Texas.

Junction between cross belt and incline belt. They convey the aggregate to concrete mixing tower, which in turn supplies the waiting trucks.



In a new concrete mix plant, original plans called for the installation of a 5-ply, 36 oz. duck conveyor belt to handle the aggregates. But United States Rubber Company engineers pointed out that their 4-ply, 42 oz. duck belt would not only cost less, but would be more flexible crosswise to trough, would train more easily and provide high-tensile strength as well. This 1,275-foot, 4-ply U.S. Giant Conveyor Belt was installed. It travels 300' per minute and delivers 294 tons per hour.

This is another instance of why it pays to consult "U.S." engineers before going ahead on a conveyor belt problem. Remember that they are backed by a wealth of experience and vast research facilities. Finally, they will work with your engineers and with the designers of conveyor equipment—a 3-Way Engineering teamwork that always pays off in higher output at lower cost. Write to address below.

PRODUCT OF



UNITED STATES RUBBER COMPANY
MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.



Tandem Rollers

with 22 Great Features
HUBER
8-12 TON • 10-14 TON

Here's a new HUBER Tandem Roller that offers new standards of performance in terms of speed, dependability, smooth operation and long life.

Make up a check list of every feature you'd like to see in a tandem roller—and see for yourself how HUBER has anticipated your needs. More than a score of major and minor refinements are incorporated in its design and construction.

Such features as permanent bearing alignment in the kingpin and swivel pin assemblies, the wrap-around frame that gives you a new concept of rigidity, and HUBER's perfected version of fluid coupling are among the improvements that will catch your interest.

The best way to get the whole story is to see one of the new HUBER tandems in action. Second best is to write for a copy of the new HUBER TANDEM ROLLER BULLETIN, No. T-152. Send for your copy today, or see your nearest HUBER Distributor.



This 16-page bulletin, T-152, tells the story of the new HUBER Tandem Rollers in pictures and descriptive copy. Ask for your copy—address requests to Huber Manufacturing Co., Marion, Ohio.

HUBER MANUFACTURING COMPANY — MARION, OHIO, U.S.A.

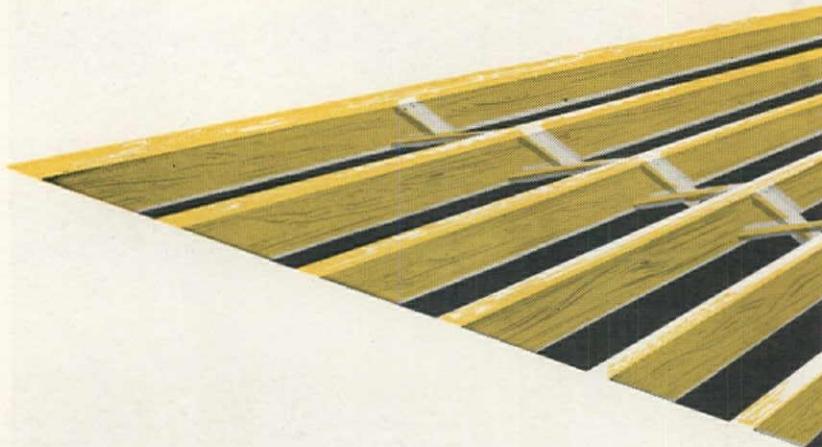
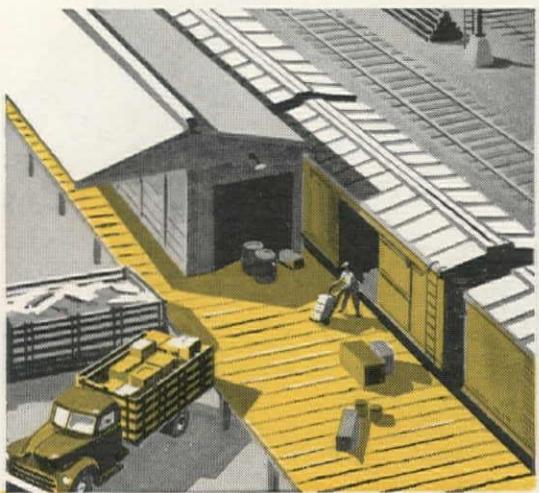
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WOOD

most
workable of
structural materials...



...lasts
years
longer
when

penta
PROTECTED *

You use wood for building construction because it is the most workable of materials, offers the greatest flexibility of design and is always available. And when you specify PENTA protection for the wood you use, you also add the valuable qualities of *durability* and *long structural life*.

The treatment of wood with PENTA assures service life many times increased through the prevention of rot and termite damage. This PENTA protection is *permanent*, too, since PENTA will not leach or evaporate. Workability is unimpaired, and building mechanics prefer to work with PENTA-treated wood because it is *clean*.

"Wood treating specifications: Structural Lumber, all species, and other wood construction materials to be used in contact with the ground and exposures of similar severity, and not to be painted, shall be treated by a method which will give a minimum net retention of 8 lbs./cu. ft. of '5% penta petroleum oil solution.' For bridge material a minimum net retention of 12 lb./cu. ft. shall be used. Where an especially clean treated wood is desired, the oil shall meet A.W.P.A. specification page 50 Section 2."

(This is an excerpt from the wood treating specifications of a plant operating in the Gulf Coast Area.)

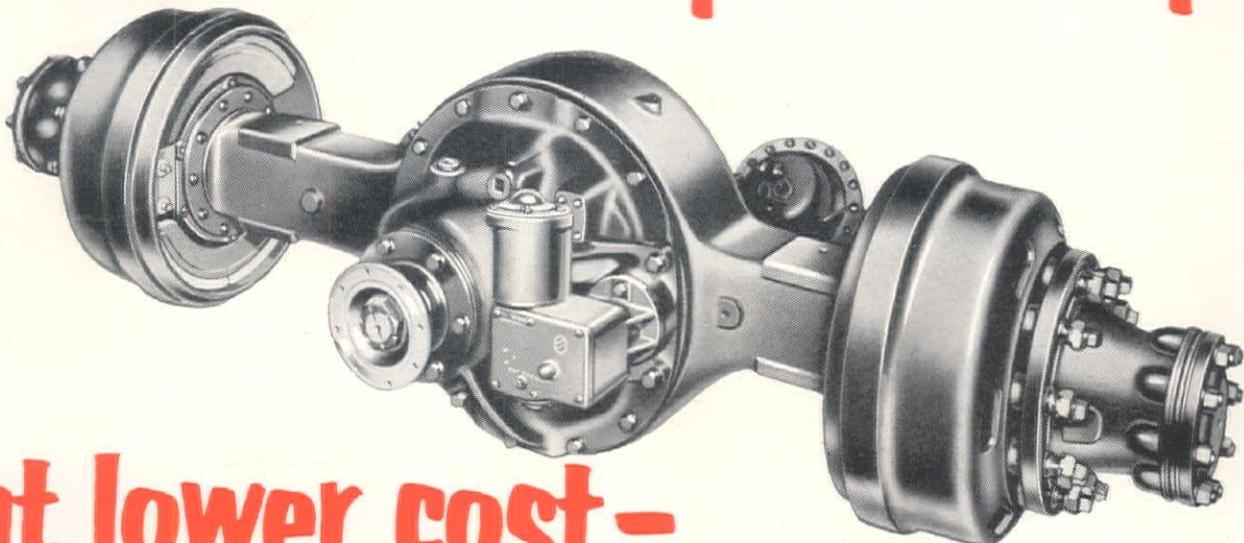
For more data write Dept. PE 40A for one of the following:

- Plant Wood Treating Specifications
- Valuable Booklet, "Pointers on Penta"

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

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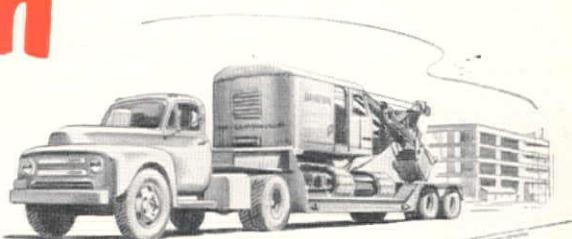
EATON 2-Speed equipped Trucks make quicker trips



at lower cost -
last longer, are worth more
on the trade-in

With Eaton 2-Speed Axles drivers select the gear ratio best suited to road, load, and traffic conditions—the ratio for maximum economy, safety, and maneuverability. Quicker trips with full loads mean more payload miles at lower cost per mile. Engines run in the most efficient and economical speed range, reducing stress and wear on engines and all power transmitting parts. Trucks stay on the job, out of the repair shop. Thousands of miles are added to vehicle life; trucks are worth more when they are traded in.

Let your truck dealer explain how Eaton 2-Speeds will enable your trucks to haul more, faster, longer, at lower cost.



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2-Speed Truck
AXLES

Axle Division

EATON MANUFACTURING COMPANY
CLEVELAND, OHIO



INSIST
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Today, America's roads are crowded with twice the traffic they were designed to carry. Help end the national traffic jam by speaking up for more and better roads.

You can tell by the **PERFORMANCE . .**



sure they're "Eucs"!

Wherever they're put to work, "Eucs" do the kind of a job that makes them the preferred equipment for moving earth, ore, rock and coal in off-the-highway service.

Big payloads, fast travel speeds and high job availability add up to more loads per hour and more profit per load. Whatever the job . . . building highways, dams, levees, airports . . . working in mines, quarries or on industrial projects, you can depend on "Eucs" for low cost hauling.

If you own "Eucs" you're already benefiting from their production and profit advantages. If you know them only by reputation, we suggest you get performance facts and figures from your Euclid distributor.



Euclid Scraper—15.5 cu. yds. struck, 21 cu. yds. heaped at 1:1 slope . . . 275 h.p. engine . . . top speed, loaded, 28.2 m.p.h.

Bottom-Dump Euclids—13 to 25 cu. yds. . . . 190 to 300 h.p. . . . top speeds loaded to 34.4 m.p.h.

Rear-Dump "Eucs"—10 to 34 tons . . . 125 to 400 h.p. . . . spring mounted or semi-rigid drive axles . . . top speeds loaded to 36.3 m.p.h.

The EUCLID ROAD MACHINERY Co., CLEVELAND 17, OHIO

CABLE ADDRESS: YUKLID

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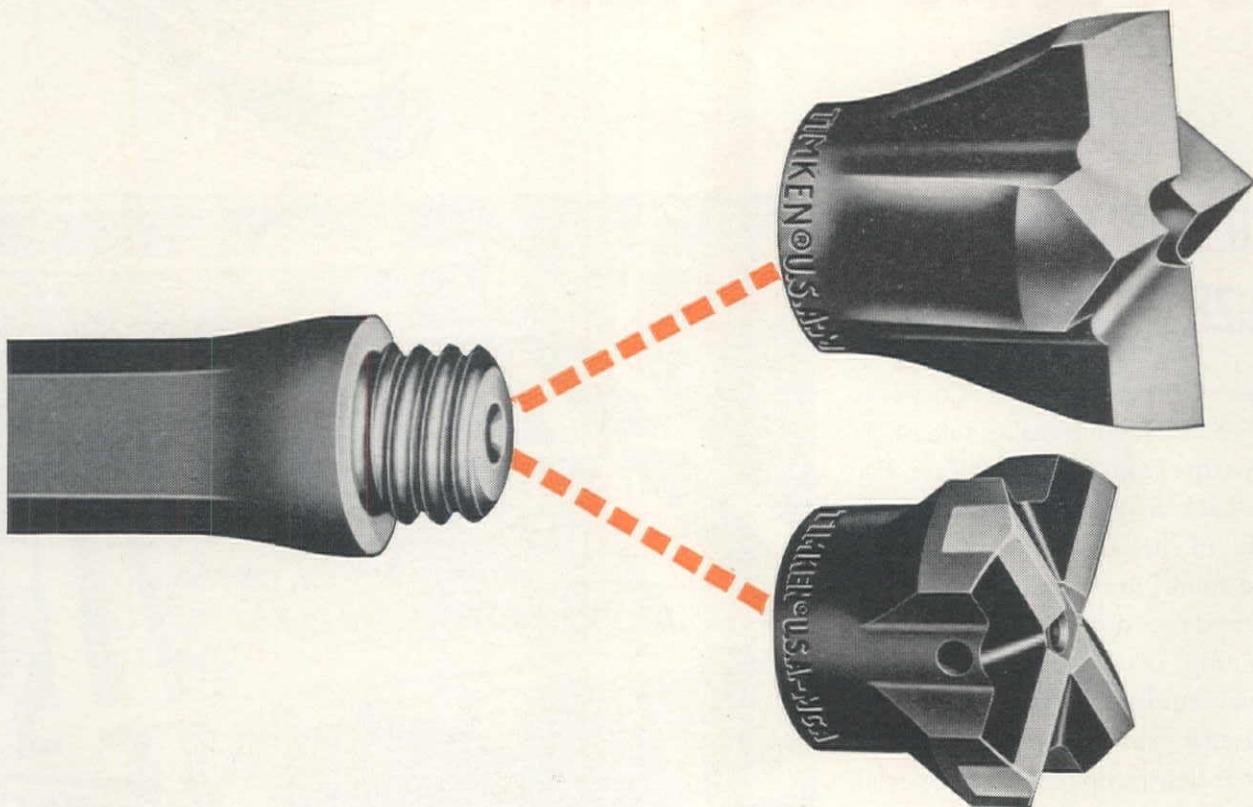


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USE THE SAME STEEL FOR BOTH ROCK BITS!



Switch bits as the ground changes . . . right on the job!

DRILLERS need only one steel on the job when they use Timken® rock bits. Both Timken multi-use and carbide insert bits, in the same series, fit the same threaded drill steel.

In drilling ordinary ground, Timken multi-use bits, when correctly controlled and reconditioned, give you the lowest cost per foot of hole when full increments of steel can be drilled.

When you hit hard, abrasive ground, quickly switch to Timken carbide insert bits for maximum speed and greatest economy. They're your best bet for very deep holes, small diameter blast holes and constant gage holes.

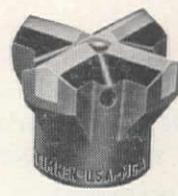
Both Timken bit types have three big advantages: (1) made from electric furnace Timken fine alloy steel, (2) threads are not subject to drilling impact because of the special union developed by the Timken Company, (3) can be changed quickly and easily.

If you're in doubt about the best bits for *your* job, call upon the 20 years' experience of the Timken Company's Rock Bit Engineering Service. Engineers

will study your problem and recommend the most economical bit for your job. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".



Timken threaded
multi-use rock bit



Timken threaded
carbide insert rock bit

TIMKEN

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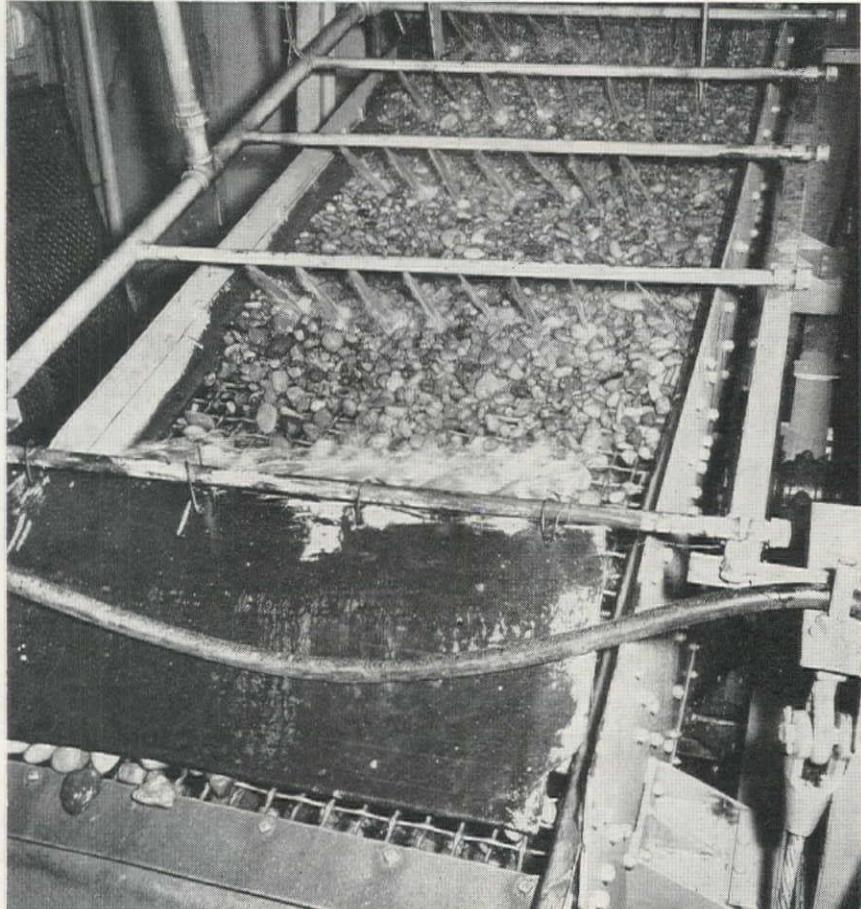
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When Gravel Products Corporation's S. S. Niagara makes one of its daily trips from Buffalo to Erie, Pa. into Lake Erie, it's out for a "big catch" of the finest sand and gravel to be found in this area. Instead of rods and nets however, this 270 foot sea-going craft is equipped with special equipment that draws the sand and gravel up from the lake floor at depths up to 80 feet. Special equipment separates the sand from the gravel and when the Niagara has a "catch" of 2,400 tons it heads homeward.



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Gravel Products Corporation's products are well known for quality throughout the Niagara Frontier and its yearly production runs into almost astronomical figures. *But even the finest gravel* must be accurately sized for complete customer satisfaction. That's why Gravel Products Corporation uses Seco vibrating screens exclusively. In the words of Mr. Ernest Hammond, "On this particular 3 deck Seco, we make four finished sizes and simultaneously rewash the gravel at the rate of 200 tons per hour (N. Y. State 1A's, 1's, 2's, and 3A's). For accuracy and dependable performance without excessive maintenance, we're absolutely sold on Seco. Another of our Seco's has served us faithfully for 12 years."

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on power...know
they can depend
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Construction men in the field have learned to count on Cummins Diesels for dependable power day in, day out. What's behind this consistent reliability? One good reason is the fact that every Cummins Diesel is actually built *twice*. After initial assembly, and run-in testing, every engine is disassembled, inspected; then reassembled and tested again.

This extra care—together with Cummins' economy-proved fuel system and efficient parts and service organization—makes lightweight, high-speed (50-550 h.p.) Cummins Diesels a wise first choice for men who depend on power.

Whatever your power needs . . . whether it's for earthmoving, portable power units or generator sets . . . or any other important jobs . . . see your Cummins dealer.

CUMMINS ENGINE COMPANY, INC., Columbus, Indiana

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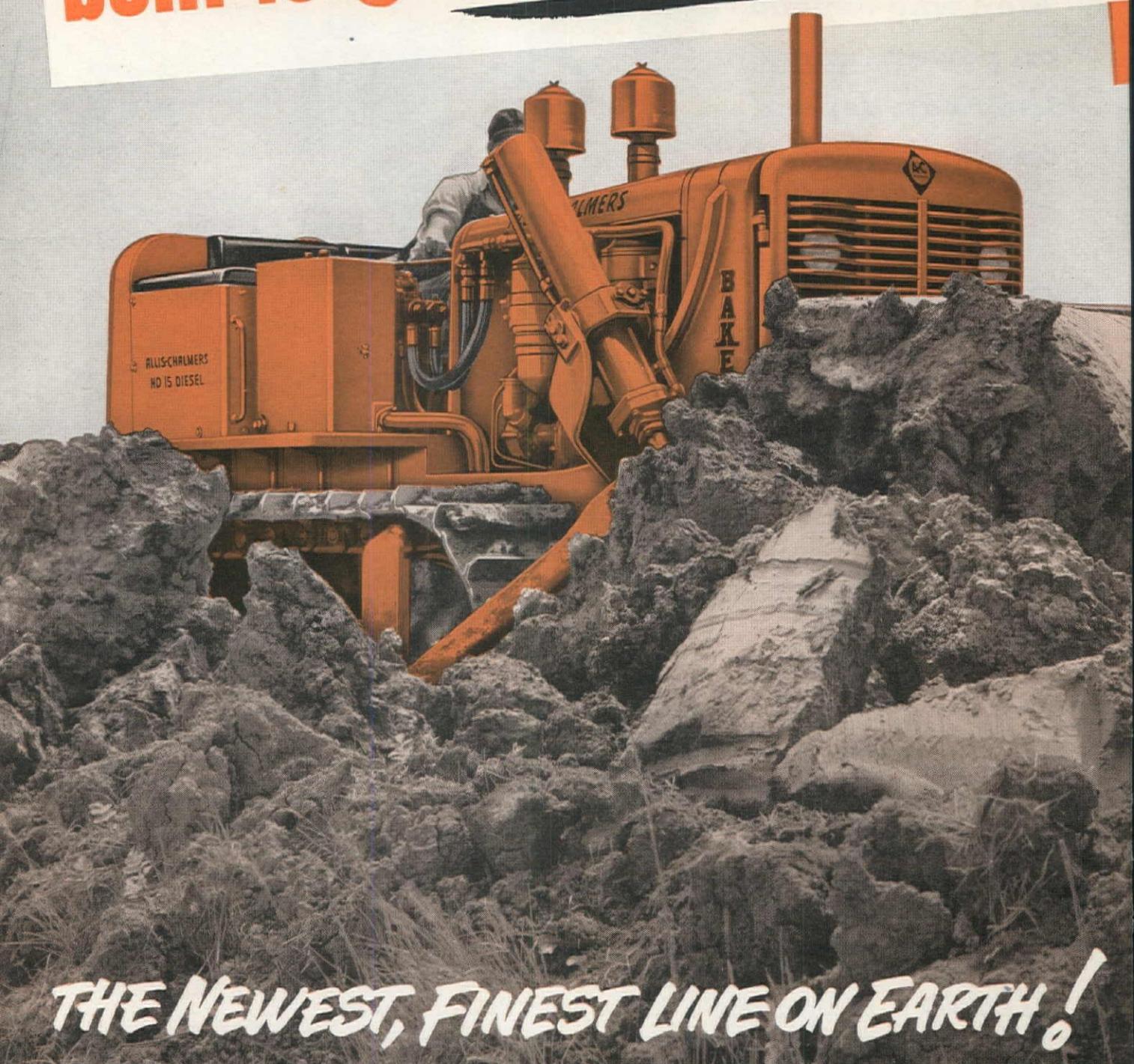
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(8-22-52)

NEW ALLIS-CHALMERS HD-9, HD-15 ARE
built to *GET MORE DONE*



THE NEWEST, FINEST LINE ON EARTH!



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40 drawbar hp.
11,250 lb.



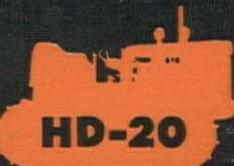
HD-9

72 drawbar hp.
18,800 lb.



HD-15

109 drawbar hp.
27,850 lb.



HD-20

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

built to TAKE IT LONGER



Unequalled Lugability

The HD-9 and HD-15 build up greater drawbar pull faster . . . hold it longer than ever thought possible in gear transmission tractors.

For example, when tough going has pulled travel speed down 40 percent, these tractors will have increased their drawbar pull almost 20 percent over rated pull. They will lug down almost 45 percent from rated travel speed before drawbar pull even starts to fall off.

To take full advantage of this important GM 2-cycle diesel engine characteristic, the HD-9 and HD-15 have longer truck frames, lower idlers and sprockets. That means more track on the ground . . . better stability . . . sure-footed traction . . . unequalled *lugability*.

Extra Long Life

Here are a few of the many reasons why these newest, finest tractors are *built to take it*.

- All-Steel Welded Construction
- More Power with Bigger Engines — Longer Engine Life
- More Weight, Greater Strength
- Extra Heavy Main Frames — No Extra Reinforcement Needed for Front-Mounted Equipment
- Long-Lasting, Large Diameter Clutches
- Double Reduction, Straddle-Mounted Final Drive Gears with Live Sprocket Shafts and Caged Bearings
- Positive Operating Track Release — Works in Oil
- All New, Specially Designed Track Assembly
- Positive-Seal Truck Wheels, Support Rollers and Idlers — Mounted on Tapered Roller Bearings, 1,000-Hour Lubrication!

Your Allis-Chalmers dealer will be glad to explain all of these advantages. See him or phone him now.

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ESTABLISHING MOUNTAIN-TOP BASE, a helicopter and a TD-24 put men, machinery and supplies on mile-high pass as first step in efforts to build road down to meet section coming up from each side. TD-24 pulled yonder, winch, and compressor into pass after bitter 7-day fight.

Big

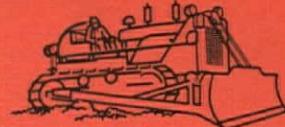
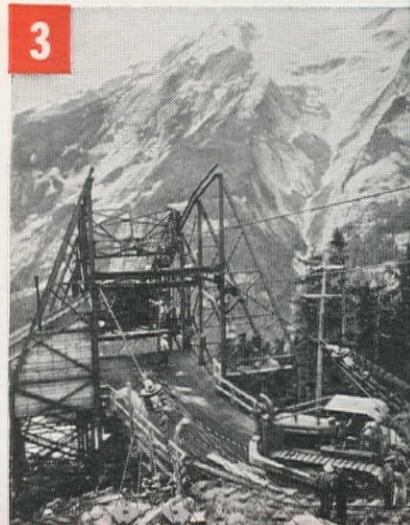


1 RAISING KENNEY DAM to fill the Grand Canyon of the Nchako River, workers sluice down some of the 3.8 million cubic yards of earth and rock it will eventually contain. Dam will form a reservoir with twice the capacity of Grand Coulee. TD-24 in foreground strips blasted rock from canyon wall abutment.

2 HEADING OPERATIONS at Kenney Dam are (left to right) Alcan Resident Engineer Harry Jomini; General Superintendent "Hak" Nielsen and Project Manager Jack Bremner, both of Mannix,

Ltd., sub-contractor for Morrison-Knudsen Company of Canada, Ltd. 110 miles west, dammed-up waters will be diverted through mountains and dropped a half mile to run turbines in sea-level powerhouse.

3 DRIVING TEN-MILE TUNNEL through mountain is done from four headings. Here, half a mile above ocean-level valley, aerial tramway has delivered TD-24 to tunnel portal for working debris down mountain. 2,600 feet below, eight-story powerhouse inside mountain is being mucked out by a TD-24 and a TD-9.



Red



Pioneers New Frontier

59 International TD-24s spearhead largest integrated engineering program in history for Alcan (Aluminum Company of Canada, Ltd.) on Project British Columbia

A fleet of 59 hard-hitting International TD-24s is blazing a new frontier across 5,000 square miles of wilderness in British Columbia.

Twenty-four hours a day, they're on the go for Morrison-Knudsen Company of Canada, Ltd., prime contractor for most of the giant development that includes:

Building the largest sloping clay core dam in the world
Driving a subway-size tunnel ten miles through a mountain
Blasting out an eight-story powerhouse two blocks long inside solid rock

Erecting a transmission line fifty miles long over a jagged mountain range

Raising the world's largest aluminum smelter and a new port city at Kitimat where 50,000 people may eventually live and work.

A. O. Strandberg, project manager for Morrison-Knudsen, says:

"These TD-24s are doing the impossible. We never thought any tractor could go where these tractors are working now. They have

4 INSPECTING MOUNTAIN TOP OPERATIONS at Keman, headquarters for construction of powerhouse, tunnels and transmission line are (left to right) A. O. Strandberg, Project Manager for Morrison-Knudsen; F. T. Matthias, Alcan Assistant Project Manager, and Walter Abrahamson, Alcan Assistant Resident Engineer at Keman.

5 LINKING UP POWER TRANSMISSION LINE ROAD, a pair of TD-24s doze toward each other through blasted rock. Across 50 miles of rugged terrain like this, a mountain-anchored powerline

the weight, they have the balance, and they have the power to get the job done."

And here's what superintendents on the firing line say:

Bill Richards: *"They're pushing boulders uphill we had to dynamite in the old days."*

Herb Wilkinson: *"I wouldn't believe where they'd go until I got them on my crew."*

John Hutton: *"They're doin' work up here they were never built for but they're doin' it just the same."*

Your International Industrial Distributor can give you the facts and figures on the TD-24. See him. You'll be a TD-24 man from then on in!

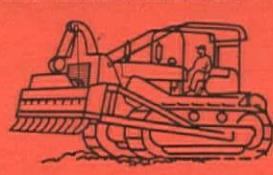
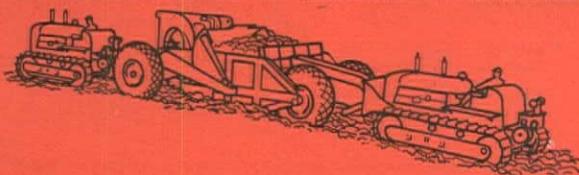
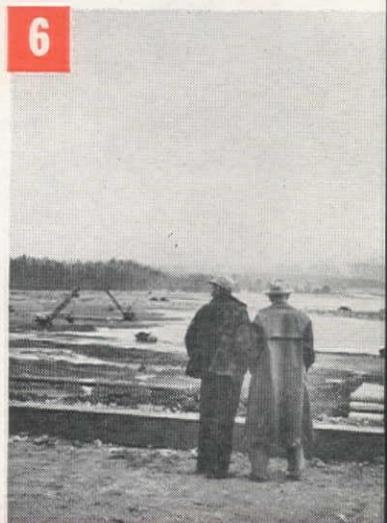
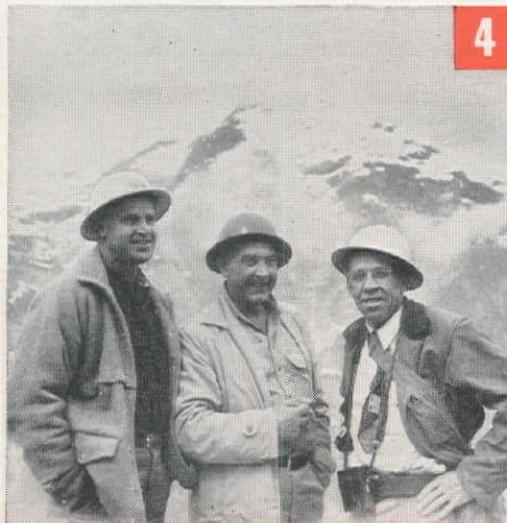
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INTERNATIONAL POWER THAT PAYS

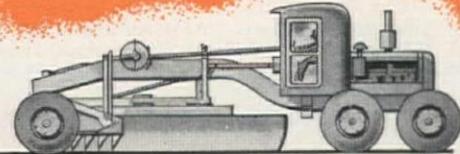
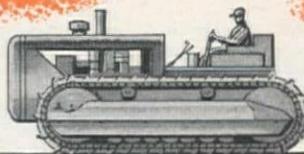
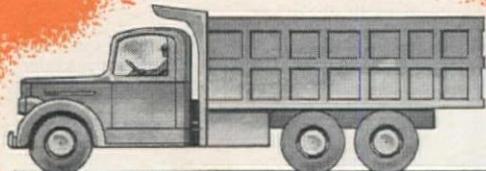
will be built to flash abundant electricity from mountain powerhouse to smelter at tidewater.

6 NEW LAND IS MADE IN OCEAN INLET by dredge which deepens anchorage for ocean shipping at the same time. H. M. Whiting (right), Project Manager for Kitimat Constructors, Ltd., and a superintendent study progress. Part of this 70 acres of new land will become site of new aluminum smelter. Town which may eventually become city of 50,000 will be built across the bay.

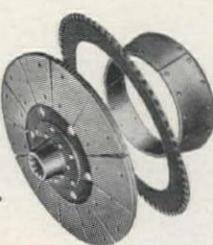


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**VELVETOUCH
MATCHED FACING
SETS**



Heavy duty hauling and earthmoving units stay on the job longer when you install Velvetouch Matched Facing Sets. Because Velvetouch clutch plate combinations give you four friction surfaces instead of the conventional two! You get extra clutch capacity . . . extra hours of service . . . extra freedom from adjustment and repair. And with Velvetouch, you can salvage worn and heat checked flywheels and pressure plates for additional savings! See your jobber, our nearest branch . . . or write The S. K. Wellman Company, 1374 East 51st Street, Cleveland 3, Ohio.



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MORE WORK FINISHED
ON THE JOB **FASTER**



PAYS FOR
ITSELF
FASTER!

You Make **PROFITS**
FASTER

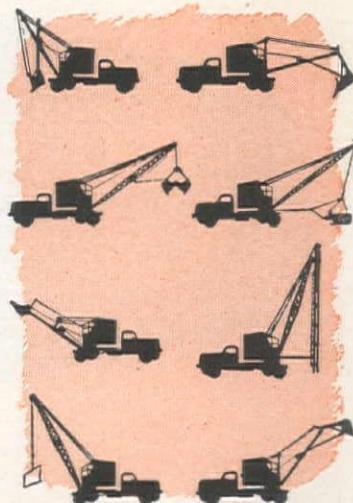
Job Tickets tell the story...more hours of work each day...more work per hour...lower operating costs...lower maintenance costs...it all adds up to bigger profits for you.



Yes, *QUICK-WAYS* make faster profits—give you fast truck speed between jobs—eight money making attachments—fast working speeds—4 models from 3 to 10 ton crane capacity.

—and quality construction too—all steel for strength and lightness—accurate balance—high capacity to weight ratio. More parts are interchangeable and easy to get at, which simplifies maintenance and repairs. All parts deliver their capacity rating and more. This fine construction means longer life—more profits on a small investment. They're economical to buy. Ask your distributor for a free demonstration.

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

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build
temporary
shacks
for

- SUPERINTENDENTS
- FIELD ENGINEERS
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- PAYROLL CLERKS
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Interiors constructed
to your specifications.

MOBILE OFFICES

The perfect replacement for any temporary field office. Columbia Mobile Offices are ruggedly constructed to withstand years of hard service and severe weather conditions. Floor areas range from $7\frac{1}{2} \times 16$ feet to $7\frac{1}{2} \times 31$ feet. Partitions, counters, shelving and closets constructed according to your specifications.

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the New

OLIVER "OC-18"

the Operator's Dream come true!



Here's a tractor that has been designed specifically to make life as easy as possible for the operator. Just check this list of "easy operating" features—it puts the "OC-18" way out in front as the tractor that gets more done . . . faster . . . every day.

1. Over-Center Clutch. The clutch bar runs across the full width of the dashboard. No need here for the operator to hunt for a single lever . . . to take his eyes off the work.

2. Air Steering is Standard Equipment. You can steer the "OC-18" with just two fingers of one hand.

3. Push Button Electric Starting. The husky starter of the "OC-18" gets the engine going . . . quick.

4. Cold Weather Starting Aid . . . standard equipment on the Oliver "OC-18" for fast, easy starting in extremely low temperatures.

5. Center-Positioned Gear Shift Lever . . . is located right where it's easiest to reach.

6. Ample Leg Room . . . no cramped legs after a hard day's work with the "OC-18".

7. Convenient Foot Parking Brakes are standard equipment on the "OC-18".

8. Comfortable, Two-Man Seat . . . plenty of room for two men in this upholstered seat.

9. Easy-Acting Friction Throttle is located at the right arm rest of the seat in the most convenient position for the operator.

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Helping to push the Desert back

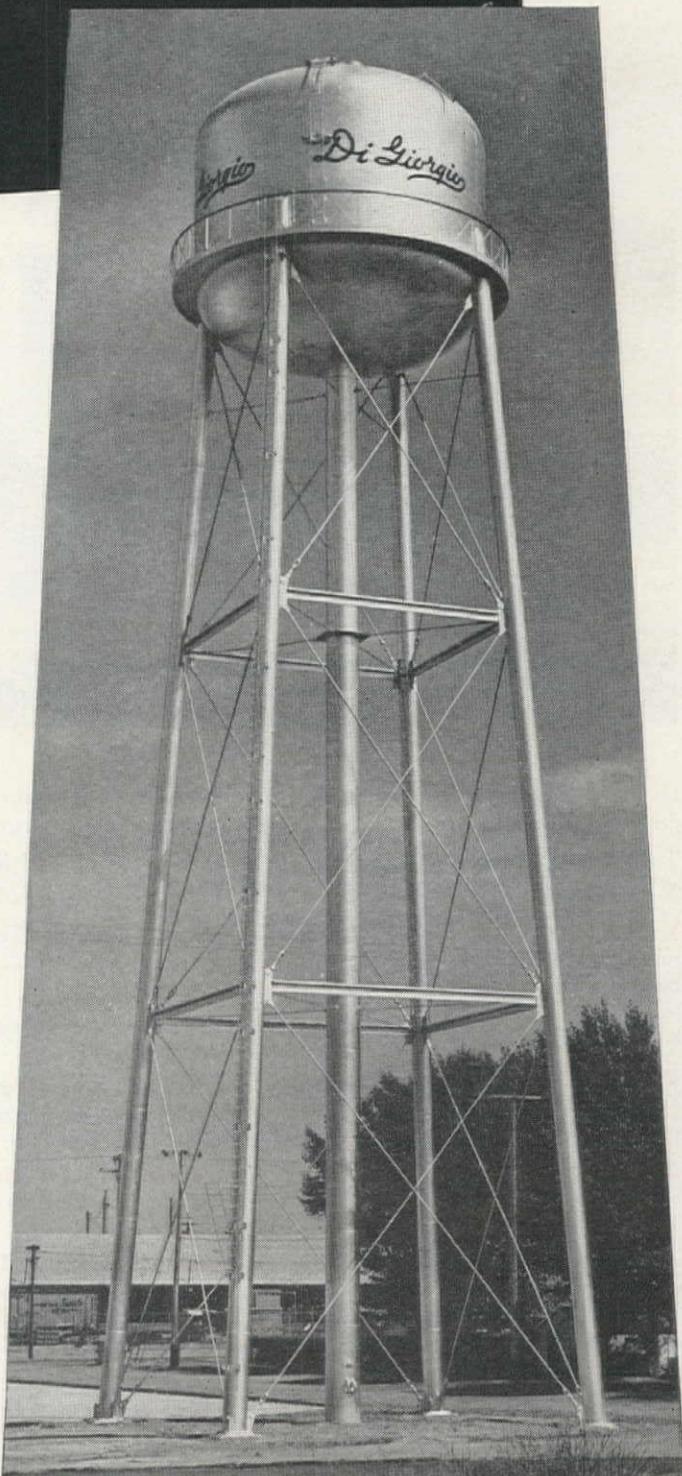
The late Joseph DiGiorgio built an industry on the barren desert sands near Bakersfield, California. DiGiorgio came to this country from Sicily at the age of fourteen and worked his way up from the bottom. Today, the DiGiorgio Fruit Corporation operates approximately fifteen ranches or farms, totaling 25,000 acres in area in California and Florida.

At the 10,500-acre DiGiorgio farm near Bakersfield, a 100,000-gallon Horton elevated water tank was installed to provide an ever-ready water supply for domestic use and fire protection for all structures on the property. Although not directly used for irrigation, this elevated water supply truly helps to keep the desert pushed back by making the "Oasis" more livable.

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100,000-gallon Horton elevated tank built for the DiGiorgio Fruit Corporation at DiGiorgio near Bakersfield, California. We also furnished a 25,000-gallon ellipsoidal-bottom tank for the DiGiorgio ranch at Borrego Springs, Calif.



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More judgment than engineering

Earthquakes and floods are natural phenomena that introduce a strong flavor of economics and judgment into normal engineering design. They represent random forces of non-conforming magnitude and unknown frequency as compared to the old-reliable law of gravity, which is the basic consideration for civil engineers. As to floods, the engineer knows "where" but doesn't know "when," and as to earthquakes the engineer doesn't have much idea about either one. In spite of this difference, and the obvious distinction between hydraulic and structural engineering, there are peculiar elements of parallelism.

Flood control engineering involves consideration of progressive hazards such as the annual flood peak, the "ten-year," the "record to date" and the ultimate. Selection of the interval of protection and the probable menace to be met, leads into more economics and judgment than engineering. Cost increment of protection must be multiplied by the factor of time and growth in the area. If the ten-year interval is selected, is it feasible to add enough to protect against the "record to date," and when will it repeat?

By comparison, provisions against earthquake damage require further application of intangibles. Conceivably, earthquake forces could be strong enough to destroy any man-made structure. Engineers, therefore, are designing to meet the generally predicted magnitude of disturbance. By similarity this might correspond to the "flood of record." Lesser disturbances may not produce damage to the basic structure, but can cause extensive superficial damage, corresponding to floods causing inconvenience and nuisance.

A building owner may wish to reduce this non-serious type of damage, or he might request that an earthquake of given magnitude should be the measure of protective design. Today, the time factor to be applied to such considerations is just as usable as the seismologist's classic prediction that, "All we know about forecasting earthquakes is that the farther you are from the last one the nearer you are to the next one." This is a rather difficult factor to introduce in figuring the cost-time ratio.

But in the background facts are slowly being accumulated on frequency, character of the forces, and the resistance of various types of design. Scientists are even advancing toward the possibility of actually measuring the strains building up in rock formations in an effort toward anticipation. It is not beyond reason to say that at some time in the future the engineer in earthquake areas can join the flood control engineer in designing for a disturbance of defined amount and predictable interval.

WESTERN CONSTRUCTION

Without benefit of bureaucracy

Possibly the scale of the program may not be on a par with present-day Federal multi-purpose projects, but the problems were similar and the solution much more healthy for the economy and future of the West. Private industry, represented by the Pacific Gas and Electric Co., and two well established public agencies—Oakdale Irrigation District and the South San Joaquin Irrigation District—have worked out a solution for river development to their mutual advantage without benefit of bureaucracy. The result will be a \$48,000,000 hydro-electric and irrigation plan for the Stanislaus River in central California. Costs will be repaid by the private utility buying the power developed at three plants, and the three reservoirs will control the annual flow and store water vital to the irrigation of lands in the districts.

Thus, without benefit of a valley authority or political doctrines, the two parties sat down as business men and made a deal that was favorable to both sides. Actually, this idea is simpler than it has been come to be regarded in recent years. Too frequently local interests have come to think that such forthright and direct solution is no longer possible. It is not only applicable for river problems of this magnitude, but at the level of inter-state compacts such a forthright procedure can apply to any watershed in the West.

Service of the "general"

The service rendered by a general contractor is no better illustrated than in the remodeling job on a large office building. The ability to coordinate the work of many specialized trades and the centralizing of responsibility are the direct owner benefits. On a recent large building modernizing project in Los Angeles the general contractor arranged for and directed the operation of a total of 35 sub-contractors, even including the installation of "Music by Muzak." On some days as many as twelve trades had crews working at the same time in the area of the building.

Circumstances will differ as to the desire and ability of a building owner to assume the highly involved task of securing and directing such a group of specialists in carrying out involved assignments. Without experience, delays and confusion can develop that will devour time and eat away the calculated savings from the decision to eliminate supervision. Work of sub-contractors is complex and their operations must be dovetailed perfectly if the job is to move efficiently. Crews must shuttle on and off the job in endless procession and what seems confusion must actually be the designed interlocking of tasks. All of the problems of selection of these specialists, arrangements, timing, checking results, direction and control are included in the advantageous function of the "general."

Like Top Hats and Snowballs

they Go Together



All-Wheel Drive and All-Wheel Steer

Getting down to fundamentals, the main job for any self-propelled grader is to move a satisfactory amount of material with the blade, and keep traveling in the desired direction. To move a satisfactory amount of material requires adequate traction. To keep traveling in the desired direction means that a way must be found to overcome the side thrust of the load on the angled blade . . . if such control is lacking, one end of the grader or the other slides sideways.

Traction and directional control . . . these are the fundamental problems of the designer. They are completely

solved in Austin-Western "88-H," "99-H" and Master "99" Power Graders by exclusive all-wheel drive and all-wheel steer. They can never be completely solved in an ordinary front steer, rear drive grader.

All-Wheel Drive and All-Wheel Steer work as a team, each making the other doubly effective. All-Wheel Drive provides 30 per cent more Power-at-the-Blade. All-Wheel Steer provides all-around maneuverability not approached by ordinary motor graders. This is why Austin-Western machines go places where others cannot go . . . do things other graders cannot do.

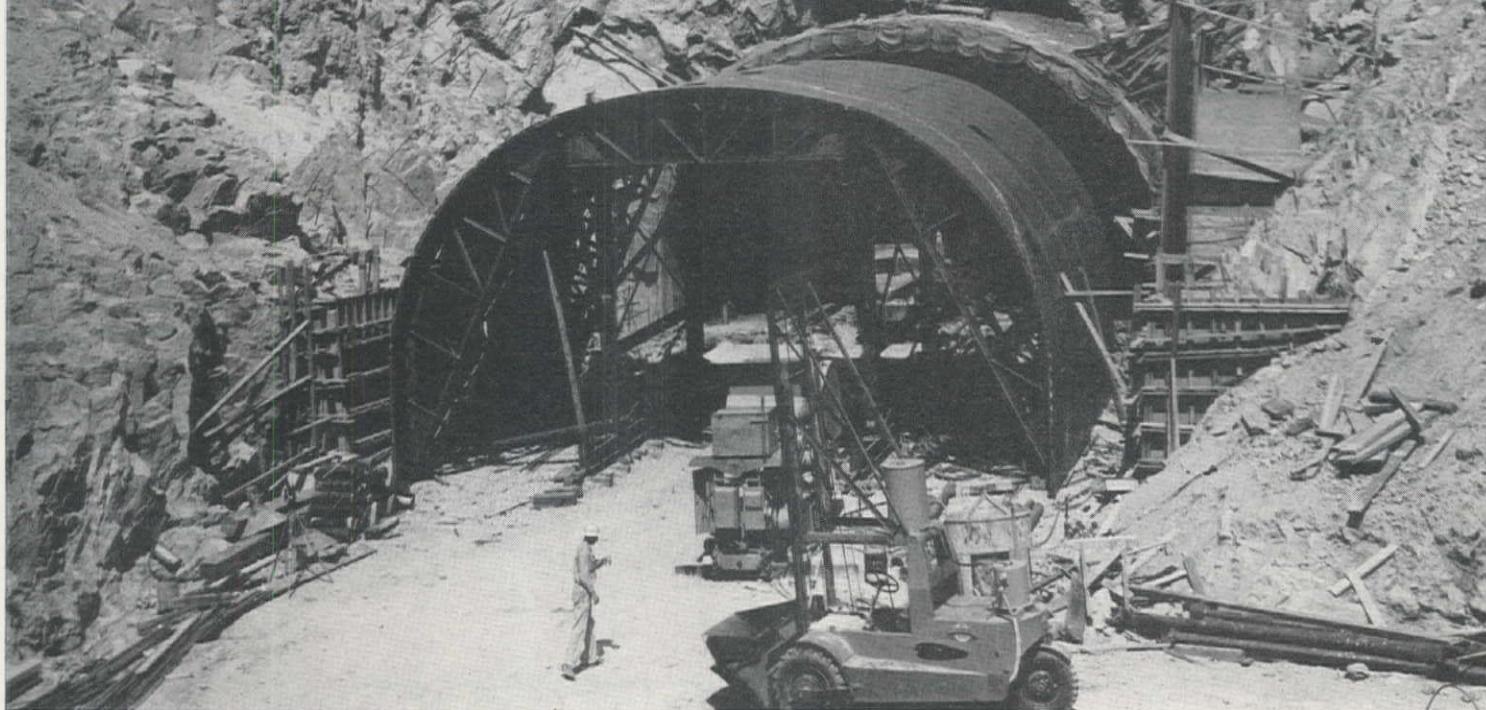
In the photograph above, an Austin-Western "88-H" is using both All-Wheel Steer and All-Wheel Drive to work smoothly and easily around a short radius curve, which a front steer, rear drive grader could not negotiate. Rear steer provides the required maneuverability . . . the live power in the front drivers completely nullifies the tendency—always present in ordinary motor graders—for the rear drivers to increase the turning radius by skidding the dead front end sideways.

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NOVEMBER 1952



Two 31-ft. forms moved alternately in —

Lining Arizona highway tunnel

First unit set with end bulkheads, filled, and then moved two lengths ahead, while following form fills spaces without bulkheads — Sequence provides efficient handling of crews and equipment

ARIZONA'S Queen Creek Tunnel is nearing completion as the Vinson Construction Co. has finished concrete lining throughout the 1,240-ft. highway bore. Portal structures, paving, and illumination equipment remain for incorporation in this important Superior-Miami link in the state highway system. Relocation of U. S. Highways 60 and 70 in this stretch has eliminated a succession of dangerous curves and grades and has included construction also of two spectacular bridges over Queen and Pinto creeks.

Construction history of this highway improvement and its design to new alignment in accordance with Arizona's sufficiency rating system have been described for *Western Construction* (October 1951, pp. 61-64) by R. C. Perkins, the state highway engineer. Comprising a portion of what is primarily a two-lane



By
L. V.
MULHERRON
General Superintendent
Vinson Construction Co.

highway, the tunnel has a 6.4% grade. To handle up-grade trucking the tunnel was modified to three-lane width, providing one passing lane. The driving of the tunnel was performed last year by Fisher Contracting Co. of Phoenix.

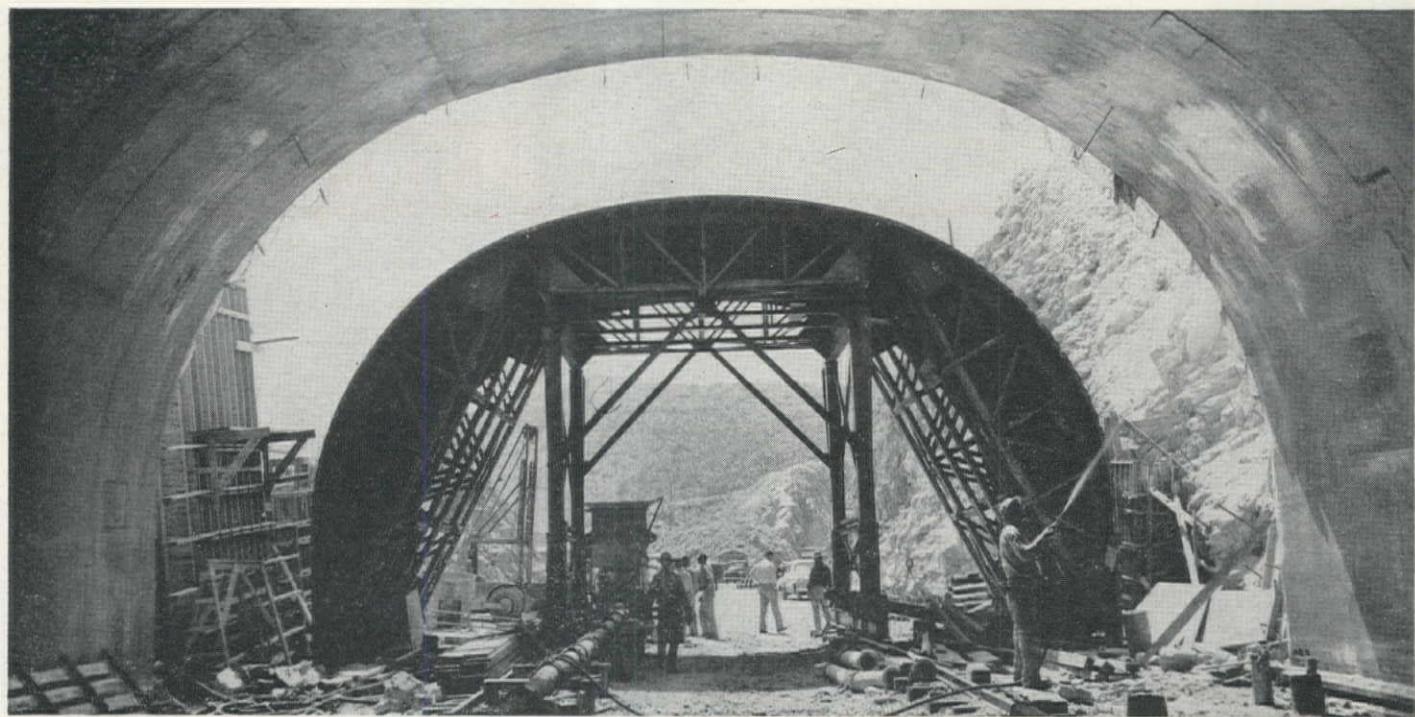
Bids for lining and paving the Queen Creek Tunnel were called by the Arizona

Highway Department early this year. Vinson Construction Co. was awarded the contract on its bid of \$527,995. Unit bids for the job were published in the April issue, page 142.

Geological problems

The highway department engineers selected an elliptical cross section, 42 ft. wide and 24 ft. in maximum height. The 1,200-ft. bore was to be driven through solid rock and was designed to be unlined if the rock formation was favorable. A geological survey prior to commencing the job revealed crevices throughout the dacite formation pierced by the tunnel. This provided a warning that a major problem might develop during driving. About midway through the bore, the partly decomposed dacite collapsed from ceiling, leaving a fissure about 106 ft. across and 50 ft. in maximum height. The magnitude of this weakness resulted in the decision of the highway department to line the tunnel with reinforced concrete. Prior to lining a special treatment was provided in the space where the rock fell.

First, 10-in. steel H beams, on 24-in. centers, were anchored to floor footings and extended up the walls of the tunnel



in an arch above proposed lining. This row of steel arches was then decked with 12 x 12-in. timber cribbing over which was placed a 15-ft. depth of Perlite to serve as cushion in case of any further displacement of rock.

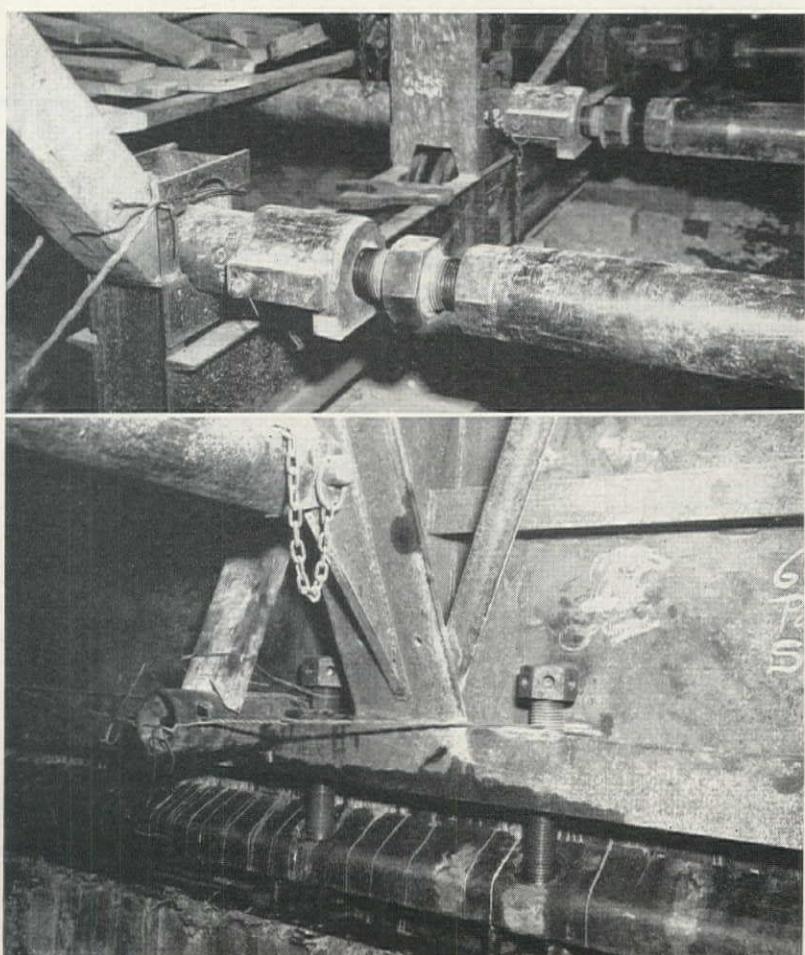
Form design

Allison Steel Manufacturing Co. of Phoenix received the contract to build the forms for Vinson. J. A. Rau, chief engineer of Allison, directed the design of the forms. Two systems of form design and use were given consideration: (1) a 60-ft. form to be poured and then moved forward 60 ft. as a unit, and (2) two 31-ft., 2-in. forms to be used and moved alternately. Use of the two-form method proved to be especially advantageous from the standpoint of economy in time and operational costs. The dominant factor in this decision was the specification requirement of a 72-hr. period after each concrete pour before the form could be moved. It was imperative to insure continuous working operations and not have crews stand by during the 72-hr. waiting period. By working the two forms alternately, a continuous working schedule (8-hr. shift, 6 days per week) could be maintained. During the waiting period after a form was poured, the same crew could move the other form into position. Another contributing factor in this decision was the maximum loading capacity. Further, it was estimated that an average pour for the short form would be about 200 yd. The output of the Pumpercrete unit was between 25 and 33 cu. yd. per hr., making one 8-hr. shift adequate time to complete a pour.

The skin plate was 5/16-in. steel shaped to the finished surface of tunnel arch. Weight of each form was 60 tons excluding accessories (working platforms, etc.). Forms were braced with heavy steel framework for supporting hinged-wing walls and arch.

FIRST SECTION Poured (above) and form moved forward two lengths while second section is assembled and prepared to be set in the alternate space. Note traveling supports on rails and hinged design at the crown section.

DETAILS OF FORMS (below) included such provisions as the push-pull jacks (top) which controlled the movement of the wings, and the bolts through the bottom edge of the wings (bottom) which held them in position against the concrete curb.



After fabrication in the Allison shops, the forms were completely assembled and checked for all working parts and dimensions, then each was dismantled in six 12-ton sections and transported by truck 90 mi. to the job site where they were reassembled and put into service.

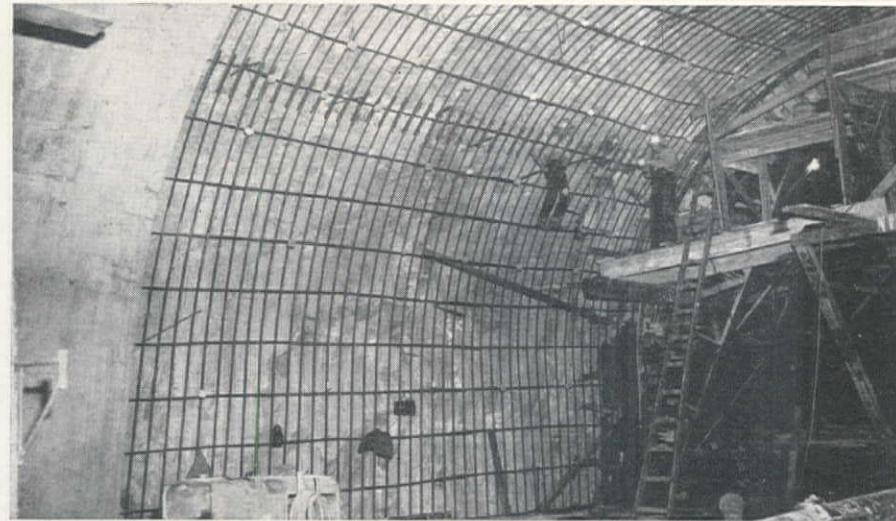
Allison also provided and delivered 250 tons of reinforcing steel for the side walls and arch of the tunnel. To facilitate placement of this steel a jumbo was built on a trailer bed which carried working platforms for the crew (see illustration).

Placing concrete

The most outstanding feature of the lining program was the progressive movement of the forms into their respective working positions. Each form was assembled on a structural steel frame supported on 16-in. wheels moving on

from the Rillito plant of the Arizona Portland Cement Co. Aggregate was delivered by dump truck from a preparation plant set up 5 mi. west of project on Queen Creek. From the batching plant, concrete was delivered by two mixer trucks. A 1-*yd.* Wagner Hyster took concrete from the trucks and elevated it to the charging hopper that served the 200 Single Rex Pumpcrete setup inside the tunnel.

Hinged access doors through the skin of the walls and arch provided openings for concrete and men with vibrators to work the mix into place. To maintain equal pressure on form, a specially designed Siamese connection equipped with pin valves was used to divide the flow of concrete from one sidewall to the other. Control was from working platform. Each 8-hr. pour pumped from 200 to 350 cu. yd. of concrete into place.



PLACING STEEL in the 31-ft. section with the forward form in the distance. With steel in place the second form will be moved ahead to fill this space.

rails as the form was drawn up the tunnel's 6.39% grade and into the working section. The form was then elevated and set to required height and alignment ($\frac{1}{8}$ -in. tolerable allowance) by hydraulic jacks in the four telescopic columns. Jacks were of the oil-field type of 30-ton capacity, and operated by a Baker hydraulic pump. Then, by means of threaded push-pull steamboat-type ratchet jacks, two on each side, the side wings were moved into position. These jacks were designed to lift the dead weight of the side wings only, which put a load of approximately 7,000 lb. on each one, as compared to their rated 10-ton capacity. Seven 6-in. adjustable pipe struts were then extended across the form as spreader bars. The bottom edges of the two side wings were then attached by means of ten $2\frac{1}{2}$ -in. bolts, to the curbs which had been poured in advance for support of the arch forms. This procedure transferred the entire load of the form and concrete to the side wall curbs, as the hydraulic jacks were released.

Aggregate for tunnel lining concrete was batched through a 120-ton capacity Noble plant equipped with a 400-bbl. cement silo. The plant was established about 1,200 ft. down grade from west portal. Cement was hauled by tank truck

Ready for stripping, the seven adjustable center struts were removed, the steamboat jacks collapsed the wings until they cleared the curb, which allowed the form to be lowered approximately 6 in. by bleeding the hydraulic jacks in columns. Then the lead form was moved ahead to two spaces, leaving a gap of 31 ft., 2 in. Bulkheads were then built at each end to conform to the rock wall. After this third section of lining was poured and the leading form moved to the fifth position, the second form was moved into position in the gap left between the first and third pours. This second form did not have bulkheads but was equipped with flanges that fitted smoothly over the ends of the poured sections making smooth joints. In this procedure the lead form progressed ahead, always skipping one position which the second form filled in as it followed.

A crew of ten men were able to handle the pouring and form moving operations. The forty pouring operations required to complete the tunnel lining were worked alternately, two one week and three the next, requiring over 16,000 tons of concrete.

At several locations the fractures in the tunnel roof were too extensive to fill

in one operation. After the regular lining had been in place 21 days additional concrete was pumped in to fill these areas through connections in the lining which had been installed for that purpose. At one point the concrete reached a maximum of 15 ft. as it conformed to rock above.

The required thickness of wall lining was 1 ft., 6 in., and weepers of 3-in. steel tubing were installed at 15-ft. centers at the base of the tunnel wall.

Fog curing

The arch area was equipped with a fog spray which created a mist over each new section of concrete for seven days. This fog method of keeping concrete damp was most successful as it eliminated dripping of water on workmen and was a safety factor as some electric wiring had to be on the tunnel floor.

Twelve hours after a pour was completed the center struts could be removed to allow passage of vehicles to the work in progress ahead of the forms. For this reason, working platforms beneath the forms were built high enough to pass equipment. With this plan, progress continued even after a slide outside the tunnel completely closed the east portal by a rock fall estimated at 10,000 cu. yd. The east portal had been used as the regular entrance for equipment and materials but a route was available to the west portal and the lining operations progressed according to schedule. However, the removal of this mountain slide delayed building and pouring forms for the east portal facing which had been scheduled to be completed before last pour of tunnel lining.

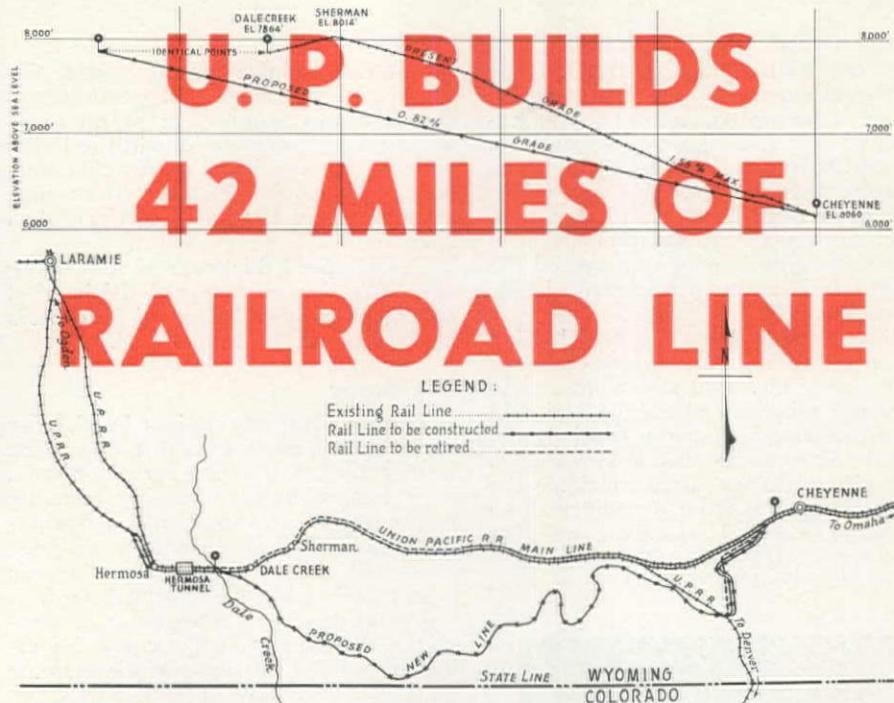
The lining finish will be $\frac{1}{2}$ in. of gunite, pebble finish to springline, a height of 6 ft. This will reduce glare from headlights and also lessen surface defacement through vandalism. The tunnel roadbed and approaches will be completed with 10-in. concrete paving.

The tunnel's distinctive lighting system, designed by L. McDougall of the state highway department, will be installed and operated by the Edison Company. A photo-electric control system, operated by the intensity of light outside the tunnel, will automatically regulate the battery of fluorescent lights at tunnel entrances. This is intended to reduce light-shock produced by glare before entering tunnel. Inside, the tunnel will be illuminated by 70 regularly spaced fluorescent lights.

Both east and west portal facings will be constructed of reinforced concrete in an imposing block-like structure which is suggestive of American Indian design and will be in natural harmony with its historical setting.

Personnel

Glen L. Vinson, founder and owner of Vinson Construction Co., which carried out the lining contract, is a past president of the Arizona Chapter of the Associated General Contractors of America. L. V. Mulherron is superintendent for the contractor and Ray Gardiner is resident engineer for the Arizona Highway Department. R. C. Perkins is state highway engineer of Arizona.



WEST END of the line cuts through granite, and rock work is scheduled for completion in June 1953. Typical rigs are Worthington drills and compressors mounted on Caterpillar D8's for mobility. About 3,000,000 cu. yd. of rock will be moved. Blasted rock is handled by shovel and trucks (see below).

LOADED by 5-yd. Manitowoc, the rock moves into the fills. Deepest cut is near the west end of the line and will be 110 ft. and require the moving of 300,000 cu. yd. of rock. There are no bridges on the new line, all waterways being passed under fills by means of culverts. The twenty-three 180-in. multiplate culverts on the line are already in place.



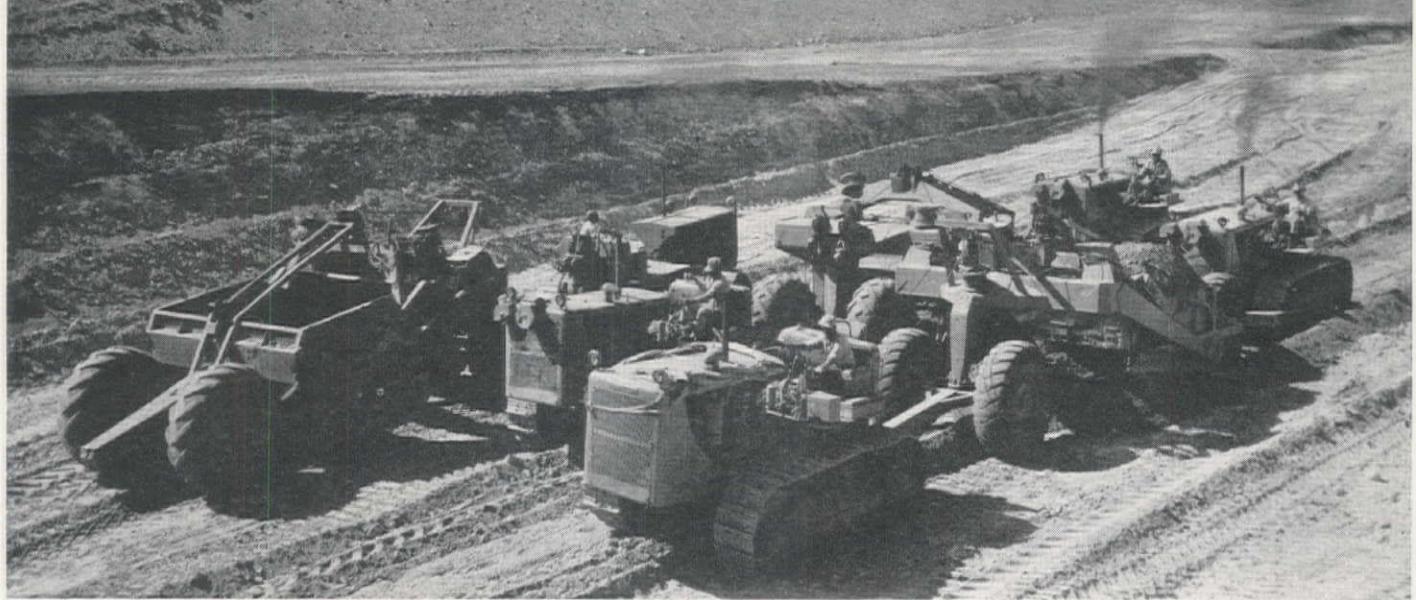
West of Cheyenne the biggest line change since the days of the Golden Spike is being built for the Union Pacific by Morrison-Knudsen Co.

UNION PACIFIC Railroad's largest construction project since this pioneer Western line was completed in 1869 is under way in eastern Wyoming. A 42-mi. section of new line is being built at a cost of \$16,000,000. The purpose of the line change, which will handle westbound traffic between Cheyenne and Dale Creek, Wyoming, is to reduce the grade from 1.55% to 0.82%. Although the new route will be 9 mi. longer than the existing line, running time of trains will be cut by as much as 15 min. because of the grade reduction. Morrison-Knudsen Co., Inc., has the contract for grading and structures, and the Union Pacific is doing the track work. The new line will be single-tracked over most of its length, because the existing route will handle eastbound trains.

Eight separate Morrison-Knudsen crews are at work and during the summer moved an average of 1,000,000 cu. yd. per month.

The new line will be double-track for 6 mi. at its east end to the line running south from the double track to Denver. This double track will facilitate the flow of traffic to and from Denver. When the first line was laid in 1868, the builders chose the easiest route over the top of the hill, not having the equipment to follow the new route, which involves several deep cuts and high fills.

In general, the fills are being constructed with 1½:1 slopes and cuts with 1:1 slopes, except where slight deviations are required to fit special soil conditions. There are no unusual provisions in the grading specifications for compaction of fills, since heavy equipment



moving over the material assures adequate consolidation. Also, no special steps are being taken to protect side slopes from erosion, because the soil materials are heavy rock, clay and sand, not particularly susceptible to erosion. Also, the area has a relatively light average annual rainfall and generally little snow.

Where county roads pass through culverts, the bottoms are covered with gravel and an asphalt pavement 4 in. thick.

Featured on the new route will be the latest operating facilities, including centralized traffic control. Engine cab signals also will be installed.

W. C. Perkins, chief engineer for Union Pacific, is in general supervision of the project, with J. A. Bunjer, assistant chief engineer, in charge in the field. Project engineer for Morrison-Knudsen is R. E. Denham.

TOTAL EXCAVATION on the project is about 7,000,000 cu. yd. and the largest fill will contain 775,000 cu. yd. Compaction of fills is primarily by the hauling units themselves.

SLOPES IN THE CUTS are generally on 1:1 slope, varied to meet special soil conditions. Most of the 25 mi. on the east end of the line is graded through gravels and clay. Tractor-drawn scrapers handled most of this work. Earthwork is scheduled for completion this fall, with the entire project expected to be in operation by August of next year.



GRADING was relatively light where the line leaves Cheyenne on the eastern end and much was handled by elevating grader, with Caterpillar motor graders used for finishing. Side slopes of fills are not receiving special protection against erosion because the rainfall is light in the area.

TYPICAL COUNTRY for the 42-mi. relocation, where the 0.82% grade will rise westward from El. 6060 at Cheyenne to about El. 7900 where it rejoins the present line.



The West's first major prestressed concrete highway bridge

Bureau of Public Roads will build structure on U. S. 101 along Oregon Coast with 56 post-tensioned girders

FIRST BRIDGE in the West to include prestressed concrete girders designed for standard highway loading (H20) will be built by the Bureau of Public Roads on U. S. 101 north of Coos Bay, Oregon. The structure crosses Ten Mile Creek and a branch of the Southern Pacific railroad in the Siuslaw National Forest on the coast. Design calls for the post-tensioning of 28 girders 45 ft. long and 28 girders 60 ft. long as well as 192 cast-in-place diaphragms. The bridge forms part of a relocation program which includes about 8 mi. of grading and surfacing. General contract for the entire job, including the bridge, was let to Fred H. Slate Co. and E. C. Hall Co., Portland, on a low bid of \$774,821. Snook Bros., Corvallis, Ore., will be subcontractor for the bridge. The Stressteel Corp., according to report, will carry out the work of tensioning.

Bridge bid figures

Removed from the over-all contract price, the low bidder's figure for the bridge itself was \$191,765. This represents a figure of \$15.11 per sq. ft. of bridge. The nine bids for the bridge ranged from a low of \$181,615 to \$259,397, or an average of \$210,731.

Reduced further to the figures relating to the prestressed girders which were bid as complete units in place, the Slate and Hall bid was \$48,300 for the 56 prestressed girders. The range of bids on the girders was from \$42,000 to \$95,200,

with an average of \$68,900. Finally, computed in terms of prestressed concrete, the successful bidder's figure represented \$150 per cu. yd. The spread was from a low of \$130 per cu. yd. to a high of \$296, or an average of \$214.

The unit bids of the successful contractor were \$800 for each of the 45-ft. girders in place and a corresponding figure of \$925 for the 60-ft. girders. The corresponding low unit bid for these two sizes of girders was \$600 and \$900.

The relocation of this major highway through the national forest on the Oregon coast line has been under consideration and study for some time. The project reached the active design stage at the time when steel was critical a year ago. As a result, the Bureau of Public Roads elected to prepare a design based on prestressed concrete girders as a saving in the amount of steel required for the job. There was also the desire to use this current method of concrete construction in the interest of gaining design experience and to determine comparative costs in the field.

General design features

The structure will be 423 ft. long, with a 2-lane roadway 30 ft. wide between curbs. The structure crosses the creek and a single line of the Southern Pacific. Clearance required for the railroad line to pass under the bridge at a sharp skew determined a 45-ft. length of girder for two spans. This spacing was extended to

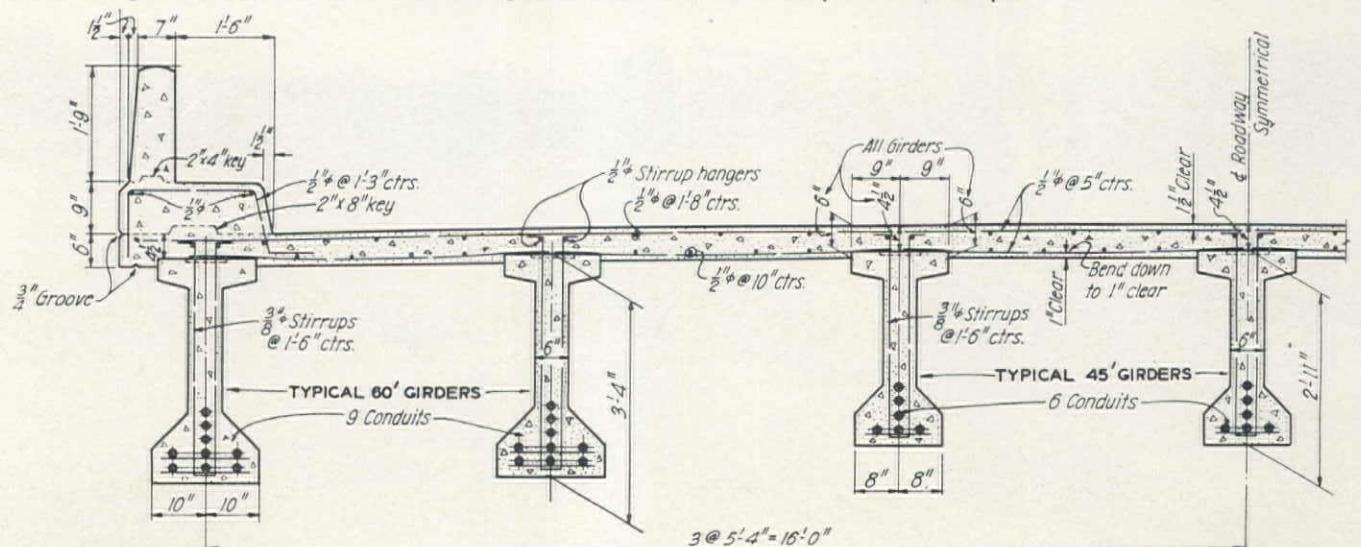
one abutment, making four 45-ft. units. Studies were made to extend this same spacing across the creek in the interest of uniformity for the remainder of the structure. This 45-ft. span length did not fit economically into the remaining space and the decision was made to use 60-ft. spans for the remainder of the bridge.

The final cast-in-place member of this supporting system is the transverse beam or cap spanning between the two-column bent and extending 4 ft., 8 in. as a cantilever on either side. On this supporting system the seven lines of prestressed girders are set. The middle girder extends along the center line of the roadway and the other girders are spaced at 5-ft., 4-in. intervals in either direction.

Details of girders

Each of the prestressed girders is in the form of a modified I-beam with a heavy lower flange to handle conduits for the tensioning wires. The general location of the groups of wires in the girder is indicated in the detailed drawing. In general dimensions the girders of 60-ft. span are 3 ft., 4 in. deep and have a 6-in. thickness of web which increases to a rectangular section 1 ft., 8 in. thick at both ends. Stirrups consist of $\frac{3}{8}$ -in. round steel at 18-in. spacing. A $\frac{1}{2}$ -in. round stirrup is provided at either end as a lifting eye. Weight of the 60-ft. girder is 28,800 lb.

SECTION through the prestressed girders shows arrangement of the steel wire bundles and shape of members. Note that the drawing shows both the 60-ft. and 45-ft. girders which are not actually in the same span.



The corresponding 45-ft. girders are 2 ft., 11 in. in depth with the same 6-in. thickness of web and a 16-in. width at the end. Weight is 17,700 lb.

In final position each of these girders will bear with a steel plate on a corresponding plate to be embedded in the transverse caps. A socket is provided in the detail of these bearing plates. Length of the girders provides a $\frac{1}{2}$ -in. space between adjacent ends, at the center line of the transverse cap and this space will be filled with joint compound.

Cast-in-place diaphragms extend between the girders at approximate third points. These diaphragms are 6 in. wide and provided with conduit openings corresponding to holes left in the webs of the girders. Post tensioning will be applied to these diaphragms from anchorages on the outside girders. Thus compression will be applied to the girder system to provide for lateral loads and insure continuity for the supporting system under the cast-in-place slab.

Lastly, the cast-in-place slab will be poured with a depth of 6 in. and provision made to have the lower surface of the slab dropped 1 in. below the top of the girders. This keying of the slab to the girders combined with $\frac{1}{2}$ -in. stirrups which extend up from the girders into the slab and shear keys in the top of the girders permits the design to incorporate the principle of T-beam action.

Post tensioning

Commonly referred to as prestressing, the design actually provides for the introduction of tension in the groups of wires which are threaded through the conduits left in the girders, after the concrete has assumed its 28-day strength. The design has been arranged to facilitate the use of the Freyssinet system of stressing, although the contractor is permitted to elect any other system which will provide the same comparable strength in the girders. In fact, the contractor will be permitted to increase the depth of the girders if that will be an advantage in the tensioning system he elects.

Exact specifications are provided for the materials to be used in these members—concrete and steel wire. Concrete is of Class Y, with a 1-in. maximum aggregate, with Type 2 cement and an air entrained agent. Girders and diaphragms are designed for a 4,000-lb. concrete. A 28-day curing period is provided between the time of pour and the application of the stressing. The wires are to be of steel having an ultimate strength of 240,000 psi. with 15% allowed for creep and shrinkage. If the contractor elects to use a wire of lower strength the area of the wire must be increased accordingly. According to the design as prepared, each bundle of wires to be threaded through the conduits will consist of 12 individual wires having a 0.196-in. diameter.

Detailed specifications for this post-tensioning operation, the anchoring and the subsequent handling of these complete units are provided in the accompanying quotation from the official specifications.

Quotes from the specifications relating to casting and post-tensioning of girders

THIS ITEM shall consist of precast and post-tensioned girders and cast in place and post-tensioned diaphragms constructed in conformity with the details shown on the plans and in accordance with this specification.

MATERIALS

Concrete. Materials for the concrete shall conform to Item 206, Supplemental Specifications dated August 1945 except that the coarse aggregate for Class Y Concrete shall be graded from $\frac{1}{4}$ in. to 1 in.

Post-Tensioning Wire. The post-tensioning wire shall conform to the following specification:

Minimum ultimate tensile strength: 240,000 psi.

Diameter: 0.196 in.

Diameter tolerance: ± 0.002 in.

Minimum elongation of rupture: 2% in 10 in.

The wire shall be clean and free from grease.

The wire shall not be galvanized.

The wire shall be delivered in coils not smaller than 5 ft. in diameter.

Alternate designs will be considered with wires having a minimum ultimate strength of 200,000 psi., or with manufactured steel cables having a minimum ultimate strength of 200,000 psi.

Conduit or Sheath: The conduit, or sheath, used to protect the wires during pouring of the concrete shall be grout tight so that the mortar cannot enter the conduit or sheath and hinder the free movement of the wires. The conduit, or sheath, shall be strong enough to maintain its shape under such forces as will come upon it during handling, and the placing and vibration of the concrete.

Grout for Conduits in Precast Girders and Diaphragms. Grout shall be composed of 0.7 parts of sand, all passing the No. 40 sieve, 1.3 parts of portland cement and 1.0 part of water, all measured by volume.

Aluminum powder shall be added to the grout as follows: Approximately two grams of the powder (about a teaspoon) shall be added for each sack of cement used in the grout. The exact amount of aluminum powder shall be designated by the engineer. The dosage per batch of mortar shall be carefully weighed. A number of weighings may be made in the laboratory and doses placed in glass vials for convenient use in the mix. Batches of grout shall be made small enough so that the batch may all be used up in less than 45 minutes, as the action of the aluminum becomes very weak after that period of time. The aluminum powder shall be blended with pumicite or other inert powder in the proportion of 1 part powder to 50 parts pumicite (or other inert powder) by weight. The blend shall be thoroughly

mixed with the cement and sand before water is added to the batch, as it has a tendency to float in the water. The aluminum powder shall be the unpolished variety. After all ingredients are added the batch shall be mixed for three minutes.

CONSTRUCTION METHODS

Girders. The girders shall be precast and after the concrete in the girders has attained a strength of 3,600 psi., as determined by test cylinders, they shall be post-tensioned.

Diaphragms. The diaphragms shall be cast in place and after the concrete has attained a strength of 3,600 psi., as determined by test cylinders, they shall be post-tensioned.

Post-Tensioning and Conduits. The design shown on these drawings requires the use of flexible metallic conduits $1\frac{1}{8}$ -in. \pm inside diameter. Each conduit shall contain 12 wires of .196-in. diameter (240,000 psi. ultimate). The initial tensioning force shall be 51,800 lb. per conduit. After creep and shrinkage this force is assumed to reduce to 44,000 lb. per conduit. When tensioning conduits, all conduits on the center line of the girder shall be tensioned before the conduits on each side. For the side conduits not more than one conduit shall be tensioned before balancing by tensioning one on the other side. Conduits shall be centered as shown and secured to tie bars and stirrups.

When post-tensioning has been completed the conduits shall be flushed out with water, after which they shall be blown out with air. The conduit shall then be entirely filled with grout under not to exceed 100 lb. pressure.

Alternate designs, utilizing wires of different size than shown, wire cables, high strength alloy steel bars, or different size conduit will be accepted under the following conditions:

1. The resultant design shall be equal to that shown on the plans.
2. Allowable unit stresses shown on the plans or specified herein shall not be exceeded.

3. Dimensions of the girders may be modified to conform to the system adopted by the contractor, except that the vertical dimension of the 45-ft. span girders shall not be changed.

4. Design shall conform to Standard Specifications for Bridges, AASHO, except as otherwise provided.

The contractor shall submit to the engineer for approval, within 30 days after award of the contract, details of the system of post-tensioning which he elects to use. The source of materials shall also be furnished. The proposed system and details shall be approved by the engineer prior to ordering of materials for the precast beams or commencement of their construction.

The Ten Mile Creek Bridge has been designed by C. R. Black, Senior Bridge Engineer under the direction of H. R. Angwin, Supervising Highway Bridge Engineer at the Western Headquarters of the Bureau of Public Roads in San Francisco. Raymond Archibald is Chief,

Western Headquarters of the BPR. Bids were called, contract was awarded and construction will be under the direction of Division 8 of the BPR in Portland. W. H. Lynch is Division Engineer and R. B. McMinn is Senior Highway Bridge Engineer.

Soil-cement proves practical for Fresno County road jobs

Cement stabilization of local soil with high fines content eliminates need for long hauls of import materials — Cement combined with pit run material at central mixing plant also used for bituminous plant-mix — Paving machine spreads stabilized base material

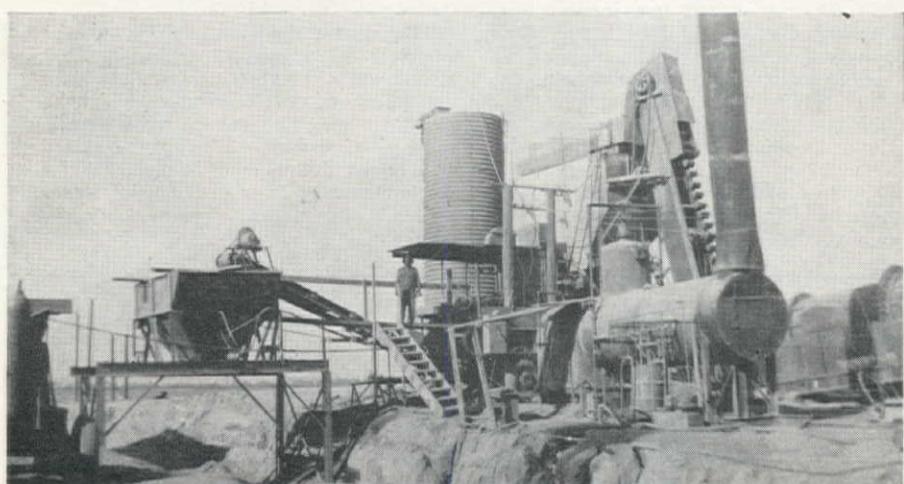
WITH 3,818.5 mi. of roads ranging from the crest of the Sierra Nevada to valley sinks, Fresno County has not only the second largest mileage in the state, but also an unusual variety of road building problems. In the mountain areas there is an abundance of suitable road building materials, including decomposed granite and natural gravels which can be mixed in place. But in the lower elevations of the valley where some of the local materials are heavy adobe or high alkali content soils, a blanketing of more suitable material must be introduced to support the roadway surfacing. This is where the county road building program comes to grips with basic economies.

The problems

Finding suitable material for surfacing and for subgrade support is the first problem. Such sources of material as have been found are generally far from the proposed projects. Long hauls are therefore necessary for import materials, and with long hauls up goes the cost of the project almost beyond economic consideration. At the present time the revenue for road construction purposes and road maintenance is derived solely from the county's share of the California state gas tax. With these limited funds available a constant endeavor is made to discover new materials and new methods of road building to cut the costs of construction.

Fresno County first became interested in cement-treated bases in January 1950.

THE CONTRACTOR chose to put the cement-treated base material through this same Barber-Greene plant he used for the asphalt surfacing. The cement silo in the background appears an odd accessory to an asphalt plant.



fines to be rather high with the material passing the No. 200 sieve running about 30%.

The material in the pit showed California Bearing Ratios of 39 to 78 with "R" values, as determined by the Division of Highways, ranging from 60 to 74. Due to the amount of granular and unstable material present some method of stabilization was needed to hold this material together to support the surfacing material properly on the roadbed.

Portland cement treatment was tried using 1% and 2% cement, an average amount as used by the state on other jobs throughout California. It was found that with the addition of 2% of cement by weight the CBR values jumped from 39-to-78 up to 96-to-280 and the "R" values increased from 60-to-74 to between 76-and-82.

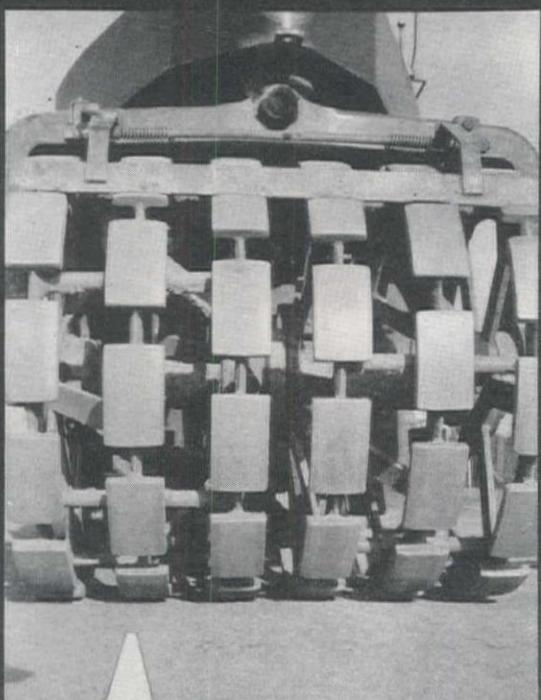
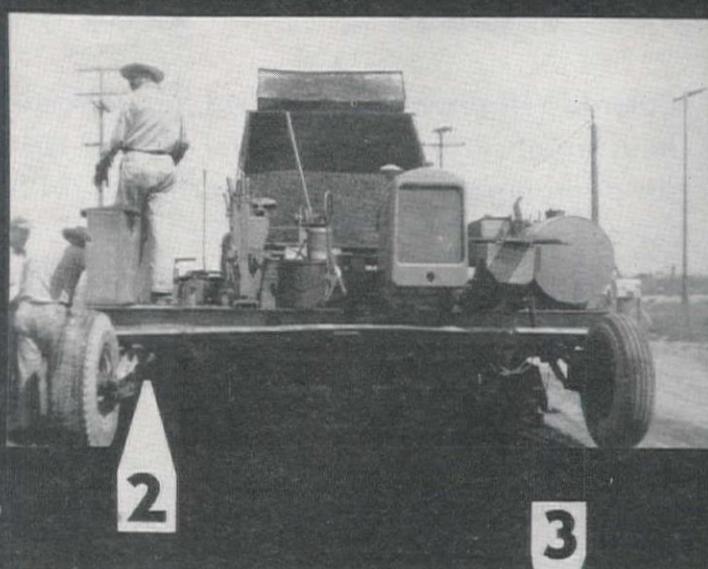
Costs compare favorably

So a new cost estimate was prepared on the basis of the use of cement stabilization of the local pit run material. Also included in this cost estimate was the use of plant-mix surfacing which was preferred over the road mix. A resultant savings in costs was found. This cost estimate showed an estimated contractual cost of \$150,440 or a savings of \$21,060 over the imported untreated rock base. Cement stabilization was evidently the answer.

The contractor's field operations provided for the addition and mixing of the cement with the pit run material by means of an ordinary central, portable mixing plant which was also used for mixing the surfacing material. The cement mixed base material was hauled to the subgrade and spread by means of an Adnun paving machine. This unusual method of laying cement-treated base material proved to be quite satisfactory. To complete the job a 3-in. plant-mixed surfacing 22 ft. wide with 3-ft. shoulders on either side was placed upon the 4-in. cement treated base which was constructed to the full width of 28 ft. After two years of service this road carries a great volume of traffic, with no sign of failure and a perfectly smooth surface.

On three more jobs

Results of the Madera Avenue project were so satisfactory that three other similar projects have been satisfactorily undertaken using cement stabilized subgrades. These projects are all Federal Aid jobs. Shaw Avenue, about 6 mi. north of Fresno from U. S. Highway 99 to Fruit Avenue, a distance of 3.27 mi., was completed in June 1951. Manning Avenue, about 4 mi. west of the town of Reedley from Zediker Avenue to the Reedley Bridge just west of Reedley, a distance of 2.97 mi., was completed in September 1951. This was the first project to use the new pad type roller, which had just come out, on both the cement-treated base and the plant-mix surfacing. Finally a project on the Fresno-Coalinga Road about 12 mi. northeast of Coalinga, for a distance of 3.75 mi., has just been completed. In each of these projects a 4-in. cement-treated base was placed on a grade of natural material with very satisfactory results.

**1****2****3****4**

1—Cement-treated base and the plant-mix surfacing were compacted with the new type Buffalo-Springfield pad roller.

2—An unusual feature was the use of an Adnun Paver for laying the pre-mixed cement-treated base material.

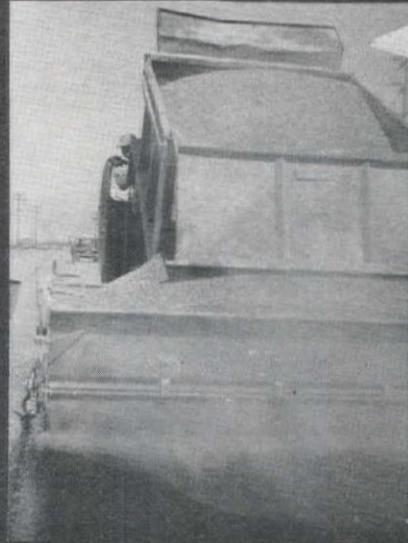
3—Three-foot shoulders were laid by Apsco shoulder machine on the cement-treated base, which was spread to full width of 28 ft.

Soil-cement on a Fresno County road job

4—A strike-off extension on the left side of the paver was used in laying 3-in. plant-mixed surfacing.

5—Final step in the pavement was the application of a class "C" seal coat with screenings spread as shown.

6—Oil for the seal coat was spread in the form of emulsion by a Spears-Well distributor.

**5****6**

Soil-cement pavement jacking

Colorado Highway Department has corrected the heaving of slabs on the Boulder-Denver Turnpike by pumping in a slurry proportioned with one sack of cement to one cubic yard of soil

SURFACE IRREGULARITIES in the new Boulder-Denver turnpike have recently been ironed out by Colorado Highway Department maintenance forces using the process of mud jacking. Unpredictable heaving, ranging from 1 to 6 in. above the roadway shoulders, had left some of the concrete with unpleasant riding qualities and had introduced undesirable stress in the slabs. Mud jacking has satisfactorily corrected the situation by raising the unsettled portions of concrete to provide an easier transition over the heaved areas.

Neither in the recent turnpike situation nor elsewhere generally in Colorado highway experience has concrete pavement roughness of this wavy, or undulating, nature been attributable to pumping of subgrade soil. Such a condition usually arises only in extremely fine grained soils containing excess moisture and subjected to the impact of heavy wheel loads. Colorado has been fortunate in avoiding this type of pavement deterioration, and the reason probably is that we have always placed a 2-in. sand cushion under our concrete pavements. Should we have difficulty with pumping, we would undoubtedly use the asphaltic pavement subseal that is used on airports and by many states for highways. Such a subseal is used primarily to seal the subgrade against moisture infiltration,

preventing supersaturation of subgrade soil and the resultant erosion of fine particles to the pavement edge and through pavement cracks. It not only stops the pumping action but stabilizes the subgrade against those progressive actions that lead to pumping.

Mud jacking, on the other hand, has been used actually to raise concrete pavement, either restoring it from a settled state to its former level or, as in the recent turnpike work, establishing it at a higher point corresponding to portions that have heaved up as a result of natural forces.

Heaving of pavements over swelling soils should not be confused with frost heave. There is no correlation between the two that we know of. The actual swell in a soil can take place directly below the surface, or it may occur many feet below. It is caused by the soil absorbing moisture. This can be due to the presence of clays containing bentonite, illite, magnesium sulfate, etc. Once an expansive soil of this type has heaved it seldom, if ever, reverts to its original

PUMPING SOIL-CEMENT slurry under slabs to readjust the riding surface of the turnpike. Soil is being shoveled into the mixer from the truck and mud hose is being inserted in the hole prior to the start of jacking as material is smoothed over the hole just filled.

By
CHARLES KEMPF
Maintenance Superintendent



and
W. J. WALSH
Staff Construction Engineer
Colorado Highway Department

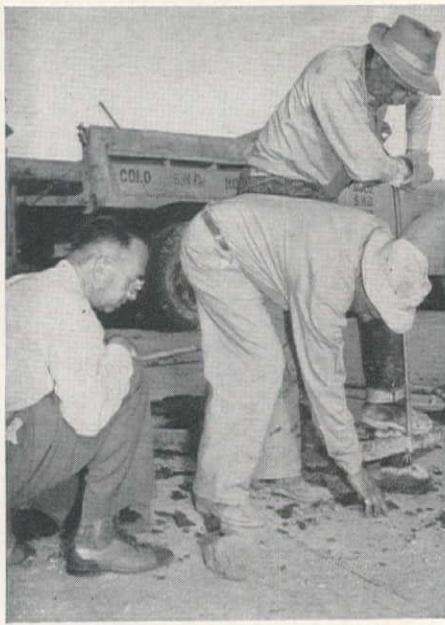


position. Faced with such a condition, we attempt to smooth out the roadway surface contour by raising unaffected areas of pavement to provide as easy a transition as possible.

The slurry injected beneath pavements is composed of cement, water, and, most critical, soil. We find that the best type of soil is a silty loam such that when wet, it will feel smooth and velvety. We never use sand or heavy clay soil for this purpose. Sand will not flow freely and builds up in the apparatus. Heavy clay shrinks considerably during the drying and setting up process.

The materials are usually proportioned in the ratio of 1 sack of cement to





A. J. DAVIDSON (above left), superintendent of the Denver-Boulder Turnpike, observes the results of jacking operation.

AIR IS USED (right) to blow out a hole and the area under the adjacent concrete slab before starting the pumping. Normally, holes are spaced 6 ft. apart and are staggered.

1 cu. yd. of soil; however, these proportions may be varied slightly with experience with different soils. Under average conditions the mixture is made with enough water to provide a creamy mud. The amount of water is also variable, though, and will be in accordance with the particular soil and the condition of the pavement to be raised.

The equipment, and its use

The mudjack itself includes machinery for mixing the soil, cement, and water in a type of pug mill and also a pump for forcing the mud under the pavement. A hose 25 or 30 ft. long is used to convey the material. A 3-in. diameter hose, reduced to 2½ in. at the nozzle, has been found best for the purpose. The nozzle is self expanding so that it will stay in the drilled hole in the pavement when under pressure. Other major equipment items include two dump trucks, one water tank, an air compressor and drill with bits.

The foreman marks the holes for drilling. He also keeps a close watch while the pavement is being raised, and he checks all parts of the operation and materials. The mudjack operator controls the mixing of the materials and sees that the proper mix consistency is maintained. Two laborers are required to shovel soil and cement into the mixing machine. One jackhammer operator can take care of drilling the pavement in advance of the mudjacking crew. Two operators are required to handle the injection hose and nozzle. Additional personnel include truck drivers and a minimum of two flagmen to slow and warn traffic of the operation.



The work should be undertaken only by experienced operators. It requires a skilled supervisor also; the foreman must be able to judge just when sufficient slurry has been placed and the pavement raised the right amount. If

the operation is prolonged, slurry will flow under sections of pavement that should not be disturbed. Great care must be taken also as too rapid an application of slurry will cause the slab to rise too quickly at some point and result in pavement cracking. Usually, therefore, it becomes necessary to do the work in two or more stages, waiting several days between stages for the slurry to harden.

Hole spacing

The spacing and pattern of holes drilled in the pavement will vary somewhat with conditions and will depend to a great extent on the foreman's judgment. Normally the holes are spaced about 6 ft. apart and are staggered. By this means the slurry can be pumped under the pavement to form a solid layer of material. The holes are made with a 2½-in. drill. Under certain conditions, with the pavement very uneven or cracked, it may be necessary to place the holes at closer intervals.

In order to avoid excessive pressures and pavement cracking, the stage method of jacking, described above, is followed. Also, the slurry is introduced in small quantities and the operation rotated from hole to hole in order to distribute the pressure as uniformly as possible. A further precaution taken is not to perform the work while there is frost in the subgrade, or at such time of year that the material is likely to freeze. Mix consistency is important to the success of mud jacking. Care must be taken not to have the slurry too thick as it will then honeycomb or form voids under the pavement.

From California to Colorado

A REPORT on California's technique for subsealing concrete pavements appeared in *Western Construction* last August, pp. 72-73. The article described how hot asphalt is used to combat pavement pumping by filling up the voids that result from progressive erosion of subgrade fines. A particular point made in the article was the degree of control necessary to prevent actual jacking of the pavement by the asphalt intrusion pressure.

In Colorado there has been a recent case, described in the accompanying article, where a comparable intrusion process was used intentionally to raise the pavement. Although not new either in Colorado or other Western states, "mud jacking" with a soil-cement slurry becomes interesting especially as it compares with asphalt subsealing. Not only are the materials different, but so are the undesirable conditions remedied by mud jacking.—*Editor.*

Court orders trial to settle scope of contractor's license

California Supreme Court reverses lower courts and result will be a friendly suit to secure a jurisdictional declaration as to the scope of a general contractor's license

THE SUPREME COURT of California late in September ruled that Charles L. Harney, Inc., a prominent Western engineering contractor, was entitled to obtain a judicial declaration of the scope of his "A" (general engineering) contractor's license without showing specifically that he had bid or intended to bid on any work for which a specialty contractor's license is required by the Contractors' State License Board of California.

In a unanimous decision that was sweeping in its terms, the Supreme Court reversed prior rulings both of the San Francisco Superior Court in May 1950 and the California District Court of Appeals in December 1951. The original ruling, upheld by the appellate court, had stated substantially that no legal controversy existed to entitle the case to proceed to trial. The way is now cleared for trial of the case to proceed as planned.

Title of action

The case is titled *Charles L. Harney, Inc., vs. Contractors' State License Board, et al.*, and is an action known as a complaint for declaratory relief in which Harney is seeking to test the validity of an administrative regulation affecting the scope of his operations as a general engineering contractor in California. The action is sponsored by the Northern California Chapter, The Associated General Contractors of America, Inc.

The implications of the situation summarized above may be of interest to construction contractors throughout the West. Although the licensing laws of individual states differ in various respects, many of them have followed the form of California's since that state was among the first to require licensing of contractors. With this in mind, it is perhaps well to explore some of the specific background incidents that gave rise to the current adjudication.

History of problem

The suggestion of a problem, if not an actual controversy, existed as far back as 1944, when there was disagreement between contractors and the State License Board. Generally, there exist in California three branches of contracting practice, designated by Section 7055 of the Business and Professions Code as (a) General engineering contracting, (b) General building contracting, and (c) Specialty contracting. In ordinary reference, individual licenses are known as "A", "B", or "C" licenses. The disagreement was centered in the Board's rulings as to the scope of activity permissible by a contractor under the general engineer-

ing license. The rulings had been made in apparent contradiction of opinions issued by the state attorney general's office as far back as 1939. Hence, at the 1945 session of California's legislature a bill was adopted which wrote specific definitions into the law.

These specific definitions did not apply to the contractor, but to the License Board's power to classify contractors. By the provisions of the new section (7059), the board might continue to adopt rules and regulations for its administration of the contractor licensing provisions of the Business and Professions Code, and "may limit the field and scope of the operations of a licensed contractor to those in which he is classified and qualified to engage, as defined by Sections 7055, 7056, 7057 and 7058." The latter three sections mentioned expand somewhat on the brief definition of contracting branches given in Section 7055. The Board was thereby rendered able to exercise its discretion in classifying contractors only within the limits of these four sections.

A specific case

There occurred no further major controversy until August 1948, at which time two contractors of the San Francisco Bay area bid on two separate school jobs in Alameda County. The contractors were Lee J. Immel of San Pablo and Clements & Co. of Hayward, and each was low on his bid. Each was an "A" or general engineering contractor, then defined by Section 7056 of the Code as "a contractor whose principal contracting business is in connection with fixed works for any or all of the following divisions or subjects: Irrigation, drainage, water power, water supply, flood control, inland waterways, harbors, railroads, highways, tunnels, airports and airways, sewerage and bridges."

Before awarding the contracts, Alameda County officials contacted the License Board in a routine inquiry as to whether the bidders were duly licensed. The Board, for the purpose of making its decision, was advised that the work in both cases consisted of grading and paving school playgrounds, with some incidental curb and gutter work, fence work and construction of backstops. The Board stated that the bidders were not duly qualified, reasoning that this type of work, when standing alone and not part of a general engineering contract, was not within the province of an "A" contractor but, rather, was properly reserved to contractors holding Class C-12 licenses, applying to excavating, grading, trenching, paving and surfacing.

The mention of "Class C-12" introduces into this discussion for the first time the matter of subclassification of "C" or specialty contractors. The License Board had effected this subclassification in its own administrative rule No. 732, adopted as part of the California Administrative Code in 1947. Presumably, this rule had been an assistance in determining jurisdiction as among various specialty contractors seeking to perform certain work. The rule set up 30 classifications of specialty contracting licenses, including one to be issued where none of the other 29 specifically applies. But, applied as a governing factor in the award of the Alameda school jobs to Immel and Clements, the rule was felt by the Northern California Chapter of AGC to be very much out of order.

Fortunately, in the actual situation, it was possible to delay the contract awards until both Immel and Clements could be issued supplemental licenses as C-12 contractors. They subsequently were awarded the contracts and performed them successfully. The awkward question remained, however, and the AGC chapter sought a clarification, or interpretation, of the situation with License Board personnel.

Formal meeting held

Informal attempts to achieve a meeting of the minds were unsuccessful, and so was a formal hearing held at Sacramento. It was then determined by the AGC chapter that appropriate legal action should be undertaken.

The original complaint was filed in San Francisco by Charles L. Harney, Inc., in February 1949. He acted as representative plaintiff at the request of the board of directors of the Northern California Chapter of AGC, which sought a judicial declaration of the proper scope of general engineering contractors' licenses held by its members.

Attorneys for Harney were Gardiner Johnson and Thomas E. Stanton, Jr., general counsel for the AGC chapter. Commenting upon the effect of the late decision of the Supreme Court, Johnson said: "The action will not interfere in any way with the present scope of work now being performed by any contractor. What the court held was that any licensee of a state administrative body is entitled to have the courts determine the validity of an administrative agency's rules and regulations without the necessity of his suffering actual financial damage or disciplinary penalties before coming into court to seek a declaratory ruling. This principle is of importance to architects, engineers, surveyors and all other licensees of the various state agencies."

"Actually, the superior court never got around to hearing any evidence as to the scope of the work customarily performed by general engineering contractors. We were thrown out of court before we were able to call a single witness. What the supreme court has now ruled is that we should have been allowed to present our evidence."

Concerning future activity in the case, *Continued on page 116*

25-yr. old Sutherland Dam being completed by San Diego

After 25% of multi-arch structure had been built in 1927 work was shut down because of politics and water rights — With Colorado River water now available the storage project is being completed

STARTED twenty-five years ago, the Sutherland Dam which was planned to provide local storage for the water supply of the City of San Diego is now being completed. A \$2,896,485 contract has been awarded to Bent Construction Co. and Daley Corporation as a joint venture for the completion of the multiple-arch structure. Present operations consist of clearing the dam site area and preparing the remainder of the site for the new construction.

The Sutherland project consists of a dam and about 12 mi. of pipe line which includes a 2,800-ft. tunnel and 6-ft. inside diameter, to convey water from Sutherland Reservoir to the San Vicente Reservoir drainage basin. The water conveyed by the pipe line will be carried about 5 mi. in a natural creek channel to San Vicente Reservoir, and thence through an existing pipe line to the Alvarado Filtration Plant near Murray Reservoir. After filtration, the water will be delivered directly to the distribution system of the City of San Diego.

Why work stopped

As designed and started in 1927 the Sutherland Dam is a single-wall buttress type multiple-arch structure. Excavation was first performed at what is known as the lower site, later abandoned when the foundation conditions proved unsatisfactory, and work was moved to the upper site. After about 25% of the dam had been completed, work was terminated as a result of political changes

and because of contractual water commitments which made the continuance of the work impracticable at that time.

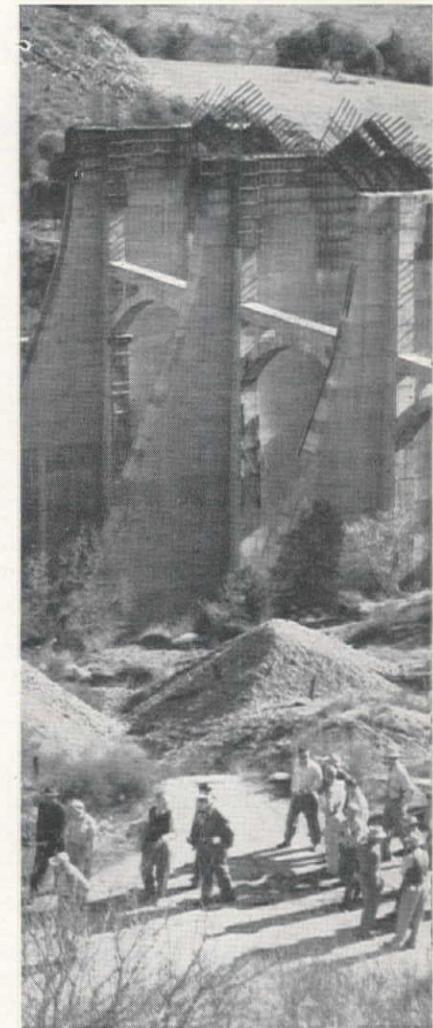
Since the advent of the Colorado River water importation through the San Diego aqueduct, certain deficiencies which would have occurred as a result of diversions at the dam can now be made up from Colorado River water and contract water supply commitments can be fully met as a result.

The reservoir at Sutherland will develop a yield from 53 sq. mi. of drainage basin which is the most prolific watershed area for its size in San Diego County. The average runoff is nearly 16,000 ac. ft. yearly, and about 8 mgd. can be delivered to the city when the new works are operated in conjunction with the remainder of the city's water system.

Present operations

Length of the dam itself is about 1,020 ft., or 1,240 ft. including the spillway. Streambed elevation is at 1912, and the top of the parapet at el. 2074. This makes the height of the dam 162 ft. from streambed to top of parapet. The spillway is designed to discharge 37,000 sec. ft. Initial construction will be to store water to el. 2057 with a reservoir capac-

CLEARING the dam site areas and preparing for new construction is now under way (below). Cleaning reinforcing steel extending from partially completed buttresses (above) was one of the first items of new work.



ity of 29,000 ac. ft. Ultimately tainter type spillway gates will be installed which will raise the storage capacity to 36,700 ac. ft.

About \$1,000,000 was expended on the original construction which carried the dam to about 25% of completion. Early in 1950 the project was revived and a bond issue authorized by the electors

Concluded on page 116



Plans ready for \$48,000,000 irrigation and power program and— Three dams approach bidding stage

A COMBINED irrigation and power project involving three dams and hydro plants is under inspection and planning by contractors. The development program is located on the middle fork of the Stanislaus River in central California and will be carried out jointly by the Oakdale Irrigation District and the South San Joaquin Irrigation District. The project became financially assured with the signing of a contract between the two districts and the Pacific Gas & Electric Co. for the purchase of the resulting power for a period of forty-five years after the plants begin operation in 1955. The cost of the entire project is estimated at \$48,000,000.

Designs for the dams, tunnels, penstocks and power plants have been prepared by International Engineering Co., Inc. of San Francisco. Preliminary plans for the Donnells Dam which will be a constant angle concrete arch have been prepared by George E. Goodall, consulting engineer of Sacramento.

Financing and power

The districts will own and operate the entire project jointly. The program, in addition to the power development, will add a total of 230,000 acre-feet more storage on the Stanislaus River to supplement the water supply now available to the districts for irrigation. This storage will provide insurance against low water years.

Financing will be by bonds sold by the districts but secured only by power revenue. The power sale contract of the P. G. & E. is reported to provide a revenue of \$2,500,000 annually when the project is in full operation. The power contract produces an annual surplus

over construction, maintenance and operating costs which will accumulate to the districts.

On the Stanislaus River in central California the Oakdale and South San Joaquin irrigation districts have designs ready for dams, tunnels and power plants, with financing from revenue bonds backed by a power contract with Pacific Gas and Electric Co.

over construction, maintenance and operating costs which will accumulate to the districts.

There follows a brief description of the various engineering features of the three dams and hydro plants. An accompanying table presents the major quantities involved in the work.

Donnells dam and plant

The dam site is located in a granite-walled canyon on the Middle Fork of the Stanislaus River about 40 mi. by State Highway 108 east of Sonora. It will be a constant angle, concrete arch, flanked by a gate-controlled spillway in a notch through the left abutment. Preliminary plans show a height of 288 ft., a volume of 247,000 cu. yd. and a crest length (arch) of 760 ft.

7.2-mi. tunnel

From the dam a tunnel, having a total length of about 7.2 mi., will carry water to the upper end of a penstock for the largest power plant in the proposed Tri-Dam Project. This tunnel will be of horseshoe cross-section, 12½ x 13 ft. with paved invert throughout its length. Intake will be in the reservoir, on the left bank about 80 ft. above (upstream from) the dam. Both a fixed-wheel gate and an emergency bulkhead gate will

control flow through the tunnel. Gates will be operated through a shaft about 300 ft. downstream from the trashrack intake.

Course of the tunnel (see map) is southwesterly through generally good, massive granite formations to a point 3,000 ft. from the site of the proposed power plant, where a surge chamber will be excavated into the rock and a butterfly valve will control flow into a 6-ft. penstock to the power plant. There are six possible headings, one at each end, two from an access adit where Mill Creek crosses the tunnel line, and two from a similar access adit near the Lily Creek crossing. The access adits will be plugged with concrete after the tunnel is completed.

Powerhouse of conventional design will be located on the left bank of the Middle Fork with foundation conditions at the site excellent and the structure founded on sound, firm granite. Installed capacity will be 54,000 kw.

Beardsley dam and plant

Beardsley Dam and power plant (see map) is about 6 mi. by access road from State Highway 108, 35 mi. east of Sanora. All structures (dam, spillway, powerhouse) will be founded on firm, sound granite.

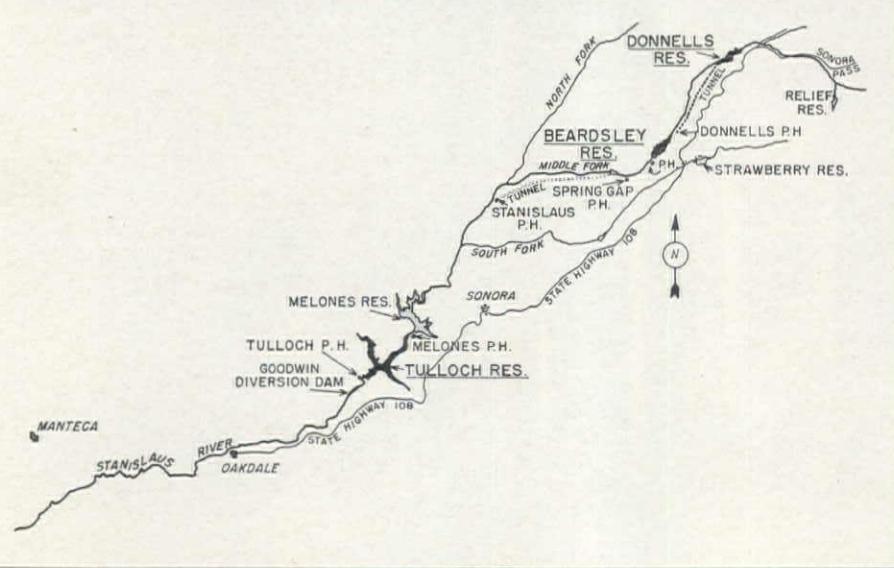
The dam will be earth- and rock-fill 280 ft. high above streambed with an impervious vertical core and will contain 3,000,000 cu. yd. of fill. The spillway is to be a gate-controlled overflow weir discharging into a chute cut in rock. Material for riprap and rock portions of the dam embankment will be obtained from the spillway channel excavation.

Diversion tunnel

A diversion tunnel will be required to handle river flows during construction of the dam embankment, and this tunnel will be used as both power and outlet conduit after diversion during construction. The steel penstock will be installed in the diversion tunnel downstream from the intake gate. At the outlet portal the penstock will divide, the main branch leading to the powerhouse, the other continuing to the outlet channel.

Located on the right bank of the river near the downstream portal of the diversion tunnel, the powerhouse will be a reinforced concrete structure. Installed capacity will be 10,000 kw. An afterbay

GENERAL PLAN AND RIVER PROFILE FOR THE TRI-DAM PROJECT



PRINCIPAL ITEMS OF WORK AND QUANTITIES

DONNELLS DAM, TUNNEL AND PLANT

	Unit	Estimated Quantity
Excavation, diversion tunnel (16-ft. horseshoe)	lin. ft.	1,200
Foundation excavation	cu. yd.	310,000
Spillway excavation	cu. yd.	55,000
Concrete in dam, thrust block and spillway	cu. yd.	247,000
Structural steel in radial gates and guides	lb.	425,000
Tunnel excavation (12 ft., 6 in. x 13 ft., 0 in.)	lin. ft.	37,900
Concrete in tunnel invert (entire length)	cu. yd.	7,000
Concrete in tunnel arch (where required)	cu. yd.	19,000
Reinforcing steel in tunnel	lb.	270,000
Steel penstock and plate steel lining	lb.	3,100,000
Foundation excavation for plant	cu. yd.	15,000
Reinforcing steel in plant	lb.	500,000
Structural and misc. steel in powerhouse and switchyard	lb.	170,000



RUGGED SITE for Donnells Dam where a constant angle concrete arch will be fitted between granite walls. Height will be 288 ft. above streambed; concrete quantity will be almost 250,000 cu. yd.

dam 30 ft. high, of simple design, will be constructed about a mile below the Beardsley power plant. This structure will form sufficient pondage to reregulate the power releases and prevent sudden rises and falls in the stage of the river below. Construction of this after-bay dam will be included in the general contract for Beardsley Dam.

Tullock dam and plant

The Tullock Dam and plant (see map) will be located on the main Stanislaus River about 16 mi. east of Oakdale. It will be of the concrete gravity type 200 ft. high and 1,940 ft. long with a gate-controlled overflow spillway and an integrated intake structure. The powerhouse, with 17,000-kw. capacity, will be a reinforced concrete structure on the downstream toe of the dam in the bed of the present river channel. The structure will be of sufficient size to house two turbine-generator units. To form a reregulating reservoir below Tullock Dam, it is planned to raise the existing Goodwin Diversion Dam 7 ft. Plans are not available, but construction at Good-

win Dam will be included in the general contract for Tullock Dam.

Additional information

Detailed information on the project can be obtained from either R. E. Hartley, Chief Engineer, Oakdale Irrigation District, Oakdale, Calif., or T. P. Stivers, Chief Engineer, South San Joaquin Irrigation District, Manteca, Calif. Preliminary engineering plans are available and both logs for drill holes and cores are available for inspection at the Oak-

dale District office. The quantity figures as indicated in the accompanying table are only approximate and subject to change with more detailed design.

The districts contemplate that the invitation for bids will allow contractors to bid on the entire project, or any one of the major sub-projects, or any combination. The award may be made as a single contract or as individual jobs. Call for bids will probably be about the first of the year, with work scheduled for beginning next April.

Hungry Horse has no more appetite for concrete

FOUR YEARS of high-speed construction activity at the Bureau of Reclamation's big multi-purpose Hungry Horse Dam on the South Fork of the Flathead River in northwestern Montana was climaxed October 4 with placement, nearly one year ahead of schedule, of the last bucket of concrete in the 564-ft. high dam.

Placement of the last concrete came

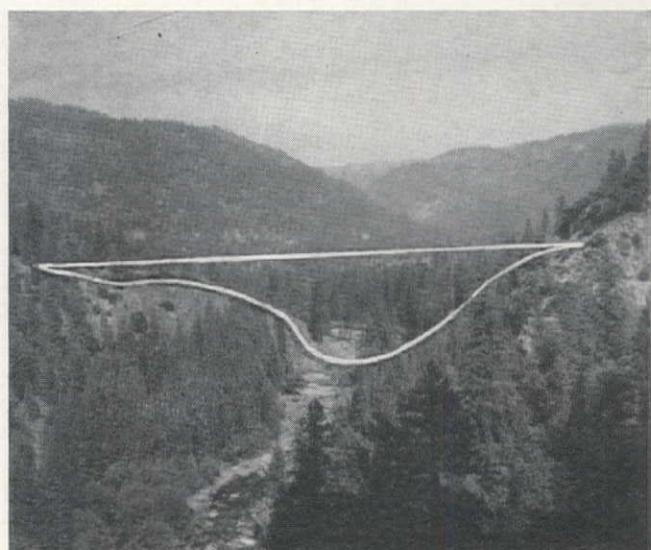
just three days after President Truman's visit to the project on October 1, at which time he officially dedicated the dam and started the first generator.

Work on the Hungry Horse Project, largest concrete dam now under construction in the United States, was officially started on July 10, 1948, and the first bucket of concrete was placed in the dam on September 7, 1949.

BEARDSLEY DAM AND POWER PLANT		Unit	Estimated Quantity
Excavation, diversion tunnel, 17-ft. 6-in. horseshoe	lin. ft.		1,600
Foundation excavation	cu. yd.		300,000
Spillway excavation	cu. yd.		540,000
Embankment for main dam	cu. yd.		3,000,000
Concrete in tunnel and spillway	cu. yd.		34,000
Reinforcing steel	lb.		3,000,000
Radial gates and guides	lb.		600,000
Miscellaneous structural steel and metalwork	lb.		450,000
Steel penstock	lb.		500,000

TULLOCH DAM AND POWER PLANT

TULLOCH DAM AND POWER PLANT		Unit	Estimated Quantity
Foundation excavation	cu. yd.		150,000
Mass concrete in dam and spillway	cu. yd.		200,000
Reinforcing steel	lb.		1,000,000
Radial gates and guides, steel	lb.		1,000,000
Structural steel	lb.		360,000
Plate steel conduit liner	lb.		175,000



DOWNTSTREAM from Donnells is the Beardsley Dam site, with crest at elev. 3400. Design calls for an earth- and rock-fill structure 280 ft. high containing 3,000,000 cu. yd., and a concrete overflow spillway.

TUNNEL IN HARDROCK FOR COLORADO HIGHWAY



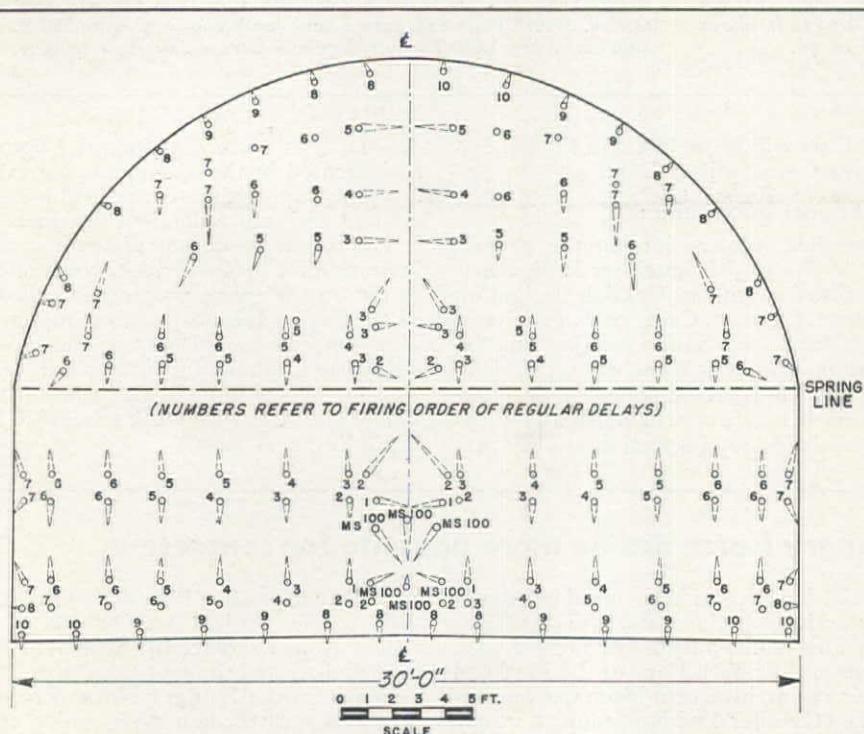
Saving 1,600 ft. of distance and many thousands of yards of solid rock excavation, this 340-ft. two-lane tunnel was the solution to a tough relocation job in the mountains west of Boulder

By J. HARRY JOHNSON

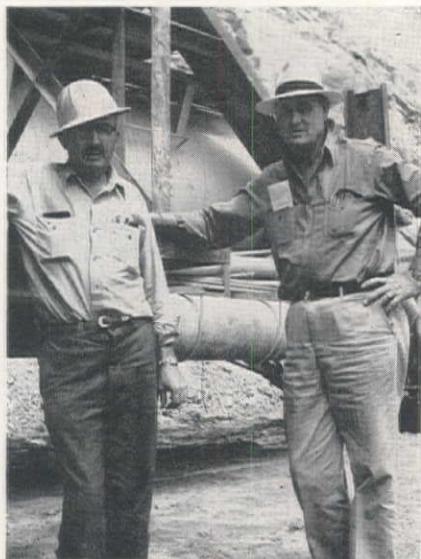
Superintendent
Lowdermilk Bros.
Denver, Colo.

CONTRACTORS are always being asked the engineering question, "Why go to all the work and cost of driving a tunnel through this mountain when the highway might just as well go on up over the top?" We try to help out our engineering associates by providing these visitors and tourists with a simplified version of the proper explanation. The public doesn't realize that as the state highway departments and the U. S. Bureau of Public Roads bring our Western highways up to modern standards with safe and high-speed alignment and grades, the pinch comes in getting up rocky canyons and over narrow ridges within these requirements. In other words, getting over Colorado mountains maintaining a 6% maximum grade and 18-deg. curves runs up against tough natural barriers. A good example of this typically Western highway problem and its solution is the tunnel we are now punching through a granite mountain top on the Boulder-Idaho Springs route in Roosevelt National Forest for the

Text continued on page 68



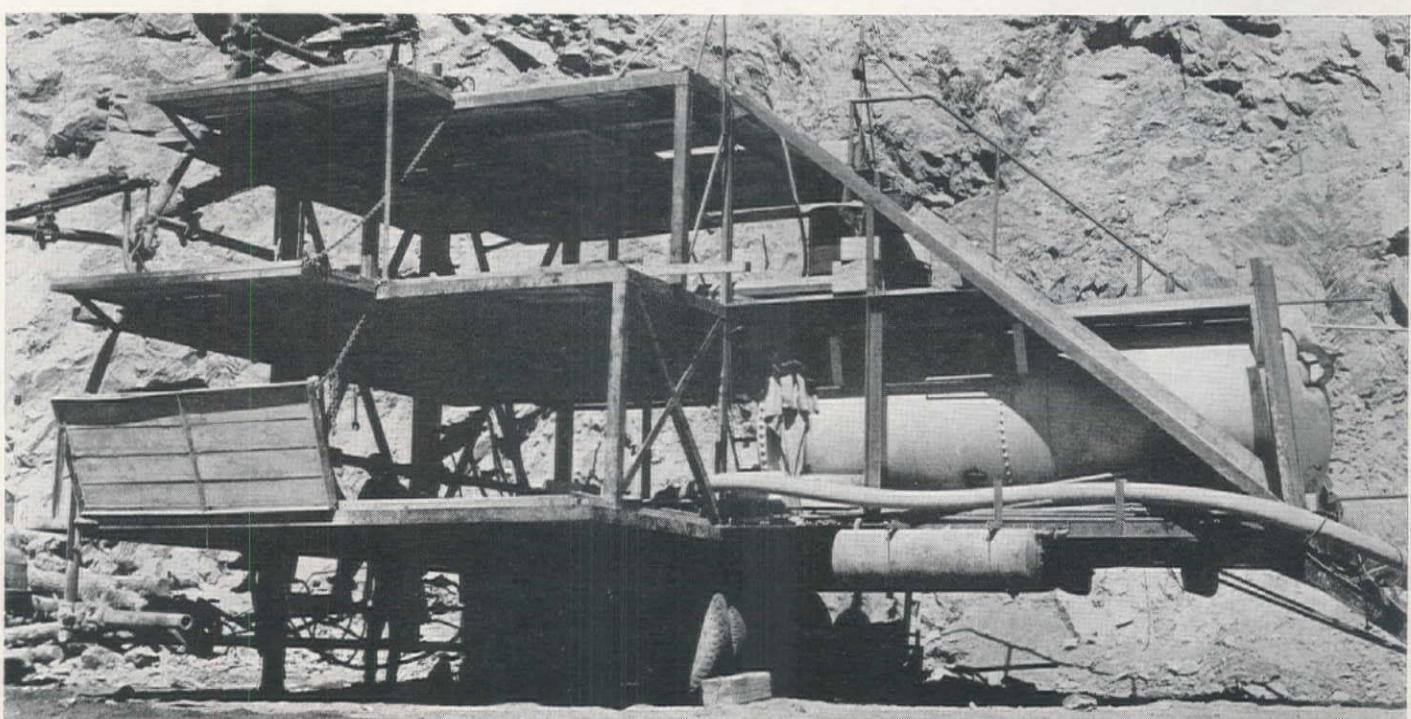
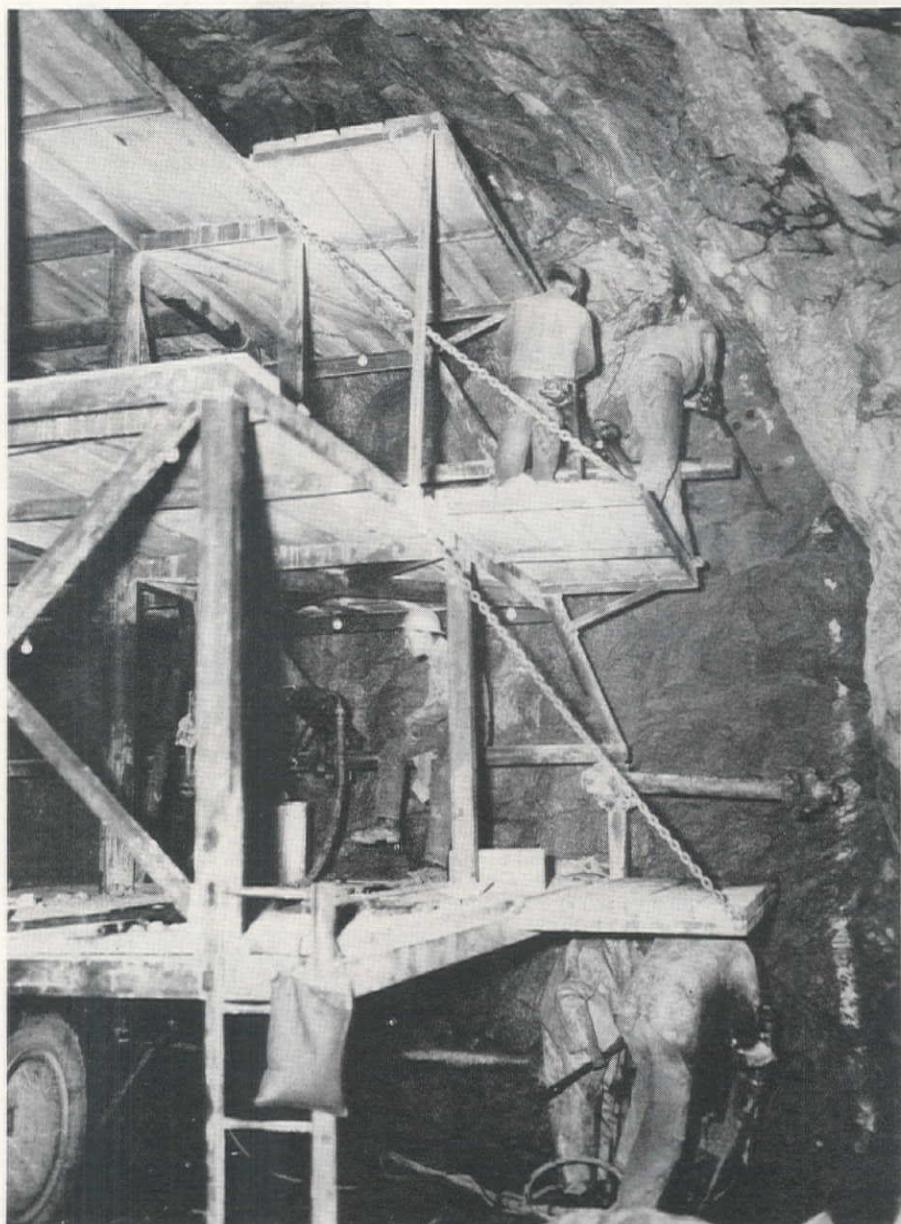
DRILLING DIAGRAM FOR A TYPICAL 11-FT. ROUND

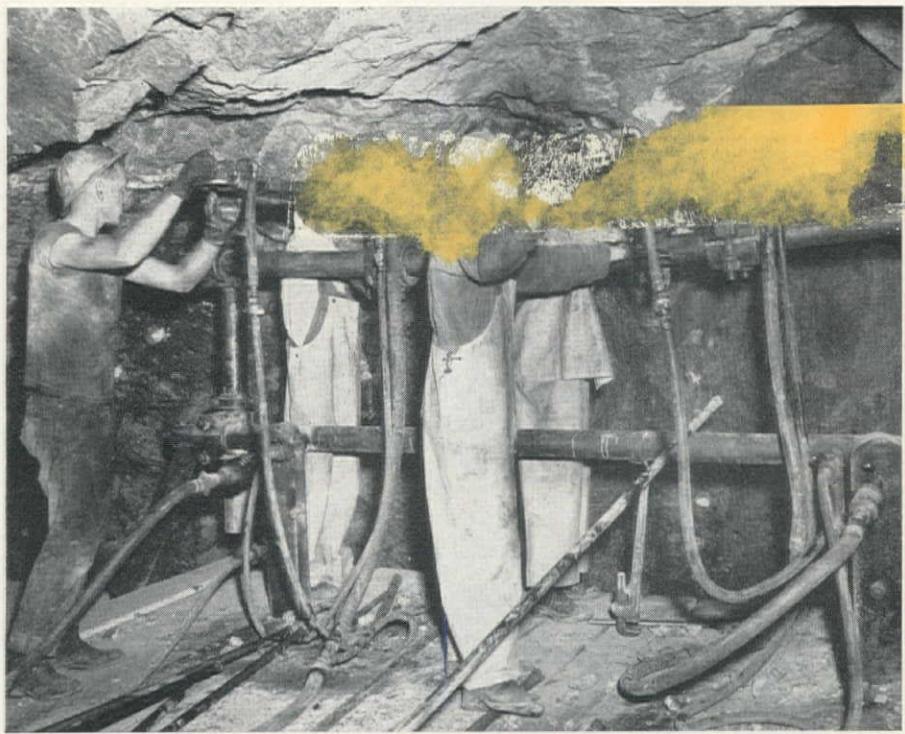


DIRECTING contract operations are J. H. Johnson (left) superintendent, and Hoyle Lowdermilk of Lowdermilk Bros. of Denver.

FOUR LEVELS OF DRILLING under way (right) from the jumbo mounted on half an old truck chassis. The eight drills were Ingersoll-Rand DA-35 and Gardner-Denver 99 using carbide bits. Painted line on the face is an indication of good driving practice.

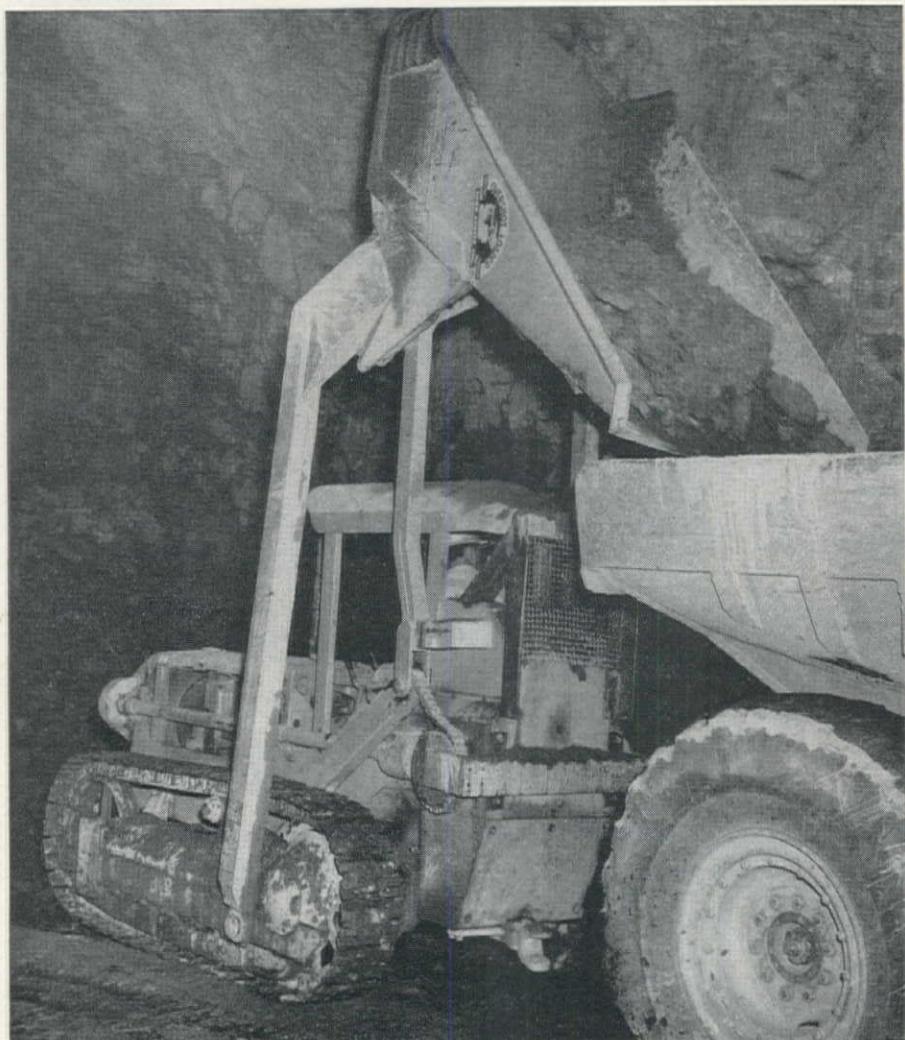
PULLED OUT FOR SHOOTING a round, view below shows the general arrangement of the jumbo with air receiver supplied by Gardner-Denver compressors. Jumbo was moved in and out of the tunnel by tractor.





ON THE TOP DECK of the four-level jumbo these I-R drills are putting in holes for an 11-ft. round. An unusual feature of the jumbo was the use of the 6-in. welded steel pipe for the dual purpose of structural members and conveying compressed air.

POWDER REQUIREMENT was estimated at about 5 lb. per cu. yd., but the quantity got down to about 3½ lb. because of careful drilling and loading, combined with an unusually high number of delays. Resulting mucking was not difficult for an Austin Loader and Koehring Dumptors.



Bureau of Public Roads. [Unit bids for the \$329,379 job appeared in the February 1952 issue of *Western Construction* on page 114.—Editor.] This tunnel,

1600 ft. of distance and saved a lot of solid rock excavation.

The special feature of this tunnel job is a jumbo designed and constructed for this project which could facilitate "full face" drilling with eight drift drills mounted at four different levels. The framework of the jumbo was constructed of welded 6-in. steel pipe which acted in a dual capacity as air conduit and as structural members. Smaller pipes were installed to carry water to the drills. This framework and a large air tank were mounted on the front half of an old truck chassis and then moved in and out of the tunnel by tractor. Air was supplied by five Gardner-Denver compressors.

Equipment

Drilling was accomplished with eight Ingersoll-Rand DA-35 and Gardner-Denver 99 pneumatic drills using carbide bits. A normal round of 150 holes, 11 ft. deep, was drilled, loaded and shot in an 8-hr. shift. Spacing, direction and delay number for each drill hole are shown on the accompanying sketch.

Powder was Dupont Gelex No. 2 (45%), and regular delays were used throughout. The requirements were originally estimated at 5 lb. per cu. yd.; however, the quantity actually used amounted to slightly less than 3.5 lb. The comparatively high yield per pound of powder may be attributed to the use of a larger number of delays than usual, as well as extreme care in drilling and loading.

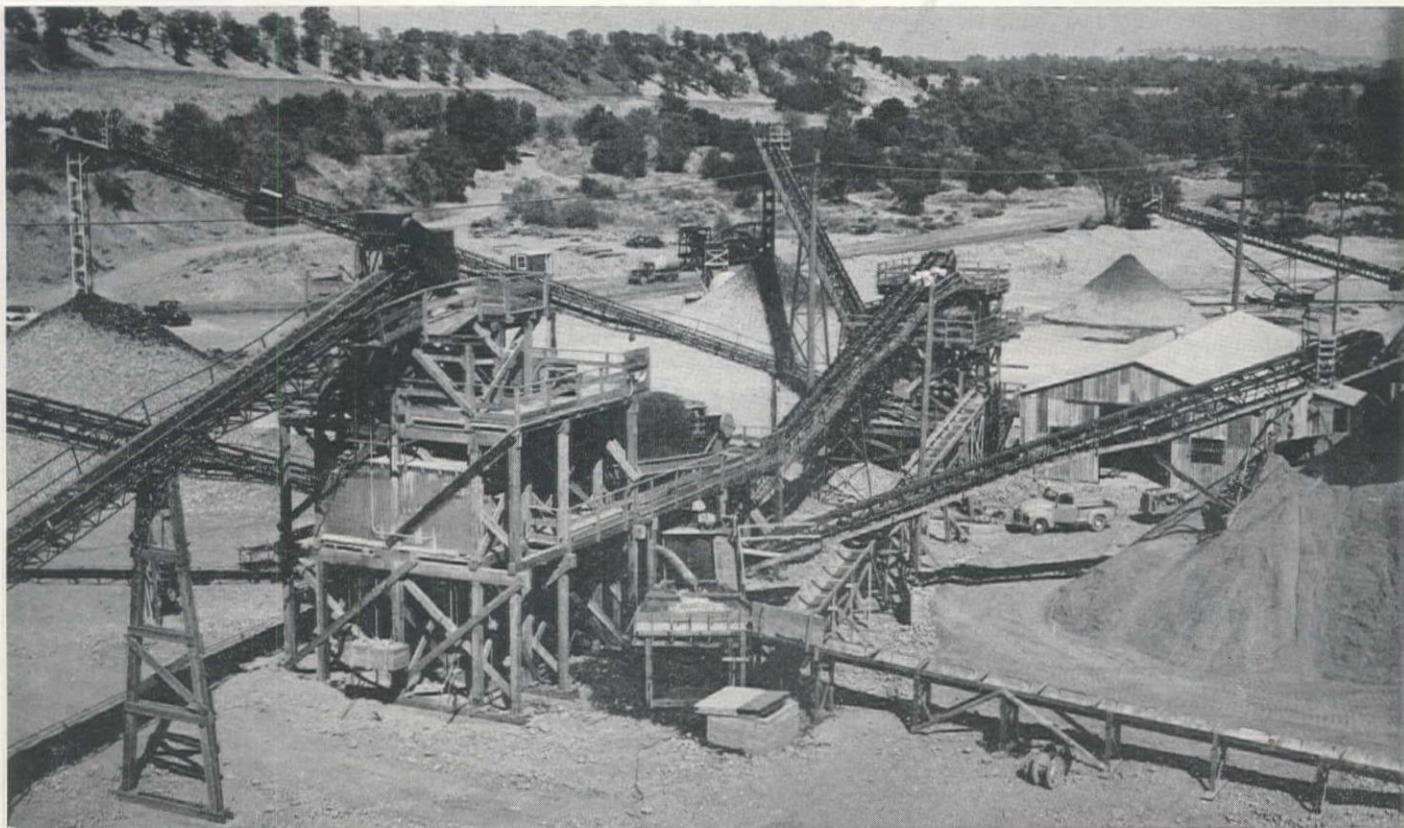
Mucking equipment consisted of an Austin Overshot Loader mounted on a D-4 Cat and the hauling equipment was four Koehring Dumptors.

No unusual problems were encountered during drilling operations. As predetermined by core drilling, the rock was solid granite throughout, with an occasional intrusion of quartzite. Water amounting to approximately 17 gal. per hr. flowed from the core drill hole prior to driving the tunnel but was intercepted at three or four different places during tunneling operations.

Tunnel design

This tunnel, with portal structures included, will be 342 ft. in length and will accommodate two traffic lanes 12 ft. in width. The roadway will consist of concrete pavement 8 in. thick with combination sidewalk, curbs and gutters. Portals will be constructed of reinforced concrete with stone masonry spandrel walls. Drainage structures include 6-in. perforated corrugated metal pipe beneath the pavement, connected to concrete drop inlets and metal drainage pipes. A 1½-in. coating of shotcrete will be applied to all rock surfaces within the tunnel and a 3/8-in. coating will be applied to the inside surface of concrete portals.

For the Bureau of Public Roads, M. J. Ennis and Jack Lacey are project engineers. B. W. Matteson is Division Engineer at Denver.



700 tons per hr. is the scheduled rate, screening — **AGGREGATES FOR FOLSOM DAM**

Duplicate screen setups in primary, secondary, and sand screening towers enable high production of four sizes of rock and a blended sand — Wide, high speed reclaiming belts hasten loading out for 3-mi. truck haul up-river — 3,300 ft. of conveyor is last link in transport system.

OCTOBER was the month for shaking down the aggregate production system at Folsom Dam. It was also the month for placing the first concrete in the dam site, with some of the early batches being put together jury fashion before all components of the rock and concrete production installations were complete. Merritt-Savin, the prime contractor for the big Corps of Engineers project, is rushing this and every other phase of the work in a "race against the river," California's American River, which at any time after November 1 can be expected to carry flows in excess of the project's diversion capacity, about 9,000 cfs. A summary of foundation excavation progress on the \$29,000,000 contract is presented in the News Section of this issue. This article covers only the operations of aggregate production and transportation to the dam site.

Source of aggregate

The story begins about 3 mi. downstream at the aggregate source—Mississippi Bar. It moves $\frac{1}{2}$ mi. upstream to a crushing and screening plant on the right bank that will handle 700 tons per

hr., producing four sizes of coarse aggregates and a precise blend of concrete sand. It follows these aggregates in a fleet of dump trucks along a 2.8-mi. haul road to a set of bunkers dug into the hillside just below the downstream cofferdam. And it winds up on a 3,300-ft. series of conveyor belts that will charge the batch plant hoppers at a rate of 550 tons per hr. This last link in the system includes a river crossing by a suspension bridge that is 500 ft. below towers.

At the time of the first concrete placement, the suspension crossing had not been completed and this part of the system could not be used. Trucks from the screening plant therefore bypassed the bunkers feeding the belt and transported aggregates across the river by way of the downstream cofferdam. Near the batch plant itself, just short of the steeply inclined conveyor that leads to its top, a temporary timber hopper was built, and here the trucks discharged their contents.

No other phase of the operation was on such a makeshift basis, perhaps, but elsewhere in the system there were many "variables" that still had to be nailed

down as "constants" before aggregate production commenced in wholesale fashion. And wholesale it will be, with 1,200,000 cu. yd. of concrete to be placed during the next two seasons. All last month contractor personnel and Army engineers observed the facilities closely, changing screen openings here, resetting the primary crusher opening there, adjusting feeds on the many belts, and generally tuning up the system for full-scale production.

Mining tailings used

The American River near Folsom is a rich aggregate source. The riverbed itself contains heavy deposits of gravels washed down by hydraulic mining operations in the early years, and much adjacent land has subsequently been worked by gold dredgers, leaving behind huge windrows of rock tailings. Mississippi Bar lies normally at the left, or inside, bank of the river channel where it makes a sweeping turn to the left 3 mi. below the dam site. The right bank in this reach is a high bluff, and low flows of the river form a narrow stream close beside it. Mississippi Bar was chosen for

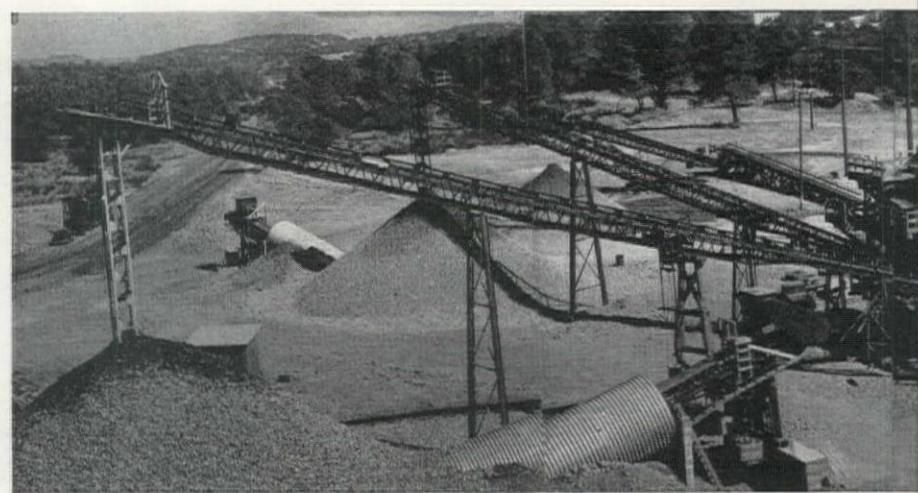
the Folsom operation because it alone contains enough aggregate for the project, unlike nearby Nigger Bar upstream.

The presence of Folsom Prison (and other existing facilities) on the left bank of the river between the bar and the contractor's plant at the dam site made it impossible to produce and transport aggregates entirely on one side of the river. Therefore, the contractor excavated a diversion channel across the bend at Mississippi Bar, which in effect put the bar on the right side of the river. Here there was room aplenty for screening plant and haul road construction.

Gravel deficient in cobbles

Analysis of the riverbed gravels showed them to be slightly deficient in cobbles of 3- to 6-in. size, so nearby dredger tailings were surveyed for augmenting the supply of this size. A likely area was selected on the right bank above the flood plain and just downstream from Mississippi Bar. A portable double-deck screening plant is installed there to produce 3- to 6-in. material.

Excavation of the principal borrow area at Mississippi Bar is being handled by a 5-cu. yd. dragline, loading 35-yd. bottom-dump Euclid wagons. The operation hadn't smoothed out early in the month, but Chick Alexander, rock plant superintendent for Merritt-Savin, estimated that about 5 Eucs would be need-



FROM THE HEAD PULLEY at the cobble stockpile the whole plant is seen in panorama: Primary screens are fed from raw surge at the right and produce cobbles (foreground), sand plant surge (right, rear) and minus 3-in. to secondary screening (center). Secondary screening produces two more rock sizes stockpiled at left. Sand plant (background) produces pea gravel and blended sand. Crushing, screening and feeder equipment is Telsmith and conveyor system is Barber-Greene.

ed for continuous supply of the plant. The haul will vary as the bar is exhausted, but only between limits of about $\frac{1}{4}$ and $\frac{1}{2}$ mi.

Raw surge pile

On the west end of the aggregate plant, the raw aggregate is received in

either of two surge bins. These are provided for separate handling of rock from the two sources, bar or dredger tailings. The bins lie in-line, and No. 1 conveyor, leading to the raw surge pile, is loaded by plate feeders under each bin. Raw aggregate falls free from the conveyor to a 20,000-ton surge pile that can rise to a height of 60 ft.

From the surge pile raw aggregate is carried to a single-deck vibrating screen that scalps all over 12-in., dropping this big stuff into a gyratory crusher. Reduced to less than 6-in., it rejoins all that passed the screen and drops to a conveyor leading to the primary screening tower.

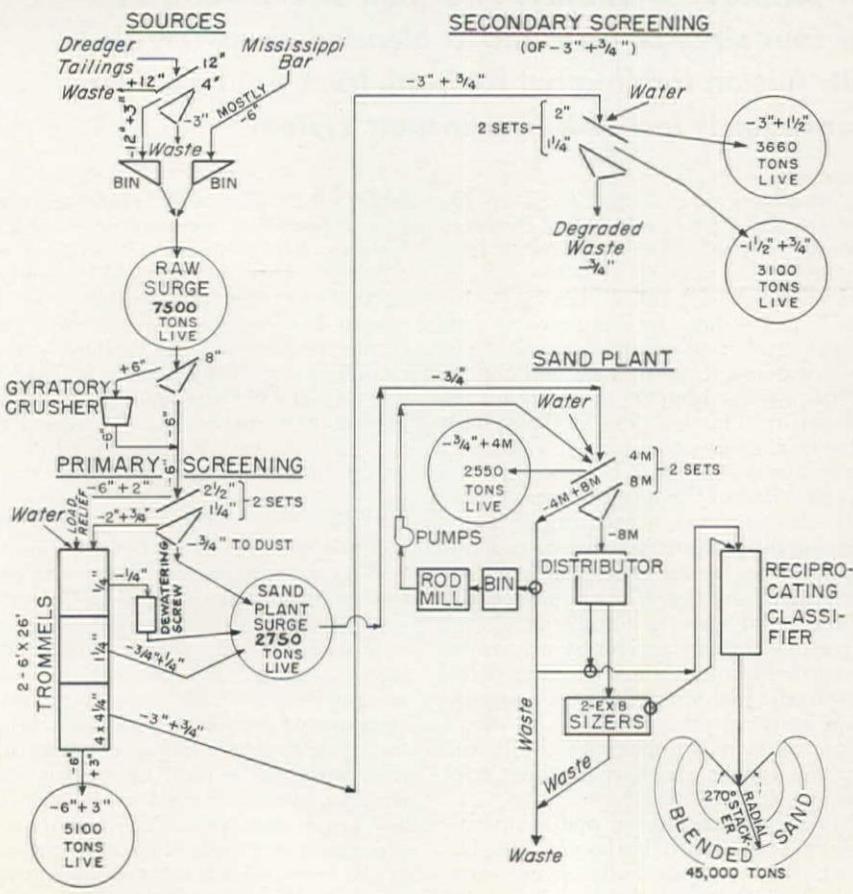
Twin installations

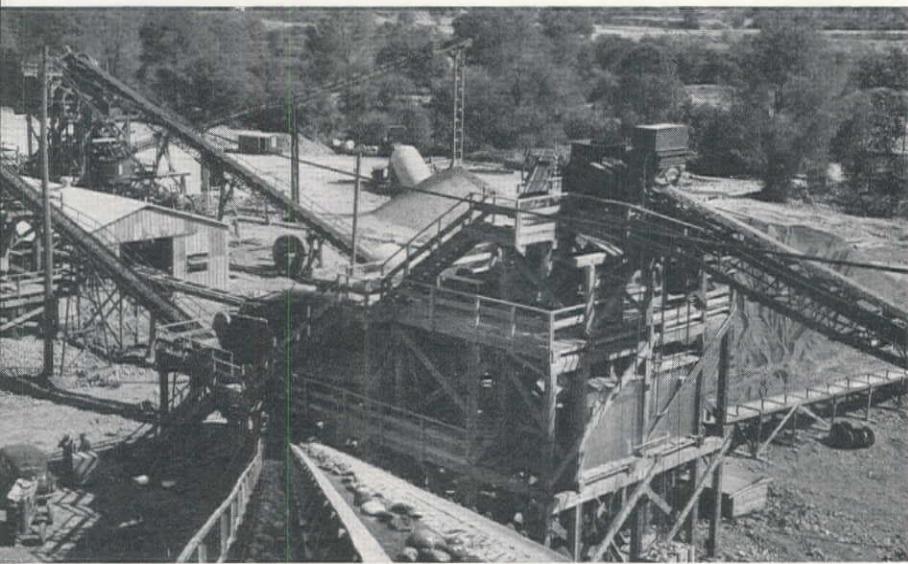
Starting at the primary screening setup, all subsequent separations and classifications are performed by twin installations of equipment—two screens, two trommels, two sizers, etc. Only the conveyor belts are single, and they are run at high speed both to supply, and to receive from classifying equipment. The primary separation consists of two sets of double-deck screens. As first installed, these had upper and lower screen openings of $2\frac{1}{2}$ in. and $1\frac{1}{4}$ in., respectively. Although the openings may be changed after observation, their function will remain the same. In the case of the top screen this function is to scalp off all material over 2 in. in order to relieve the load on the lower screen. The latter passes only $\frac{3}{4}$ -in. material, and not all of that since the volume handled is so great. Essentially, then, the total effect of the two screens is one of relieving the load borne by the trommels which are next in the succession of classifying equipment.

The two 6×26 -ft. revolving screens act both as scrubbers and classifiers. From the double-deck screens above they receive material ranging all the way from 6 in. down to dust, although much of that smaller than $\frac{1}{4}$ in. has been screened out and dropped to a belt leading to the sand plant surge pile. The

FLOW DIAGRAM FROM SOURCE TO FINISHED AGGREGATE

The minus 3-in. waste at the head of the plant is not strictly waste since it is used as part of the fill material for the right wing dam. The three circles on the lines in the sand plant indicate points where controls can vary the flow in any desired proportion.





trommel screen openings pass, successively, three sizes of rock, with a fourth size classified by the fact that it passes through the entire length. The first set of openings in the trommels is $\frac{1}{4}$ in., and material smaller than that size drops through to a screw classifier where it is washed, dewatered and conveyed to the sand plant surge. The second set of openings, originally $\frac{3}{4}$ -in., has been changed to $1\frac{1}{4}$ -in. Still, due to the volume handled, the effect is that of passing $-\frac{3}{4} + \frac{1}{4}$ -in. material. This also is conveyed to the sand plant surge pile. The final set of openings, square ones measuring $4 \times 4\frac{1}{4}$ in., pass $-3 + \frac{3}{4}$ -in. material for conveyance to the secondary screening tower. All remaining cobbles, $-6 + 3$ -in., pass clear through the trommels and drop to a belt that leads to the stockpile for that size.

Three basic separations

It is to be noted that only three basic separations are effected by the primary screening operation, despite the employment of double-deck screens and trommels combining to produce six sizes. The system at this point has been designed to deal expeditiously with a large volume of material, and many of the separations are performed only to relieve the load on subsequent screens. In particular, it can be seen that the sand plant surge is fed from no less than three points in this primary operation.

The secondary screening tower represents a simpler operation. A pair of double-deck screens there produces $-3 + 1\frac{1}{2}$ -in., and $-1\frac{1}{2} + \frac{3}{4}$ -in. material, both sizes being conveyed directly to their respective stockpiles. Degraded waste is carried off with wash water. Degrading at all finish stockpiles is minimized by rock ladders.

The total screening operation to this point has produced three sizes of coarse aggregates and a variegated stack of raw surge sand, washed and unwashed, ranging from $\frac{3}{4}$ -in. down to dust. It has also produced a lot of waste water. The water used in both screening towers and, more important, in the sand sizing and classifying operations to follow, is pumped from the American River adjacent to

the plant site. Five Jacuzzi deep-well pumps (5-stage, 10-in.) have been installed above a sump dug into the river bank for water supply. Only four are customarily in use, pumping from a depth of about 40 ft., with the fifth pump on standby. The system is estimated as capable of furnishing 5,000 gpm. if needed, at 90 psi.

The three coarse aggregate stockpiles are not located in-line, as is often the case, to be served by a single reclaiming tunnel. Rather, each is tapped by a syntron or a reciprocating plate feeder that loads out a 42-in. belt. These discharge belts are protected by tunnels of 8-gauge Armco corrugated Multi Plate, 10 ft. in diameter. Combined with the wide belts are high belt speed (up to 350 fpm.) and belt controls installed on panels accessible from dump truck cabs. Thus, the drivers of the truck fleet hauling aggregates up-river to the dam site can load out in a hurry without leaving the driver's seat.

The sand plant is supplied from the

RECLAIMING TUNNELS for all rock sizes are tapped by 42-in. belts. Installation (not shown completed) includes push-button control for truck drivers. Belt speed is 350 fpm.



sand plant surge, all smaller than $\frac{3}{4}$ in. Again, as in the preceding operations, there are two double-deck screens handling the screening. These are 4M and 8M, the former scalping all $-\frac{3}{4} + 4$ M for conveyance to a stockpile of pea gravel. This stockpile has reclaiming facilities such as have been described for the coarse aggregate.

Control of sand sizes

Material ranging between 4M and 8M may be controlled at several points to take any one of three courses in varying quantities. It may be shunted into a bin for further processing in a $5\frac{1}{2} \times 12$ -ft. Darcy rod mill. This mill produces material which is pumped back into the sand circuit to offset a deficiency of fines in the raw sand. The 4M-8M range can also be wasted, if that is advisable in any quantity, or routed directly to a reciprocating rake sand classifier.

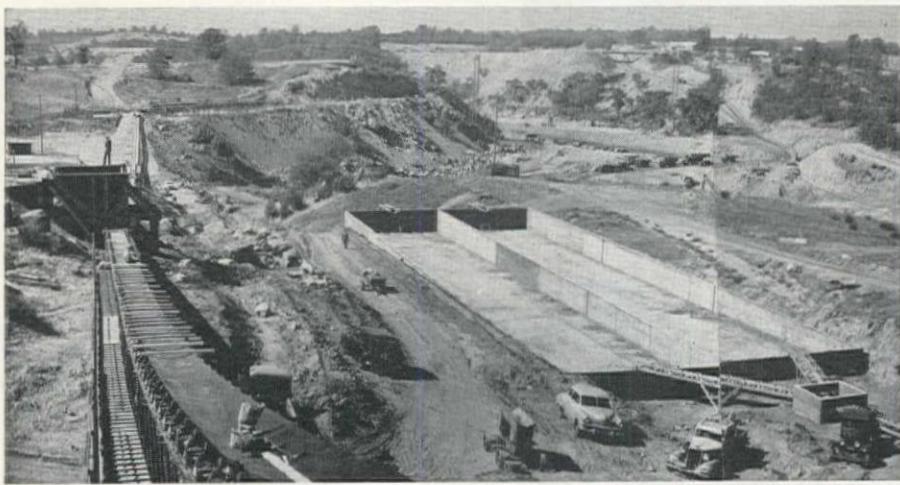
Material passing the 8M screen goes to a distributor. In ordinary operation, roughly two-thirds of this material will be equally distributed to a pair of sand sizers, while about one-third will go direct to the classifier. At this point, therefore, the classifier is receiving fines from two variable sources, $-4M + 8M$, and $-8M$ to pan.

The sand sizers each contain eight separations, or pockets, in which controlled velocities of incoming water at the bottom regulate the degree of agitation of the sand. These velocities decrease for each successive pocket, thereby allowing successively smaller particles to settle in each pocket. The sizes segregated correspond (as nearly as they can be controlled) to standard sieve sizes—16, 30, 50, 80, 100, 150, 200, and -200 (pan). Variable releases of the sized sand provide another control over the blend leaving the plant, as this sand also proceeds to the reciprocating classifier. The natural sand seems to be long on 30 to 50M, and deficient in the very small stuff, 100M and smaller. Hence, the use of the rod mill.

The classifier mixes and dewateres all the sand furnished to it and deposits the sand on a belt leading to the radial sand stacker. This stacker is somewhat more extensive than usual, operating through an arc of 270 deg. to achieve its 45,000-ton storage capacity with a height of only 30 ft. The radius is about 116 ft. at crest line. Due to the shape of this stack, a reclaiming conveyor isn't feasible. For loading from this stockpile skip loaders are employed.

Hauled by truck

Classified aggregates are moved from the plant to the dam site by a combination of truck haul and conveyor. A fleet of 12-yd. rear-dump Mack trucks handles the 2.8-mi. haul to bunkers on the right bank just below the downstream cofferdam. The number of trucks will vary from time to time according to the concreting schedules, of course. Additionally, it is expected that experience will permit a more precise determination of trip times and batcher operation cycles. These considerations will govern the actual number of trucks employed.



TRAIN OF CONVEYORS carries 550 tons per hr. across American River to batch plant. Bunkers are in the right background. Suspension bridge towers are joined by main cables, but belts had not been installed early in October. Rock and sand at that time were hauled across downstream cofferdam (note truck line-up) and brought to hopper at left, feeding on to last belt. Settling basins are for graded waste resulting from rescreening at batcher.

The bunkers are compartmented to receive sand and four grades of coarse aggregate, including the $-3\frac{1}{4}$ to $+4M$ gravel scalped at the sand plant. The bunkers have an approximate capacity of 2,200 tons. This is about a 4-hr. supply to the batcher, and to this extent the bunkers serve as surge for the batcher operation. Storage at the batcher itself totals only about 1,500 tons.

A reclaiming tunnel beneath the in-line bunker compartments not only makes for simplicity of conveyor belt loading, but also provides for rough proportioning of coarse aggregates as they are sent to the batcher. Since the aggregates are rinsed and rescreened at the batcher anyway, it makes for simpler operation there to have the rock arrive in typical proportions. This system applies only to the coarse aggregates. Sand is carried alone on this series of belts that cross the river and rise to the batch plant.

To the batch plant

Five conveyors are involved in the operation, in addition to the reclaiming tunnel conveyor at the bunkers. The first belt is the longest, about 960 ft. between head and tail pulleys, and this is the one carried on a suspension crossing of the river. It has a net fall of about 30 ft. from right bank to left, the direction of load travel. The bridge is 880 ft. between anchorages, 500 ft. between towers. It is pictured here under construction by crews of Consolidated Western Steel Corp., the erection subcontractor. The materials were fabricated for Merritt-Savin by Columbia-Geneva Steel Corp.

The second and third conveyors in the "train," respectively 637 and 520 ft. long, have no appreciable net rise or fall along their alignment. They skirt Folsom prison property and lead to a fourth conveyor.

The fourth conveyor, like the three preceding, was brought by the contractor from Bull Shoals Dam in Arkansas. They are all 30 in. wide and travel on this job at about 525 fpm., carrying 550 tons per hr. The temporary hopper into

which aggregates have been fed for early batch plant operation straddles this conveyor just behind its head pulley.

The final link in the system, and the steepest one, is a fifth conveyor that rises 140 ft. in its own 609-ft. length to discharge aggregates into the batch plant rescreening system. This unit is a Barber-Greene (as is the reclaiming conveyor across the river), and it is powered by a 125-hp. motor. Belt tension is estimated at 8,800 lb. The Goodrich belt is 30 in. wide and has 6 plies, giving a unit tension of about 49 lb. per ply-in.

Rescreening

Received at the batch plant, the aggregates are rescreened and chuted into separate storage bins. A gated bypass below the head pulley of the last conveyor serves to shunt sand directly to its own bin without passing through the four screens. The roughly proportioned aggregates, on the other hand, go successively through a pair of double-deck screens that classify them as before. Some degraded waste results from the truck haul operation and many belt transfers. It is hydraulicked out by the wash water in the rescreening process, settled in basins, and hauled away as necessary.

This completes the aggregate production and transportation story for Folsom Dam. The concrete batching and placement story, with its attendant problems, will be presented in the future. The concrete mixes to be used have had precedent in those designed for Pine

Flat Dam on California's Kings River, another Corps of Engineers project. In particular, the problems of sand grading there were studied with an eye also to writing specifications for concrete at Folsom. The reader is therefore referred to a previous article in *Western Construction*, "Sand grading for lean mass concrete," March 1952, pp. 69-71. The author of the article was S. D. Burks, now field engineer in charge of concrete dam construction on the Folsom Project.

Directing personnel

Folsom Dam is a project of the Sacramento District, Corps of Engineers. Col. C. C. Haug is district engineer. Project engineer at Folsom Dam is Robert B. Jenkinson, replacing Fred L. Geis, Jr., who recently retired. Jenkinson held a similar position during the principal construction period at Pine Flat Dam.

Special assistant to Jenkinson is Irwin E. Burks. In addition to S. D. Burks on concrete dam construction, Wilmer Clark is the engineer in charge of earth dam construction at Folsom. The present contract encompasses some 8,400,000 cu. yd. of embankment in the main dam and three auxiliary dikes.

The prime contract is held by a joint venture of Merritt-Chapman Scott Corp. and The Savin Construction Corp. Project manager for Merritt-Savin is D. E. "Dave" Stinson, and project engineer is L. G. Sumner. The office engineering staff is headed by J. R. Blinn and includes George E. Blessis and R. B. Nebel. A. W. Bartlett is field engineer and L. F. McCarthy is excavation superintendent.

Aggregate plant design

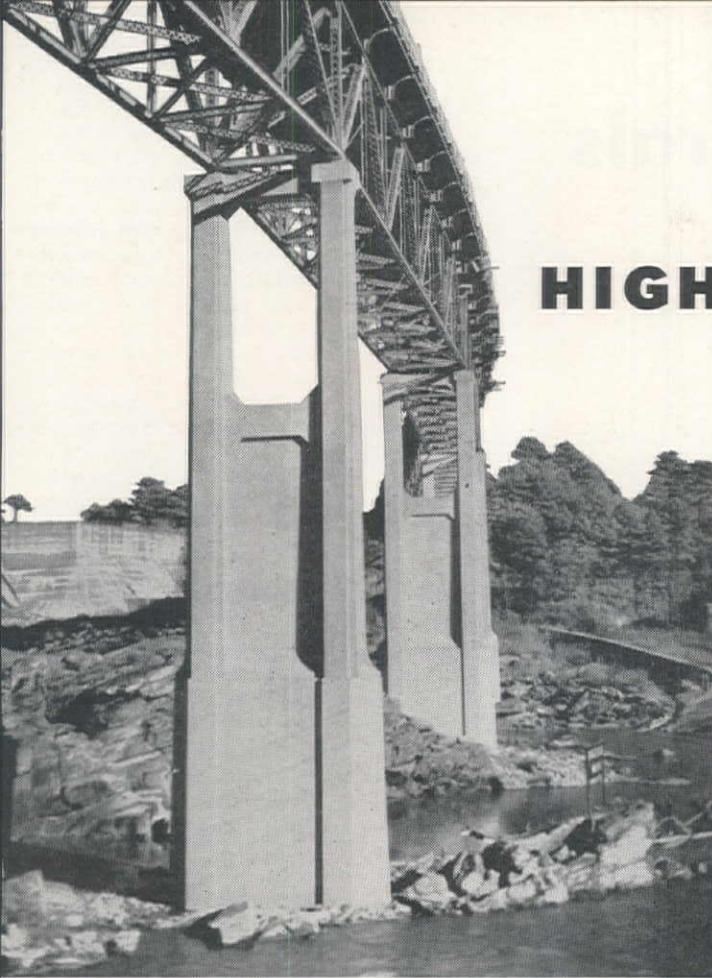
The aggregate plant for Folsom Dam was designed by Mines Engineering & Equipment Co. of San Francisco. Crushing and screening equipment is Telsmith, as are the feeders. The conveyors are Barber-Greene. Sand sizers and classifiers are Dorr Co. The plant was erected by the prime contractor and is operated by Charles M. "Chick" Alexander, plant superintendent.

The suspension crossing of the American River, erected for the aggregate conveyor system, has been described and credit noted for its design and construction. Conveyors throughout the system are variously new and used, some having seen service at Connemaugh and Bull Shoals dams. Installations for those leading from the suspension bridge to the batch plant were designed and built by Merritt-Savin.

New Mexico highways may cost \$17,000,000 in 1953

RALPH JONES, chairman of the State Highway Commission, announced before the Santa Fe Associated Contractors that New Mexico expects to spend between \$16,000,000 and \$17,000,000 on highways next year. The sum tops the current year's estimate of \$14,500,000, and \$12,000,000 spent in 1951. Jones substantiated his estimate by claiming that

a constitutional amendment of the Highway Commission made it possible to form long-range plans for future highway construction. He said that the state could match federal funds in quantities by the constantly improving gasoline tax, and moreover, he feels that declining war efforts will make more steel available for construction purposes.



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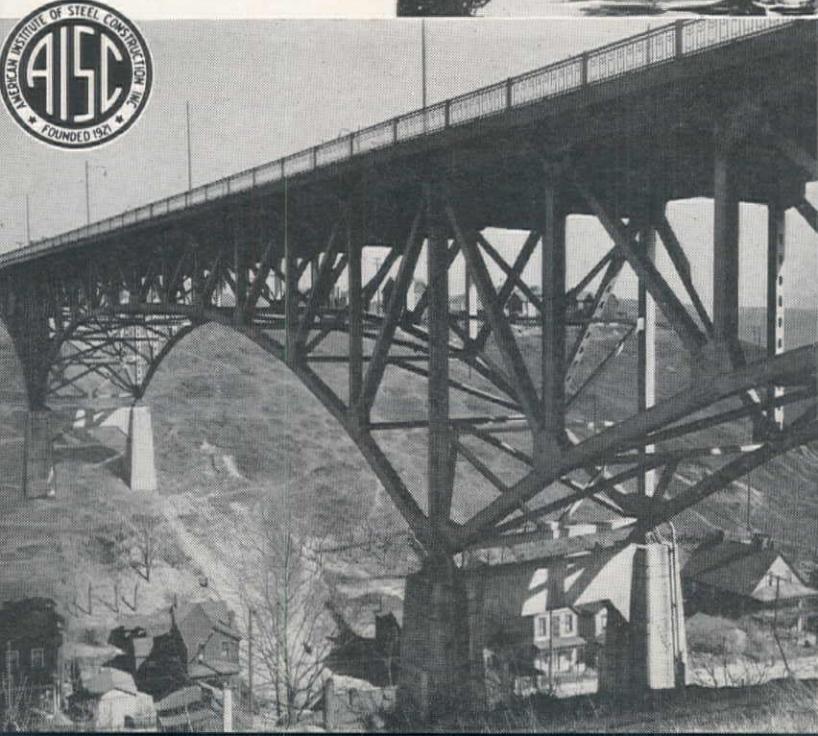
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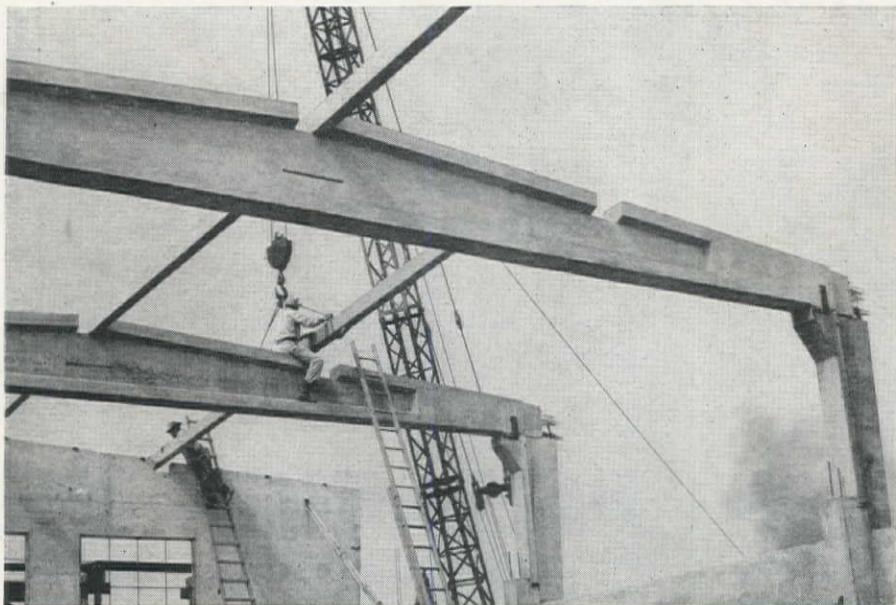
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Prestressed structurals in standard sizes



Tacoma firm will prestress concrete on a manufacturing basis—"Raised by its bootstraps," pilot plant construction utilizes roof beams of type to be produced

WITH THE HOLDING of demonstrations of prestressed concrete structural members before a wide audience of engineers of the Pacific Northwest this month, operations of the Concrete Engineering Co., of Tacoma, Washington, have begun. On view to interested visitors are two examples of the company's art and science, a small office structure and a pilot plant, both of precast and prestressed concrete construction. The new firm is headed by Arthur and Thomas Anderson, civil engineers who have devoted a major part of their academic study and later practice to the subject of prestressed concrete. Their venture in Tacoma encompasses the manufacture and sale of prestressed concrete structural members in standard sizes.

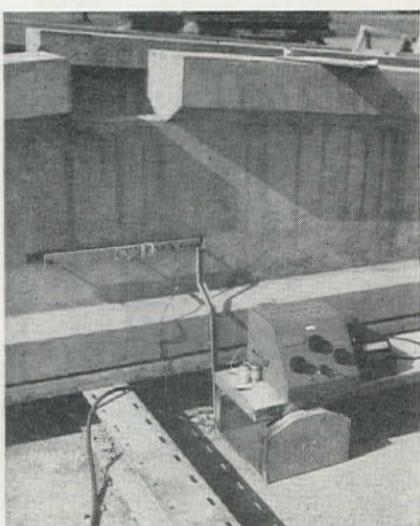
The problem of economy

Two principal problems face the new firm. One is economy of operation in prestressing concrete. The other is creating a market for the end products. The former problem is the one that has been given the most attention in the United States in recent years as engineers have considered the many possible applications of prestressed concrete.

The forming and pouring and prestressing of a concrete structural shape in this country gives rise to labor and material costs that are just the reverse of those in Europe. With labor relatively cheap there, and materials relatively high, prestressing has made a great hit because of its savings in both concrete

and steel. On the other hand, its production involves many more skilled man-hr. in building husky forms, in placing and prestressing wires (whether by the pre-tensioning or post-tensioning technique), and in controlling the operation generally. The Andersons hope to lick this obstacle by the very nature of their enterprise. Rather than build separate and individually designed prestressed

ELABORATE QUALITY CONTROL includes measurement of percentage loss of prestress. The Andersons' own wire tensometer is fixed to prestressing wire exposed by special forming. Tension in the wire is determined and creep loss of tension with time is recorded.



concrete members for particular applications and, moreover, doing so at each individual job, they will standardize their designs and perform all production at a single plant.

Refinements in technique will still be necessary, as will control of the work. The new plant incorporates permanent concrete abutments against which jacking reactions can be thrust as prestressing wires are taken to the desired stress. Thus, a major part of the forming cost is defrayed for "all time." Similarly, other costs that usually reappear on separate jobs of engineered concrete construction will be reduced by the manufacturing nature of this venture and its application of manufacturing production techniques.

Equipment and testing

The equipment itself rates a mention. The Andersons, in pursuing their objective of quality while still achieving the economy necessary to successful competition, have selected and installed the best equipment, some of it even foreign or custom-made. The batch plant is their own; the concrete mixer, similar to a pugmill or foundry sand slinger, came from Sweden.

Concrete mixes will be of the Andersons' own designs and will be batched to a nicety in this equipment. They will result in 6,000-psi compressive strength after three days. Further, every day's production will be subject to the utmost in laboratory test and inspection routines, a Tinius Olson 400,000-lb. universal testing machine being installed in the plant. The Andersons have also devised certain special tests significant to the proper control of production. These have been formulated with an eye also toward their use in disproving skeptics among potential customers.

The tests include a bending test that will be performed in the Tinius Olson machine with the aid of a precisely machined jig providing two simple supports for the test specimen. Another test makes possible the measurement of percentage loss of prestress with passage of time. This test installation is pictured.

Marketing possibilities

The problem of creating markets is perhaps a more formidable one. It may be argued that clients for a high-grade mode of construction such as this will all be large firms that have retained qualified engineers to make their designs and oversee the construction of their new plant facilities. Such engineers would, of course, be versed in the matter of first cost vs. long run cost, in which comparison are included such factors as maintenance, depreciation, insurance rates, etc.

The situation is not so simple, however. These clients, their engineers, and such extensive structures as are thereby implied, will continue to be highly individual in their requirements and, therefore, in their designs. In time, to be sure, they will recognize the advantages of prestressed concrete. And they will look for quality products manufactured

Concluded on page 117

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REPORTS from the COURTS

By
HOWARD S.
BURNSIDE
Attorney at Law
Registered
Professional Engineer



Single contract held no joint venture

"IT IS UNLAWFUL for any two or more licensees (licensed contractors) . . . to jointly submit a bid or otherwise act in the capacity of a contractor . . . without first having secured an additional license for acting in the capacity of such a joint venture . . ." Further, one acting as a contractor may not sue to recover his compensation unless he is a duly licensed contractor.¹ These statutory provisions were relevant in the case of *MacIntyre v. Angel*² where the plaintiff, a licensed contractor, executed a contract for remodeling work together with a mural painter whose occupation did not require a license. An additional license for a joint venture was not obtained.

The written contract described the work to be done and was signed by plaintiff as contractor and by the mural

painter as "Designer-Decorator." When a portion of the price remained unpaid after completion the contractor brought an action for the amount still due. At the trial it became important to determine whether the contract was the joint and several obligation of these two signers; that is, had they entered into the contract as joint adventurers and executed it in that capacity. If so, the statutory provisions noted above would prevent a recovery by the contractor.

The trial court determined that the written contract was ambiguous concerning the relationship of the contractor and the painter and submitted the question to the jury for a determination from conflicting evidence.

Testimony at the trial indicated that the painter had discussed his portion of the work with the owner independently

of and prior to the contractor's negotiations for the work; and that the parties were instructed to lump their fees under one agreement. The owner denied a separate agreement with the painter.

The jury found that there were two separate contracts embodied in the one contract according to the intention of the parties. The contractor was given a judgment which was affirmed on appeal.

While the statutory provisions noted above relate to California, they are not uncommon in other jurisdictions, and such licensing laws are applied strictly. In this case had it not been for the ambiguous contract and more important, the court's decision that it was ambiguous, the case would not have gone to the jury and the contractor would most likely have been denied a recovery in this action.

¹7029, 7031 Calif. Bus. and Prof. Code.
²MacIntyre v. Angel 109 C.A. 2d 425.

Interpretation of contract to manufacture

HERE IS A CASE where the reader may compare his decision against the Court's decision in the interpretation of a relatively simple contract and set of facts.

The defendant, a die casting manufacturing company, contracted to build a 12-cavity die to fabricate hose nozzles "per sample." The sample was a machined brass nozzle furnished to defendants by plaintiffs. Plaintiffs were machinists.

The contract continued with terms of payment and concluded with "We will then supply a minimum of 10,000 sets to you at 10¢ per set as cast" signed by defendants.

When the die was completed sample castings were made and delivered to

plaintiffs. A nozzle set consisted of two parts, the body and the cone, which would require machining for a water-tight fit. Plaintiffs assembled the parts as received. They leaked. Plaintiffs would not approve them and sued to recover payments already made. Defendant cross-complained for damages.

The trial court gave judgment for the plaintiffs feeling that defendant never delivered or offered to deliver nozzles which did not leak. The defendant appealed. The problem before the Appellate Court under these facts is, did the defendant agree to deliver nozzles similar to the sample and which did not leak.

The decision: "A die could not possibly be of the same type and character as the machined sample. A die is a mold

in which a raw casting is made. Defendant did not agree to make a die that would cast nozzles in the finished form of the sample or to manufacture finished nozzles that did not leak water when in use. They did not agree to manufacture machined nozzles conforming to the sample nozzle submitted. The sample nozzle had been machined on a lathe. Defendant agreed to build a die from which sample castings were first to be made; and then, if they were approved, to supply a minimum of 10,000 sets "as cast" . . . A casting is that which is cast in a mold. It is not necessarily a finished product; if precision is desired, it usually requires tooling or machining . . . Plaintiffs were machinists . . . There was no evidence that if machined the nozzles would have leaked when in use."

¹Meguiar v. Universal Die Casting Co. 239 P. 2d 699 C.A. 1/21/52.

The purpose of workmen's compensation

IN A RECENT Arizona case involving a technical point the court reviewed the theory and policy behind workmen's compensation.

"The Workmen's Compensation Act was enacted to protect the workman and to relieve society of the burden caused by industrial accidents. Industry is chargeable with and must bear the burden of the loss by injury and death to the human machine. It has been repeatedly held that the Act should receive a liberal interpretation in favor of the employee. Where there is doubt as to the

construction, that construction should be adopted which will best effect its purpose of compensating the injured employee for his loss of earning power."¹

In this case a worker filed for compensation for injuries due to inhaling chemical fumes. He filed four years after the time allowed by the statute had expired. However, at the time of his injury he was advised by doctors that he had not suffered an industrial accident; and he thought he had tuberculosis. The court adopts what it terms the modern rule, there being different rulings in the

various states on this problem. This rule states that if the injury is slight and non-compensable and later on develops unexpected results then the time for filing runs from the date the results of the injury became manifest and compensable. The worker was incapacitated for eleven days and according to the definition of the law he had a compensable injury (7 days required). So it would appear his time for filing had commenced running and expired. But the court expressed the opinion that the 7-day statute applies only when "one has suffered a patently compensable injury."

¹English v. Industrial Commission 237 P. 2d 815.

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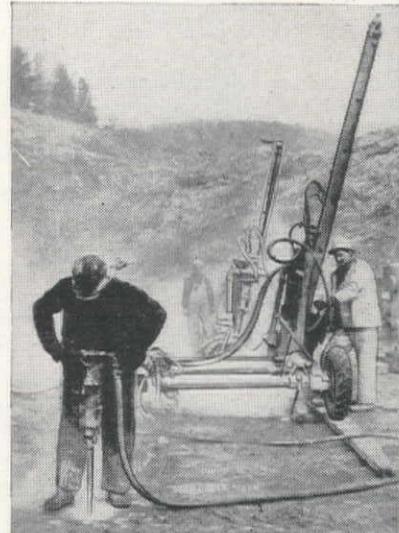
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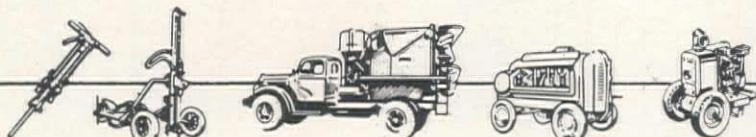
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NOVEMBER 1952

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Folsom Dam builders refuse to be kyoed by river and circumstances

SCHEDULING foundation excavation and main dam construction in the river channel at Folsom Dam has been a poker game this season, with circumstances and the American River seeming to hold the high cards. But, as of early October Merritt-Savin, the prime contractor, had made quite a dent in the season's work allotment. Here's how things happened.

Troubles in diversion tunnel excavation held up that key portion of the work until mid-June. The situation was relieved only by the fact that a record runoff season had persisted until that time and would have made earlier river diversion difficult if not impossible. As it was, the tunnel was bought from T. E. Connolly, Inc., on June 19 and turned over to Merritt-Savin the following day.

Cofferdam construction commenced immediately and diversion of the river was begun not quite a month later, on July 17. The cofferdam upstream is largely dumped rock, placed on a 3-shift basis. An upstream layer of fine material comprises an impervious blanket, and is augmented by a sheet pile core wall driven near the downstream toe. This piling is 30 ft. long and is backed up by impervious material, with dumped rock added on. The cofferdam rises to an elevation of 237 ft., whereas the river channel in this reach is normally at about el. 210.

Downstream there are, in effect, three cofferdams: The "real" one rises to el.

218, and is constructed similar to the upstream cofferdam. Just above the lower one, however, has been built an auxiliary cofferdam. The pool between the dams is used to settle material out of water continuously pumped from the unwatered foundation area. This avoids dumping detrital material into the river which would have to be removed in some other manner so as not to interfere with work downstream.

The third "cofferdam" is actually the right bank of a temporary canal constructed to carry diversion tunnel effluent across the American River channel from its right bank portal and along the left bank. In this manner the river channel downstream is rendered dry for tailrace channel excavation that must be performed there. The diverted water, carried in this makeshift canal, eventually is dumped into the PG&E power canal at the old power company dam site about $\frac{1}{2}$ mi. downstream.

In the foundation and flip bucket area, site of the most important work this season, a lot of assorted dirt and rock has been moved. A net depth of excavation of some 60 ft. had been achieved by October, the big machines then working at about el. 150. Blasting had been necessary to clear out about 102,000 cu. yd. of ledge rock, some 25% more than was anticipated. Boulders totaling 5,000 cu. yd. had been removed, while the biggest item, gravel excavation, had come last

FOUNDATION AREA at Folsom Dam site viewed upstream (late in September). Any time after November 1 flow in American River can be expected to exceed diversion capacity to flood this area. Excavated material is being moved to wing dam embankment on bank to left.



month to 350,000 cu. yd. Gravel will remain the biggest item, for hydraulic mining debris in the American River channel in this immediate area totals over 2,300,000 cu. yd. And it all has to come out during dam and tailrace channel excavation under the prime contract.

The rock is being drilled by a battery of 20 Ingersoll-Rand wagon drills, and by an Ingersoll-Rand Quarry Master. Loaded out by a pair of 2½-yd. Northwest 80-D's and a 4-yd. Marion, the shot material is transported by a fleet of rear-dump Eucs and Macks to the wing dam embankment on the right bank. Gravel has been similarly excavated by a 5-yd. Manitowoc dragline (pictured), but that rig has now been moved down to feed the rock plant at Mississippi Bar. A 2½-yd. Bucyrus-Erie remains to drag out the gravel. A 3½-yd. P&H shovel will continue to excavate river gravels in the tailrace channel area downstream of the outlet channel of the tunnel.

Any time after November 1 the river can be expected to run up to 12,000 cfs.—about 25% over diversion capacity. It might hold off until after the first of the year, or, if it did flood the hole out, it might fall again and permit more work this month and next.

Merritt-Savin is hanging on as if nothing troublesome were in prospect. The goal is still 140,000 cu. yd. of concrete this season, enough to bring the dam itself up to el. 225, creating a low, broad weir over which the river could flood without harm. Aggregate production and transport is described in the article on pages 69-72.

Tolt River eyed as Seattle water source

A REPORT submitted by City Engineer R. W. Finke recommends that the Tolt River basin be developed as a new source for Seattle's water supply. The Tolt River would supply the Kirkland and Bothell areas and territory north of the Seattle city limits. The engineer recommends construction of a storage reservoir on the south fork of the Tolt River, to be connected by a flume or conduit pipe to a diversion dam on the north fork of the river. From that point a pipeline would be extended south of Bothell, then to Kirkland, and it would continue around the north end of Lake Washington to a reservoir west of Bothell. Cost of both pipelines would be almost \$9,000,000, excluding costs of the dams or property costs which cannot be determined until a geological survey is conducted.

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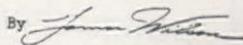
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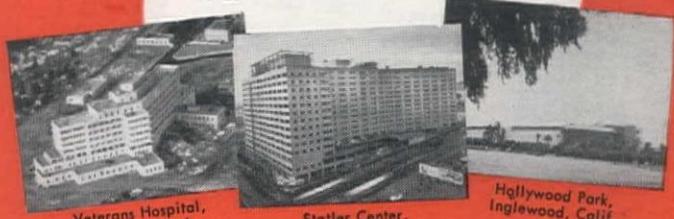
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- Tournatractor is easily converted to Tournadozer with addition of A-frame, bulldozer blade. Double-drum PCU, down-pressure attachment, tilt mechanism, cab, winch, etc. also available.

Auxiliary Tournatractor tools assure steady earnings year-round

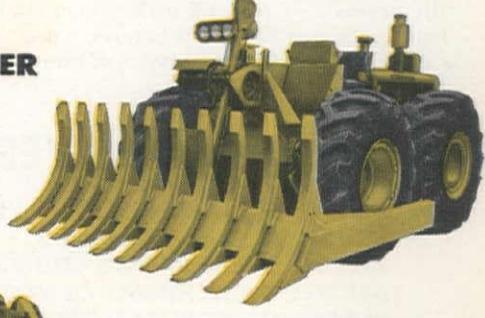


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For dozing work, the Tournatractor can be equipped with 13' x 41½" Angledozer or 11'4" x 43" Bulldozer. Angledozer blade can be angled 20° right or left. Both Bulldozer and Angledozer are electric motor controlled.



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Go-ahead for toll bridge across San Francisco Bay

LEGAL CONTROVERSY has delayed progress on the building of the Richmond-San Rafael bridge across San Francisco Bay. Engineering studies were authorized and financed at the last session of the California Legislature and have now been completed, including foundation exploration. However, interests favoring a solid fill across the arm of the Bay at or near the proposed bridge site appeared before the Toll Bridge Authority in public meeting and demanded that the bridge be postponed indefinitely or that the project be changed to provide the highway crossing on solid fill. The Toll Bridge Authority heard arguments on both sides of the question and the final decision was in favor of going ahead with the bridge project as now planned, which is estimated to cost about \$65,000,000.

Present plans call for a 6-lane structure with a total length of about 4 mi. with a high level crossing over the two navigation channels. The spans crossing the channels will each have a length of 1,000 ft. and a vertical clearance of 185 ft. over the main channel. The six lanes of traffic will be handled on two levels with three lanes traveling the same direction on each deck. Construction of the second deck, providing the additional three lanes, will be deferred until justified by increased traffic, but designs will provide for installation at a later date. Present traffic is estimated at about 4,000,000 vehicles per year when the bridge is first opened.

Proponents of the solid fill crossing, which would also serve as a salt water barrier, contend that this type of construction represents the most economical plan considering its multiple advantages. Cost estimates for such a plan were rather vague and engineers for the Toll Bridge Authority insisted they did not include provision for locks, spillway and other appurtenances. In fact, engineers estimated the cost of putting the highway over such a fill would be almost equal to the present cost estimate for the steel bridge.

Another problem related to a consideration of navigation, including the important naval shipping to and from Mare Island Navy Yard upstream from the Richmond site. The proposed high level bridge would not introduce new navigation problems whereas the barrier with its navigation locks would require movable spans that would be opened so much of the day as to prove intolerable to traffic. The possibility of vehicular tubes to extend under the navigation channels would induce a greater cost item.

Estimates made some time ago on the solid barrier with necessary spillway and locks were set up at more than \$100,000,000 without any highway facilities provided.

Another point raised by the Authority was the lack of funds which they would have available at present, or in the foreseeable future, for building such a barrier. Revenues from highway traffic tolls



CARVER PUMPS

would not be adequate, or legally available to finance more than the highway facilities.

As a result of further study and review of the arguments presented, the Authority has approved the recommendation of the Department of Public Works to construct the proposed bridge financed by revenue bonds and has authorized procedures for creating such bonds to be offered for investment as soon as possible.

Subsequent to this decision, court action was started to delay the actions taken by the Authority.

Final work begins on Rio Grande channel

WORK IS UNDER WAY on the second and final major contract for channelization of the Rio Grande to provide an increased water supply for the drought stricken Middle Rio Grande Valley in New Mexico. The job was awarded in September by the Bureau of Reclamation to the List and Clark Construction Company of Kansas City, Mo., on a low bid of \$713,012.50.

The contract calls for the channelization of a 10-mi. stretch of the river extending north from San Marcial, New Mexico, and the construction of dikes, levees, drains and culverts, and other features to control the waterflow in the stream. Under the contract, the work must be begun within 30 days after notification to proceed and be completed in 450 days thereafter.

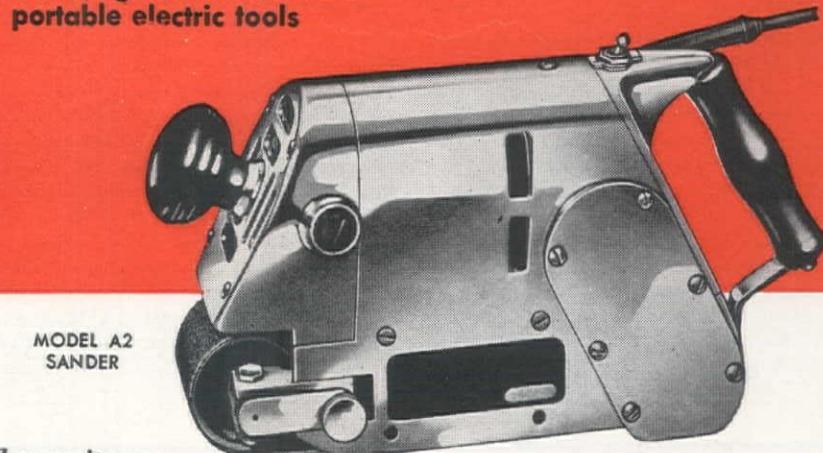
Channelization of a 21-mi. stretch of the river from San Marcial to the narrows of Elephant Butte Reservoir near Socorro, New Mexico, is nearing completion under another contract awarded last year to McGinnes Company, Inc., of Houston, Texas, on a low bid of \$940,115. The work is part of an \$18,000,000 program for improved water service in the area.

Montana contractor sues state for "extras"

S. BIRCH & SONS Construction Co., Great Falls, Mont., has opened suit against the highway commission for \$14,645.88—the extra costs Birch suffered when the state withheld certain information at the time the contract was awarded. According to press reports, Birch has nursed his complaint for two years, ever since beginning a 17.8-mi. job on the Rogers Pass-Simms highway. The highway commission, he claims, had assured him that sufficient material for the work could be found on the site—without mentioning that tests had proved that the material was not standard quality. The \$14,645.88 is the extra cost which Birch was forced to pay in order to obtain suitable material from another source. Had he been presented with the true information, the contractor stated that he either would have withdrawn his bid or adjusted it to meet the additional costs.

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\$30,000,000 plan for Albuquerque utilities

THE CITY COMMISSION of Albuquerque, N. Mex., is examining plans for a nearly \$30,000,000 water and sanitary sewer expansion. The city's present system already is inadequate but expansion is made all the more imperative because population growth is anticipated to reach 226,000 by 1970. Southwest Engineering Co. of Albuquerque, and Burns & McDonnell Engineering Co. of Kansas City, Mo., have proposed two master plans which would cost more than \$8,000,000 to handle only the present demands. Even so, water rationing in Albuquerque would be forced to continue until 1954.

Proposed improvements would increase (well) water supply from today's maximum of 34.3 mgd. to 97 mgd. by 1970, and to 50 mgd. as soon as possible. The water reservoir capacity from the present 22 mg. would be increased to 40 mg. by 1970 and to 30 mg. as soon as possible. The sewage disposal system eventually would provide handling of 21,700,000 gal. daily. (In 1949 the present plant was enlarged to handle 10,700,000 gal. daily but it is already overloaded.)

The plans would add new wells to tap the underground resources which are the basis of Albuquerque's water supply. A total of 42 wells are operating today with four currently under construction but 103 would be on the record by 1970.

The engineers recognize the necessity of checking the exact resources of the ground water supply, of adding softener, of providing a central control station, of maintaining water rights of the Jemez River supply in case the wells run dry, and of working for a share of the proposed San Juan-Chama transmountain diversion project. The present reservoir would be expanded, and a new one would be built. The supply and pumping facilities would be protected against local arroyo floods, chance hazards of an arid region, and the possibilities of a major flood on the Rio Grande. Southwest Engineering Co. has the contract to draw up the working design and to supervise construction for 5% of cost.

Bids asked on first unit of Utah's Weber Project

WORK on the Gateway Tunnel, first unit of the \$70,000,000 Weber Project (*Western Construction*—December 1949, p. 58) will begin soon. The Bureau of Reclamation issued invitations to prospective bidders in the middle of September for construction of the 3.3 mi. tunnel, a portion of the 11.8-mi. Gateway Canal which will extend west from a diversion dam on the Weber River in Utah, beginning 3 mi. west of Morgan. At present about half the total stream flow in the large Weber Basin area flows uselessly into Salt Lake. Half its land

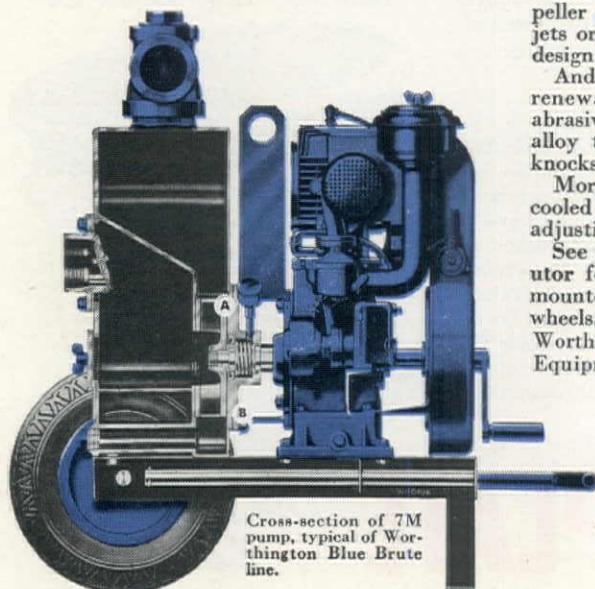
is waterlogged, and 27,000 acre-feet of recoverable ground water is undeveloped.

The entire project is one which will utilize the resources contained within the boundaries of one state—Utah. Water will be supplied to several hundred thousands of people and will afford the means to develop the potentially rich but notoriously arid farming land into productivity. In the 1930's two dams had been built which were believed to be sufficient for the area, but the advent of wartime activities with its drain on existing water supplies proved these two projects (Echo Dam on the Weber River and Pine View Dam on the Ogden River) to be inadequate.

The Weber Basin Project is one of the ten reclamation undertakings for which Congress appropriated preliminary working funds this year. When completed, more than 50,000 acres of new land and 24,000 acres now insufficiently irrigated will be supplied with ample water. Moreover, water will be provided for municipal and industrial use in communities in Weber, Davis and Box Elder counties, and for three permanent military bases in that area: Hill Air Force Base, Ogden Arsenal and Clearfield Naval Supply Depot. Damaging floods along the Ogden and Weber rivers should be eliminated, and hydroelectric power would be supplied during off-irrigation season. Waterlogged areas will be properly drained, thus eliminating the hazards of stream pollution and mos-

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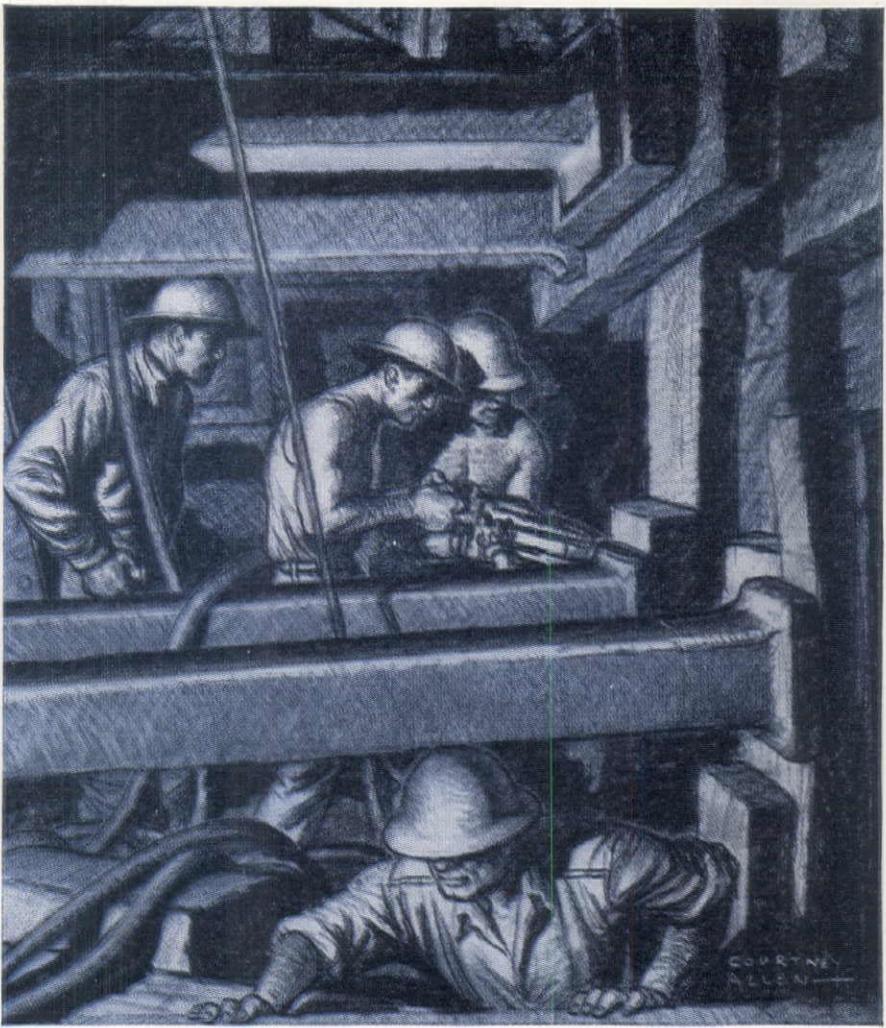
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Popular Worthington 4M has earned contractors' enthusiastic OK on all sorts of jobs. Has fabricated all-steel casing to take roughest service, yet weighs less than 75 lb. Hand carriage also available.

Grand Coulee engineers honored for heroism

EIGHT ENGINEERS, who on March 14 risked death inside Grand Coulee Dam in order to save the world's biggest power plant, have been awarded the Department of Interior's Gold Medal Distinguished Service Award. Their heroism aborted near disaster when an insecure cover to an inspection shaft tore loose after a giant valve was inadvertently opened and sent the Columbia River roaring into the interior of the dam through the shaft towards two giant power plants located at the end of the dam. The men waded waist-deep through the icy current to reach the power controls before substantial damage was done. If the flow of water had not been stopped promptly, power production in the Northwest would have been seriously crippled, and the loss of energy would have been felt throughout the country. Those eight engineers are: General Engineer Norman G. Holmdahl, 42, Seattle; Mechanical Engineer Donald D. McGregor, 35, Wheatland, N. Dak.; Mechanical Engineer Milton L. Berg, 26, Howard, S. Dak.; Superintendent of Operations John S. Bates, 57, Yakima, Wash.; Assistant Chief Powerhouse Operator Harold E. Parmenter, 49, Portland; Assistant Powerhouse Operator Irven E. Sloughter, 35, Milford, Mich.; Assistant Powerhouse Operator Perry W. Crandall, 44, Bishop, Calif.; Electrical Engineer James P. Green, 36, Malden, Wash. In addition the Silver Medal Meritorious Service Award was given to Powerhouse Shift Supervisor Roy F. Peterman, 48, of Cove, Ore. The entire Grand Coulee staff was awarded the Department of Interior's Unit Citation for Meritorious Service for outstanding teamwork, selfless discharge of duty and arduous labors in protecting the dam and power plant, and keeping disruption of power service at minimum during the emergency.



On the job...and on the bond EXPERIENCE COUNTS

quito-breeding territory.

Two other units of the Weber Basin Project are scheduled to begin before June 30, 1953. One will be the Wanship Dam, and the other Davis Aqueduct. Plans to round out the project involve raising the Pine View Dam and East Canyon Dam, above Morgan, and the construction of two other new dams—Lost Creek Dam and Willard Bay Dam.

Bugge toys with idea of toll roads in Washington

SPEAKING September 30 before the annual convention of the Washington State Good Roads Association, William A. Bugge, state highway director, suggested discriminating use of toll roads and bridges in Washington. Bugge feels that his proposed innovation is justified "where sufficient traffic will be developed to amortize fully all costs." It would be one means to obtain highway adequacy. Bugge introduced the subject during a discussion on highway financing.

To witness the herculean task of constructing a vital transportation link beneath the perilous bed of a surging river is to see revealed the unsurpassed magnitude of the American construction industry.

And to watch the required technical skill and resourcefulness in action is to know the meaning of experience.

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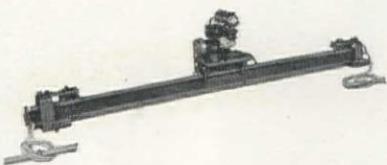
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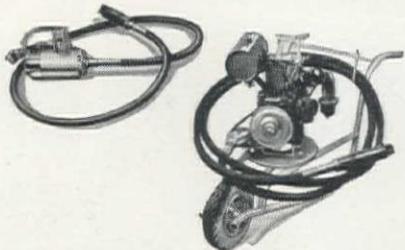
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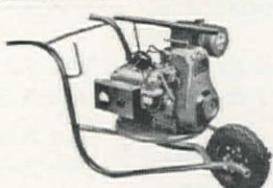
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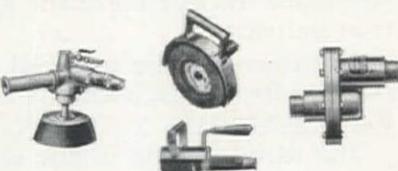
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**First power production
at Cabinet Gorge Dam**

THE FIRST of four 50,000-kw. generators powered by the \$46,000,000 Cabinet Gorge project began operating for Washington Water Power late in September—only 20 months after work began. Cabinet Gorge, located in the Idaho panhandle on the Clark Fork River, is the largest hydroelectric development in that state. It is the 12th plant to be operated by Washington Water Power. Cabinet Gorge's resources will be linked with the Beacon Hill substation in Spokane, and when the plant is completed it will double the power potentialities in that area. The generator has a 230,000-volt circuit. It measures 33 ft. in diameter, weighs 700 tons, and is as large as any now servicing the Northwest. The next generator is expected to be producing by the end of October. Morrison-Knudsen Co., Inc., has had the main contract.

**Montana forces ready for
snow on the highways**

600 MEN are getting ready for that annual campaign against the wintertime blockade of Montana highways. The State Department of Highways has divided Montana's 147,138 square miles into 11 districts, each of which will be responsible for plowing through about 535 mi. of road. The Department has 365 plows at its service and a total of 5,505 mi. to keep clear. It also has 66 sand spreaders which will diminish the possibilities of skidding after the vanguard snow plows have done their work.

The hazards of a northerly latitude have been known to bury certain sections of the state under snowfall in late spring when other sections of the country were long under plow. Last year eastern Montana still was handicapped by drifts in late March and early April. It cannot be predicted which sections of the state will receive the hardest blows. Snow falls heaviest in the mountains (especially in western sections), but some of the worst headaches are the drifts which pile up in the open prairies. Fortunately Montana's 2,000,000 ft. of snow fencing provide enough barriers to make the work a little easier. Another aid is "snow sloping"—cutting down steep banks on either side of the road so that snow blows away instead of forming dunes on the highway. Highway crews do not even bother maintaining certain roads which haven't enough traffic to warrant the extra expense. State highways 49 and 38 both are closed during winter, as is the Red Lodge-Cooke City highway.

The State Highway Department uses 203 one-way rigid plows, 81 one-way reversible plows, 61 V-type plows and 20 rotary plows. The first types of plows are adequate for snow 6 to 8 in. deep; for heavy drifts the rotary plows are set in motion.

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U. S. now member of world irrigation group

In conjunction with the acceptance of U. S. membership into the International Commission on Irrigation and Drainage, Walter E. Blomgren was elected Chairman of the United States National Committee. Blomgren is Assistant Chief Engineer of the Bureau of Reclamation with headquarters at Denver, Colo. At that time, Sept. 9, the Commission was meeting in Chicago and was represented by a world-wide roll call of 14 nations. The United States, Canada, West Germany, Nepal, and Greece participated as observer nations.

Walter E. Blomgren, chairman of U. S. National Committee



The United States National Committee is a non-governmental, privately financed body, widely representative of irrigation and drainage interests in this country. It includes individuals who are associated with industry, irrigation construction, representatives of several governmental agencies, members of professional societies, economists, and members of organizations concerned with operation of irrigation and drainage undertakings.

Other members elected to the United States Committee include: G. T. McCarthy, partner, Knappen-Tippets-Abbott-McCarthy, New York City; A. P. Rollins, member, Texas Board of Water Engineers, Austin, Tex.; I. D. Wood, Irrigation Engineer, Soil Conservation Service, and also President of the American Society of Agricultural Engineers, Denver; S. M. Gross, Drainage Consultant, Armco International Corporation, Middletown, Ohio; H. A. Scott, Chief, Planning and Reports Branch, Corps of Engineers, Jacksonville, Fla.; and Harold Conkling, Consulting Engineer, Los Angeles.

The next international meeting of the Commission is scheduled to be held at Algiers, Africa, in April 1954.

Bridges take warning:

IN DENVER an absent-minded bulldozer driver found himself in court on charges of careless and reckless driving, destroying public property, failure to report said indiscretions; hence "hit and run of a fixed object." The victim: a bridge. The driver, Glen W. Bennet, was observed heading the machine down the street at about 15 mph. when the collision occurred. Fifteen feet of the bridge railing was ripped out but the bulldozer emerged from the encounter with no apparent damage.

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FASTENERS

Engineers chiefly responsible for keeping buildings earthquake-proof, says panel

THE TEHACHAPI earthquake of last July got a full measure of interpretive treatment at a meeting of the Structural Engineers Association of Northern California held in San Francisco on September 16. Four scheduled principal speakers, plus an equal number speaking impromptu, described earthquake damage resulting both from the major shock of July 21 and from the aftershocks that culminated in severe damage at Bakersfield on August 22. Colored slides facilitated the speakers in their analyses of the various instances and degrees of damage.

Principal speakers were William Cloud, U. S. Coast & Geodetic Survey; Karl Steinbrugge, Pacific Fire Rating Bureau; S. B. Barnes, structural engineer of Los Angeles; and Henry Degenkolb, consulting engineer of San Francisco. Representatives of the Southern Pacific Co. and the Pacific Gas & Electric Co. also summarized their companies' earthquake experience.

It was the consensus that earthquake-resistant design, as it is known today, was not fully tested in the recent shake, which was described in its overall significance as only moderate. However,

the experience pointed up several lessons pertaining to the "administration" of a structure from its inception to the end of its economic life.

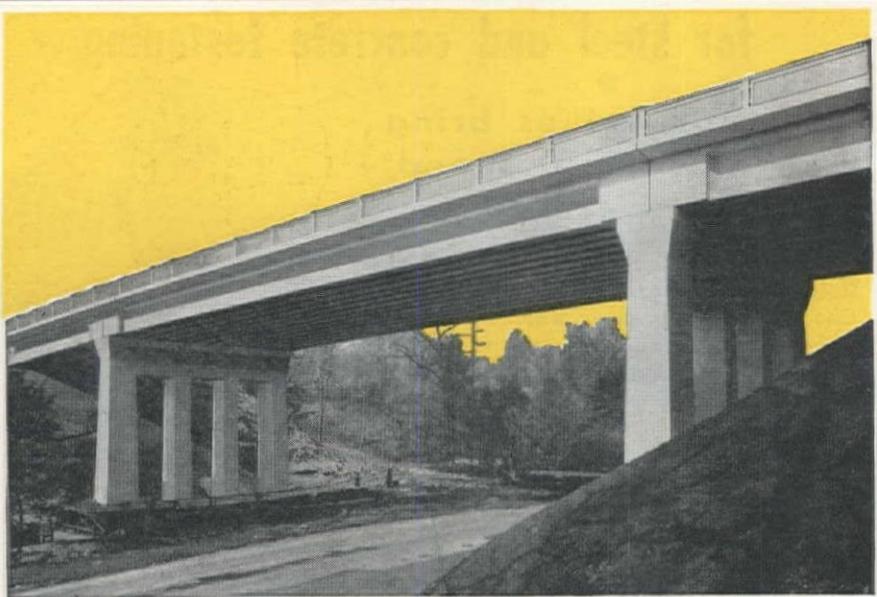
Foremost is the matter of checking and inspection. Design checking must assure structural detailing in accordance with provisions of the basic design; such detailing must be consistent throughout the structure. Lateral rod bracing must be designed for installation at angles such that it will work as intended. Diaphragm action of both vertical and horizontal surfaces can be expected only in direct proportion to the strength of their boundary connections to other members of a structure. Building location should be considered: there were instances of destructive pounding where structures were too close together. Also, there was advanced the thought that a larger seismic coefficient might be used where the building site consists of fill material.

In the matter of seismic coefficients generally, it was strongly noted that California generally is susceptible to earthquake. With earthquake resistance comprising a relatively small addition to design and construction costs, it may be fallacious to establish arbitrary earthquake "zones." Such zoning leads, in effect, to design for "half an earthquake," through the use of smaller coefficients. The implicit conclusion is to design for a whole earthquake or none at all.

Field inspection must be rigid in order to assure good workmanship and proper execution of the engineer's design. Poor workmanship was not evident alone in old masonry buildings. Many medium-sized modern commercial structures suffered, for instance, because of insufficient lap of reinforcing steel and inadequate provision of ties. Rod bracing failed to work properly in a few structures either because it had not been drawn taut in construction or because it had not been taken up periodically as a maintenance measure thereafter.

A point brought out by Karl Steinbrugge related to many important older buildings that were "loosened up" in the earthquake. In answer to a question as to the proper placement of responsibility for the scope and nature of their structural repairs, Steinbrugge later indicated that the responsibility rests in a large degree with the engineering profession. He seemed to feel that firm and continuing action in the public interest on the part of competent engineers is a prerequisite to enforcement of earthquake safety standards. In Bakersfield, where owners have not retained their own consultants, the City has done so, with the first objective of thorough inspection. This action is commendable.

Where they exist, municipal disaster councils (charged primarily with Civil Defense functions) can be effective in this regard. All too often, however, it is only the police and fire departments that bear the load, Steinbrugge noted. Although their integrity is unquestioned, their functions do not include the exercise of needed engineering knowledge and judgment.



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Job accidents take their toll

TWO WORKMEN were crushed to death in Los Angeles Sept. 19 when a series of concrete walls planned as partitions for an underground storage bin collapsed. The victims, both employed by William P. Neil Construction Co., were Constantine Janovec, 40, labor foreman, and Russell Black, 42, carpenter. According to press reports, the accident occurred when backfill was being placed between the outside of the excavation and the first of the series of 50 ft. long, 25 ft. high concrete partitions. This outside wall toppled over, and in turn four other walls were toppled.

Also in Los Angeles, on October 1, Dolore Gonzalez, 33, died when a sewer trench caved in. Gonzalez was cementing joints behind another worker who was laying pipe. The accident occurred at a point where the trench had been widened to a width of about 5 ft. as a safety precaution after a layer of loose, sandy soil had been encountered during excavation. No shoring had been placed because the width of the trench had been considered an adequate precaution.

ACCIDENTAL DEATHS and serious injuries on the West's construction jobs are reported each month in the interest of promoting safety on-the-job.

At the Bingham Strip Mine in Utah, Ray Cowlishaw, 39, operating engineer for Utah Construction Co., received fatal injuries while refueling a tractor. The fuel barrel into which he was pumping air exploded and he was struck in the head.

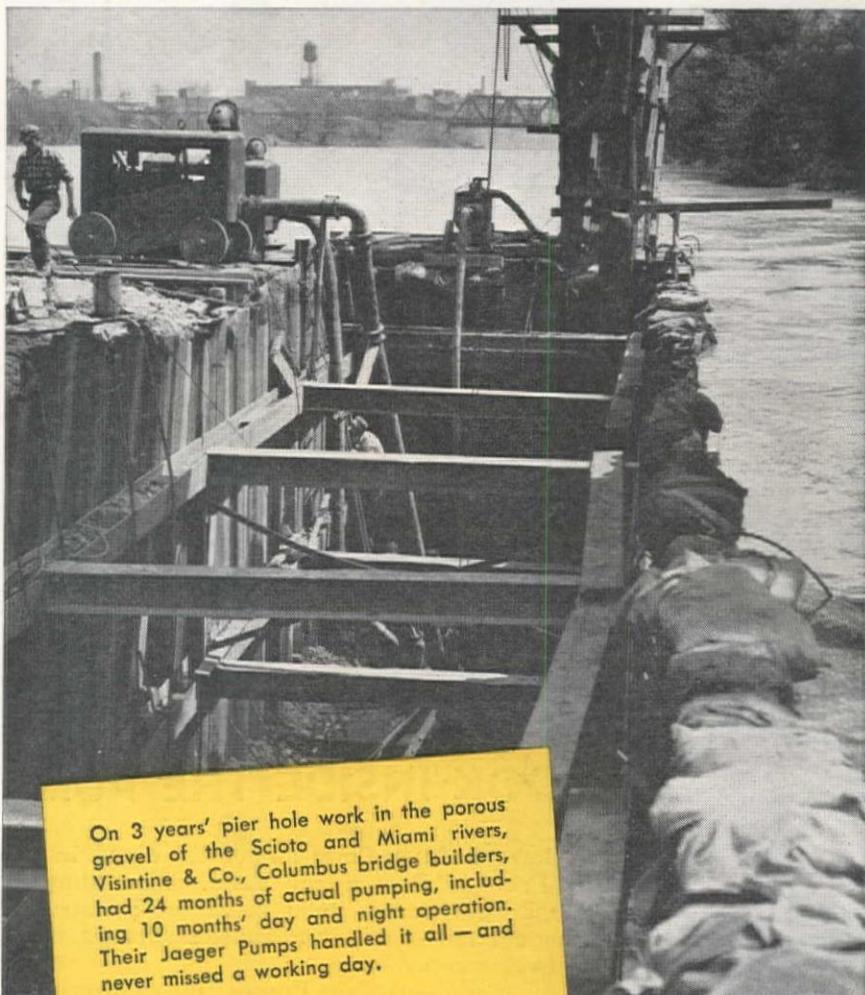
At Hungry Horse Dam in Montana, John B. Gauss, 33, was killed instantly when a 2-ton concrete bucket dropped after an electrical failure on the dam's cableway. Although this was the 20th accidental death at Hungry Horse, it was the first attributable to cableway operations.

At Mead, Washington, Hershel Neal, 28, was killed when he fell about 30 ft. from a scaffold and landed on an electrical switch. Neal was apparently moving the scaffold near a 13,000-volt bus installation at the Mead rectifier station when he slipped. He burned his hand on the bus and then struck his head on the switch when he fell. It was believed that he died of electrocution. Neal had arrived on the job the previous week from his home in Rivera, Calif.

At Clearfield, Utah, Luther Gentry of Redwood City, Calif., superintendent of roofing carpenters for E. W. Latimer Construction Co., was killed when he fell 20 ft. from the roof of a partially completed Naval Supply Depot warehouse.

On the Bear River Dam project in Amador County, California, Mathew Maxwell, 20, employee of Utah Construction Co., was killed when he fell into the hopper of a concrete mixer.

When you're in a hole, you can bet your shirt on Jaeger pumps



On 3 years' pier hole work in the porous gravel of the Scioto and Miami rivers, Visintine & Co., Columbus bridge builders, had 24 months of actual pumping, including 10 months' day and night operation. Their Jaeger Pumps handled it all—and never missed a working day.

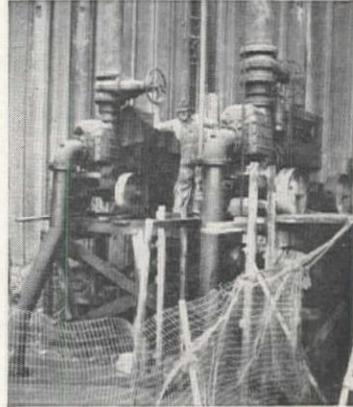
Stronger pull at slower speeds gives you more confidence in Jaeger "Sure Prime" Pumps:

Where ordinary pumps run fast to reach capacity and race up to 2000 rpm to prime, Jaeger Pumps deliver full rated volume at an easy 1200 rpm, and sure-prime quickly at no more than 1400.

This easy speed means thousands of hours more life in both pump and engine, no vapor lock on the long, hard pulls, extra performance you can depend on when the chips are down.

Sold and Serviced by:

Edward R. Bacon Co. San Francisco 10
Nelson Equipment Co. Portland 14
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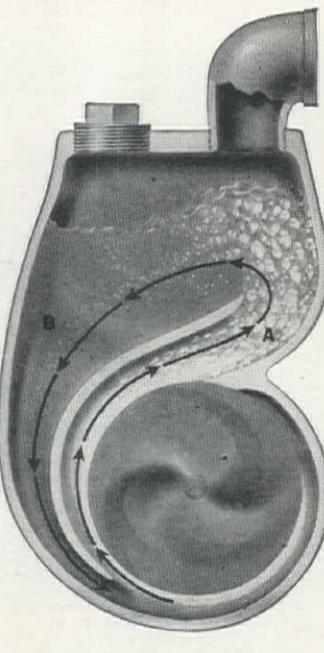


2 Pumps Drain 2152' Long Cofferdam: This pair of 10-inch Jaeger portables easily kept the big Cheatham Lock excavation on Cumberland River dry for U. S. Engineers.

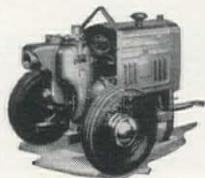
Smith Booth Usher Co. Los Angeles 54
A. H. Cox & Co. Seattle 4 and Wenatchee
The Sawtooth Co. Boise & Twin Falls, Idaho
Tractor & Equipment Co., Sidney, Miles City, Glasgow
Central Machinery Co., Great Falls & Havre
Wortham Machinery Co., Cheyenne, Wyo.

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Bulletin 8-CP-11

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In Gorman-Rupp Pumps the self-priming feature has reached its highest achievements.

Note the priming action illustrated above. The air and water are discharged through channel "A" into the chamber, where the air escapes from the water. The heavier air-free water is pulled downward again through channel "B" to the impeller where more air is entrained, discharged upward and released until the priming cycle is completed.

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THE  **GORMAN-RUPP COMPANY**
MANSFIELD, OHIO

LETTERS

First concrete cableway?

Editor, *Western Construction*:

I note with interest your photograph and statement on page 163 of the October 1952 issue that you have given credit to a job in connection with the Bureau of Reclamation diversion dam job on the Yellowstone River, as having the first aerial cableway used in placing concrete.

The writer while connected with the Scofield Construction Company at Philadelphia during the period of 1903-1905, worked on the construction of League Island Dry Dock No. 2, on which Francis Betts Smith ("Dry Dock Smith") was General Superintendent and on which job, a Lidgerwood Cableway spanning the dry dock and running on steel rails, the cableway having wood towers, was used throughout the construction.

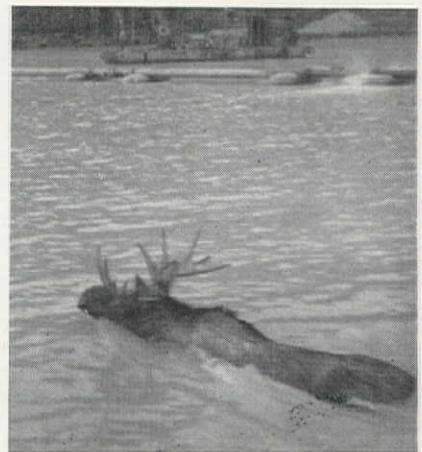
The above statement can certainly be checked with either the United States Navy, under whom the job was done, or the Lidgerwood Cableway Company.

D. E. ROOT
Guy F. Atkinson Co.,
Long Beach, Calif.

A ten-point hazard

Editor, *Western Construction*:

Your article on the dredge "Skookum" (September *Western Construction*) was read with interest and pleasure by the men on the job here in Alaska.



I am enclosing a picture taken by E. G. Smith, dredging superintendent for the Hydraulic Dredging Co., showing some of the hazards of dredging on Lake Eklutna. The "Skookum" is visible in the upper left hand corner of the picture with the pontoon pipeline in the background. In case you are wondering, the photogenic moose is still around here since Lake Eklutna is in a game reserve.

W. J. TALBOT
Project Manager
Ben C. Gerwick, Inc.

CALENDAR OF MEETINGS

November 12-14—National Reclamation Association, at Long Beach, Calif.

November 29—Arizona Section, ASCE, annual meeting at Phoenix.

December 2—Denver General Contractors Association, AGC, annual meeting, at Albany Hotel, Denver.

December 5-6—Northern California Chapter, AGC, annual meeting, at the Palace Hotel, San Francisco.

December 9—Seattle Chapter, AGC, annual meeting, at Seattle. Chapter address, 215 West Harrison St., Seattle 99.

December 9-12—American Association of State Highway Officials, Annual Meeting, Kansas City, Mo.

December 20—Nevada Chapter, AGC, annual meeting, at Reno.

1953

January 9-10—Intermountain Branch, AGC, annual meeting, at Salt Lake City.

January 9-10—Montana Contractors' Association, AGC, annual meeting, at Finlen Hotel, Butte (date and location tentative).

January 12—Portland Chapter, AGC, annual meeting, at Multnomah Hotel, Portland.

January 16—Mountain Pacific Chapter, AGC, annual meeting, at Benjamin Franklin Hotel, Seattle.

January 19—Alaska Chapter, AGC, annual meeting, at New Washington Hotel, Anchorage (date tentative).

January 30-31—Colorado Contractors Association, AGC, annual convention, at Shirley-Savoy Hotel, Denver.

February 1-4—Mason Contractors Association of America, Inc., national convention and show at Sherman Hotel, Chicago.

February 5—Wyoming Section ASCE, annual meeting, at Connor Hotel, Laramie.

February 9—Colorado Section, ASCE, annual meeting for installation of officers.

February 10—Tacoma Chapter, AGC, annual meeting at Tacoma.

February 25-28—American Concrete Pipe Association, annual convention at Baker Hotel, Dallas.

March 3-6—American Society of Civil Engineers, national convention, at Fairmont Hotel, San Francisco.

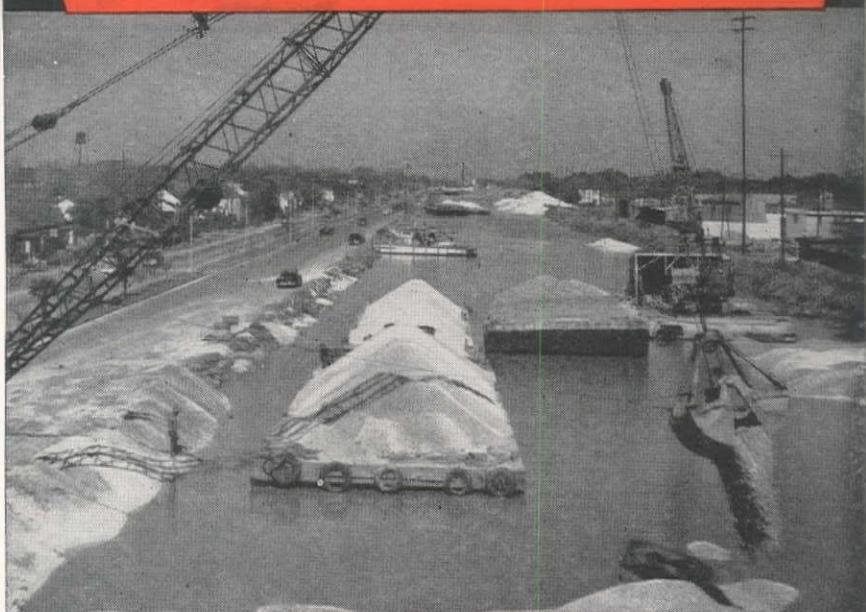
March 23-28—Associated General Contractors, 34th annual convention, at Miami, Florida.

September 14-16—Associated General Contractors, mid-year board meeting, at Edgewater Beach Hotel, Chicago.

1954

March 1-4—Associated General Contractors, 35th annual convention, at Statler Hotel, Los Angeles.

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ENGINEERS ON THE MOVE

Forty-three years of service to the development of Western water supplies ended October 1 with the retirement of **William H. Nalder**, Chief Designing Engineer of the Bureau of Reclamation. **O. L. Rice**, Nalder's assistant, has been named Acting Chief Designing Engineer.

Nalder was a designer in Denver until 1931, when he became Assistant Chief Designing Engineer under John L. Savage, and acceded to Savage's position following the latter's retirement in 1945.

He is a member of the Colorado Society of Engineers and the American Society of Civil Engineers. In ASCE, he is on the executive committee of the national Hydraulic Division.



Nalder



Stanley

Owen G. Stanley, for 46 years a familiar figure on Calif. waterways projects, has recently retired from the C. of E., though he plans to continue his engineering work on a consultant basis. The highlight of his long career was his energetic work on the Sacramento River Flood Control Project. Stanley became chief civilian engineer of the Sacramento District office in 1919 and served in that capacity until 1939, when he was transferred to the South Pacific Division Office of the Army Engineers in San Francisco, and placed in charge of all flood control and debris control work in California, Arizona, Utah and Nevada. Stanley was appointed Chief Civilian Engineer of the division in 1947, and was responsible for all engineering activities in both military and civil work construction. He assumed his present position as special assistant to the Division Engineer in 1951.

Warren D. Curtis, representing Dames & Moore, foundation engineers of San Francisco, is in Flathead, Mont., where the Flathead Anaconda aluminum plant is under construction.

Emil Bickel, resident engineer, will be in charge of an office for the REA engineering division of the Mont. Water Conservation Board in Broadus. His of-

fice will survey the lines for the Tongue River Electric Co-op. under construction nearby.

The former city engineer of Lewiston, Idaho, **W. P. Hughes**, has been retained as liaison engineer between the Idaho Highway Department and cities throughout the state.

Alfred E. Caswell has abandoned his USBR work on land mapping and a land classification survey in Casper and Cody, Wyo., for at least one year in Libya. The soil scientist will conduct a Point Four project endeavoring to find new lands which will help the Libyan people in their efforts to increase food production.

The Washington office of The Portland Cement Association has appointed **Robert H. Lochow** to the post of State Highway Paving Engineer, with headquarters to be located in Olympia. Lochow was formerly a field engineer in the Seattle office. His position has been newly established, since the Portland Cement Association feels that such an act will encourage the continued good relationship between citizens of Washington, the St. Dept. of Hwys. and its own industry.



Lochow



Smith

The recent death of **Walker J. Boudwin** necessitated an election of directors and officers of the Nevada chapter of the Associated General Contractors. **Duane Ramsey** of Ramsey Brothers, Reno, and **Rodney Boudwin** of Boudwin Construction Co., Reno, were elected to the board of directors. **F. R. Smith**, Reno's mayor and president of the Ready-Mix Concrete Co., is the new president. **John H. C. Roberts** of Reno is first vice president, and **Howard Wells** of Wells Cargo is second vice president.

Keith E. Grim, public works superintendent in Ellensburg, Wash., has recently resigned to take a position with the Seattle engineering firm of Carey, Kramer & Associates.

George C. Shannon, city manager of Oxnard, Calif., was appointed city manager in Anchorage, Alaska.

The retirement of **Jonathan Jones** of Bethlehem Steel Co. terminates a half-century of activity in the fabricated steel construction field. During his career Jones received international recognition as a structural engineer. He has recently been awarded two significant honors, one an honorary membership in the American Society of Civil Engineers, and the other an honorary degree of Doctor of Engineering at Lehigh University. Jones has supervised engineering on the Golden Gate bridge, the



Left: Jones



**Bottom: (l. to r.)
Ball and Jameson**



George Washington bridge, and recently on the Chesapeake Bay bridge. **Ethan F. Ball** is his successor as chief engineer of fabricated steel construction. Both Jones and Ball came to Bethlehem from the McClintic-Marshall Co., a construction firm which was acquired by the steel company in 1931. **W. H. Jameson** is replacing Ball as assistant chief engineer, bridges and buildings, in the fabricated steel construction division.

In Alaska the C. of E. has assigned **Lt. Col. John K. Addison** as resident engineer for military construction at Ladd and Eielson air force bases. Col. Addison is replacing **Judson H. White**.

W. A. Sanford, Huron, So. Dak., has been appointed construction engineer for the Tiber Dam. He was acting engineer for the project two years ago when work was halted at the outbreak of war.

New city water superintendent of Great Falls, Mont., is **Ben H. Chestnut**, replacing **Carl J. Peterson**.

The state highway commission of Portland has promoted three men. **John O. Petty**, formerly structural inspector, is now resident bridge engineer with headquarters in Portland. **Frank E. Ter-**

pin is no longer transitman in Bend but is locating engineer at Clatskanie. Carroll T. Keasey of Roseburg has been promoted from senior draftsman to division office engineer.

Harold B. Hammill, San Francisco consulting civil engineer, announces the removal of his office from 381 Bush St. to 417 Market St.

Fritz B. Burns, one of the founders of the National Association of Home Builders, was honored at a banquet given by the Los Angeles Chapter of the Building Contractors Association of California. The association has named him "Builder of the Year."

Frank R. Kelley has resigned as Humboldt County (Calif.) surveyor to enter private practice of civil engineering and land surveying.

A. M. Nash is being transferred by the California Division of Highways to Marysville district No. 3. His former territory, district No. 1, embracing Humboldt, Del Norte, Lake and Mendocino counties, will be taken over by C. V. Kane, who leaves district No. 8, the San Bernardino area.

Following the retirement of Robert B. Chandler, Leonard Bushnell was provisionally appointed to the post of Santa Clara County (Calif.) engineer.

72-year-old John Lucian Savage, famous consultant on the world's largest reclamation projects, recently began his eleventh 'round-the-world flight in ten years—all undertaken since his retirement from the USBR in 1939. Savage's 30,000-mile journey will include stop-offs in Alaska, Japan, Australia, the Philippines, Java, Singapore, India, Afghanistan, Turkey, Lebanon, London and South Africa. He will visit six continents during his four-month absence from Denver.

Donald A. Gray of the USBR is conducting Upper Klamath River Basin Investigations as chief of the development division of the Klamath Project in Klamath Falls, Ore. He had been conducting the Pajaro River Basin Investigations in Hollister, Calif.

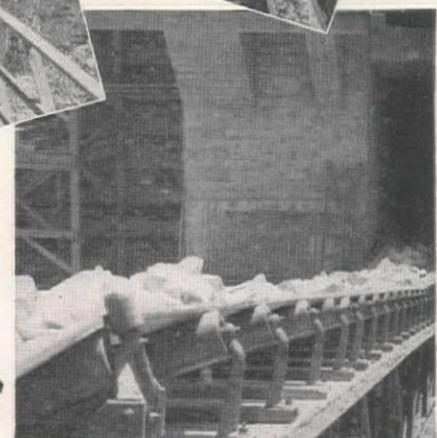
M. J. Shelton, general manager and chief engineer of the La Mesa, Lemon Grove and Spring Valley Irrigation district, Calif., has been elected director of District 2, American Society of Civil Engineers. Shelton will serve a three-year term, representing the members of his profession in California, Arizona, Utah and Nevada.

Lewiston, Idaho's new city engineer is Richard Lowrie, formerly city engineer at Pocatello.

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CALIFORNIANS at the Mid-Year Meeting of the Associated General Contractors Governing and Advisory Boards at The Greenbriar, White Sulphur Springs, W. Va., Sept. 8-10. (Standing) I. to r. *Fred J. Early, Jr.*, National AGC Director and Director of Central California Chapter, AGC; *Winfield H. Arata*, Manager, Northern California Chapter, *Dallas Young*, Vice President, Northern California Chapter, *Melvin F. Gautier*, Vice President, Central California Chapter, *George C. Loorz*, Past President, Northern California Chapter, *Frank G. Corker*, Manager, Central California Chapter, *James D. Marshall*, Assistant Managing Director, National AGC. (Sitting) I. to r. *H. E. Foreman*, Managing Director, Washington, D. C.; *H. O. Parish*, President, Northern California Chapter, *A. S. Horner*, 1952 National President, AGC.

Miles D. Catton, director of development of the Portland Cement Association since 1949, is now assistant to the vice president for research and development, following the retirement of H. F. Gonnerman. Catton's pioneering studies on the feasibility of scientific control of native soil and portland cement were in large measure responsible for the development of this low-cost paving material. Succeeding Catton is Douglas Mc-

Henry, who joined the Association staff in April after eleven years with the USBR in Denver.

Carl A. Menzel, well known because of his extensive research and development work on building materials and construction techniques, and formerly manager of the Housing and Cement Products Bureau of the Portland Cement

Association, Chicago, is now their consultant on concrete technical problems. Menzel has received top awards for his outstanding development work in the concrete field. He is being replaced in his former position by S. H. Westby.

Leslie N. McClellan recently has been presented with the Department of Interior's highest honor, the Gold Medal Distinguished Service Award, in recognition of his four years with the USBR as chief engineer and director, division of design and construction. McClellan's brief term of office has witnessed first delivery of water to three of the nation's greatest reclamation projects—Columbia Basin in Washington, Central Valley in California, and Colorado-Big Thompson in Colorado.

L. E. Weckerling is opening Bureau of Reclamation offices at Amarillo, Tex., in preparation for construction of Vermejo Dams in northern New Mexico.

H. Dean Miller, former Mesa, Ariz., city engineer, has accepted a post as general manager of Springfield, Mo., city utilities.

J. E. Papin, Ajo, Ariz., has a new position as concentrator superintendent, Morenci Branch, Phelps Dodge Corp. H. T. Herivel, who currently holds the position at Morenci, will become consulting metallurgist of the branch.

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When you use Primacord detonating fuse there's only one cap required for a blast . . . and it's on the surface. There are no caps in the holes! No chance of unexploded caps or explosives in the muck. The one cap used to initiate the Primacord in the round is not attached until connections are checked and men and equipment are safely away from the blast scene. Primacord is also insensitive to stray currents. It's doubly safe. It's easiest to use. Primacord can solve many of your blasting problems.

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DEATHS

Howard Halvorson, 38, contractor, died of a heart attack October 6 in Portland.

Kenneth H. Talbot, 65, well known engineer in the field of concrete construction, died Sept. 23 in Phoenix.

John McTaggart, 77, a builder in Phoenix for 40 years, died Sept. 10 in Phoenix.

Harvey Whipple, for 32 years secretary and secretary-treasurer of the American Concrete Institute, died on Sept. 6, at his home in Northville, Mich. Since 1919 his work in Institute affairs increased its membership from 232 to over 5,800. He was author of the book "Concrete Stone Manufacture."

Frederic J. S. Kyser, 75, retired railroad construction engineer, died Sept. 18 in Grantville, Calif.

Otto D. Rohlfs, former Seattle city engineer and water superintendent, died Sept. 25 in Seattle. During the war he was called to Washington, where he was principal engineer in the mineral division of the War Production Board, which later honored him with a merit award for his work.

Gilbert H. Hogue, 75, retired for five years after more than 44 years with the USBR, died Sept. 26 in Fresno, Calif. He was in charge of the location and topographical surveys for the Friant Dam, the Madera Canal and the Friant-Kern Canal of the Central Valley Project. In 1949 he was presented with a Bureau certificate for his work as chief engineer of the Lindmore Irrigation District (Calif.).

Benjamin Zoss, 62, president of the Zoss Construction Co., died in Malibu Colony, Calif., on Sept. 14.

Ralph S. Corlew, 67, an engineer with the U. S. Bureau of Public Roads in Denver for 33 years, died Sept. 26 in Grand Lake, Colo.

Stanley Albert Kerr, retired from the Bureau of Reclamation in 1950, died Sept. 17 in California. He had been Regional Planning Engineer throughout the development and construction of the Central Valley Project.

Dow H. Young, 62, superintendent of Salt Lake Waterworks and Water Supply Department, died July 20 in Salt Lake City, Utah.

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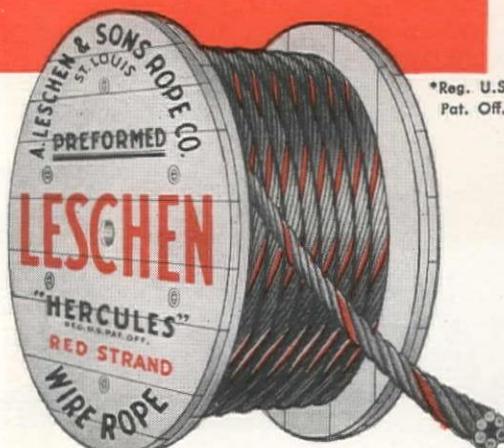
Are you getting preformed wire rope that is manufactured with the precise care... the exacting insistence upon higher-than-rated quality... and the specialized craftsmanship that goes into Hercules Red-Strand preformed wire rope?

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Leschen wire rope specialists will help you answer these questions... to your profit. Ask them... before you place your next wire rope order.

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SUPERVISING THE JOBS

A short road construction job among the tall firs of Klamath National Forest in Siskiyou County, Calif., is under the supervision of **Alfred T. Bennett** for Huettig, Schromm & Bennett.

Howard S. Wright & Co., Inc., is building a hangar at Boeing Field, Wash. The job superintendent is **Everett J. Peters**. **M. J. Peterson** is carpenter foreman, **Axel Swanberg** is labor foreman, and **Maurice Hillyard** is office manager.

Thomas H. Kelly is job superintendent near Cordelia Underpass, Solano County, Calif., for one of Peter Kiewit Sons' Co.'s numerous roadwork ventures. Other key men are **David M. Scott**, job engineer, **Jerry Kassler**, hot plant engineer, and **Jack Randall**, office manager.

Two Kiewit road jobs are in southeastern Idaho. One between Alton Flats and Border in Bear Lake County is supervised by **Wendell McNeal**. Another, under the supervision of **Hans Nelson**, is the maintenance and repair of 40 mi. of Highway 91 from the Jefferson County line to the Montana border in Clark County.

J. W. Jones and **A. L. Willems** are superintending 10 mi. of grading and draining between Twin Bridges and Dillon in Madison County, Mont. The con-

tractor is Nilson-Smith Construction Co.

Alf E. Eriksson is supervising the Fred J. Early, Jr., Co. construction of additional fuel storage facilities at the U. S. Naval Air Station, Alameda, Calif.

Cecil Wagner is overseeing the reconditioning and oiling of eight mi. of the John Day-Burns highway in Oregon for the Newport Construction Co.

Construction of three school buildings of over \$1,000,000 each is going on in California. Beginning with an edifice for advanced education, **A. L. "Andy" Jensen** is superintendent for the Allison Honer Co. on construction of the Social Sciences and Humanities Building at the Riverside campus of the University of Calif. His assistants are **James Higginbotham**, general foreman; **Don Honer**, office manager; **Bill Horton**, carpenter foreman; and **Joe Crane**, labor foreman.

The Paso Robles School for Boys, consisting of seven brick structures and a swimming pool, is being built by Maino Construction Co., with **James Emslie** as superintendent. His assisting foremen are **Harold Houghtaling**, **Thurman McDaniels** and **L. M. Soto**.

Harold E. Paul is project manager for Harris Construction Co., Inc., which is

erecting Roosevelt High School in Fresno. Job superintendent is **Anton Johnson**; general foreman is **Cyrk Stiles**.

Elmer Fauset, general superintendent; **Lee Richardson**, his assistant, and **Foreman Wilbur Hunt** are Madonna Construction Co. crewmen at work on bridge repairs, consisting of new piers, abutments and spans, to be constructed across the Santa Ynez River, about one mi. north of Lompoc, Calif.

Stolte, Inc., and Morrison-Knudsen Co., Inc., have **Pete Vandenhook** supervising the construction of approximately 30 buildings and miscellaneous work at Beale Air Force Base, Calif. The project engineer is **Gordon Schnell**; the office manager is **Ben Fitzpatrick**.

Michael Lichty, superintendent, and **L. W. Martin**, pipe foreman, are working on Lichty Construction Co.'s contract for 8.1 mi. of the Ethete road, Fremont County, Wyo.

The Cache Slough Pumping Plant, Vallejo, Calif., is being constructed by Fred J. Early, Jr., Co., Inc., with **Jack Kreutter** as superintendent and **Edward Field** as coordinator.

Supervising the construction of the Northern Pacific overcrossing to a junction with P. S. H. No. 12 in Lewis County, Wash., is **James Holland** for Peter Kiewit Sons' Co.

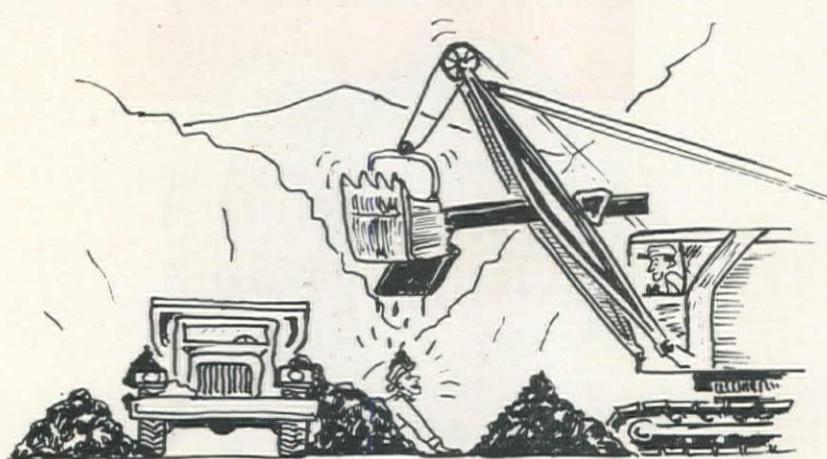
F. R. Melbye is superintendent for a J. S. Anderson Co. job to remove timber, to clear a right-of-way, and access road construction for the Coleville-Republic (Wash.) transmission line. His assistants are **D. S. Armstrong** and **Sandy Replinger**.

More new school news: **R. C. Day** will be a busy man for some time. He is now supervising the construction of Longley Way School in Arcadia, Calif., and after its completion he will move a little south to work on a school going up in San Juan Capistrano.

Among the many construction jobs under way for the U. S. Air Force are two in Washington. **Charles Cheney** and **Colby Ardis** are supervising the construction of utilities at Larson Air Force Base, Moses Lake, for McAtee & Heathe. Burrow, Milone & Tucci is building fuel storage facilities at McChord Air Force Base. **Edward de Sarro** is superintendent, and **Cliff Caseboldt** is project engineer.

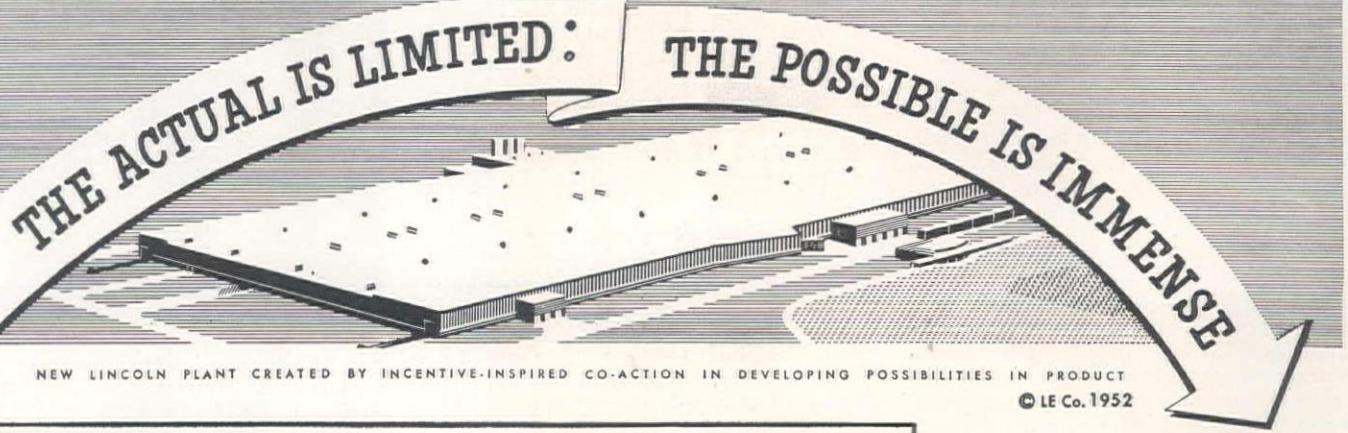
A contract to surface 70 blocks of city streets in Jal, New Mexico, is being worked on by the Pecos Valley Construction Co. Heading the job are **Sid**

Down-time By Domagalski



"You're getting warmer"

Western Construction



WELDED DESIGN SIMPLIFIES CONSTRUCTION ...SPEEDS FABRICATION, CUTS ERECTION TIME

SHOWN below are typical examples of how welded design cuts building costs. Continuous framing and elimination of splice plates save substantial tonnage of steel. Efficient shop fabrication is achieved with fast, downhand welding techniques. Simple beam-to-column details speed field welding with resulting cost savings of 15% to 20%.

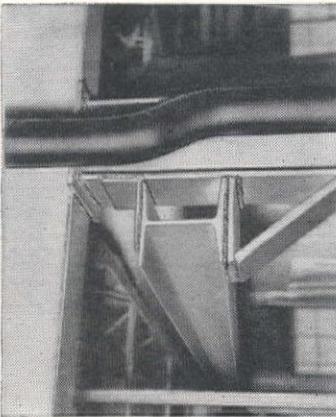


Fig. 3. Simple details cut costs 23% on factory building. 500 ton framework is set and welded by 5 man crew in 70 days. Fabricating and erecting costs are \$150 per ton compared to \$195 for riveting. Contractors, Republic Constructors, Inc., Columbus, Ind.

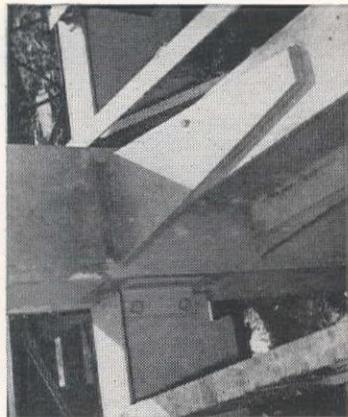


Fig. 4. Continuous girder passes over column and is spliced at point of minimum stress. Typical detail is from multi-story 1700 ton framework that requires 15% less steel. Structural design by Paul E. Jeffers and Robert Wilder, Los Angeles, California.

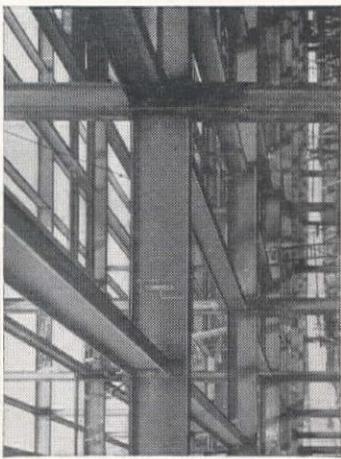


Fig. 5. Beam to column connection on 11 story apartment. 1200 ton framework erected with 25% less steel. Field welds are made in fast, downhand position to cut erection time. Engineers and Contractors, Byrne Organization, Inc., Washington, D. C.

WELDED DESIGN ALWAYS SAVES STEEL AND LOWERS COST

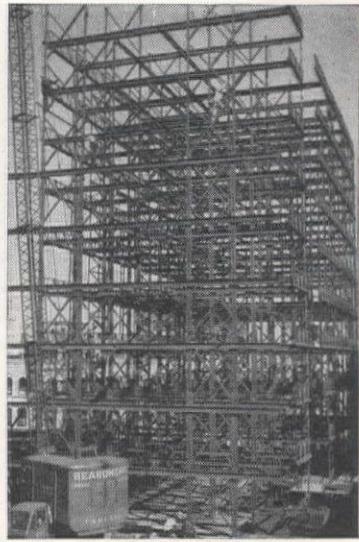


Fig. 1. Cuts steel 25% on 13 story Ridpath Hotel, Spokane, Washington. Cost of all-welded design 900-ton framework is 20% less than riveting. Architect, Ned L. Abrams, Sunnyvale, California.

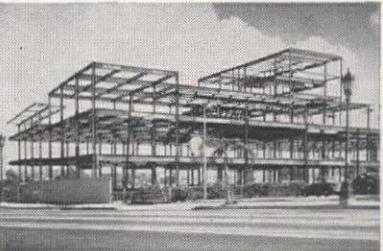


Fig. 2. Steel tonnage is 15% less on four story department store for J. W. Robinson Department Stores, Los Angeles, California. 6" less height per story results from welded design. Architects, Pereira and Luckman and Charles O. Matcham.

HERE'S HOW

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CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

Milligan, street superintendent; Roy Neal, concrete superintendent, and Wallace Ross, chief clerk and expeditor. J. S. Witt, partner in the firm, is actively in charge.

Tom Reilly, superintendent, and Ed. Cunningham, foreman, are doing about 5½ mi. of road work in Adams County, Wash., for Goodfellow Bros., Inc.

Two firms under separate contracts are now at work on the State tuberculosis hospital at Salem, Ore. H. N. Lankins is general superintendent for E. E. Settergren, who is building a reinforced concrete dormitory. The foremen are Webb Smith and Al Possehl. A two-

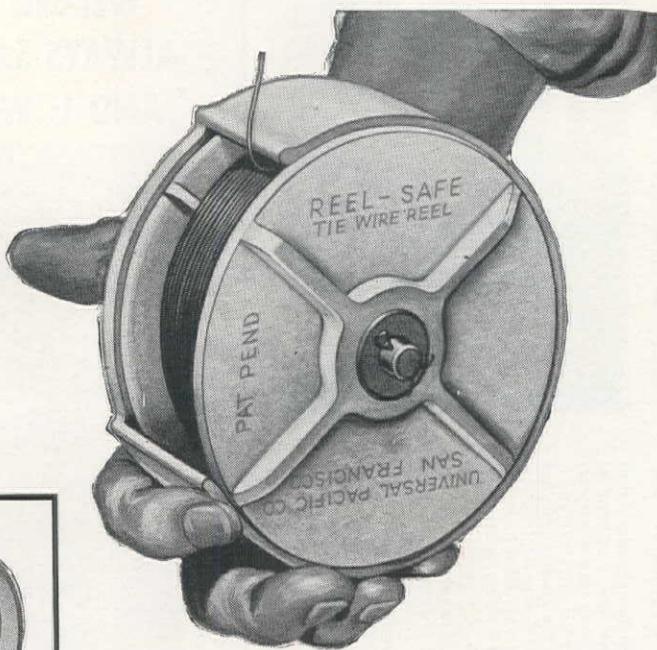
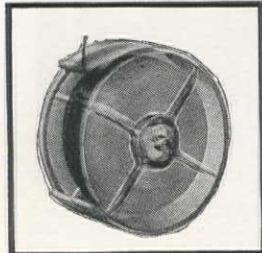
story addition to the hospital is being constructed by the Donald M. Drake Co. W. E. Smith is general superintendent, and Bob Karstens and Walt Jones are the foremen.

E. A. (Sam) Derrer is superintendent for the Montana Engineering and Construction Co. project to build a 310.5-ft. steel and concrete overhead pass between Forsyth and Miles City, Custer County, Mont. Mike Cinker is foreman.

The Pacific Dredging Co. is digging a 30-ft. channel in Coos Bay, Ore. C. R. McCoy is manager of operations and G. W. Rich is superintendent.



R. I. "Pop" Gunn, project manager for Swinerton & Walberg Co., just completing the California Western Life Insurance Building, Sacramento, Calif., at a cost of nearly \$3,000,000.



CAL-TIE WIRE in the Safe Dispenser

In concrete reinforcement tying jobs, CAL-TIE in the safe dispenser steps-up work and brings down costs. It's a sound safety measure too, for CAL-TIE wire in a Universal Pacific Reel-Safe leaves no loose pieces underfoot. And the savings in wire will surprise you.

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9967



A. B. Gerdig, above, foreman for A. G. Raisch Co. on street construction work in a new subdivision of Napa, Calif.

Three contracts totaling almost \$7,000,000 have been awarded by the 11th Naval District to the Allison Honer Co. and Cox Brothers Construction Co. The projects are to expand training facilities and build rifle ranges at various points in the large Marine training station, Camp Pendleton, Oceanside, Calif. H. E. Cox, Jr., is project manager and has a large crew of assistants, as follows: Stewart J. Stronach and R. C. Reif are assistant project managers of structures and engineering, respectively; E. D. Stones, general superintendent of structures; R. A. Kerfoot, general superintendent of engineering. Jim Dykstra is superintendent at Camp San Mateo, Jack Conner is superintendent at Camp Pulgas, Ken Johnson is superintendent of rifle range construction, Chet. Gundersen superintends at the sewage plant,

and Martin Day superintends at the reservoirs. Engineering has Frank King as general foreman and Bud Adams as tractor foreman. Wm. Brothers is plant foreman, and J. H. Lane is truck foreman. Other men on the job are J. McIntyre, master mechanic; Jack Ellerson, office manager; John Groves, comptroller; J. R. Newell, equipment manager, and Earl Davis, chief timekeeper. Edward Rodman and Harold Singer, both representing Newberry Electric Corporation, superintendent and purchase. E. O. Nay Co., Inc., has Jack Thorpe as superintendent and Frank Nay does the purchasing.

Activity in the Tiber Dam area is beginning to hum as officials conclude preliminary preparations. General superintendent for the Guy H. James Construction Co. and the Wunderlich Construction Co., is F. A. Bleecker, whose name was misspelled in the last issue. H. E. Birdsall is superintendent of equipment, and Walter Aman is office manager.



J. T. Smith, superintendent of a road reconstruction job on Fort Bragg Road near Willits, Calif. Contractor is Macal Improvement Co., Inc.

Under construction in Monterey, Calif., is a U. S. Naval Post Graduate School of Engineering, Bureau of Yards and Docks. Archie Johnson is superintendent for Haas & Haynie, contractors. He is assisted by Gail Showalter. Other important men are: Frank McMahon, carpenter superintendent; Charles Smithers and Vic Custer, labor foremen; Ralph Siler, timekeeper; John Goerl and Ross Hardy, engineers; and R. J. Stone and James Capps, carpenter foremen. R. L. Welborn is superintending for subcontractor Soulé Steel Co. Supervising for the Navy are: Commander W. W. Moore, resident officer in charge, and Lieutenant Commander Frank Connelley, his assistant. Resident inspector is Arthur S. Heley.

Haas & Haynie also is installing a sewage pumping and treatment works for the near-by town of Pacific Grove. Loren Olson is superintendent, and Olaf Olson and Leroy McGinnis are foremen.

Henry Thaut is superintending the Stone & Thaut Construction Co. award for highway work in Stevens County, Washington.



HELTZEL ON THE JOB ON THE PENNSYLVANIA TURNPIKE

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were made and broken

PROBLEM: To select batching equipment of speed, accuracy and ultra portability to put paving operations on a much faster schedule than ever attained.

ANSWER: After charging as high as 140 batches per hour on an airport project this batching operation was moved to the Pennsylvania Turnpike where this high production was maintained.

Heltzel Type One for aggregates and Type E-2 for bulk cement were set in line for continuous truck drive-through. Using dual batchers, 2-batch trucks were loaded in one stop and 3 and 4-batch trucks in only two stops.

Type One—Capacities: 52, 72, 85 and 100 tons; used with 1 1/4-cu. yd. Universal Batcher or 2 1/2-cu. yd. Dual Batcher.

Type E-1*—Capacities: 100 and 200 bbls.

Type E-2*—Capacities: 300 and 400 bbls.

*Used with 14-cu. ft. Dustless and 28-cu. ft. Dual Dustless Batchers.

Capacities may be increased with hopper extensions and recirculating tanks.



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Construction Equipment Since 1910



WARREN, OHIO



KEY MEN for W. H. Shields Construction Co. at work on the Leaburg Trout Hatchery, Leaburg, Ore., for the Corps of Engineers. L. to r., **W. H. Shields**, carpenter foreman, **Michael Popovich**, labor foreman, **Jack Barker**, superintendent, **Aron Stevenson**, assistant superintendent, **Robert Graham**, power saw operator, **James Sheridan**, form work foreman. Also on the job but not in the picture are **Otto F. Miller**, resident engineer, and **Eugene Jensen**, superintendent, for Mercer Steel Co., which holds the sub-contract for placing and furnishing reinforcing steel. **William Thomaston** is sub-contractor for cement operations.

Morris Mikkelsen is boss of a crew constructing the Snohomish (Wash.) reservoir for Everett McKellar, contractor. **Delbert Manson** is carpenter foreman and **Bill Donahou** is shovel runner.

Superintending The Quinn & Conant construction of the Beverly Alond Corporation Bldg. in Beverly Hills, Calif., is **A. J. Gibson**. Mauser & Kuzee are doing the concrete work, and have **Paul Fagus** superintending.

Harold Stjern will be wintering in Alaska as superintendent for the Valle-Sommers Construction Co. \$10,000,000 award for construction of eight-family quarters buildings at Elmendorf Air Force Base.

A million-dollar one-story hospital for post polio victims is being constructed by Baruch Corp. at Rancho Los Amegos (Los Angeles). **Ace Barnett** is superintendent, assisted by **K. J. Olsen** and **Ed Fulton**.

L. R. Conzelman is supervising construction of a water main in Long Beach, Calif., for **E. C. Losch**. Project engineer is **Roland W. Browne**; **E. F. Hibberd** is purchasing agent.

Bob Smith is supervising a stretch of track removal and repaving in San Francisco for Eaton & Smith. Foremen are **Slim Roller**, **John Hanley**, **Bill Sheehy** and **Jim Took**. **Lloyd Watson** is timekeeper.

Two crews from **J. E. Haddock, Ltd.**, are working on road jobs in Los Angeles. **Ken Murray** is superintendent, **Art Anderson** is structure superintendent, and **Bren. Madden** is office manager for a half million dollar grading and paving contract. The other large contract is a \$1,900,000 undertaking for

about one mile of PCC paving, and 19 retaining walls and a pedestrian undercrossing on Harbor Freeway. **Hank Ralston** is superintendent, **George Wiggers** is structure superintendent, job engineer is **Bill Stevens**, and **B. T. Cook** is office manager.

Joseph Simpson is supervising construction of a junior seminary in Van Nuys, Calif. Project manager is **P. P. Dejongh**; construction manager is **W. V. Lawson**. The contractor is **George A. Fuller Co.**

Another Alaskan job under way is a 54½-mi. stretch of the Seward-Anchorage highway in Chugach National Forest. **W. R. Rogers** and **Howard McInroe** are superintending for Babler Bros. & Rogers.

L. L. Lawler is supervising the strengthening of taxiways and parking areas in Mojave, Calif., for Peter Kiewit Sons' Co. He is assisted by **Don Fix**, project engineer; **John F. McLaughlin**, office engineer, and **Allen Crowder, Jr.**, job office manager.

One of the scenes of greatest activity this month is at Fort Ord, Calif., where three big construction jobs are under way for the Army. Largest roll call takes place at the scene of the \$18,000,000 Del E. Webb Co. construction of permanent troop space and supporting facilities. The superintendent is **John N. McPhee**, with **Gilbert A. Murray** as his assistant. Job and field engineers are **W. W. Clark** and **Morris De Connick**, respectively. Overseeing the office and cost are **W. A. Warriner** and **Dave Askins**, respectively. **A. H. (Andy) Shearer** is carpenter superintendent, and **C. K. (Whitey) Maslen** is labor superintendent. There are four carpenter foremen: **Rodney Murphy**, **Ed Reynolds**, **L. E. Benton** and **Jack Dodd**. **C. D. Draucher, Inc.**, has the

electrical contract for the Webb job. **George W. Berry** is superintendent. **E. Collins** is superintending installation of the plumbing for the Scott Co. The excavating was supervised by **Otto Prester** for Frank T. Hickey, Inc.

Ray Sutton is superintending the motor pool buildings which are going up by Stolte, Inc. His foremen are **Vernon Ask**, general; **Myrl McArthur**, carpenter, and **Kenny Johnson**, labor. The surveying for that Fort Ord work was done by **George C. Bestor** of nearby Carmel. The reinforced steel is supplied by Steelfab, Inc., of Castroville, Calif., with **Ed Davies** superintending.

Peterson Construction Co. is putting up the telephone building, and also the bachelor officers' quarters in the same vicinity. Superintending all of the work for the company is **Fritz Feiltheim**. **Len Williams** is carpenter superintendent, **James E. Johnson** is carpenter foreman, and **James Haga** is timekeeper for construction of the telephone building. **Jim Sumrall**, **Serafin Caballo** and **John Silver** are carpenter foremen for the BOQ job.



E. E. Anderson, superintendent of road reconstruction near Drain, Ore., for Fred H. Slate & E. C. Hall Co., is pictured with his son.

E. L. White is superintendent, and **J. F. Ledbetter** his assistant, as the Sully-Miller Contracting Co. does 4½ mi. of highway construction between Santa Ana and Costa Mesa in California. The office is managed by **P. A. Abbott**. **F. L. Hibbs** is project timekeeper.

Building four barracks, a mess hall and other structures at Fairchild Air Force Base, Washington, for Bennett-Campbell, Inc., is **Bob Baker** and assistant **Arley Robinson**, who are supervising the job.

The Ralph M. Parsons Co. has a contract with Union Oil Co. for construction in connection with its sulphur plant erection. **Carl Brown** is superintendent, with **Dave McNabb** as his assistant. **Earl M. Bolden** is carpenter foreman, with **Ben Parsons** as office manager.

Robert S. McKesson is superintendent for Anasco Construction Co., Long Beach, Calif., on rebuilding runway at Long Beach airport. **Frank Gieff** is assistant superintendent and **Bob Dodge** is equipment superintendent.

MANITOWOC 2000

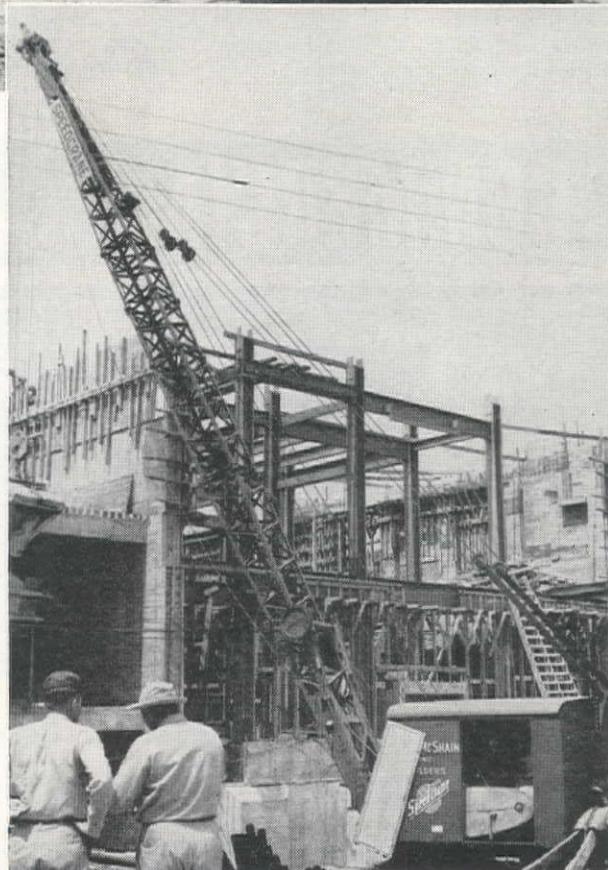
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- Speed means more work capacity. Compare hoist speeds as high as 227'/min., swing 4.35 R.P.M., and travel 1.1 M.P.H.
- More power at the dipper. Only 13 gears; only working gears turn—greater efficiency, less trouble and more effective horsepower.
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It's the best buy, by far in the 1 1/4 yard class. That's why more and more contractors are switching over to fleets of these husky 2000's every day. Manitowoc Engineering Corp., Manitowoc, Wis.



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One of the 4 Manitowoc 2000's owned by John McShain, Inc., Wash., D.C., excavating for Georgetown University Athletic Field.

Another Model 2000 placing concrete at Naval Health Institute, Bethesda, Maryland.



I. D. Robbins (left), and **Bud Snowball** (right), (see item below).

Doing highway and bridge work at Salmon Falls near Folsom, Calif., is **I. D. Robbins** superintending for Morrison-Knudsen Co., Inc. Assisting are **Bud Snowball**, excavation superintendent; **Dick Vogel**, office manager; **Russ Ball**, master mechanic; **Floyd Bible**, carpenter foreman; **Don Collar**, job engineer; **Chuck Kincaid**, office engineer. Representing the C. of E. are **Bob Jenkinson**, who is resident engineer; **Bill Clark**, field engineer, and **Marion Kelly**, inspector.

Paul Carpenter and **Dan Lehmer** are on the job for Midstate Construction Co. in San Bruno, Calif., where the Capuchino Junior High School is under construction. Carpenter is general superintendent, and Lehmer is foreman.

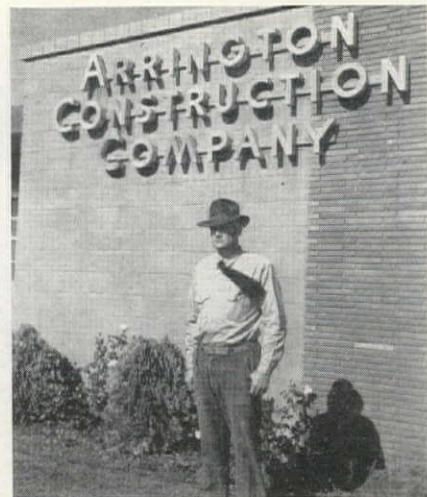
Gus Lian is superintending construction of a building for the National Carbon Co. in South San Francisco. Carpenter foreman is **Arnold Heidel**, and **H. D. Thomas** is office manager. Panelcrete Co. of California has the contract.

Three housing projects on the peninsula south of San Francisco are being constructed by F. & O. Corporation, land developers. The work is supervised by **James Desmond**, with **Roy Larrecon** assisting. **George Hestand** is concrete superintendent. The grading foremen are **Oran Brown**, **Jack Osborn** and **Howard Dogerty**. Office manager is **Marlow Prehn**.

Another large California housing project is Lake Murray Manor in La Mesa. **R. J. Swaner** is project manager, and **Ben Learned** is job superintendent. Bollenbacker-Kelton has the contract.

Bernal Heights, a housing project in San Francisco, is superintended by **M. Puccetti** for Thomas S. Meyers & Sons. **James Hull** is general superintendent; **Walter Ghelmetti** is general foreman. The inspector for FHA is **Charles West**.

A \$17,912,000 VA hospital going up in Los Angeles by the Gust K. Newberg Construction Co. is supervised by **Arnold Anderson**.



W. E. Arrington, manager of Arrington Construction Co., stands proudly before his building at Idaho Falls, Idaho.

We have a lengthy list of the men who are constructing the Nimbus Dam and Powerhouse near Sacramento, Calif., for Winston Bros. Co. and the Albert Johnson Construction Co., contractors. **A. T. (Abe) Evans** is the project manager. The general excavating superintendent is **Glen McAfee**, and **R. M. Hayden** is general concrete superintendent. **Deane Matthews** is project engineer and **John Fondahl** is office engineer. Other men are: **Charlie Wilkins**, office manager; **Jim Reynolds**, purchasing agent; **Bud Foster**, field engineer; **Chris Veasman**, master mechanic; **John Goggans**, carpenter superintendent, and **E. C. (Curly) Larsen**, grade foreman. The USBR has appointed **R. A. Young** as resident engineer and **H. F. Bahmeier** as construction engineer.

The second barrel of the San Diego Aqueduct is under way with **W. A. (Al) Denton** as project manager for Engineering Constructors, Inc., who are laying four mi. of 48-in., and six mi. of 60-in. concrete pipe. Field manager is **T. R. (Tommy) Wilcox**, and office manager (field) is **Ray Mather**.

M. H. Slocum of South Pasadena, Calif., left for India in September to supervise construction of a tremendous dam for the Indian government. He signed a 10-year contract with Premier Nehru. When the dam is completed it will supply the water to 6,500,000 acres in the Sutlej River valley in West Punjab, near Lahore.

Three Westerners received awards from the Eutectic Welding Alloys Corporation, contending with international rivals in the field of Category "A," "Welding Engineering and Theory." **H. Edward Flanders** of the University of Utah won a \$300 second prize. The third prize of \$200 was shared by **Paul Broadstone** and **Fred Salmons** of the R. G. LeTourneau Corporation of Longview, Tex.

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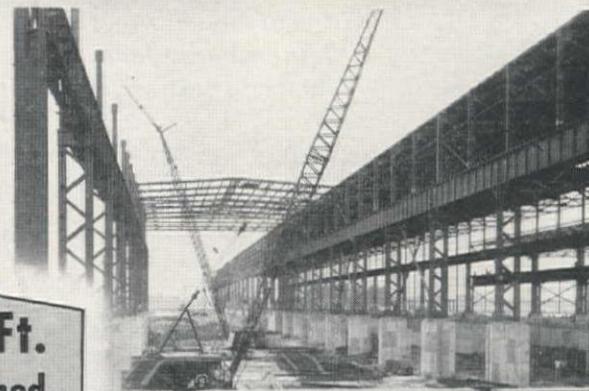
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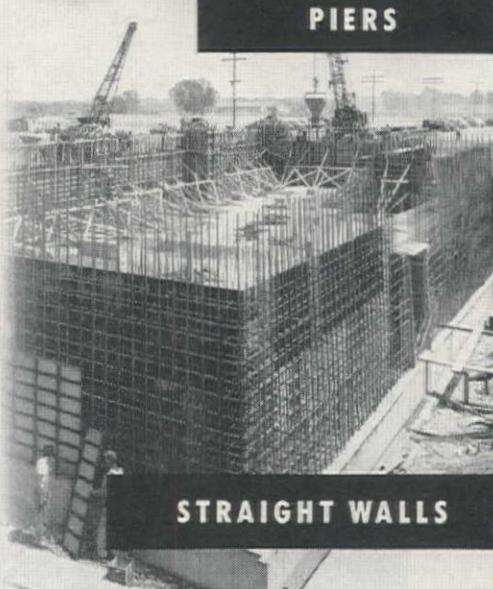
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AGC nominates Street and MacLeod as 1953 leaders

Mid-year board meeting, attended by more than 400 members, features discussions of ways to better relationships with subcontractors

THE NOMINATION of C. P. Street, secretary and manager of McDevitt and Street Co., Charlotte, North Carolina, for president of The Associated General Contractors of America in 1953 has been announced by the association. John MacLeod, president of Macco Corp., of Paramount, Calif., was nominated for vice president. The nominations were made during the mid-year meeting of the AGC governing and advisory boards at the Hotel Greenbrier, White Sulphur Springs, West Virginia, Sept. 8-10.

Voting will be by letter ballot and the installation of officers will be made at the conclusion of the AGC annual convention in Miami, Fla., in March 1953. Street is currently vice president. Arthur S. Horner, of the A. S. Horner Construction Co., Denver, president of the association, will serve through the Miami meeting. More than 400 members from all parts of the country attended the board meeting, making it the largest ever held.



C. P. STREET of North Carolina, nominated for the 1953 presidency of AGC.

C. P. Street has been a member of the same building construction firm since his graduation from Vanderbilt University, Nashville, Tenn., in 1922. A former chairman of the association's Building Contractors' Division and public relations committee, he has been very active in AGC. Currently he is a member of the executive, adjustment, governing provisions and public relations committees. In 1944 he was president of the Carolinas

Branch of AGC, having previously been vice president in 1942 and 1943.

John MacLeod has been president of his firm since 1929, and is noted as a builder of dams, Army and Navy ordnance test stations, air bases, supply depots for armed forces, amphibious force installations and industrial facilities, particularly for the oil industry.

MacLeod's committee posts in AGC are many. He was president of the Southern California Chapter in 1941 and chairman of the Heavy Construction and Railroad Contractors' Division in 1950. Currently he is chairman of the public relations committee and a member of the executive, finance, labor and progress committees; a district director of AGC; a member of the Bureau of Yards and Docks specifications committee, a task unit of the contract forms and specifications committee, and the Construction Industry Manufacturers Association-AGC joint cooperative committee.

Subcontractor relationships

Extended discussion was given during the meeting to just and harmonious relationships with subcontractors. All discussions emphasized that the best interests of the owner and the industry require that undivided responsibility for construction of projects be centralized in general contractors, and anything which weakens that responsibility is contrary to those interests. The Boards also recognized the responsibilities of general contractors for proper relationships with subcontractors.

Three actions were taken by the Boards. These were:

1. Approved the report of a special committee, headed by E. J. Wheeler, of Frank Messer & Sons, Inc., Cincinnati, which had been appointed to study the subject of depositories for bids of subcontractors. The committee's conclusion:

"This committee has reviewed the conclusion arrived at by the AGC special committee appointed in 1948 to develop 'A Suggested Guide to Bidding Procedures' in which they stood firm in their position that bid depositories are undesirable, and which position was approved by the AGC Executive Committee. Our committee at this time concurs with the position taken by the above referred-to committee.

"It also recognizes the desirability of establishing better and closer relationships with the subcontractors and urges that all chapters, branches and members individually of the AGC cooperate to this end, to correct any questionable practices . . ."

2. Adopted a motion "that we stand



JOHN MacLEOD of California, nominated as 1953 vice president of AGC.

strongly against the naming of subcontractors and separate contracts."

3. Adopted another motion that the Boards "hereby authorize officers and Executive Committee to initiate such cooperative actions as they deem appropriate directed toward establishing more harmonious relationships between specialty and subcontractors and general contractors. The Boards further recommend that chapters and branches take such action in their areas."

Highway contractors

A wide variety of highway and airport construction problems were discussed by highway contractors at their roundtable meeting, Chairman Fred W. Heldenfels, Jr., Heldenfels Bros., Corpus Christi, Texas, reported.

The meeting emphasized the need for more rapid utilization of federal aid highway funds by the states. The advertisements by various manufacturers pointing out to the public the needs for highway construction were commended. It praised the "Project-Adequate Roads" program and current "grass roots" meetings on highway needs such as those sponsored by the Texas Good Roads Federation and others.

Contracts and specifications

Actions of the Committee on Contract Forms and Specifications, and its subcommittees and task units in working with other groups in developing improved contract documents, specifications and administrative procedures were reviewed by Chairman George C. Atkinson, Guy F. Atkinson Co., South San Francisco. The committee recommended that legislation continue to be sought to assure the right of judicial review of disputes arising from government contracts. The AGC had recommended such legislation to offset effects of the Supreme Court decision in the Wunderlich case to the past session of Congress and a bill was passed by the Senate.

Eimco's Cut Loading Costs on Airport Jobs



Loading Time Chart — In Minutes Per Truck
Average Conditions*

MATERIAL	SIZE OF TRUCK			
	Light 2 - 4 Ton	6 Yd.	10 Yd.	15 Yd.
Sand (In Place)	.4 - .6	.6 - .8	1.0 - 1.4	1.5 - 2.0
Gravel (In Place)	.5 - .7	.6 - .9	1.0 - 1.5	1.5 - 2.3
Stockpiled Material	.4 - .7	.6 - .9	1.0 - 1.5	1.5 - 2.3
Quarry Rock (Small)	.7 - .9	1.0 - 1.3	1.7 - 2.3	2.5 - 3.3
Tunnel (Rough Bottom)		1.5 - 2.2	2.7 - 4.0	

*Quoting time from jobs where machines were factory equipped for service intended. These are actual loading time studies on a "per truck loaded" basis. Time for shifting trucks should be added.

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NEW BOOKS

HANDBOOK OF APPLIED HYDRAULICS—Davis, Ed.

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LEGAL GUIDE FOR CONTRACTORS, ARCHITECTS AND ENGINEERS—Werbin

I. Vernon Werbin, who is both a licensed professional engineer and a member of the New York Bar, has added another handy guide to help avoid the pitfalls of legal difficulties in the con-

tracting, architectural and engineering fields. His previous work, "Legal Phases of Construction Contracts," 1946, covers 46 legal problems commonly arising from construction contracts. This new volume covers 83 additional problems, so that the two books combined should supply many answers to typical headaches rising from the breaching and changing of contracts which may end up in court. Both books are not intended as a substitute for legal advice. The language is such that it can be readily understood by laymen as well as by attorneys. Published by McGraw-Hill Book Co., Inc., New York. 374 pages, $5\frac{1}{2} \times 8\frac{1}{2}$. Priced at \$4.75.

STEAM POWER PLANTS—Zerban and Nye

A readable, usable and well-illustrated treatment of steam power plants is presented in this text, which is intended to cover the basic elements in the field but is not to be regarded as an exhaustive reference. An understanding of the principles of heat-power engineering is of timely importance, since nearly 70% of all electric power is generated in steam stations. The authors' three aims are: to utilize fundamental principles of science toward the art of heat-power engineering; to bring to attention the economic factors influencing engineer-

ing decision, and to present a general picture of the equipment of representative manufacturers. Published by International Textbook Co., Scranton, Pa., 1952. 524 pages, $6\frac{1}{2} \times 9\frac{1}{2}$. Priced at \$7.50.

ELECTRIC ARC WELDING—Austin

Arc welding is brought down to fundamentals in this presentation and the book will answer your questions on everything from how electrodes are selected for hard facing to the best way to tell whether a welding machine is properly set. In the second stages the book applies the ground work presented in the opening sections to major fields of welding. This is an excellent reference work and practical guide for those in arc welding. Published by American Technical Society, 280 pages, $5\frac{1}{2} \times 8\frac{1}{2}$. Priced at \$3.90.

Books reviewed in this section are made available by J. W. Stacey, Inc., retailers of technical books (stores at San Francisco and Denver). You may obtain a copy of any book reviewed this month by sending an order to J. W. Stacey, Inc., c/o Western Construction, 609 Mission St., San Francisco 5, California. C.O.D. orders will be accepted.

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CONTRACTS

A Summary of Bids and Awards For Major Projects in the West

Alaska

\$397,841—Peter Kiewit Sons' Co. and Fred J. Early Co., Inc., 1300 Aloha, Seattle—Award for outside utilities for a hospital, Ladd Air Force Base; by C. of E.

\$2,154,530—Kuney-Johnson Co., 235 Ninth Ave. N., Seattle—Award for 14 eight-family quarters buildings in the hospital area at Ladd Air Force Base; by C. of E.

\$2,543,220—Kuney-Johnson Co., 235 Ninth Ave. N., Seattle—Low bid for five dormitories and mess-and-administration building, Eielson Air Force Base; by C. of E.

\$731,000—Lease & Leigland and M-B Contracting Co., 1019 Lloyd Bldg., Seattle—Award for sewer system and pumping station in a dispersal cantonment area at Fort Richardson; by C. of E.

\$308,075—Manson Construction & Engineering Co., and Osberg Construction Co., 1132 N. 128, Seattle—Low bid for dredging the entrance channel to Women's Bay, Kodiak; by U. S. Navy.

\$448,990—Morrison-Knudsen Co., Inc., 603 Hoge Bldg., Seattle—Low bid for Fort Richardson by-pass of the Glenn highway; by Alaska Rd. Comm.

\$1,817,440—S. S. Mullen, Inc., 621 Ninth St. N., Seattle—Low bid for 14 eight-family housing units and utilities, Ladd Air Force Base; by C. of E.

Arizona

\$411,000—James Biaconi, John Fisher and R. M. Haddox, Yuma—Low bid to clear 1,040 acres of land for farming, Colorado River Indian Reservation.

\$176,515—Dail Construction Co., 2018 W. Mulberry, Phoenix—Award for structural steel superstructure of Hell Canyon Bridge, Prescott-Ash Fork highway; by St. Hwy. Dept.

\$206,425—D. A. Flickinger, 1261 E. Cambridge, Phoenix—Low bid for 3.3 mi. approaching Queen Creek tunnel on Superior-Miami highway; by St. Hwy. Dept.

\$276,689—W. J. Henson, P. O. Box 471, Prescott—Low bid for 4.1 mi. work on Holbrook-Lupton highway, Navajo County; by St. Hwy. Dept.

\$144,997—Heuser & Garnett, 731 N. 19th Ave., Phoenix—Award for 1.5 mi. work on highway, outskirts of Yuma; by St. Hwy. Dept.

\$353,619—Pioneer Constructors, P. O. Box 2768, Tucson—Award for 5 1/4 mi. work on Tucson-Florence highway, beginning 4 mi. north of Tucson; by St. Hwy. Dept.

\$330,873—Tanner Bros., 731 N. 19th Ave., Phoenix—Award for work on 4.5 mi. Geronimo-Solomonsville highway; by St. Hwy. Dept.

\$126,830—Wallace & Wallace Contractors, P. O. Box 470, Phoenix—Low bid for rebuilding 4 1/4 mi. of Kirkland-Hillside highway; by St. Hwy. Dept.

California

\$1,196,230—Ball & Simpson, and Erickson, Phillips & Wiseberg, 3341 Telegraph Ave., Oakland—Award for undercrossings and retaining walls, portions of a freeway to be graded, etc., between Fallon and Market Sts., Oakland; by Div. of Hwys.

\$163,195—Basich Bros. Construction Co., 1148 N. Gabriel Blvd., Garvey—Award for railroad overhead and roadway, 0.6 mi. at Garnet; by Div. of Hwys.

\$1,603,000—Baruch Corp., 321 S. San Vicente St., Los Angeles—Award for 5-story rein. conc. Life-Science Bldg.; University of California at Los Angeles.

\$422,268—Chadwick & Buchanan, 433 34th St., Manhattan Beach—Low bid for 10,000,000-gal. rein. conc. reservoir, Torrance; by City.

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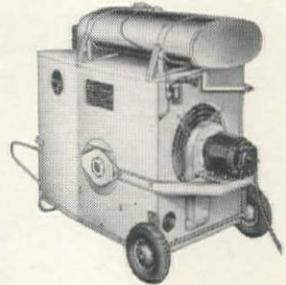


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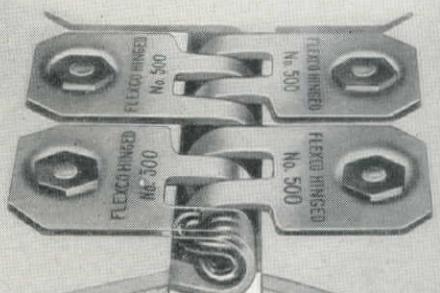
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\$203,413—Fred J. Early Jr. Co., Inc., 369 Pine St., San Francisco—Low bid for water pumping plant and reservoir, Fairfield; by City.

\$350,000—Engineers Ltd. Pipeline Co., 225 Bush St., San Francisco—Award for installing 11½ mi. of 22-in. steel pipe line, Ventura County; by Southern California Gas Co.

\$250,475—Erickson Construction Co., 1119 E. Bassettlaw Ave., North Sacramento, and Campbell Construction Co., Sacramento—Low bid for installation of a water supply system and construction of storage facilities, McClellan Air Force Base.

\$748,733—Erickson Construction Co., North Sacramento, and Campbell Construction Co., 800 R St., Sacramento—Low bid for furnishing and installing a central heating plant and steam distribution for the hospital and its facilities, Beale Air Force Base near Marysville; by C. of E.

\$292,035—Griffith Co., 1060 S. Broadway, Los Angeles—Low bid for improvements, Rivergrade Rd., Arrow Hwy. to Garvey Ave., Baldwin Park; by Los Angeles County.

\$2,100,000—Haynie & Haas, 275 Pine St., San Francisco—Award for five-story underground parking garage in St. Mary's Square, San Francisco.

\$1,336,320—Hadley-Cherry, 8754 Beverly Blvd., Los Angeles—Award for 175 frame, stucco dwellings on Manning, O'Malley and Murray Aves., Azusa.

\$1,297,900—Harris Construction Co., P. O. Box 109, Fresno—Award for Sequoia Junior High School, Fresno; by City.

\$182,790—Kevry Construction, Inc., 655 Peralta Ave., San Leandro—Award for Schedules 1 and 2, combined westerly interceptor sewers, Menlo Park; by City.

\$217,105—Kirst Construction Co., 836 W. Atlanta St., Altadena—Award for streets, gutters, curbs in Tract 17820, Van Nuys; by City.

\$1,309,460—C. A. Larsen, Box 1208, San Diego—Award for Kearney High School, Linda Vista (San Diego); by Board of Education.

\$1,447,395—McCommon-Wunderlich Co., Palo Alto, and C. K. Moseman, 727 Barron Ave., Redwood City—Award to four-lane 7½ mi. of Highway 50 and construct two bridges between the Redmond Overhead in San Joaquin County and the Corral Hollow Rd.; by Div. of Hwys.

\$335,436—Paul E. McCollum, 1527 21st St., San Pablo, and C. L. Cypher, Richmond—Award for 3.8 mi. to be graded and surfaced with plant-mixed surfacing on untreated rock base, between Moccasin Creek road and Priest, Tuolumne County; by Div. of Hwys.

\$684,480—Owl Truck & Construction Co., 500 S. Alameda St., Compton—Award for clearing, stripping and grouting Cherry Dam site, under Hetch Hetchy Contract 252, San Francisco; by Pub. Utilities Comm., City.

\$508,613—George W. Peterson, and Jack W. Baker, 4110 Fountain Ave., Los Angeles—Award for bridge over the S. P. tracks, 5th St. and Route 153, and approaches and ramps to be graded, Ventura County; by Div. of Hwys.

\$1,135,000—Pruitt Construction & Equipment Co., 8617 4th Ave., Inglewood—Award for 227 frame, stucco dwellings on Leland Ave., Whittier.

\$15,000,000—C. L. Peck, Los Angeles, and Cahill Construction Co., 206 Sansome St., San Francisco—Joint venture to construct Anheuser-Busch brewery in San Fernando Valley.

\$254,879—Rice Bros., Inc., 8th and Yuba St., Marysville—Award for grading and surfacing about 5.3 mi. between Farmersville and State Hwy. 10 at Mitchell's Corner, and between Farmersville and Exeter, Tulare County; by Div. of Hwys.

\$348,000—The Shea Co., 2801 W. Mission Rd., Alhambra—Award for Black Canyon Tunnel, Sutherland-San Vicente Conduit, San Diego; by City.

\$716,033—Sully-Miller Contracting Co., 1500 W. 7th St., Long Beach—Award for grading and surfacing about 1.9 mi. between Pacific Coast highway in Newport Beach and 20th St. in Costa Mesa, Orange County; by Div. of Hwys.

\$243,254—J. A. Thompson & Sons, P. O. Box 518, Inglewood—Low bid for reinf. conc. bridge on Placentia-Yorba road, between Esperanza road and Route 43, Orange County; by St. Div. of Hwys.

\$388,580—John Robert Ukropina, T. P. Polich, and Steve Kral, 8425 E. Clarence, San Gabriel—Low bid for two reinf. conc. bridges and approaches crossing S. P. tracks and San Gabriel River, about 2.5 mi. west of Whittier, Los Angeles County; by Div. of Hwys.

\$1,987,000—Williams & Burrows and Carl N. Swenson Co., Inc., 10 California St., Burlingame—Award for 6 ward buildings and comm. building at Sonoma State Home, Eldridge; by State Div. of Arch.

Colorado

\$164,985—Northwestern Engineering Co., P. O. Box 567, Denver—Award for stabilization and asph. surf. of 5.8 mi. of U. S. highway 160 between Dove Creek and the Utah state line; by St. Hwy. Dept.

\$536,164—Schmidt Construction Co., Box 66, Grand Junction—Award for 13.3 mi. Willow Creek Pass highway, Arapahoe Natl. Forest, Grand County; by BPR.

Idaho

\$492,097—Duffy Reed Construction Co., Box 1092, Twin Falls—Low bid for roadway, surfacing and a conc. steel underpass, U. S. 93, Twin Falls County; by St. Dept. of Hwys.

\$298,750—Hoops Construction Co., Box 431, Twin Falls—Award for roadway and bit. surf. treatment and for two conc. bridges on 5½ mi., between Lemhi and High bridge; by St. Dept. of Hwys.

\$325,312—Tony Marrazzo, Box 876, Boise—Award for grading and surfacing 4.5 mi. of the Clearwater highway between Greer and Weippe; by St. Dept. of Hwys.

\$270,870—Miller & Strong, Inc., 3871 Royal Rd., P. O. Box 292, Eugene, Ore.—Award for section of McCall-Stibnite road in Valley County; by BPR.

\$422,255—Nottingham Construction Co., 329 Grove, Boise—Low bid for streets, railroad trackage, water and sewer systems, Mountain Home Air Force Base; by C. of E.

\$2,590,405—Russ Mitchell, Inc., and Bruce Construction Co., P. O. Box 7421, Fort Worth, Tex.—Low bid for completion of outlet works, Lucky Peak Dam, Ada County; by C. of E.

\$235,925—Quinn-Robbins Co., Inc., 703 S. 16th St., Boise—Low bid for grading and surfacing 1.32 mi. of the North Fork Payette highway, Valley County; by BPR.

\$173,050—Whiting and Haymond, 250 W. 2nd N., Springville, Utah—Award for 6.5 mi. of access road at the National Reactor Testing Station, Idaho Operations Office, AEC; by AEC.

Montana

\$193,872—S. Birch & Sons Construction Co., 314 Ford Bldg., Great Falls—Award to grade and drain 6.7 mi. of Fort Peck-South road, McCone County; by St. Hwy. Comm.

\$309,808—S. Birch & Sons Construction Co., 314 Ford Bldg., Great Falls—Award to grade, gravel surf., road-mix oil, and drain 8½ mi. of Harlowton-Ryegate highway, Wheatland County; by St. Hwy. Comm.

\$219,277—Hilde Construction Co., Inc., 3810 7th Ave. N., Great Falls—Award for grading, graveling and draining 5.1 mi. of Geraldine-Fort Benton road in Chouteau County; by St. Hwy. Comm.

\$372,103—Albert Lalonde Co., Sidney—Award for construction of 11 mi. of the Circle-Sidney road, Richland County; by St. Hwy. Comm.

\$1,664,678—Lease & Leigland, 1501 N. 35th St., Seattle, Wash.—Low bid for dormitory buildings and a mess-and-administration building, Great Falls Air Force Base; by C. of E.

\$146,935—McKinnon-Decker Co., 1520 Hauser Blvd., Helena—Award to grade, gravel, oil and drain 6.12 mi. Kevin-West and East road, Glacier County; by St. Hwy. Comm.

\$265,530—McKinnon-Decker Co., 1520 Hauser Blvd., Helena—Award to gravel, oil and drain 7.26 mi. of Red Lodge-Columbus road, Carbon County; by St. Hwy. Comm.

\$371,560—McLaughlin, Inc., 331 Ford Bldg., Great Falls—Low bid for 9 mi. of the West Gallatin highway south of Bozeman; by BPR.

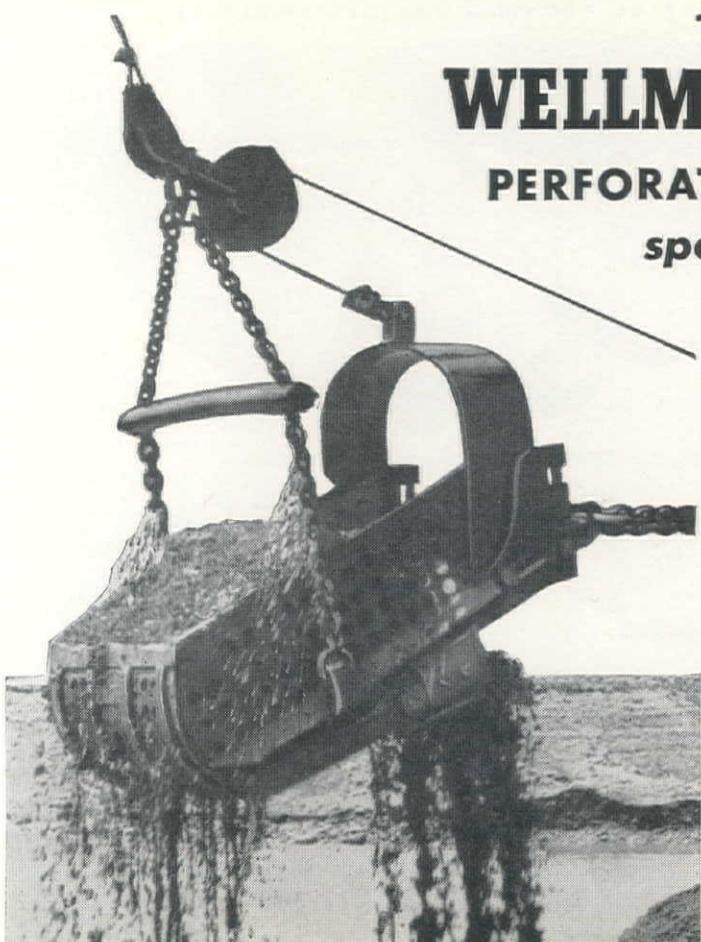
\$162,975—Nilson-Smith Construction Co., P. O. Box 1147, Great Falls—Low bid for surfacing 8.1 mi. of Marias Pass route between Columbia Falls and Glacier Park; by BPR.

\$142,145—O'Neil Construction Co., P. O. Box 1151, Havre—Award to excavate foundation for the Missouri Diversion Dam; by USBR.

\$143,105—Taggart Construction Co., P. O. Box 560, Cody, Wyo.—Award to grade, gravel, oil and drain 4.41 mi. of Columbus-southeast road, Stillwater County; by St. Hwy. Comm.

\$172,393—Union Construction Co., Inc., P. O. Box 1506, Fort Missoula—Award for 5.6 mi. of Swan River federal forest high-

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way south of Swan Lake; by BPR.

\$123,236—**Walling Construction Co.**, 408 Huron St., Lewiston—Award for work on 6.1 mi. of Hilger-Winifred highway, Fergus County; by St. Hwy. Comm.

Nevada

\$287,420—**Dodge Construction, Inc.**, Fallon—Low bid for 8.349 mi. of highway 8½ mi. south of Pony, Lincoln County; by St. Dept. of Hwys.

\$437,522—**Isbell Construction Co., Inc.**, P. O. Box 2351, Reno—Award for a portion of highway in Clark County, from east slope of Mormon Mesa to 1½ mi. northwest of Riverside; by St. Dept. of Hwys.

\$574,185—**Carl E. Nelson Co.**, 50 E. 10th N., Logan, Utah—Award for a portion of highway from Las Vegas to Camp Desert Rock, Clark County; by St. Dept. of Hwys.

\$182,035—**Wells Cargo, Inc.**, P. O. Box 1511, 1800 E. 4th St., Reno—Award for 9½ mi. of state highway, Mineral County; by St. Dept. of Hwys.

New Mexico

\$568,170—**Brown Contracting Co.**, P. O. Box 1479, Albuquerque—Award for 9½ mi. of U. S. 70-80 between Lordsburg and Deming, Hidalgo County; by St. Hwy. Dept.

\$291,462—**Brown Contracting Co.**, P. O. Box 1479, Albuquerque—Award for 7 mi. of construction and blacktopping on U. S. 64-87 between Des Moines and Clayton, Union County; by St. Hwy. Dept.

\$153,510—**Skousen Construction Co.**, 201 Springer Bldg., Albuquerque—Low bid for 8.7 mi. on State Hwy. 21 between Ojo Feliz and Ocate, Mora County; by St. Hwy. Dept.

Oregon

\$378,055—**Acme Construction Co.**, P. O. Box 306, Eugene—Award for 4.47 mi. of grading and paving on Pacific highway north of Ashland; by St. Hwy. Comm.

\$2,478,480—**Guy F. Atkinson Co.**, P. O. Box 7528, Portland, and

Ostrander Construction Co.—Low bid for bridge crossing Columbia River 2 mi. east of The Dalles.

\$14,437,978—**Guy F. Atkinson Co.** and **Ostrander Construction Co.**, 10 W. Orange Ave., South San Francisco, Calif.—Award for concrete spillway dam, including channel at The Dalles Dam site on the Columbia River, Washington and Oregon; by C. of E. \$462,872—**Bethlehem Pacific Coast Steel Co.**, Seattle—Award to furnish and erect all structural steel for bridge deck to cross the Willamette River near Wilsonville; by St. Hwy. Comm.

\$3,062,725—**Donald M. Drake Co.**, 904 Lewis Bldg., Portland—Low bid for Salem high school; by Salem School District.

\$1,245,875—**Funderburk & Stoen Construction Co.**, Sutherlin—Award for 4.62 mi. of grading and paving on Siletz Bay-Miner Creek section of Oregon Coast highway; by St. Hwy. Comm.

\$468,485—**Gibbons & Reed Co.**, 259 W. 3rd South St., Salt Lake City, Utah—Award for Banfield Expressway, Multnomah County; by St. Hwy. Comm.

\$774,820—**E. C. Hall Co.**, 12012 S.W. Barbour Blvd., Portland, and **Fred H. Slate**—Award for grading 8 mi. of Oregon Coast highway and construction of a 423-ft. bridge crossing Ten Mile Creek in Coos and Douglas counties; by BPR.

\$639,993—**Carl M. Halvorson, Inc.**, 218 Builders Exchange Bldg., Portland—Award for movable span bridge over Coquille River and ½ mi. road at Bullards Ferry, Coos County; by St. Hwy. Comm.

\$320,721—**Roy L. Houck & Son**, Salem—Award for Willamette River-Marion County Line Unit, Barbour Blvd.-White School section of West Portland-Hubbard Hwy. about 6 mi. north and west of Hubbard, 2.11 mi. of grading and paving, Clackamas County; by St. Hwy. Comm.

\$141,000—**J. H. Trisdale, Inc.**, Box 779, Redding, Calif.—Award for clearing 530 ac. of Area "A" in the Dexter Dam Reservoir Area, and the disposal of the spoils of clearing operations; by C. of E.

Utah

\$168,332—**Gibbons & Reed Co.**, 259 3rd South, Salt Lake City—Low bid for earthwork and structures, Provo River banks, Jor-

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danelle to Deer Creek Reservoir, Provo River Project; by USBR. \$137,750—**Enoch Smith Sons Co.**, 1441 Beck St., Salt Lake City—Award for installing auxiliary storm sewer, Salt Lake City; by City.

Washington

\$175,560—**Asphalt Paving & Engr. Co.**, Box 356, South Tacoma—Award for draining, grading, surfacing and paving with plant-mix 4.9 mi. of highway, Poulsbo vicinity, Kitsap County; by St. Hwy. Comm.

\$373,185—**Guy F. Atkinson Co.**, 5315 N.E. 101st Ave., Portland—Award for reconstructing lock moorage wall, McNary Dam; by C. of E.

\$189,230—**J. M. Collins**, Toppenish—Low bid for Schedule 1, construction of north trunk sewer and underdrain outfalls, Toppenish; by City.

\$179,415—**J. M. Collins**, Toppenish—Low bid for Schedule 2, construction of south trunk sewer and underdrain, Toppenish; by City.

\$1,205,730—**Roy T. Earley Co.**, 321 Middle Waterway, P. O. Box 1591, Tacoma—Award for admin. bldg. for lighting division of the Tacoma Dept. of Public Utilities; by City.

\$237,704—**N. Fiorito Co.**, 844 W. 48th St., Seattle—Award draining, grading, surfacing and paving with asphaltic conc. and constructing a reinf. conc. box girder bridge on 1.8 mi. of State Hwy. 3, Parker to Sawyer, Yakima County; by St. Hwy. Comm.

\$357,915—**Hall-Atwater Co.**, 605 13th Ave., Seattle—Low bid for ordnance ammunition area at Fort Lewis; by C. of E.

\$236,565—**Carl M. Halvorson, Inc.**, 218 Builders Exchange Bldg., Portland, Ore.—Award for clearing, draining, grading and surfacing with asph. conc., constructing conc. girder sewers and rein. conc. girder undercrossing on about $\frac{1}{2}$ mi. of Vancouver freeway, 39th St. undercrossing, Clark County; by St. Hwy. Comm.

\$222,380—**Herman Kathman**, 12054 23rd N.E., Seattle—Award for clearing, draining, grading, surfacing and paving with asph. conc. on 1.78 mi. on State 1-D, Columbia Beach vicinity, Island County; by St. Hwy. Comm.

\$2,384,061—**Morrison-Knudsen Co., Inc.**, 603 Hoge Bldg., Seattle—Low bid for Schedule A, the Alaskan Way Viaduct, 8 mi. of tunnel, Seattle; by St. Hwy. Comm.

\$739,250—**Northwest Construction Co.**, 3950 6th Ave., N.W., Seattle—Award for two reinf. conc. bridges and paving 3.9 mi. of State Hwy. 2 east of Tanner; by St. Hwy. Comm.

\$267,500—**Pacific Bridge Co.**, 333 Kearney St., San Francisco, Calif.—Low bid for completion of river-channel slope protection below Grand Coulee Dam; by USBR.

\$239,530—**Sather & Sons**, P. O. Box 197, Spokane—Low bid for underpass and diversion work on Trinidad hill between Quincy and Wenatchee, Grant and Douglas counties; by St. Hwy. Comm.

\$275,710—**Seattle Contracting Co.**, 101 Nickerson St., Seattle—Low bid for paving, 40th Ave. S.W., Seattle; by City.

\$493,325—**Seattle Contracting Co.**, 101 Nickerson St., Seattle—Award for paving in area above Sand Point Naval Air Station, Seattle; by City.

\$3,355,000—**Strand & Sons**, 3939 University Way, Seattle—Award for warehouse, shop building, aircraft maintenance hangar and control tower at Ault Field, Whidby Island; by U. S. Navy.

\$402,262—**Otis Williams & Co.**, P. O. Box 1193, Kennewick—Low bid to provide earth blanketing on a portion of Potholes East Canal in the Columbia Basin Project; by USBR.

Wyoming

\$555,097—**Stanley H. Arkwright, Inc.**, P. O. Box 1211, Billings, Mont.—Award for work on 4 $\frac{1}{2}$ mi. Green River-Rock Springs highway, Sweetwater County; by St. Hwy. Dept.

\$252,805—**Boatright-Smith**, P. O. Box 703, Rawlins—Award for work on 4.5 mi. of Tensleep-Buffalo road, Washakie County; by St. Hwy. Dept.

\$130,996—**Heald & Christler, Inc.**, Cody—Award for improvements on 9 mi. of the Greybull-Otto road, Big Horn County; by St. Hwy. Dept.

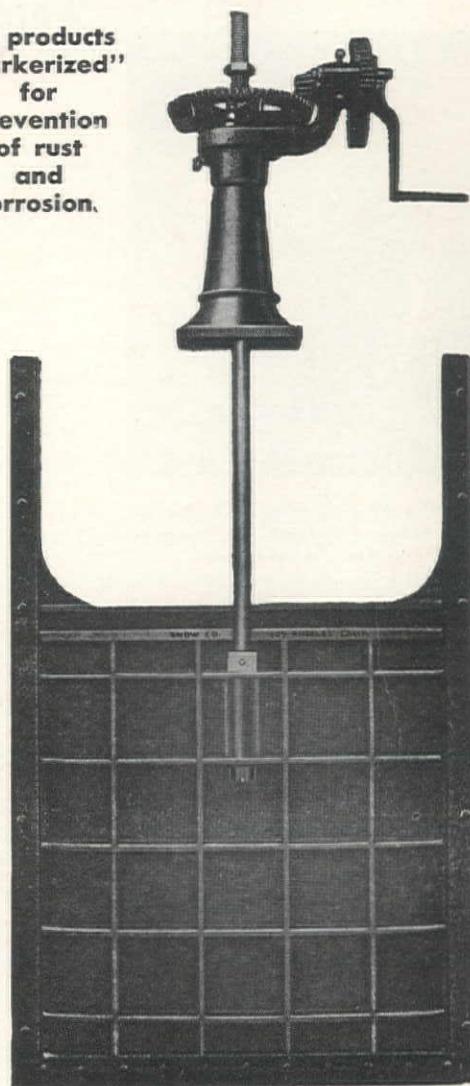
\$198,525—**Engineers Limited Pipeline Co.**, P. O. Box 4279, S. Denver Station, Denver, Colo.—Award for installation of supply and distribution gas mains, and the conversion of 165 coal furnaces to burn gas at Warren Air Force Base, Cheyenne; by C. of E.

SNOW HEAVY DUTY INDUSTRIAL GATES

Gates manufactured in sizes up to 72" by 72".

Designs in all cast-iron specifications.

All products
"Parkerized"
for
prevention
of rust
and
corrosion.



For Many Industrial Uses

Cotton Mills

Paper Mills

Chemical Plants

Oil Refineries

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Dam Sites

Sewage Disposal Plants

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Dam Sites

Our Engineering Service is available to assist you with your problems. We will be pleased to help you and to quote on any type of water controlling equipment.

SNOW IRRIGATION SUPPLY CO.

(Div. of Bardco Mfg. & Sales Co.)

2437 EAST 24th STREET, LOS ANGELES, CALIFORNIA

Walter Huber installed as ASCE national president

WALTER L. HUBER, consulting engineer of San Francisco, was installed as national president of the American Society of Civil Engineers, at the annual business meeting October 15 in New York City. He succeeds Carlton S. Proctor of New York City, president during the last twelve months.



TAKING OVER responsibilities as national president of ASCE, Huber (right) accepts the gavel from out-going president Carlton Proctor.

Mr. Huber is a graduate of the University of California and has had a distinguished career as a consultant, including extensive work in the fields of structural and hydraulic engineering. He has previously served as vice president and director of the Society and is a past president of the San Francisco Section. A biographical sketch of his professional career appeared in the June 1952 issue of *Western Construction*.

Mr. Huber will be the national president of the Society at the time of the national meeting in San Francisco March 4-5-6, 1953.

Directors from the West installed at the October meeting were: Mercel J. Shelton, general manager and chief engineer of the La Mesa Lemon Grove and Spring Valley Irrigation District, near San Diego, Calif., and Glenn W. Holcomb, professor of structural engineering, Oregon State College, Corvallis.

In his inaugural address at the Hotel Statler, Huber pointed out a challenge that faces the engineering profession, summarized in his own words as follows: "Much . . . public spending is done without due consideration of . . . engineering fundamentals . . . The engineer must assume the responsibility of furnishing and guiding public leadership to an extent he has never done before."

NATIONAL CONVENTION of the American Society of Civil Engineers will be held in San Francisco March 4-5-6, 1953. Plans are being made for an extensive technical program and social events, including a post-convention trip to visit the Hawaii Section in Honolulu.

UNIT BID PRICES

Selected bid abstracts for Western projects

Water Supply

First sections of the San Diego Aqueduct second barrel

California—Various Counties—USBR. Successful bidders for construction of the second barrel of the San Diego Aqueduct, involving construction of a 31-mi. stretch from Hemet to Rainbow, Calif., of the 71-mi. aqueduct were: R. V. Lloyd & Co., Coachella, Calif., \$2,574,800 on Schedule I, to excavate trenches, lay and test 9.3 mi. of 75-in. concrete pipe, construct structures for blowoffs, manholes, turnouts and vents, and furnish and install regulating flow meters, gates, and power-operated gate hoist in the existing structure of the San Jacinto regulating reservoir; Engineering Constructors, Inc., Los Angeles, Schedule II, \$2,065,021, to furnish and install 3.9 mi. of 48-in. and 6 mi. of 60-in. concrete pipe; and Johnson Western Constructors, San Pedro, Calif., Schedule III, \$3,192,826, to furnish and install 2.9 mi. of 48-in. and 8.6 mi. of 60-in. concrete pipe. Work must be completed in 730 days. Unit bids were submitted as follows:

	Sched. I	Sched. II	Sched. III
(1) R. V. Lloyd & Co.	\$2,574,800	(no bid)	(no bid)
(2) Engineering Constructors, Inc.	(no bid)	\$2,065,021	(no bid)
(3) Johnson Western Constructors	(no bid)	(no bid)	\$3,192,826
(4) Bressi & Bevanda Construction Co. and A. Teichert & Son, Inc. (1)	\$2,658,186	2,113,280	3,394,288
(5) W. E. Kier Construction Co., R. A. Wattson Co., H. I. Foster, and L. B. Butterfield (2)	2,706,063	2,031,414	3,461,193
(6) B. J. Uropina, T. P. Polich, Steve Kral and Steve Rados, Inc. (3)	2,795,990	2,364,471	3,380,018
(7) S. A. Healy Co.	2,972,004	2,193,007	3,463,527
(8) Haddock-Engineers, Ltd., and Engineers, Ltd., Pipeline Co.	(no bid)	(no bid)	3,856,760
Engineers' estimate	2,586,886	1,791,101	2,956,511

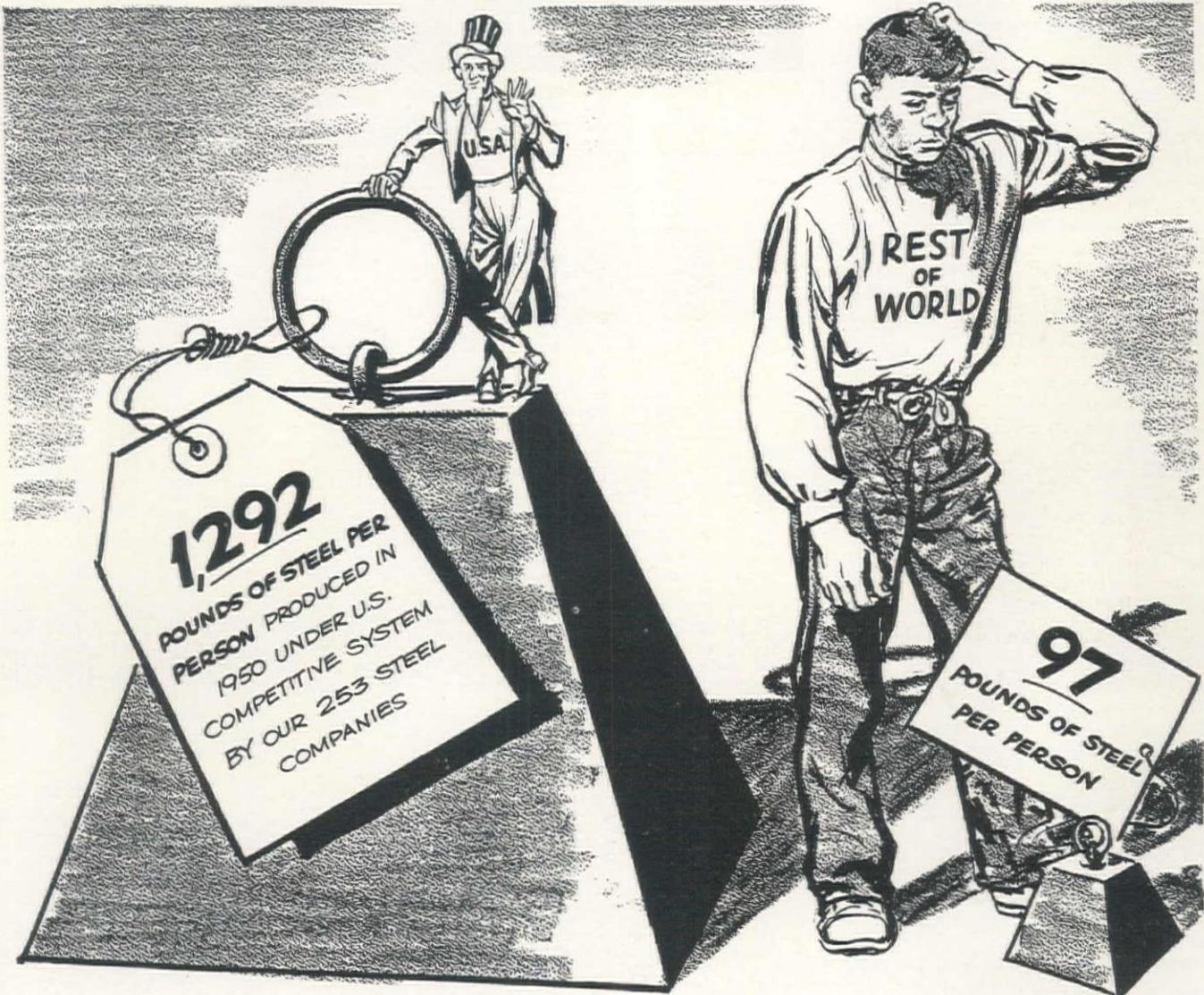
STIPULATIONS

- (1) All, or any combination of two.
- (2) All or none.
- (3) All or none.

	(1)	(4)	(5)	(6)	(8)
270,000 cu. yd. excav., Sta. N138+86 to N470+00 ....	.52	.40	.60	.70	.60
48,000 cu. yd. excav., Sta. N470+00 to N567+00 and N573+00 to N593+00 ....	.52	.40	.60	.70	.75
16,000 cu. yd. excav. Sta. N567+00 to N573+00 and N593+00 to N620+00	4.95	2.00	3.00	.70	2.10
230,000 cu. yd. backfill ....	.55	.45	.42	.40	.35
18,000 cu. yd. backfill from borrow area shown on dwg. No. 1 (409-D-311)	1.16	.45	.36	1.00	.40
160,000 mi. cu. yd. hauling backfill from borrow area shown on dwg. No. 1 (409-D-311) ....	.12	.20	.24	.12	.25
19,000 cu. yd. consolidating backfill	2.20	3.25	1.20	1.30	2.00
7,000 cu. yd. compacting backfill	1.70	3.50	3.60	3.00	3.00
10 sq. yd. dry-rock paving	15.00	6.00	15.00	30.00	8.00
230 cu. yd. concrete in structures	60.00	100.00	60.00	80.00	75.00
12,000 bbls. furn. and hauling type II cement	4.35	4.30	4.50	4.10	4.50
26,000 bbls. furn. and handling type V cement	4.55	4.50	4.70	4.40	6.00
8,000 lb. furn. and placing reinf. bars in structs. ....	.20	.20	.18	.20	.18
4 lin. ft. furn. and erect 48-in. dia. conc. pipe for shafts of blow-off structs.	60.00	65.00	66.00	60.00	40.00
200 lin. ft. furn. and erect 48-in. dia. std.-str. conc. culv. pipe for shafts of structs.	38.50	40.00	42.00	40.00	36.00
8 lin. ft. furn. and erect 72-in. dia. std.-str. conc. culv. pipe for shafts of vent. struct.	44.00	55.00	66.00	60.00	70.00
18 covers furn. and placing precast-conc. covers	100.00	42.00	60.00	70.00	50.00
7 nozzles furn. and install. 20-in. dia. nozzles with covers or blind flanges	470.00	450.00	470.00	500.00	400.00
13 nozzles furn. and install. 20-in. dia. nozzles without covers	275.00	260.00	280.00	300.00	200.00
1 nozzle furn. and installing 6-in. dia. nozzle	110.00	100.00	105.00	150.00	90.00
1,700 lb. furn. and install cast-iron pipe and fittings ....	.50	.60	.48	.70	.40
100 lb. furn. and install. steel pipe and fittings ....	.50	.75	.48	1.00	.60
1 valve furn. and install. 6-in. globe valve	200.00	125.00	150.00	100.00	110.00
5,000 lb. furn. and install. misc. metalwork ....	.65	.65	.48	.50	.60
110 lin. ft. furn. and erecting chain-link fence	6.00	5.00	4.20	6.00	4.00
Lump sum, furn. and install. slide gate, slide-gate hoist and gate oper. controls	\$12,000	\$12,000	\$6,000	\$25,000	\$7,000
Lump sum, furn. and install. recording flow meter	\$1,750	\$2,500	\$2,400	\$1,500	\$2,000
Lump sum, furn. and install. electrical system	\$1,200	\$2,000	\$2,400	\$500	\$500
12,870 lin. ft. furn. and lay. conc. pipe symbol A75NC25	36.10	39.50	39.00	42.00	36.00
17,630 lin. ft. furn. and lay. conc. pipe symbol B75NC25	38.20	41.00	42.00	44.00	38.20
8,450 lin. ft. furn. and lay. conc. pipe symbol C75NC25	40.80	44.50	44.00	46.00	41.70
9,150 lin. ft. furn. and lay. conc. pipe symbol D75NC25	44.20	47.00	48.00	49.00	46.10
1 unit. furn. and lay. pipe transition sect. NC 72-in. to 75-in.	700.00	\$1,000	820.00	\$1,000	750.00

	SCHEDULE II	(2)	(4)	(5)	(6)	(8)
460,000 cu. yd. excav. sta. N620+00—N735+00, N757+00 to N780+00, and N802+00—N818+00	1.50	.60	.60	2.05	1.00	
25,000 cu. yds. excav. sta. N735+00—N757+00, N780+00—N802+00 and N818+00—N845+00	2.35	2.00	3.00	2.05	1.70	
110,000 cu. yd. excav. sta. N845+00 to N1146+60	1.90	1.60	.96	2.05	1.40	
130,000 cu. yd. backfill	1.05	.80	.48	.68	.40	
11,000 cu. yd. consolidating backfill	1.80	3.50	1.20	1.30	2.00	
5,000 cu. yd. compacting backfill	3.75	4.00	3.60	3.00	3.00	
90 sq. yd. dry-rock paving	15.00	6.00	15.00	30.00	8.00	
250 cu. yd. concrete in structs.	75.00	100.00	60.00	90.00	75.00	
18,000 bbl. furn. and handling Type II cement	3.85	4.40	4.50	4.10	4.50	
10,000 bbl. furn. and handling Type V cement	4.05	4.60	4.70	4.40	6.00	
12,000 lb. furn. and placing reinf. bars in structs. ....	.19	.20	.18	.20	.18
50 lin. ft. furn. and erect 48-in. diam. conc. pipe for shafts for blow-off structs.	52.50	70.00	58.00	60.00	40.00	
130 lin. ft. furn. and erect 48-in. diam. std.-str. conc. culv. pipe for shafts of structs.	44.50	70.00	52.00	50.00	36.00	
70 lin. ft. furn. and erect 72-in. diam. std.-str. conc. culv. pipe for shafts of vent structs.	51.00	70.00	72.00	60.00	70.00	
22 covers furn. and placing precast-conc. covers	52.00	70.00	60.00	70.00	50.00	

Continued on next page



FORTY YEARS AGO the automobile was a rich man's toy. TV and radio were unheard of. Refrigeration? You hung a card in the front window to signal the ice man.

Today we drive 40 million cars, listen to 90 million radios, keep food in 33 million refrigerators.

Yet millions in the rest of the world are still groping in the primitive darkness of 40 years ago.

Why have we moved ahead? Competition is a chief reason. Only competition in business has made luxuries commonplace in your home today. Competition, for example, in the production and sale of steel and things made out of steel.

Steel makes progress possible—in war or peace . . . in the manufacture of everything from tableware to tanks, razor blades to skyscrapers, baby carriages to "Big Mo".

How well does this competition of ours work in the steel business?

. . . The U.S.A. shows an 83.4% gain in steel output between 1939 and 1950. The rest of the world shows an 0.8% loss.

. . . In 1939, the U.S.A. under "competition"

made $\frac{1}{3}$ of all the world's steel. Today we produce half—all with only 6% of the people in the world.

. . . Steel workers under "competition" gained in jobs, too. There were 449 thousand jobs in 1939. Today—637 thousand.

The steel industry is just one example of how a free competitive system works. Ours is the security millions of people in the world dream of when they embrace such dead-ends as "planned economies".

Look around and see what happens when people hand their jobs and factories over to the government. Or have them taken by law. Or by force. Name it what you will—"communism", "nationalization", "socialism", "regimentation"—it is a one-way street, and no turning back. By then people no longer own government. Government owns the people.

* * *

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THE COMPETITIVE SYSTEM DELIVERS THE MOST TO THE GREATEST NUMBER OF PEOPLE

Westerners winners of arc welding awards

THE JAMES F. LINCOLN Arc Welding Foundation of Cleveland has recently announced the results of its fifth Annual Engineering Undergraduate Award and Scholarship Design Program. Among the winners were several Westerners: Darrell W. Halligan, of Bend, Ore., a student at Oregon State College, and William A. Woolford, Denver, a student at Colorado A & M College. Both won 5th prizes of \$113.00 each. Halligan's paper was "Welded Steel Internal Connector for Timer Joints"; Woolford's was "The Use of Arc Welding Procedures in the Rehabilitation on Floating Dry Dock AFDB-6." Sixth prize awards of \$56.50 each went to: John Scholle Cohrs, University of Colorado, for "Design for a Storage Wall"; Harry T. Johnson, State College of Washington, for "Comparative Analysis of a Welded and Riveted Plate Girder," and Robert V. Nelson, University of Washington, for "Steel Pipe Boom for Radio Tower Erection."

The program is sponsored by the Foundation to encourage engineering students to study the possibilities of arc welding as an engineering tool for improving the quality of machinery and structures of all kinds while reducing costs.

USBR closes offices at Belen, New Mexico

THE USBR has closed its office in Belen, New Mexico. C. O. Crane, the engineer in charge, has been sent to Amarillo, Texas, and the other employees have likewise been reassigned to different localities.

The Belen office was established in 1951 to supervise construction of two major electric transmission lines serving north central New Mexico. One 80 mi. long runs between Socorro and Albuquerque; the other 50-mi.-long line connects Belen and Willard. Three switch stations—at Belen, Albuquerque and Willard—were included in the job. The total cost ran to \$2,037,000.

Superior court is told, "That gravel is gold!"

A DEFENSE of the gold standard was launched in San Francisco, Calif.'s superior court by The Canton Placer Mining Co., with Pacific Gas & Electric Co. as the defendant.

The mining firm is claiming \$25,000 in damages on the grounds that the utility firm used gold bearing rock and gravel in paving roads leading to P. G. & E. locations in the Plumas County mountains.

Canton's attorney stated that P. G. & E.'s easement across mining company lands stipulated that nothing be done to interfere with mining operations.

UNIT BID PRICES ... CONTINUED

	(1)	(4)	(5)	(6)	(8)
24 nozzles furn. and install. 20-in. dia. nozzles with covers or blind flanges	460.00	500.00	480.00	500.00	400.00
1 nozzle furn. and install. 20-in. diam. nozzle without covers	335.00	400.00	350.00	400.00	200.00
9 nozzles furn. and installing 6-in. diam. nozzles	115.00	200.00	120.00	150.00	90.00
10,000 lb. furn. and installing cast-iron pipe and fittings	.45	.60	.36	.50	.40
1,500 lb. furn. and installing steel pipe and fittings	.80	.70	.48	1.00	.60
9 valves furn. and installing 6-in. globe valves	125.00	150.00	150.00	100.00	110.00
4 valves furn. and installing 4-in. gate valves	95.00	250.00	90.00	70.00	65.00
4 valves furn. and installing 4-in. air valves	220.00	300.00	190.00	200.00	150.00
8,000 lb. furn. and installing miscel. metalwork	.65	.60	.48	.50	.60
670 lin. ft. furn. and erecting chain-link fence	7.80	5.00	4.20	6.00	4.00
13,600 lin. ft. furn. and laying concrete pipe symbol A48NC25...	20.50	22.00	23.00	27.00	17.20
2,750 lin. ft. furn. and laying concrete pipe symbol B48NC25...	20.75	24.00	25.00	27.25	17.80
670 lin. ft. furn. and laying concrete pipe symbol C48NC25...	21.55	25.00	26.00	28.00	19.10
1,100 lin. ft. furn. and laying concrete pipe symbol A48NC50...	20.60	23.00	25.00	27.10	17.70
1,340 lin. ft. furn. and laying concrete pipe symbol B48NC50...	21.15	24.00	25.00	27.65	18.70
1,360 lin. ft. furn. and laying concrete pipe symbol C48NC50...	22.00	25.00	26.00	28.40	19.70
80 lin. ft. furn. and laying concrete pipe symbol D48NC50...	23.05	27.00	27.00	29.40	21.10
7,350 lin. ft. furn. and laying concrete pipe symbol A60NC25...	27.70	29.00	30.00	33.10	25.20
2,410 lin. ft. furn. and laying concrete pipe symbol B60NC25...	28.45	31.00	33.00	33.80	26.70
490 lin. ft. furn. and laying concrete pipe symbol C60NC25...	29.85	31.00	34.00	35.10	28.40
8,900 lin. ft. furn. and laying concrete pipe symbol A60NC50...	28.45	31.00	31.00	33.80	26.70
4,900 lin. ft. furn. and laying concrete pipe symbol B60NC50...	29.65	32.00	32.00	34.95	28.10
910 lin. ft. furn. and laying concrete pipe symbol C60NC50...	31.00	33.00	35.00	36.20	29.90
200 lin. ft. furn. and laying concrete pipe symbol D60NC50...	32.20	34.00	37.00	37.30	31.40
1,550 lin. ft. furn. and laying concrete pipe symbol A60NC75...	29.75	34.00	34.00	35.00	23.10
2,390 lin. ft. furn. and laying concrete pipe symbol B60NC75...	30.85	33.00	35.00	36.10	29.80
660 lin. ft. furn. and laying concrete pipe symbol C60NC75...	.21.15	35.00	37.00	37.25	31.30
220 lin. ft. furn. and laying concrete pipe symbol D60NC75...	33.35	37.00	38.00	38.40	33.00
490 lin. ft. furn. and laying concrete pipe symbol A60NC100...	30.95	33.00	35.00	36.15	30.20
400 lin. ft. furn. and laying concrete pipe symbol B60NC100...	32.05	35.00	36.00	37.15	31.00
310 lin. ft. furn. and laying concrete pipe symbol C60NC100...	33.15	37.00	38.00	38.20	32.60
250 lin. ft. furn. and laying concrete pipe symbol D60NC100...	34.50	39.00	39.00	39.50	34.20
350 lin. ft. furn. and laying concrete pipe symbol B60C125...	34.80	40.00	39.00	39.75	35.10
200 lin. ft. furn. and laying concrete pipe symbol C60C125...	35.90	40.00	41.00	40.75	37.80
150 lin. ft. furn. and laying concrete pipe symbol D60C150...	39.05	43.00	44.00	43.75	42.60
1 unit furn. and lay. pipe transition sect. NC75 in. to 48 in.	\$1,000	250.00	\$1,100	\$1,200	\$1,100
4 unit furn. and lay. pipe transition sect. NC60 in. to 48 in.	625.00	250.00	700.00	\$1,000	650.00

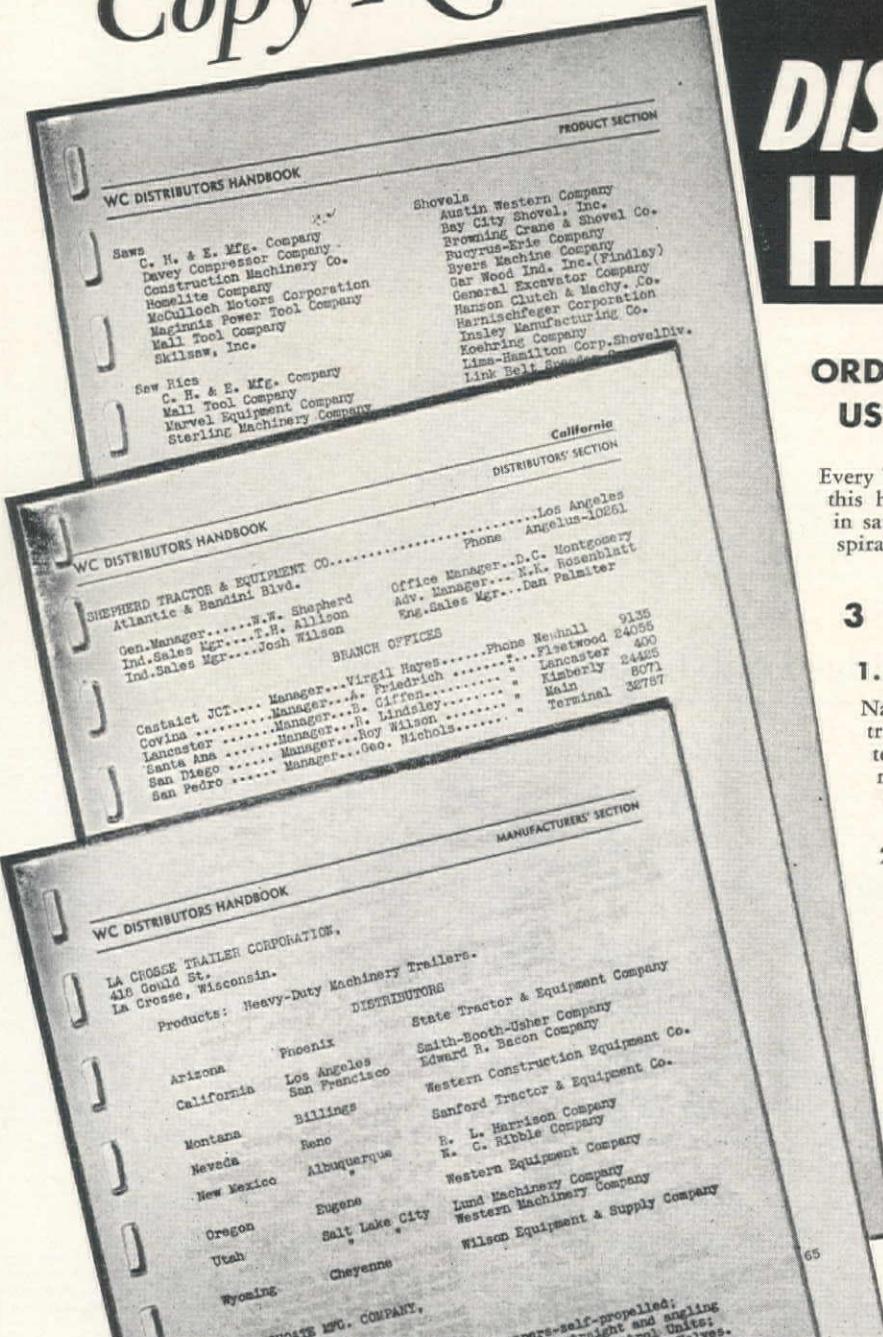
SCHEDULE III

	(3)	(4)	(5)	(6)	(8)
140,000 cu. yd. excav. sta. N1146+00 to N1505+00	1.00	.95	.72	1.76	1.50
25,000 cu. yd. excav. sta. N1505+00 to N1560+00	3.52	3.00	4.50	1.76	2.40
22,000 cu. yd. excav. sta. N1560+00 to N1611+00, and N1633+00 to N1650+00	.91	1.00	1.20	1.76	.90
17,000 cu. yd. excav. sta. N1611+00 to N1633+00, and N1650+00 to N1690+00	3.10	5.00	4.50	1.76	2.80
16,000 cu. yd. excav. sta. N1690+00 to N1702+00, and N1708+00 to N1744+00	3.84	5.00	6.20	1.76	3.50
15,000 cu. yd. excav. stations N1873+00 to N1901+60	4.73	5.00	9.30	1.76	3.00
146,000 cu. yd. backfill	.78	.80	.96	.83	.40
14,000 cu. yd. consolidating backfill	1.33	3.50	1.20	1.60	2.00
10,000 cu. yd. compacting backfill	3.67	4.00	3.60	3.50	3.00
80 ac. scarifying right-of-way	26.00	40.00	36.00	40.00	40.00
80 ac. seeding right-of-way	70.00	40.00	48.00	30.00	75.00
40 sq. yd. dry-rock paving	12.00	6.00	15.00	25.00	8.00
540 cu. yd. concrete in structures	81.50	100.00	72.00	100.00	75.00
31,000 bbl. furn. and handling type II cement	4.30	4.40	4.50	4.30	4.50
3,000 bbl. furn. and handling type V cement	4.56	4.60	4.70	4.60	6.00
32,000 lb. furn. and placing rein. bars in structs.	.26	.20	.18	.20	.18
80 lin. ft. furn. and erect. 48-in. diam. conc. pipe for shafts of blow-off structs.	57.00	70.00	65.00	60.00	40.00
210 lin. ft. furn. and erect. 48-in. diam. std.-str. conc. culv. pipe for shafts of structs.	47.00	70.00	54.00	50.00	36.00
40 lin. ft. furn. and erect. 72-in. diam. std.-str. conc. culv. pipe for shafts of vent struct.	48.00	70.00	71.00	100.00	70.00
38 covers furn. and placing precast-concrete covers	30.00	70.00	60.00	70.00	50.00
42 nozzles furn. and install 20-in. diam. nozzles with covers or blind flanges	894.00	\$1,000	924.00	\$1,000	400.00
1 nozzle furn. and install 20-in. diam. nozzle for wastewater at Sta. 1440+00	888.00	\$1,000	918.00	\$1,000	200.00
16 nozzles furn. and installing 6-in. nozzles	228.00	300.00	225.00	150.00	90.00
20,000 lb. furn. and installing cast-iron pipe and fittings	.39	.70	.36	.40	.40
17,000 lb. furn. and installing steel pipe and fittings	.33	.70	.48	.60	.60
2 valves furn. and installing 20-in. gate valve	\$1,700	\$2,000	\$2,000	\$2,000	\$1,500
3 valves furn. and installing 16-in. gate valve	\$1,160	\$1,200	\$1,320	\$1,400	900.00
16 valves furn. and installing 6-in. globe valves	112.00	150.00	150.00	120.00	110.00
14 valves furn. and installing 4-in. gate valves	72.00	300.00	90.00	60.00	65.00
14 valves furn. and installing 4-in. air valves	234.00	300.00	190.00	180.00	150.00
19,000 lb. furn. and installing miscel. metalwork	.52	.70	.54	.50	.60
360 lin. ft. furn. and erecting chain-link fence	6.50	5.00	4.20	6.00	4.00
Lump sum, modifying exist. bifurcation struct. sta. N1702+77.42	\$5,300	\$1,400	720.00	\$1,200	450.00
330 lin. ft. furn. and lay. 18-in. diam. std.-str. conc. culv. pipe	8.80	11.30	7.50	15.00	4.50
132 lin. ft. furn. and laying concrete pipe symbol B48NC25...	24.50	28.00	27.50	28.65	17.75
250 lin. ft. furn. and laying concrete pipe symbol A48NC50...	24.50	28.00	26.50	28.65	17.70
250 lin. ft. furn. and laying concrete pipe symbol B48NC50...	25.10	28.00	27.50	29.40	18.70
1,610 lin. ft. furn. and laying concrete pipe symbol A48NC75...	25.10	27.00	27.50	29.40	18.70
1,960 lin. ft. furn. and laying concrete pipe symbol B48NC75...	26.00	27.00	28.50	30.40	19.50
144 lin. ft. furn. and laying concrete pipe symbol C48NC75...	27.00	30.00	29.50	31.05	20.75
700 lin. ft. furn. and laying concrete pipe symbol A48NC100...	26.00	29.00	28.50	30.40	19.60
550 lin. ft. furn. and laying concrete pipe symbol B48NC100...	26.80	30.00	29.50	31.30	20.60
112 lin. ft. furn. and laying concrete pipe symbol C48NC100...	28.00	31.00	30.50	32.00	21.70
495 lin. ft. furn. and laying concrete pipe symbol A48C125...	27.40	31.00	29.50	35.60	22.40
1,100 lin. ft. furn. and laying concrete pipe symbol B48C125...	27.85	29.00	30.50	36.10	23.00
970 lin. ft. furn. and laying concrete pipe symbol A48C150...	27.80	31.00	30.50	36.10	21.90
470 lin. ft. furn. and laying concrete pipe symbol B48C150...	29.60	33.00	32.50	37.15	23.70
144 lin. ft. furn. and laying concrete pipe symbol C48C150...	30.00	33.00	33.50	37.80	25.00
750 lin. ft. furn. and laying concrete pipe symbol A48C175...	28.20	31.00	30.50	36.10	23.00
690 lin. ft. furn. and laying concrete pipe symbol B48C175...	30.20	33.00	33.50	38.30	24.70
1,520 lin. ft. furn. and laying concrete pipe symbol A48C200...	29.90	31.00	32.50	37.65	23.80
310 lin. ft. furn. and laying concrete pipe symbol B48C200...	30.50	34.00	33.50	38.60	25.40
2,220 lin. ft. furn. and laying concrete pipe symbol A48C225...	30.40	32.00	33.50	37.60	25.00
830 lin. ft. furn. and laying concrete pipe symbol B48C225...	30.60	34.00	33.50	38.90	26.30
1,070 lin. ft. furn. and laying concrete pipe symbol A48C250...	30.60	32.00	33.50	38.90	26.10
190 lin. ft. furn. and laying concrete pipe symbol B48C250...	31.40	35.00	34.50	39.70	27.40
1,110 lin. ft. furn. and laying concrete pipe symbol A60NC25...	31.50	33.00	33.50	30.60	25.20

Continued on next page

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SUTHERLAND DAM

...Continued from page 63

of the City of San Diego to complete construction of the Sutherland project. The total bond issue was \$6,500,000.

Construction of the dam was advertised and contract awarded to Bent Construction Company and Daley Corporation, a joint venture, for the sum of \$2,896,485. Since June, clearing the dam site and getting existing work in shape for future additions has been under way.

Project Manager is Stanley Bent, Jr., and general superintendent for the contractor is C. Milburn. Resident Engineer for the city is H. Gericke. Work of completing the designs was performed by city forces. Carl R. Rankin and W. A. Perkins were consultants on completion of plans. W. C. Brown is senior engineer and P. Beermann, the Director of the Water Department and Hydraulic Engineer for the City of San Diego.

CONTRACTOR'S LICENSE

...Continued from page 62

which must now be returned to the local superior court for trial, Johnson said: "Naturally, we are prepared to proceed to trial. We are confident of eventual success, and welcome an opportunity to have the courts rule upon the merits of the real basic issue."

The parts of the recent decision which are of particular interest to the construction industry generally are as follows:

"Plaintiff corporation is qualified to perform specialty work, but it is prohibited by rule 732 from undertaking any contract therefor without obtaining a specialty license, unless the work is part of a general project. It is, therefore, an interested party within the meaning of the sections cited above. Defendants contend, however, that plaintiff has failed to show that an actual controversy exists because there is no allegation that it has bid or intends to bid on work for which a specialty license is required by the board. Although plaintiff does not specifically allege that it intends to bid on such work, it is clear from a reading of the complaint as a whole that it desires to do so. With respect to plaintiff's failure to allege that it has bid on specialty work, we are of the view that such an allegation is unnecessary . . . Plaintiff, therefore, is not required to violate the administrative regulation and thereby subject itself to possible criminal prosecution or disciplinary action in order to obtain a declaration of its rights and duties. In this connection, it may be noted that if plaintiff performed the work in violation of rule 732, it would run the risk of being unable to maintain a suit to recover therefor. The Legislature, by enactment of section 11440, must have intended to permit persons affected by an administrative regulation to test its validity without having to enter into contracts with third persons in violation of its terms or to subject themselves to prosecution or disciplinary proceedings."

"Since the complaint is legally sufficient and sets forth facts and circumstances showing that a declaratory adjudication is appropriate, it was error for the trial court to enter a judgment for defendants on the pleadings."

"The judgment is reversed."

UNIT BID PRICES...CONTINUED

	(1)	(4)	(5)	(6)	(8)
220 lin. ft. furn. and laying concrete pipe symbol A60NC50.....	32.30	35.00	34.50	32.10	26.70
1,270 lin. ft. furn. and laying concrete pipe symbol B60NC50.....	33.50	33.00	35.50	33.00	28.10
2,140 lin. ft. furn. and laying concrete pipe symbol A60NC75.....	33.60	35.00	36.50	33.00	28.10
570 lin. ft. furn. and laying concrete pipe symbol B60NC75.....	34.80	38.00	37.50	34.40	29.80
112 lin. ft. furn. and laying concrete pipe symbol C60NC75.....	36.00	39.00	38.50	35.90	31.30
3,160 lin. ft. furn. and laying concrete pipe symbol A60NC100.....	34.80	36.00	35.50	34.40	30.20
1,120 lin. ft. furn. and laying concrete pipe symbol B60NC100.....	36.00	37.00	38.50	35.80	31.00
64 lin. ft. furn. and laying concrete pipe symbol C60NC100.....	37.00	40.00	39.50	37.15	32.60
4,130 lin. ft. furn. and laying concrete pipe symbol A60C125.....	36.40	38.00	36.50	38.30	33.10
1,450 lin. ft. furn. and laying concrete pipe symbol B60C125.....	38.80	38.00	41.50	40.15	35.10
340 lin. ft. furn. and laying concrete pipe symbol C60C125.....	40.00	43.00	42.50	42.70	37.80
5,860 lin. ft. furn. and laying concrete pipe symbol A60C150.....	38.60	39.00	39.50	40.25	44.60
1,850 lin. ft. furn. and laying concrete pipe symbol B60C150.....	39.40	40.00	42.50	41.60	36.90
144 lin. ft. furn. and laying concrete pipe symbol C60C150.....	41.00	44.00	43.30	43.15	39.60
64 lin. ft. furn. and laying concrete pipe symbol D60C150.....	43.50	46.00	46.50	45.60	42.60
3,630 lin. ft. furn. and laying concrete pipe symbol A60C175.....	39.30	40.00	40.50	40.55	36.20
2,320 lin. ft. furn. and laying concrete pipe symbol B60C175.....	40.60	41.00	40.50	42.50	38.70
144 lin. ft. furn. and laying concrete pipe symbol C60C175.....	42.00	45.00	44.50	44.30	41.10
3,120 lin. ft. furn. and laying concrete pipe symbol A60C200.....	40.30	41.00	41.50	41.90	37.70
880 lin. ft. furn. and laying concrete pipe symbol B60C200.....	41.60	44.00	44.50	43.90	40.20
48 lin. ft. furn. and laying concrete pipe symbol C60C200.....	43.50	47.00	46.50	45.10	42.80
2,260 lin. ft. furn. and laying concrete pipe symbol A60C225.....	40.90	42.00	43.50	43.20	39.30
590 lin. ft. furn. and laying concrete pipe symbol B60C225.....	42.70	45.00	45.50	45.10	41.70
660 lin. ft. furn. and laying concrete pipe symbol A60C250.....	42.30	45.00	45.50	44.60	41.10
580 lin. ft. furn. and laying concrete pipe symbol B60C250.....	43.90	47.00	46.50	46.40	43.30
220 lin. ft. furn. and laying concrete pipe symbol C60C250.....	45.80	50.00	48.50	48.30	46.30
1,030 lin. ft. furn. and laying concrete pipe symbol A60C275.....	43.90	45.00	46.50	45.90	43.30
320 lin. ft. furn. and laying concrete pipe symbol B60C275.....	45.20	48.00	48.50	47.00	45.00
3,200 lin. ft. furn. and laying concrete pipe symbol A60C300.....	45.20	46.00	46.50	46.55	45.00
510 lin. ft. furn. and laying concrete pipe symbol B60C300.....	46.00	49.00	49.50	48.30	46.60
520 lin. ft. furn. and laying concrete pipe symbol A60C325.....	46.30	49.00	49.50	48.70	47.00
660 lin. ft. furn. and laying concrete pipe symbol B60C325.....	47.10	50.00	50.50	49.45	48.60
1,100 lin. ft. furn. and laying concrete pipe symbol C60C325.....	49.35	50.00	52.50	51.90	51.20
200 lin. ft. furn. and laying concrete pipe symbol D60C325.....	50.90	54.00	54.50	53.30	53.60
Lump sum, furn. and installing anchor-block pipe Sta. N1901+60	\$1,800	\$1,200	740.00	\$1,200	425.00
1 unit furn. and lay. pipe transition sec. NC60 in. to 54 in.	630.00	\$1,200	780.00	\$1,400	600.00
1 unit furn. and lay. pipe transition sec. NC60 in. to 48 in.	630.00	\$1,200	780.00	\$1,200	650.00
2 units furn. and lay. pipe transition sec. NC54 in. to 48 in.	560.00	\$1,200	720.00	\$1,400	475.00
2 units furn. and lay. pipe transition sec. C60 in. to 48 in....	650.00	\$1,200	800.00	\$1,400	500.00

Bridge and Grade Separation

Redecking timber trestle bridges with concrete slabs

California—San Bernardino County—State, E. S. and N. J. Johnson, Fullerton, with a low bid of \$153,532, were awarded a contract by the California Division of Highways for the redecking with reinforced concrete slabs of 32 timber trestle bridges between Danby and Needles. Unit bids were submitted as follows:

(1) E. S. and N. J. Johnson	(5) E. G. Perham	\$179,542			
(2) Young & Smith Construction Co.	(6) C. B. Tuttle	180,567			
(3) Pike & Hill, Carey Bros., and Bailey	Owl Truck & Construction Co.	182,004			
(4) Norman I. Fadel					
	(1) (2) (3) (4) (5) (6)				
32 ea. traffic control system	600.00	650.00	747.00	\$1,100	835.00
42,600 sq. ft. removing surfacing .....	.25	.20	.10	.30	.24
4,820 lin. ft. removing bridge railing	1.00	.75	2.50	.80	.75
9 M.F.B.F. Untreated Douglas fir timber	200.00	300.00	250.00	300.00	390.00
1,030 cu. yd. Class "A" P.C.C.	50.00	56.00	44.00	55.00	48.00
124,000 lb. bar reinf. steel .....	.11	.13	.15	.13	.135
3,750 lin. ft. corr. metal bridge railing	4.00	4.00	5.50	4.00	7.00
3,070 sq. ft. sheet metal .....	.60	.50	.81	.40	.75
11 M.F.B.M. install. salv. timber	100.00	150.00	150.00	100.00	250.00
22,000 sq. ft. spiking bridge deck .....	.25	.12	.095	.20	.26
64 ea. removing and resetting clearance markers.....	10.00	10.00	4.00	5.00	6.00
7,424 lin. ft. metal plate guard railing	3.75	3.50	3.60	3.25	4.00

Concrete piers and substructure for Oregon's "Boone Bridge"

Oregon—Clackamas County—State, Guy F. Atkinson Co., Portland, with a bid of \$1,112,370, was low before the Oregon State Highway Commission for placing concrete piers, approached and decking for the Wilsonville Bridge on the West Portland-Hubbard highway. Known as the "Boone Bridge," the structure will replace the pioneer Boone's ferry across the Willamette River near Wilsonville. Bids were received during September for placing structural steel superstructure. Unit bids for the substructures were as follows:

(1) Guy F. Atkinson Co.	(3) C. J. Montag & Sons.	\$1,128,395	
(2) Carl M. Halvorson, Inc.	(4) General Construction Co.	1,311,353	
	(1) (2) (3) (4)		
Lump sum, shoring, cribbing, etc.	\$202,500	\$281,000	\$189,500
8,600 cu. yd. structural excav.	4.00	6.00	8.00
10 cu. yd. excav. below elev. shown	14.00	30.00	20.00
3 only furn. and drive test piles	\$1,250	\$1,500	\$1,000
18,500 lin. ft. furnish treated piling	1.00	2.00	1.05
40,000 lin. ft. furnish untreated piling .....	.70	1.00	.60
2,300 lin. ft. furnish steel piling	4.50	7.00	5.00
360 only drive treated piles	32.00	60.00	40.00
784 only drive untreated piles	35.00	60.00	50.00
32 only drive steel piles	80.00	60.00	80.00
1,030 cu. yd. seal concrete	24.00	50.00	35.00
7,000 cu. yd. Class "A" concrete	75.00	50.00	70.00
952,000 lb. metal reinforcement .....	.11	.10	.11
2,000 lin. ft. metal rail	14.00	12.00	12.00
Lump sum, inspection walks	\$12,000	\$17,000	\$7,500
3,640 sq. ft. open grid decking	10.50	10.00	8.50
Lump sum, water gaging station comp.	\$1,250	900.00	\$11,600
1,050 ton painting steel spans	30.00	30.00	43.00
Lump sum, electrical work	\$5,000	\$3,200	\$3,600

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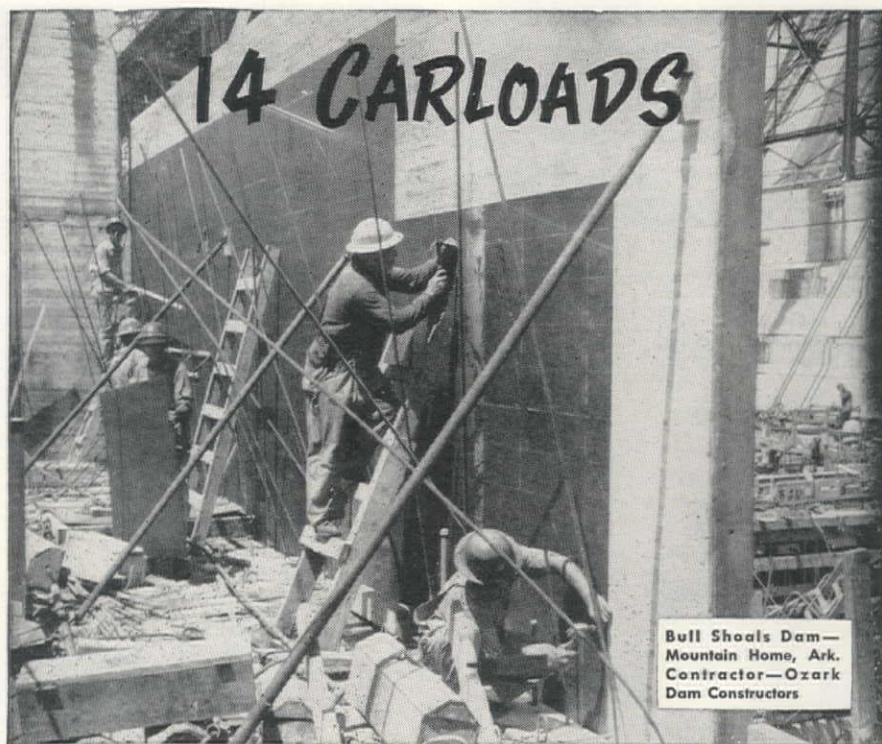
PRESTRESSED STRUCTURALS

...Continued from page 74

under controlled conditions.

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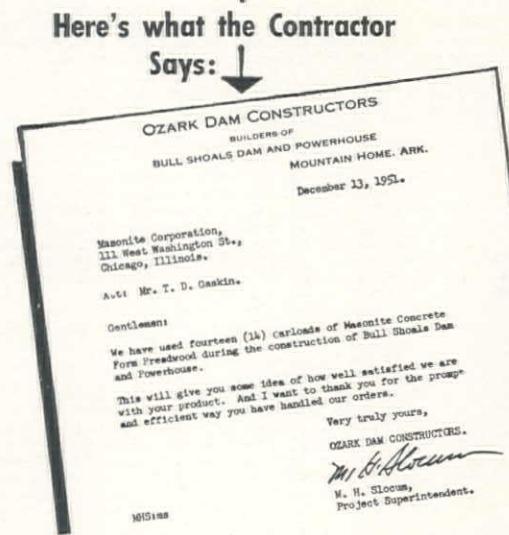
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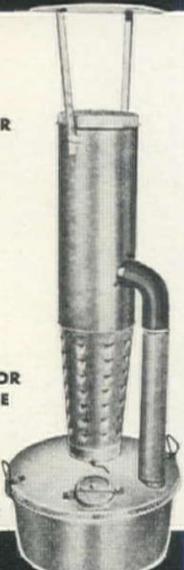
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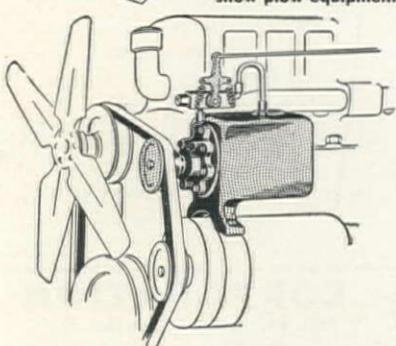
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UNIT BID PRICES... CONTINUED

Tunnel

Tunnel section of Alaskan Way Viaduct in Seattle

Washington—King County—State. Morrison-Knudsen Co., Inc., Seattle, submitted the low bid of \$2,384,661 for construction of Schedule A, the Alaskan Way Viaduct in Seattle. About .8 mi. in length, this final schedule of the off-grade Alaskan Way freeway is designed largely as tunnel, to be constructed by cut-and-cover methods. The work consists of excavation, pile-driving, underpinning of adjacent structures, poured-in-place and precast concrete construction, paving, backfilling, moving and restoration of existing utilities, and mechanical installations including ventilation and fire-control systems. Unit prices were as follows:

(1) Morrison-Knudsen Co., Inc.	\$2,384,661	(2) C. V. Wilder Co.	\$2,859,634
(2) General Construction Co.	2,485,913	(3) Guy F. Atkinson Co.	2,884,692
(3) Manson Construction & Engineering Co.	2,589,571	(4) M. P. Butler	3,151,653
(4) Dahlgren Construction Co.	2,594,065	(5) McRae Brothers	3,589,750
(5) Carl M. Halvorson	2,776,569	(6) Peter Kiewit Sons' Co.	3,749,462

	(1)	(2)	(3)	(4)	(5)
Lump sum, preparation of site	\$36,200	\$44,000	\$85,000	\$22,345	\$20,000
1,175 lin. ft. plain conc. or V.C. sewer pipe, 4-in. diam.	3.90	1.60	5.00	5.65	2.00
5,400 lin. ft. plain conc. or V.C. sewer pipe, 6-in. diam.	3.00	1.60	6.00	6.79	3.00
250 lin. ft. plain conc. or V.C. sewer pipe, 8-in. diam.	9.65	3.00	9.00	10.18	6.00
100 lin. ft. plain conc. or V.C. sewer pipe, 10-in. diam.	10.85	3.50	10.00	11.32	8.00
33 lin. ft. plain conc. or V.C. sewer pipe, 12-in. diam.	12.05	4.00	13.00	14.71	10.00
550 lin. ft. plain conc. or V.C. sewer pipe, 15-in. diam.	6.65	4.40	27.00	30.56	6.00
290 lin. ft. std. reinf. conc. culv. pipe 21-in. diam. in pl. (Denny Way from Aurora to Dexter)	122.90	70.00	160.00	181.07	80.00
680 lin. ft. std. reinf. conc. culv. pipe 21-in. diam.	8.45	7.00	27.00	30.56	10.00
325 lin. ft. std. reinf. conc. culv. pipe 27-in. diam.	10.00	9.00	45.00	50.92	11.00
610 lin. ft. std. reinf. conc. culv. pipe 30-in. diam.	10.40	12.00	50.00	56.58	15.00
48 lin. ft. std. reinf. conc. culv. pipe 36-in. diam.	22.90	15.00	69.00	78.09	20.00
240 lin. ft. cast iron sewer pipe, 6-in. diam.	9.90	9.50	8.50	9.62	6.00
3,500 lin. ft. plain conc. or V.C. sewer pipe 6-in. diam., open joint	.80	1.40	6.00	6.7935	1.10
760 lin. ft. plain conc. or V.C. sewer pipe 8-in. diam., open joint	1.05	1.50	7.00	7.92	1.50
430 lin. ft. conc. or V.C. drain pipe 4-in. diam.	.50	1.50	6.00	6.79	1.00
4,800 cu. yd. gravel backfill in place	4.80	4.50	4.50	4.25	5.00
7 only manholes (City of Seattle std.)	301.00	450.00	900.00	\$1,018	250.00
7 only drop manholes (City of Seattle std.)	\$1,597	700.00	\$2,000	\$2,263	\$1,500
10 only manholes (City of Seattle std.) with special watertight covers	301.00	500.00	400.00	452.68	275.00
52 only catch basins (City of Seattle std.)	145.75	100.00	400.00	452.68	200.00
90 lin. ft. addtl. depth of manhole or catch basin	42.15	20.00	26.00	29.42	30.00
35 only removing and resetting street inlets	60.25	50.00	100.00	113.17	60.00
7 only adjusting manholes etc. covers	48.00	40.00	50.00	56.59	50.00
15 lin. ft. rebuilding manholes etc. tops	42.15	40.00	50.00	56.58	40.00
1 only rebuilding manholes etc.	422.00	250.00	550.00	622.42	300.00
50 lin. ft. 10-in. cast iron pipe Class 150	13.20	13.00	13.00	12.90	10.00
750 lin. ft. 12-in. cast iron pipe Class 150	12.05	12.00	12.00	11.77	12.00
230 lin. ft. 10-in. cast iron pipe, removed and relaid	14.90	14.00	14.00	14.54	8.00
1,205 lin. ft. 12-in. cast iron pipe, removed and relaid	12.65	12.00	12.00	12.34	9.00
1,000 lb. special watermain castings	.40	.40	.50	.40	.35
28 only valve chambers	120.00	225.00	350.00	311.22	150.00
8 only moving hydrants	95.00	90.00	100.00	92.80	100.00
6 only resetting hydrants	95.00	90.00	90.00	92.80	100.00
1 only reconnecting hydrant	95.00	90.00	90.00	92.80	100.00
1,800 lb. shackle rods	.30	.30	.28	.28	.30
310 lin. ft. hydrant connections	7.95	7.00	7.50	7.75	8.00
21,350 sq. yd. removing existing pavement	.70	1.00	1.00	1.70	2.00
9,020 sq. yd. removing exist. sidewalk, curbs, etc.	.70	1.00	1.00	1.70	1.00
19,700 cu. yd. excav. outside of subway, incl. haul	1.10	1.00	2.00	1.33	4.00
6,930 cu. yd. structure excav.	3.60	3.00	3.00	9.82	6.00
15,300 cu. yd. excav. 3 ft. below exist. subgrade from Sta. 10+02.86 to Sta. 31+34.52, incl. haul	2.50	2.00	2.00	1.13	4.00
89,000 cu. yd. excav. inside of subway, incl. haul	2.50	2.50	2.00	2.44	4.00
2,500 cu. yd. roadway embankment	.60	.80	2.50	1.70	1.50
780 cu. yd. sand filler in place, incl. haul	4.80	5.00	6.00	4.46	5.00
22,160 lin. ft. drilling 12-in. diam. holes for steel piles	2.40	1.50	2.20	3.11	2.00
1,100 ton delivering steel piles	6.60	6.00	7.50	5.40	10.00
16,620 lin. ft. driving steel piles	3.20	3.00	1.50	5.18	4.00
5,000 lin. ft. concrete liner plates	5.40	7.00	5.00	15.14	10.00
Lump sum, underpinning film exchange bldg.	\$45,700	\$10,000	\$25,000	\$17,491	\$64,000
Lump sum, restoration of film exchange bldg.	\$12,000	\$25,000	\$15,000	\$7,932	\$3,000
11,610 cu. yd. concrete Class "A" in place	53.00	65.00	60.00	39.86	52.00
1,800 sq. yd. damp-proofing deck slab	1.85	2.00	2.00	1.81	2.00
18,070 sq. yd. cem. conc. pave. std. 14-day mix, 8-in. sec.	4.30	5.00	4.00	6.23	4.50
12,715 sq. yd. cem. conc. pave., std. 14-day mix 9-in. sec.	4.65	5.50	4.50	6.90	5.00
1,400 sq. yd. cem. conc. pave., std. 14-day mix 9-in. sec. in pl. (widening from Sta. 4+52.80 to 15+00 only)	5.10	5.50	5.00	6.90	5.50
120 sq. yd. cem. conc. pave., std. 14-day mix 11-in. sec.	6.00	7.00	6.00	8.49	6.00
1,300 sq. yd. cem. conc. base crse., std. 14-day mix 6-in. section	3.40	4.00	3.50	5.09	3.50
7,732 lin. ft. integral cem. conc. curb 6-in. x 6-in. type A	.90	.80	1.00	1.13	.60
5,800 lin. ft. integral cem. conc. curb 9 1/2 x 3-ft. 0-in.	2.70	3.00	2.50	2.27	2.50
5,800 lin. ft. integral cem. conc. curb 9 1/2 x 1-ft. 6-in.	2.20	1.50	1.60	1.70	1.50
180 lin. ft. integral cem. conc. curb 6-in. x 1'-1" 8-in.	1.85	1.50	1.70	1.70	1.00
309 cu. yd. special curb	64.00	30.00	45.00	54.33	40.00
1,450 lin. ft. type A precast white reflecting curb	3.30	2.00	2.20	2.82	1.75
7,810 sq. yd. on crse. Port. cem. conc. sidewalk 3 1/2-in. section	3.90	3.50	3.25	4.53	3.00
180 ton plant mix	11.00	10.00	10.00	11.32	12.00
1,696,200 lb. steel reinf. bars (except in precast items)	.117	.12	.11	.105	.10
9,46 lin. ft. reinf. conc. bridge railing	4.00	7.00	7.00	5.19	6.00
7,720 lb. wire mesh reinforcement	.15	.25	.20	.21	.29
42 only precast conc. beam type A incl. reinf. cem.	482.00	520.00	480.00	487.56	500.00
170 only precast conc. beam type B incl. reinforcement	458.00	500.00	450.00	461.92	470.00
42 only precast conc. beam type C incl. reinforcement	482.00	520.00	470.00	474.76	500.00

(Continued on next page)

	(1)	(2)	(3)	(4)	(5)
97 only precast conc. exhaust vent trough 13-ft. 0-in. long, complete	100.00	80.00	80.00	47.55	115.00
30 only precast conc. exhaust vent trough 9-ft. 0-in. long, complete	90.00	60.00	75.00	59.70	115.00
16 only precast conc. city light handhole complete	100.00	100.00	100.00	118.82	125.00
3,245 lin. ft. 4-in. intake and exhaust vent drains, compl.	6.30	6.00	6.00	6.11	3.00
94 only exhaust grating, type G1	126.00	140.00	120.00	123.74	125.00
20 only exhaust grating, type G2	85.00	100.00	80.00	84.10	80.00
97 only exhaust grating frame type G1	71.00	70.00	80.00	62.05	100.00
30 only exhaust grating, frame type G2	59.00	50.00	70.00	48.07	80.00
17 only exhaust grating fr. type G1, without anchors	65.00	60.00	75.00	80.43	110.00
3 only exhaust grating fr. type G2, without anchors	55.00	50.00	65.00	68.84	100.00
37 only intake cover, grating and grating fr. type G3	443.00	450.00	415.00	416.61	500.00
8 only intake cover, grating and grating fr. type G4	440.00	450.00	415.00	413.21	500.00
8 only intake cover, grating and grating fr. type G5	440.00	450.00	415.00	411.94	500.00
17 only intake cover, grating and grating fr. type G6	869.00	900.00	820.00	826.93	900.00
2 only intake cover, grating and grating fr. type G7	830.00	850.00	820.00	799.22	850.00
8 only intake grating, fr. type G6, without anchors	147.00	150.00	150.00	151.83	220.00
1 only intake grating, fr. type G7, without anchors	147.00	150.00	160.00	152.58	200.00
21 only filled grating, type G8	111.00	150.00	110.00	94.65	130.00
13 only filled grating type G9	81.00	120.00	90.00	67.18	100.00
16 only city light handhole cover and frame	189.00	200.00	45.00	191.62	300.00
Lump sum, central control station equipment complete	\$3,728	\$3,600	\$7,000	\$6,315	\$6,000
Lump sum, carbon monoxide equipment complete	\$19,591	\$18,000	\$25,000	\$24,334	\$18,000
975 only bolt inserts complete	.81	4.00	3.00	.325	2.00
6 only hydrant and fire extinguisher installed compl.	\$1,138	\$1,050	\$1,100	\$1,109	\$1,250
5 only fire doors complete	345.00	250.00	330.00	254.14	300.00
Lump sum, telephone installations complete	\$5,134	\$3,500	\$5,000	\$5,178	\$3,500
Lump sum, automatic sprinkler system complete	\$109,858	\$105,000	\$110,000	\$108,111	\$100,000
1,100 lin. ft. 1-in. conduit for upper roadway	.60	.90	.70	.713	.75
275 lin. ft. 1-in. conduit	1.00	.70	.75	.745	.50
1,570 lin. ft. 1 1/4-in. conduit	1.17	.70	.90	.924	.60
1,130 lin. ft. 1 1/2-in. conduit	1.35	.60	1.10	1.154	.50
175 lin. ft. 2-in. conduit	1.40	.60	1.50	1.371	.50
200 lin. ft. 3-in. conduit	2.50	1.25	3.00	3.015	1.05
4,600 lin. ft. 3 1/2-in. conduit	1.16	1.25	2.70	2.761	1.10
7,040 lin. ft. 4-in. conduit	1.11	2.25	3.00	3.118	2.00
1,150 lin. ft. 3 1/2#6 neoprene covered cable	.59	.60	.85	.873	.50
41,750 lin. ft. 1 1/4#6 neoprene covered cable	.29	.30	.24	.242	.30
21,600 lin. ft. 1 1/2#2/0 neoprene covered cable	.58	.70	.55	.566	.60
2 only 6-ft. x 6-ft. std. st. lighting manhole complete	494.00	900.00	340.00	409.03	500.00
10 only street lighting handhole complete	90.00	160.00	140.00	278.90	200.00
8 only ventilating fan switch assembly complete	\$1,225	950.00	\$1,150	\$1,177	880.00
72 only ventilating fan assembly complete	453.00	650.00	720.00	737.17	600.00
Lump sum, ventilating fan relay control	\$3,570	\$1,400	\$3,700	\$3,777	\$1,700
Lump sum, removing exist. street lighting standards	275.00	170.00	150.00	136.00	154.00
870 lin. ft. removing exist. underground cable	.19	.10	.23	.24	.10
1 only reset exist. mercury vapor lamp post	40.00	60.00	75.00	75.00	48.00
15 only conc. bases for surface lighting	13.00	80.00	70.00	37.80	45.00
283 only two unit fluorescent luminaire assembly	246.00	250.00	285.00	257.46	232.00
4 only single unit fluorescent luminaire assembly	169.00	140.00	170.00	177.50	125.50
18 only fluorescent continuous lighting switch assembly	243.00	110.00	150.00	156.44	95.00
46 only mercury vapor floodlight assembly	166.00	150.00	175.00	178.50	135.00
Lump sum, electronic controls for subway lighting	\$1,230	870.00	\$1,300	\$1,313	789.00
2 only merc. vapor entrance lighting switch assembly	432.00	350.00	400.00	416.00	312.00
4 only single unit mercury vapor luminaire assembly	418.00	370.00	400.00	377.00	340.00
10 only double unit mercury vapor luminaire assembly	621.00	500.00	550.00	570.20	460.00
1 only six-circuit watertight manhole distribution box	530.00	450.00	600.00	558.00	400.00
20 only neon stop motor sign assembly	270.00	160.00	200.00	203.70	145.00
1 only neon stop motor sign switch assembly	542.00	225.00	400.00	381.00	202.00
2 only subway closed stop sign assembly	\$1,980	\$1,400	\$1,300	\$1,324	\$1,271
Lump sum, subway closed stop sign relay control	\$2,270	300.00	\$1,600	\$1,660	231.00
1 only twin danger lights in curb (City of Seattle std.)	220.00	200.00	200.00	214.00	175.00
1 only twin danger light in post (City of Seattle std.)	232.00	50.00	150.00	77.29	40.00
Lump sum, footings for sign bridge, etc., complete	\$1,300	600.00	\$2,000	\$2,186	\$2,000
4 cu. yd. concrete blocking	37.00	50.00	60.00	34.08	30.00
200 only pile splices	19.70	30.00	12.00	43.07	30.00

Streets and Highways

Asphaltic concrete paving of Oregon Coast Highway

Oregon—Lincoln County—State. Funderburk Construction Co. and Stoen Construction Co., Sutherlin, Ore., were the low bidders, at \$1,245,974, before the Oregon State Highway Department, for 4.6 mi. of grading and asphaltic concrete paving of the Oregon Coast Highway. Unit bids were submitted as follows:

(1) Funderburk Construction Co. and Stoen Construction Co.	\$1,245,874	(6) Manson Construction Co. Engineering Co. and Osberg Construction Co.	\$1,685,478
(2) Carl M. Halvorson, Inc.	1,276,920	— Guy F. Atkinson Co.	1,730,928
(3) McNutt Bros.	1,393,650	— Kuckenberg Construction Co.	1,776,028
(4) Fred H. Slate Co., Oregon, Ltd., and E. C. Hall Co.	1,473,845	— Peter Kiewit Sons' Co.	1,848,335
(5) C. J. Eldon	1,479,244		

	(1)	(2)	(3)	(4)	(5)	(6)
Lump sum, clearing and grubbing	\$115,000	\$110,000	\$145,330	\$125,000	\$94,000	\$155,000
300 sq. ft. felling danger trees	5.00	5.00	5.00	6.00	8.00	7.00
3,400 cu. yd. structl. excav., unclassified	4.00	3.00	4.00	5.00	6.00	5.00
39,000 cu. yd. genl. excav., location "A", uncl.	.35	.35	.48	.40	.40	.90
1,068,000 cu. yd. genl. excav., location "B", uncl.	.64	.67	.68	.80	.78	.90
2,805,400 yd. stas. short overhaul	.01	.01	.02	.02	.02	.02
95,600 C-yd. sta. long overhaul	.50	.40	.75	.50	.80	.60
3,300 cu. yd. excav. and placing topsoil	1.50	2.50	1.50	1.25	2.50	3.00
1,000 yd. mi. truck haul on topsoil	.40	.30	.50	.30	.40	.30
4.62 mi. finishing roadbed and slopes	\$1,000	800.00	\$2,500	\$1,000	\$1,000	\$1,000
24,000 lin. ft. rounding cutbanks	.20	.15	.05	.25	.20	.20
2,300 lin. ft. 8-in. perf. metal dr. pipe, coated	2.00	2.50	2.65	2.50	2.20	3.00
170 lin. ft. 12-in. conc. pipe	2.00	2.00	1.90	2.50	2.00	4.00
2,300 lin. ft. 18-in. conc. pipe	4.00	3.75	3.40	3.50	3.90	6.00
300 lin. ft. 24-in. conc. pipe	6.00	5.00	5.00	5.00	5.20	8.00
210 lin. ft. 30-in. conc. pipe	8.00	8.00	7.00	7.00	7.00	10.00
90 lin. ft. 36-in. conc. pipe	10.00	9.00	9.30	9.00	9.00	13.00
1,800 lin. ft. 18-in. ex. str. conc. pipe	5.00	4.00	3.70	4.00	4.20	7.00
190 lin. ft. 24-in. ex. str. conc. pipe	7.00	5.50	5.35	5.75	5.90	10.00
110 lin. ft. 26-in. ex. str. conc. pipe	11.00	9.50	10.30	10.00	10.00	15.00

(Continued on next page)



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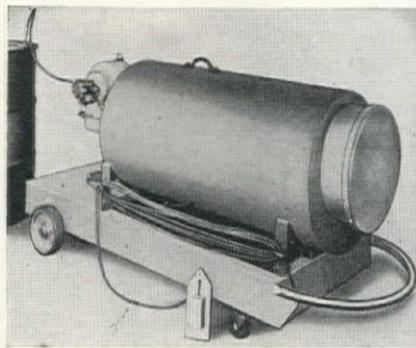
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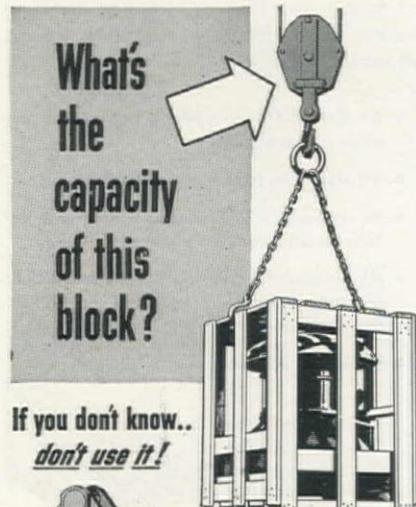
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UNIT BID PRICES...CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
540 lin. ft. salvaging culvert pipe	2.00	2.00	4.00	3.00	3.00	5.00
1,340 cu. yd. 36-in. 0 backfill in drains	6.00	6.00	7.00	6.00	6.00	5.00
480 cu. yd. Class "A" concrete	65.00	80.00	52.00	62.00	70.00	80.00
86,000 lb. metal reinforcement	.12	.13	.11	.12	.14	.12
20 cu. yd. concrete curbs	90.00	80.00	52.00	62.00	75.00	80.00
2,700 lin. ft. metal guard rail	4.00	2.75	3.60	3.50	3.50	2.75
160 only concrete sight posts	10.00	12.50	11.00	12.00	11.00	12.00
45,600 cu. yd. quarry-run rock in base	1.00	1.00	1.25	1.25	1.40	1.50
9,300 cu. yd. 1-in. 0 rock in base and shdls.	2.75	2.90	2.50	2.90	2.75	4.00
1,200 M. gal. sprinkling	2.50	2.50	3.00	3.00	3.00	2.50
14,900 gal. SS-1 emuls. asph. in sprinkling	.25	.20	.22	.25	.20	.25
1,000 cu. yd. 1-in. 0 rock in binder course	3.50	3.90	5.00	4.50	6.00	4.00
160 ton RC-3 asphalt in binder course	40.00	45.00	45.00	55.00	45.00	45.00
20,400 ton Class "B" asph. conc.	6.70	7.25	7.25	6.75	7.25	6.75
90 ton RS-1 emuls. asph. in seal coat	45.00	45.00	46.00	50.00	50.00	50.00
550 cu. yd. aggregate in seal coat	5.00	5.00	6.00	5.00	6.00	4.00
1,800 lin. ft. asph. conc. traffic markers	1.00	1.00	1.25	1.00	1.25	1.00

Gravel surfacing and road-mix oiling in Montana

Montana—Wheatland County—State. S. Birch & Sons' Construction Co., Great Falls, with a low bid of \$309,807, was awarded a contract by the State Highway Commission of Montana, for 8.4 mi. of grading, gravel surfacing, road-mix oiling and drainage on the Harlowton-Ryegate highway. Unit bids were submitted as follows:

(1) S. Birch & Sons' Construction Co.	.... \$309,807	— Stanley H. Arkwright, Inc.	.... \$333,333
(2) Sundling Construction Co.	.... 311,147	— O'Brien Construction Co.	.... 338,610
(3) Lou Richardson	.... 319,017	— Nilson-Smith Construction Co.	.... 359,494
(4) Billings Construction Co.	.... 320,920	— Inland Construction Co.	.... 385,830
(5) Hilde Construction Co.	.... 330,584	— McLaughlin, Inc.	.... 390,215
(6) Peter Kiewit Sons' Co.	.... 332,592	— Taggart Construction Co.	.... 457,635

	(1)	(2)	(3)	(4)	(5)	(6)
277,404 cu. yd. uncl. excav. and borrow	.23	.24	.24	.20	.23	.24
2,046 cu. yd. culvert excav.	2.00	1.00	1.00	3.00	1.50	2.00
7,764 mi. yd. overhaul	.25	.15	.15	.10	.15	.17
2,432 ton cr. gravel cover matl.	3.50	4.00	4.00	4.00	4.50	4.00
40,080 ton T. "A" top cover surface 3/4-in. gr.	.80	.87	1.00	1.10	1.00	1.14
160,409 ton select borrow base coat	.51	.49	.49	.52	.64	.59
200 hr. blading work	10.50	10.00	10.00	11.00	10.00	12.00
149,033 gal. app. M-3 ARO for mix	.14	.15	.15	.145	.13	.15
27,812 gal. app. M-1 ARO for prime	.15	.15	.16	.145	.14	.15
48,673 gal. app. RS-2 EA for seal	.14	.15	.16	.145	.16	.15
8,427 mi. processing	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	900.00
556 sq. yd. processing	.50	.60	.50	.50	.60	.60
7,400 M. gal. watering	1.50	1.50	1.60	1.50	1.00	1.00
250 unit rolling embankment	9.00	8.00	8.00	7.00	8.00	8.00
750 unit rolling surface co.	8.00	8.00	7.50	7.00	8.00	8.00
154 lin. ft. reinf. conc. pipe culv. 84-in. diam.	62.00	60.00	70.00	60.00	50.00	58.00
66 lin. ft. cor. met. pipe arch culv. 36-in. span, 22-in. rise	10.00	8.50	8.50	9.50	8.00	8.00
142 lin. ft. cor. met. pipe arch culv. 43-in. span, 27-in. rise	14.00	11.25	11.25	14.50	12.00	13.00
258 lin. ft. cor. met. pipe culverts, 15-in. diam.	4.00	3.50	3.50	4.90	4.00	3.50
290 lin. ft. cor. met. pipe culverts, 18-in. diam.	5.00	4.00	4.00	6.20	4.00	4.00
896 lin. ft. cor. met. pipe culverts, 24-in. diam.	7.00	8.00	8.00	7.80	7.00	6.00
284 lin. ft. cor. met. pipe culverts, 30-in. diam.	9.00	9.00	9.00	10.40	7.00	7.50
32 lin. ft. cor. met. pipe culverts, 36-in. diam.	14.00	12.00	12.00	16.10	11.00	12.00
126 lin. ft. st. sec. reinf. conc. U-pass	42.00	45.00	45.00	39.50	40.00	40.00
76 lin. ft. sec. pl. pipe arch culv. 170-in. S. - 104-in. R. SM. 0.065	100.00	75.00	75.00	85.50	70.00	85.00
388 lin. ft. relay pipe culverts	2.50	2.00	2.00	3.50	2.00	2.00
16,95 cu. yd. class "AD" concrete	80.00	125.00	125.00	125.00	100.00	110.00
3,310 lb. reinf. steel	.15	.30	.30	.30	.24	.20
325 cu. yd. gravel backfill	3.00	3.00	3.00	4.00	3.00	4.00
3 ea. drop inlets	100.00	85.00	100.00	100.00	150.00	125.00
0.270 M.B.M. headgate lumber	400.00	300.00	300.00	400.00	350.00	350.00
2 ea. conc. project markers	25.00	20.00	20.00	25.00	25.00	25.00
60 ea. conc. r/w mon.	10.00	4.50	4.50	6.10	5.00	7.00
45 ea. conc. sta. markers	15.00	6.75	6.75	8.50	6.00	9.00
Lump sum, remove, 5 ex. tim. struct. and maintain traffic	\$2,500	\$3,000	\$3,000	\$5,000	\$5,000	\$2,000
21.15 M.B.M. treated timber	370.00	355.00	355.00	355.00	350.00	350.00
0.94 M.B.M. untreated timber	340.00	355.00	355.00	355.00	350.00	350.00
32 ea. 25.0 ft. treated timber piles	80.00	90.00	90.00	90.00	75.00	80.00

Heavy grading, placing rock base, and constructing reinforced concrete bridges

California—Alameda and San Joaquin counties—State. McCammon-Wunderlich Co. and C. K. Moseman, Palo Alto, at \$1,447,396, were low bidders before the California Division of Highways for constructing about 7.5 mi. of highway between 2 mi. east of Redmond Overhead and Corral Hollow Rd. The work consists of grading and placing base material, and erection of reinforced concrete bridges along the route. Unit bids were submitted by the following contractors:

(1) McCammon-Wunderlich & C. K. Moseman	.... \$1,447,396	— Ball & Simpson	.... \$1,689,668
(2) Eaton and Smith	.... 1,546,815	— Bressi and Bevanda Constructors	.... 1,689,806
(3) Dan Caputo & Edward Keeble	.... 1,555,902	— H. Earl Parker, Inc. & Harms Bros.	.... 1,745,389
(4) Fredrickson & Watson Construction Co.	.... 1,563,102	— Lord & Bishop and M.J.B. Construction Co.	.... 1,763,534
(5) Guy F. Atkinson Co.	.... 1,639,308	— Fredrickson Bros.	.... 1,764,362
(6) Ukropina-Polich-Kral	.... 1,656,583	— A. Teichert & Son, Inc.	.... 1,794,206
		— Frederickson & Kasler	.... 2,090,711

	(1)	(2)	(3)	(4)	(5)	(6)
108 cu. yd. removing concrete	20.00	16.00	5.00	8.00	9.85	6.00
398 sta. clearing and grubbing	50.00	10.00	15.00	100.00	16.50	55.00
827,000 cu. yd. roadway excavation	.44	.52	.35	.38	.47	.56
11,300 cu. yd. structure excavation	2.50	2.30	2.50	2.00	2.70	2.60
950 cu. yd. structure excav. (bridges)	6.00	4.10	4.00	3.35	4.30	2.90
580 cu. yd. structure backfill (bridges)	3.50	3.20	3.00	3.00	3.40	3.50
3,140 cu. yd. ditch and channel excav.	1.60	1.10	1.00	1.00	1.65	2.00

Continued on next page

	(1)	(2)	(3)	(4)	(5)	(6)
21,700,000 sta. yd. overhaul	.003	.002	.004	.0034	.0037	.005
130,000 sq. yd. compacting original ground	.05	.044	.05	.04	.025	.04
288,500 ton subbase material	.80	1.00	1.15	1.06	1.10	1.00
191,500 ton base material	.90	1.10	1.30	1.18	1.22	1.00
Lump sum, dev. wat. sup. & furn. wat. equip.	\$17,500	\$27,000	\$25,000	\$30,000	\$10,000	\$8,000
46,200 M. gal. applying water	1.25	.50	1.00	1.25	1.45	1.50
398 sta. finishing roadway	40.00	13.00	15.00	30.00	19.50	12.00
4,040 ton untreated rock base	2.40	2.75	2.50	2.00	2.15	1.80
35 ton liquid asph., SC-2 (pr. ct. & pen. tr.)	32.00	30.00	40.00	32.00	36.00	37.00
10 ton asphaltic emulsion (sl. ct.)	36.00	40.00	50.00	40.00	48.00	46.00
100 ton screenings (sl. ct.)	6.00	5.00	5.00	6.25	5.15	6.00
235 ton sand (pr. ct.)	4.50	5.00	5.00	5.60	5.30	6.00
1,180 ton mineral aggregate (P.M.S.)	6.00	6.00	7.50	6.20	7.00	7.00
59 ton paving asphalt (P.M.S.)	6.00	6.00	7.50	6.20	7.00	7.00
3,795 cu. yd. Class "A" P.C.C. (structures)	50.50	54.00	58.00	57.00	57.50	48.00
1,507 lin. ft. concrete railing	5.50	6.80	6.00	5.75	6.00	6.30
2,522 lin. ft. furn. conc. piling	3.50	3.55	3.60	3.30	3.50	3.50
140 ea. driving piles	90.00	90.00	100.00	90.00	86.00	84.00
587,300 lb. bar reinforcing steel	.095	.10	.095	.095	.09	.10
100 sq. yd. mesh reinforcement	.50	.62	2.00	1.20	.32	5.00
4,800 lb. misc. steel	.40	.48	.50	.39	.50	.60
190 ea. r/w monuments	6.00	6.20	6.00	6.80	7.50	6.50
72 ea. installing grade posts and markers	7.00	4.30	6.00	5.00	6.75	5.60
2,75 mi. new property fence, Type A	\$2,000	\$1,630	\$1,600	\$1,750	\$1,920	\$1,850
13 mi. new property fence, Type B	\$1,500	\$1,350	\$1,000	\$1,220	\$1,100	\$1,500
6 ea. 10-ft. drive gates	80.00	60.00	60.00	44.00	48.00	65.00
200 lin. ft. chain link fence	1.72	2.80	3.00	1.60	2.25	2.00
2,783 lin. ft. 18-in. R.C.P.	5.40	4.50	3.25	4.00	3.85	3.60
63 lin. ft. 24-in. R.C.P.	6.65	7.00	6.00	6.00	6.60	5.00
510 lin. ft. 30-in. R.C.P.	9.20	8.50	6.00	9.40	7.70	7.50
1,040 lin. ft. 72-in. R.C.P.	27.70	30.00	30.00	31.00	40.00	31.00
262 lin. ft. 30-in. special R.C.P.	11.65	15.00	13.00	13.00	12.35	11.00
116 lin. ft. 12-in. C.M.P. (16 ga.)	3.60	3.00	3.00	2.53	2.60	3.00
2,092 lin. ft. 18-in. C.M.P. (16 ga.)	4.00	3.50	3.50	3.50	3.65	3.80
228 lin. ft. 21-in. C.M.P. (16 ga.)	5.25	4.00	4.00	4.00	4.25	4.30
804 lin. ft. 24-in. C.M.P. (14 ga.)	6.00	5.50	5.00	5.30	5.60	6.00
194 lin. ft. 42-in. C.M.P. (12 ga.)	12.00	14.00	12.00	13.00	13.00	13.00
232 lin. ft. 48-in. C.M.P. (10 ga.)	15.00	19.00	22.50	19.00	18.60	19.00
280 lin. ft. 54-in. C.M.P. (8 ga.)	21.00	26.00	28.00	26.00	25.80	26.00
930 lin. ft. 22-in. x 13-in. C.M.P. arch (16 ga.)	5.00	4.00	4.50	3.76	4.15	4.50
986 lin. ft. 29-in. x 18-in. C.M.P. arch (14 ga.)	7.00	6.00	6.00	5.66	6.20	6.50
670 lin. ft. 36-in. x 22-in. C.M.P. arch (12 ga.)	10.00	9.50	9.00	8.80	9.65	10.50
13 lin. ft. 42-in. non-reinf. conc. irrig. pipe	14.50	15.00	16.00	17.00	16.20	14.00
88 cu. yd. filter material	6.00	8.80	6.00	5.00	4.60	6.00
15 ea. spillway assemblies	45.00	40.00	35.00	41.70	37.50	32.00
518 lin. ft. 8-in. C.M.P. downdrains (16 ga.)	2.50	2.00	2.50	2.60	2.25	2.30
7 ea. spillway assemb. downdrains slip joints	30.00	35.00	20.00	23.00	22.25	23.00
7 ea. downdrain pipe anchors	25.00	20.00	22.00	23.00	19.20	17.00
81 lin. ft. salvaging exist. pipe culverts	2.50	1.50	2.00	1.40	1.80	2.30
4 ea. cast steel frame and cover for drop inlet	35.00	85.00	100.00	90.00	90.00	105.00
3 ea. steel grates	40.00	70.00	150.00	50.00	36.00	116.00
2 ea. 24-in. slide headgates	120.00	115.00	90.00	100.00	130.00	105.00
2 ea. 30-in. slide headgates	160.00	177.00	130.00	145.00	185.00	140.00
3 ea. water metering devices	80.00	70.00	75.00	54.00	65.00	60.00
2 ea. 12-in. metal end sections (16 ga.)	20.00	25.00	16.00	26.60	30.00	30.00
1 ea. salvaging existing headgates	50.00	48.00	25.00	40.00	36.00	60.00
Lump sum, engineer's office	\$4,500	\$2,000	\$5,000	\$4,000	\$4,000	\$6,000

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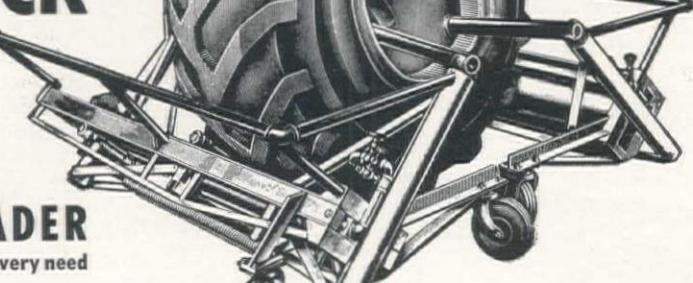
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NEW LITERATURE

1101

Hard-facing guidebook revised

Maintenance men concerned with the rebuilding and hard-facing of heavy equipment used in earth-moving, mining, lumbering, cement and allied industries will be interested in the new edition of **Stoody Company's** hard-facing guidebook. The various materials used and methods of applying these alloys are comprehensively described.

1102

116-page manual on cableways, aerial tramways and light suspension bridges

The engineering, construction and application of every type of aerial wire rope tramways are discussed in this unusual book offered by **Columbia-Geneva Steel Division, United States Steel Co.** In 116 pages are described the various classifications of aerial carriers including continuous bi-cable, double reversible, single reversible, monocable, and monorail. Liberal use of photographs shows tramrails in operation for mines, lumber handling, sand and gravel handling, etc. Component parts of the aerial

system are described and illustrated such as towers, stations, loading and discharge terminals, buckets, drives and cables. A separate section is devoted to passenger tramways. Also included are photographs and discussion of cableways as installed at major dam projects throughout the West. Another section covers light suspension bridges used in transportation of gas, oil or water pipelines.

1103

How to prevent winter-stalled engines

Instant starting diesel and gas engines, even in sub-zero weather, is the purpose of an electric pre-heater described in a folder offered by the **Kim Hotstart Manufacturing Co.** Pictures show installation details.

1104

All about wall-form construction

All the latest information and improvements in the **Symons Clamp & Mfg. Co.** forming system is explained in detail in a 44-page catalog issued by the company. Illustrations show how simply

and easily the forming system operates and picture actual construction where the forms have been used. Blueprints and complete specifications are given with material necessary, time required and cost figures on actual jobs. Catalog also contains detailed information on Symons safety shores and column clamps.

1105

Be your own weather forecaster

An unusual and valuable booklet on weather forecasting is being offered by **The Galion Iron Works & Mfg. Co.** Most of you cannot do much about changing the weather, but with the help of this little booklet, you can at least prepare for it. The guide contains sixteen four-color pictures of different types of skies, with simple explanations of the weather they foretell. It is claimed that with the aid of this booklet, you will be able to forecast with remarkable accuracy.

1106

Many building maintenance problems answered

A 48-page guide to practical, economical building maintenance is being offered by **Stonhard Co.** Manual tells you how to resurface or patch any type floor; how to solve water seepage in underground foundations; repair leaky roofs; preserve concrete or wood surfaces; protect structural steel from rust, and gives many other time and labor saving methods of building maintenance. Products suitable for specialized problems in road and tunnel construction, mining and public utilities are described.

1107

Facts about rear-dump designed for off-road work

R. G. LeTourneau, Inc., has released a booklet describing in detail the Tournarocker, a haul unit built from the ground up for off-road hauling. Complete mechanical details of the unit, and operation of the truck in action are illustrated. Cut-out photos of integral parts of the machine show how and why it hauls capacity loads anywhere, even on mountain trails and cross country.

1108

Something new in rock drilling

A completely new method of drilling by which one man can do the work of two is described in a folder released by **Copco Pacific, Ltd.** The advantages of the light weight design are enumerated and the equipment is described in detail.

1109

How to improve wire rope service

If you use wire rope in any capacity you will find this 72-page, pocket-size booklet from **A. Leschen & Sons Rope Co.** crammed with practical information.

"SAVED \$800 PER MILE with my new STOW SCREED!"

Performance like that is *important* on any paving job. It's the reason why so many contractors are now using STOW screeds on all their road paving jobs!

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Dealing with the care and handling of wire rope from the time it is unloaded at your receiving place, the book tells you how to handle, reeve, break in and store the coils or reels. Over 50 illustrations and 32 diagrams and charts demonstrate the various end preparations, socket installations, how to splice and apply clips. Miscellaneous information includes valuable hints on measuring and ordering wire rope, the amount of stress used in cableways, inclines or shafts, and approximate amount of lubricant necessary to maintain the rope in top operating condition.

1110

Versatility of bitumuls emulsified asphalt described

A wealth of information on the use of bitumuls emulsified asphalt in maintenance work is contained in this booklet designed for use by contractors, paving engineers and government project contractors. Sections of the booklet include information on the modern way to use asphalt with comprehensive discussion of the characteristics and types of bitumuls, bitumuls and hydrophilic aggregate; importance of proper sealing, black seal, sand seal and non-skid surface treatments; and bitumuls penetration macadam plus many more. Booklet is made available from American Bitumuls & Asphalt Company.

1111

Specification sheets for Nordberg engines

A series of 12 two-page specifications sheets on Nordberg Type 4FS one, two and three-cylinder diesel engines are made available by Nordberg Manufacturing Co.

Literature briefs . . .

1112

BELT LACING — Information sheet describing and listing the Alligator long length conveyor belt lacing has just been issued by **Flexible Steel Lacing Co.** Shows application views, sizes and list prices as well as other pertinent information.

1113

MASONRY DEHYDRATOR — How to use Dehydratine, the **A. C. Horn Company, Inc.**'s heavy-bodied black coating dehydrator on masonry walls. Brief but complete description of method and uses.

1114

TRAILER HOISTS — This new **Gar Wood Industries, Inc.**, bulletin illustrates both the cam and roller and the telescopic hoists produced by this company.

1115

BIN INDICATOR — Said by manufacturer to be the only low-cost bin indicator giving positive, fool-proof signals under pressure or vacuum, the Bin-Vue is described in a folder offered by **Convairst**.

1116

SKID-SHOVEL — Operators, contractors and engineers will be interested in this broadside, published by **Drott Manufacturing Corporation**, on three models of skid-shovels for International tractors.

1117

MOTOR GRADER — Improvements made on the Model 512 motor grader occasion this folder by the **J. D. Adams**

Manufacturing Co. Specifications and optional equipment list also given.

1118

TRUCK SELF LOADER — "LoDal" truck self loader, manufactured by **Brisson Bros. Machinery Company**, is illustrated in use as it loads, hauls and dumps in this new folder. Designed to be a ready reference for this type of equipment.

1119

CABLEWAYS — Illustrated bulletin describing the Travelift cableways recently introduced in this country by **Construction Improvements Limited** of Canada. Numerous pictures showing cableways in use.

1120

CRUSHER REBUILT PROCESS — How to save time and money by rebuilding and repairing various types of crushers and eliminate build-up welding on Hammermill Hammers is the subject of the folder distributed by **Stulz-Sickles Co.** Manganal, 11%-13½% manganese-nickel steel is the essence of this instructive folder.

1121

GROUTING TILE — Horn Acid-Resisting Non-Shrinking Grout, which was developed by the **A. C. Horn Company, Inc.**, to meet the tile floor problem is described in an information sheet distributed by the company. Directions are also given for application.

1122

THE STORY OF I-R — In an interesting 36-page booklet **Ingersoll-Rand Co.** presents a brief history of the company and nearly 100 pictures showing its products at work.

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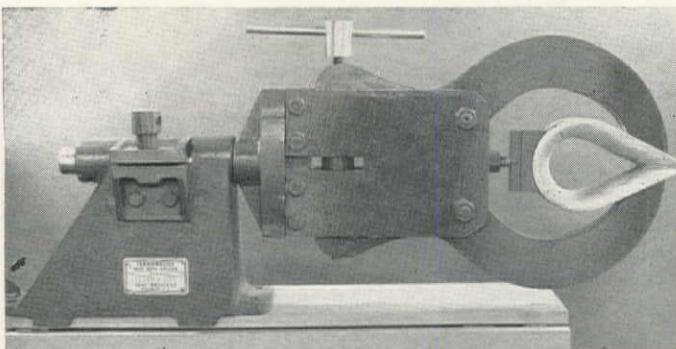
NEW EQUIPMENT

More information on any of the items in this section may be obtained by using coupon on page 123.

1123

The right splice for the stiffest wire rope

Quay Industries has designed a No. 10 "Torquemaster" wire rope splicer which is now required by all combat construction battalions and all cargo handling battalions of the



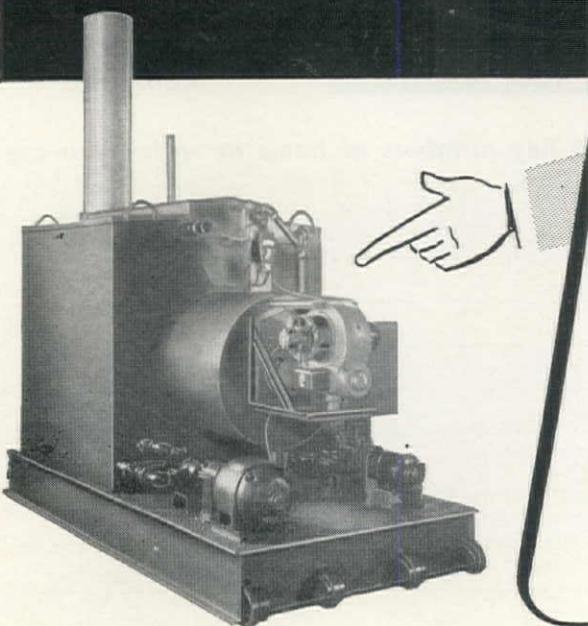
Navy. The powerful machine uses two interchangeable jaw assemblies on one base, the small assembly handling $\frac{3}{8}$ -1 in. wire rope as did the old No. 9, and the large assembly handling $\frac{3}{4}$ to $1\frac{1}{4}$ -in. wire rope. The resistance regulator which

1124

Easy operation is the keynote to Oliver's first heavy-duty tractor

The Oliver Corporation had the operator in mind when it introduced its new "OC-18" Crawler Tractor on the market. Its equipment has been designed to provide minimum operating fatigue—all factors encouraging the maximum production which this heavy-duty tractor can turn out on a hard day's work. The easy-operating devices include air steering which can guide the machine by the pressure of only two fingers. Air brakes may be supplied if desired. An over-center clutch is another top feature—the clutch bar crosses the width of the dashboard so that the driver need not take his eyes off his work. A push button electric starter gets the engine going quickly even on cold mornings. The operator can work from a comfortable two-man seat with ample leg room and reach out easily towards a center-position gear shift lever. The foot brakes are conveniently placed, and the throttle is located at the right arm rest of the seat.

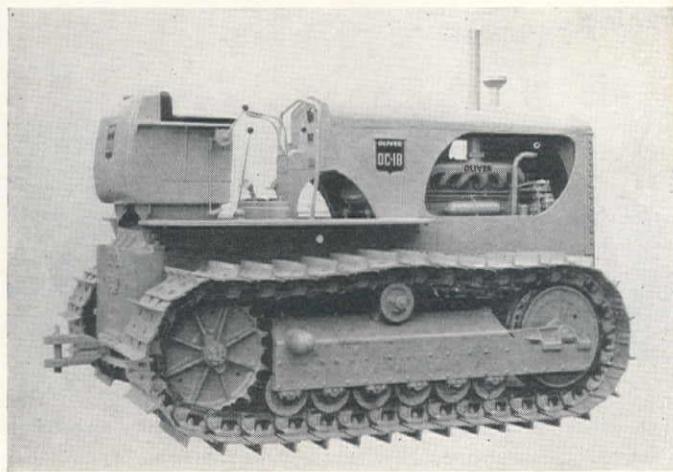
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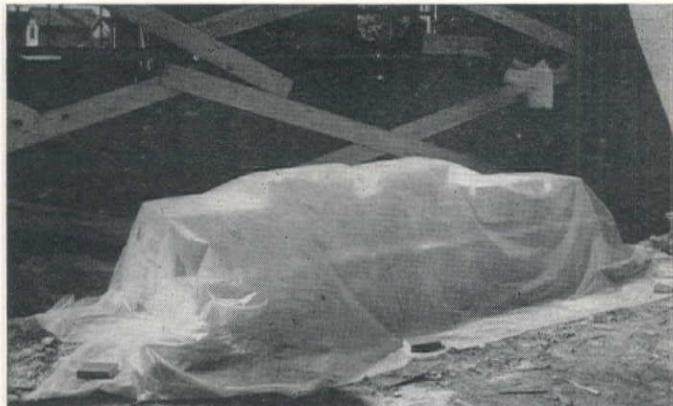


This rugged Oliver "OC-18" affords greater pulling power and stability because the track hugs the ground almost its entire length. The protected, unobstructed high clearance ignores mud, rocks and tree stumps. The Oliver "OC-18" has a six-cylinder 126 rated horsepower full diesel engine with high back-up torque, and it is fed by a 66-gallon fuel tank mounted back of the seat.

1125

Shroud your equipment with a new style tarp

Instead of being burdened with the usual canvas tarpaulin, why not try one one-tenth its weight and one-third its cost?



Canton Containers, Inc., has developed a new "C-Line" tarp, made of 100% pure Visqueen film, which is not only rugged but versatile despite its fragile appearance. It is completely waterproof and mildew proof; weather resistant and does not become brittle in -92 degree weather; transparent yet tough and tear-resistant; easily washed and dried and does not absorb paints or liquid. The tarp protects ground storage of building materials, and may also shield drying paint or plaster, or open work in a partially completed structure.

1126

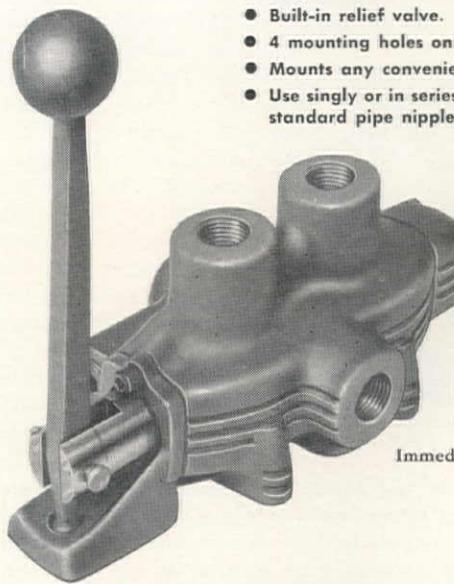
Electronic stethoscope helps diagnose those tell-tale ticks

A sensitive little instrument recently announced by the Anco Instrument Division, is able to detect the source of friction noises in machinery, thanks to its electronic "ear." The Elec-Dec uses a metal probe which serves as a microphone to locate the exact source of tell-tale noises. Sound impulses transmitted through an amplifier to headphones help the mechanic diagnose the trouble and determine quickly where to make repairs without tearing down the

For Construction Equipment GRE-SEN HYDRAULIC CONTROL VALVES

Ideal for operating bulldozers, scrapers, front-end loaders, landlevellers and other hydraulic-controlled rigs. Low in cost, yet you get these top-value features:

- Smooth, positive, easy control.
- Fully-balanced and self-centering.
- Built-in relief valve.
- 4 mounting holes on bottom.
- Mounts any convenient location.
- Use singly or in series—interconnect with standard pipe nipples.



Model 400 (shown) operates double acting cylinders; Model 300, single acting cylinders. Capacity 16 g.p.m.; pressure to 1250 p.s.i.

LIST
\$ 20 25

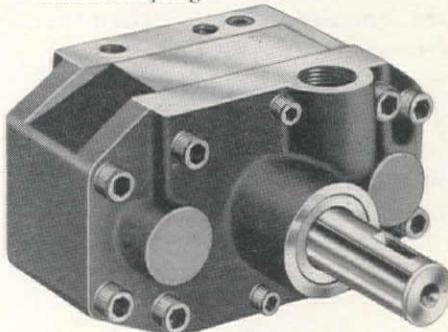
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GRE-SEN HYDRAULIC PUMPS

Made for use with dozers, scrapers, loaders, landlevellers, and other hydraulic-controlled earthmoving rigs. Low in cost, but include these important features:

- Semi-hardened gears.
- Gear shafts hardened and ground to high finish.
- 90%-dense bronze sleeve bearings.
- All bearings pressure relieved.
- Close-grain iron housing.
- Built-in relief valve.
- Permanent or torque bar mounting.

Gear and bearing wear is practically eliminated because pump operates on 3-gear principle that keeps hydraulic forces in balance. Pump mounts either (1) by use of simple splined coupling and anchor bar with fulcrum at least 12" from center of pump shaft, or (2) by use of rigid bracket and flexible coupling.



Model KJ (shown) has pump capacity of 12 g.p.m. Shipping wt. 22 lbs. Model KJH, 8 g.p.m., shipping wt. 20 lbs. Both develop 1000 p.s.i.

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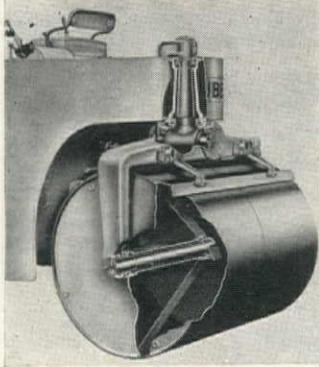
entire equipment. It can locate friction noises in bearings, pistons, gears, ratchets, cams, clutches, etc., in such a way that maintenance should find this portable Elec-Dec an invaluable asset.

1127

Tandem roller with a yoke to knock out scuff

New 8-12 or 10-14 ton tandem rollers have an exclusive yoke design which the manufacturer claims can knock the "scuff" out of tandem rolling jobs. The "scuff" or "rut" which is caused when the guide roll lags as the tandem stops to reverse direction is said to be eliminated in the completely adjustable guide roll assembly.

The yoke design makes it possible to adjust tapered roller bearings at (1) the kingpin, (2) the yoke swivel pin, and (3) the roll axle. Any looseness which develops can be corrected immediately, thus eliminating guide roll yoke "wobble," one of the main causes of "scuff." Another important feature of the tandem is the unit-welded steel frame which enables it to more than carry the required load. Side panels and crossmembers of the frame are cut from deep section, rolled steel, and are welded into a deep box. Additional lateral strength is provided by crossmembers of channel which also serve as the engine mountings. The 4 1/8-in. drive roll axle adds another strengthening cross-member, since it is bolted rigidly in place between the two



side panels of the frame. The kingpin housing is removable, and fits snugly into an especially welded compartment in the rear of the frame. All vital parts of the roller are readily accessible through adequate inspection plates and dust covers for on-the-spot servicing. The 8-12 ton tandem drive roll has a compression of 278 lb. per lineal inch, and the 10-14 ton exerts 326 lb. per lineal inch. Manufactured by the Huber Manufacturing Co.

1128

Map and blue-print reader for \$3.75

A German import for measuring maps and blue-prints is now available on a money-back basis from Marshutz Optical Co. The instrument resembles a thin pocket watch and has easily interpreted dials. It converts inches to miles or fractions, as well as miles to inches. Also converts centimeters to kilometers, nautical miles. Especially useful for measuring floor plans, circumferences, perimeters, or converting winding road map routes into definite mileage. Manufacturer offers the device on a money-back basis.

who else protects you with this kind of a WARRANTY?

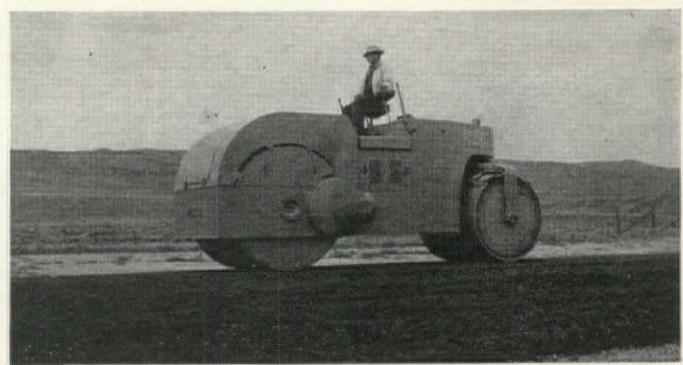
Many a manufacturer will guarantee his own products and replace them if they are defective. But the makers of Winslow Filters and Elements go further than that. Their written warranty guarantees not only the quality of Winslow products but also the safety of your equipment when these products are properly used on it. For this extra protection, look first and only to Winslow!



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Winslow Engineering Company

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We represent leading lines of fluorescent and incandescent fixtures to meet every requirement in industry and commerce. Get in touch with us for data on:

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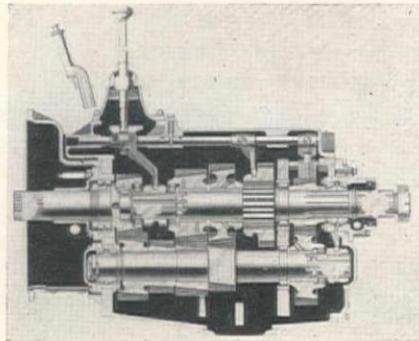
325 - 9th Street
San Francisco 3
Phone: MA. 1-3251

568 - 1st Ave. So.
Seattle 4
Phone: Mutual 2554

BRANCHES & DISTRIBUTORS IN KEY WESTERN CITIES

New transmission for use with torque converters

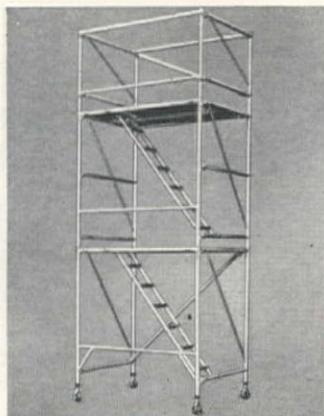
A transmission designed with four closely spaced gear ratios, and high ratio of capacity to weight, makes new load-and-road performance possible in heavy hauling where conditions are unusually severe. With the converter, it brings



smoother load pickup and climbing, elimination of shock load on engines, drive lines and axles, and greater operator ease. The transmission is manufactured by Fuller Manufacturing Co.

Only one man need handle folding aluminum scaffold

Wouldn't you like a lightweight scaffold as easy to open as your card table at home? One man, unassisted, can erect the base section of this folding aluminum scaffold in less than one minute.



This sturdy scaffold opens sideways with no member swinging more than 90 degrees, thus preventing danger of collapse during erection. Its tubular aluminum frames and casters make it easy to move either before or after erection. "Fold-a-Way" scaffold can be purchased from Patent Scaffolding Co., Inc.

Tilting 3 1/2-S concrete mixer saves operator's time

Kwik-Mix Co. is proud of its model 3 1/2-S Dandie tilting concrete mixer which incorporates features saving time and work for operators. One can easily tilt the loaded drum for discharging because the tilting device works through a gear reduction arrangement for minimum effect. A simple friction brake will stop and hold the drum in any position.



... to the job on a
UTILITY trailer

Progressive operators everywhere know they can depend upon Utility "Job Designed" Trailers. Typical is this special Low-Bed Multi-axle trailer with "Jeep" being used by the Owl Truck Company (whose entire fleet of Low-Beds are Utility built) to haul all types of heavy equipment from bulky power shovels to huge transformers, generators, etc., over all types of terrain.

Yes Utility "Job Designed" Trailers provide the user with equipment that will operate year after year with greater dependability and lower maintenance costs.

You will find the Utility Design Engineers ready to help solve your knottiest hauling problem.

Before you buy any trailer give the Utility Representative nearest you (they're in all Western

Cities) a call—Let him explain in detail Utility's many exclusive, money saving, better performance features such as 10 inch brakes, torque arm for Dual axle gear, etc. Remember for the epitome in Trailer Transportation

—IT'S UTILITY.

"America Needs Better Roads...NOW!"

UTILITY **Trailer Manufacturing Co.**
LOS ANGELES 54, CALIFORNIA

Its push-down tow pole gives safe one-man spotting anywhere on the job or hitching to truck for trailing. The machine is equipped with improved mixing blades, is only 43 in. high, and is powered by a standard make gasoline engine of 3.4 hp.

1132

Snake bite kit a "must" in rattlesnake territory

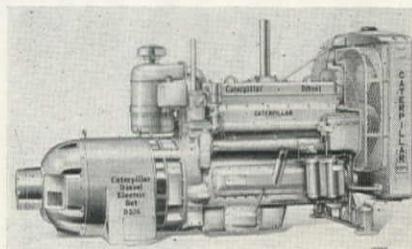
Whether at work or play in rattler territory, a first aid kit is always a wise precaution. The Saunders' Snake Bite Kit, introduced by Medical Supply Co.,



contains in a compact package everything needed for immediate action: the Saunders' venom suction pump (administered by the victim alone if necessary), a tourniquet, a lancet for opening fang punctures, ammonia inhaler for shock, iodine swabs, and adhesive bandages.

1133 New 6-cylinder diesel engine by Caterpillar

Cat D326, a high-speed diesel engine, with six cylinders and a 5 1/8-in. bore and 6-in. stroke, is in production at Caterpillar Tractor Co. This engine is offered



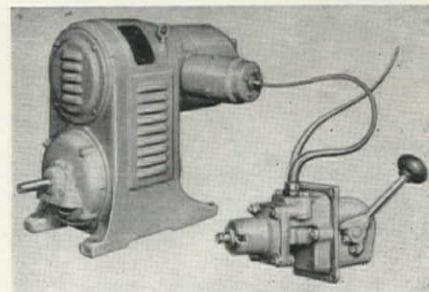
in three arrangements: (1) D326 Industrial Engine—intermittent output rating of 170 hp. at 2,000 rpm.; weight, approximately 3,650 lbs. (2) D326 Electric Set—12-hr. rated output of 80 kw.; set available as a 50-cycle unit, with a 60-cycle unit anticipated at a future date. (3) D326 Marine Engine—on 24-hr. continuous duty, produces 118 hp. at 1,600 rpm.

D326 follows last year's introduction of the Cat D337, similar in many ways but built for a higher horsepower output. With the engines came new developments in Caterpillar fuel injection system of individual pumps and valves. The pumps are mounted directly adjacent to the cylinders they serve, and the fuel lines made short and identical.

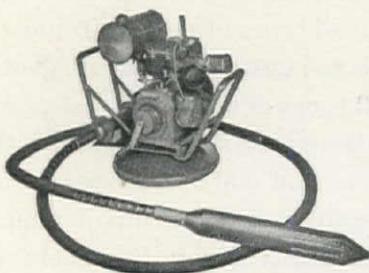
These pumps, as well as the intake and exhaust valves, are actuated by a single camshaft. Both engines include special heat resisting metal inserts in the tops of pistons and the valve seats. Main and connecting rod bearings are precision-type, of steel-backed aluminum with high fatigue resistance. Piston cooling is by means of oil jets from under-mounted nozzles.

1134 Pneumatic remote control for Varidrive motors

An efficient device to vary speed in U. S. Varidrive motors by pneumatic remote control is now possible. This control consists of a positioning unit—an air-operated plunger attached to the



Varidrive speed changing device and an air valve remotely controlling the positioning unit, which operates with an air pressure of either 60 or 100 psi. The check valves and control station selec-



Only White Vibrators Have All These Features

which have made them successful all over the world.

All Flexible Drive Sections are Interchangeable. No special sections, or expensive extra couplings needed. Each casing has ball bearing connector.

No Limit to Length of Flexible Drive. Each driving core has slip joint which does not separate in service. Prevents stretching.

All Vibrator Heads are Interchangeable. Can be put directly on any drive section. Can be opened for repairs. Double row ball bearings.

Grinding Spindles can be attached to any section. No special drive needed. For wet and dry grinding.

Standard Power Units. Gasoline engines or electric motors which can be serviced almost anywhere. Swivel base. Barrows.

Minimum of Repair Parts Needed. One spare driving core is ample. Either 7' or 12'.

Write for circular and name of nearest dealer.

Elkhart 24 White Mfg. Co. Indiana



Scrap iron and steel supplies are again running short of the amounts needed to maintain the present high level of steel production.

You're asked to search out the idle iron and steel in your plant and yard . . . and turn it over to your local scrap dealer.

Be sure to include obsolete machinery, un-used jigs and fixtures, gears, pulleys, chains, pipe and other equipment . . . non-ferrous scrap is needed now, too!

DON'T DELAY...

GET IN THE SCRAP NOW

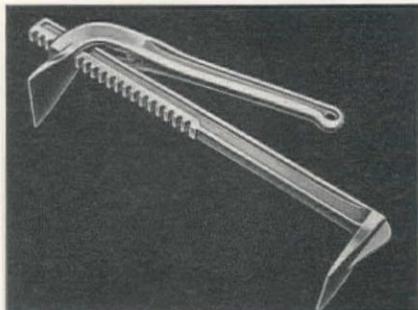


tors can change the speed of the Vari-drive from any number of control stations. Conversely, any number of Vari-drives may be controlled by one station if they operate at the same speed. Manufactured by U. S. Electrical Motors, Inc.

1135

Magnesium tongs take weight away from bricks

Magline, Inc., has introduced all-magnesium tongs handling up to eight bricks per load. This new light-weight unit

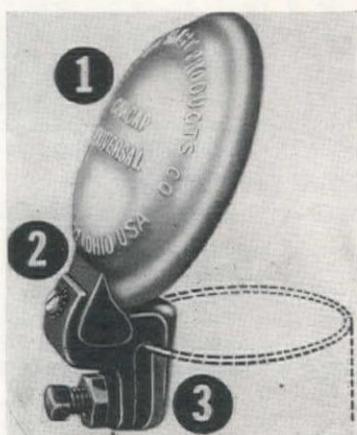


weighs only $2\frac{1}{4}$ lbs., approximately one-third the weight of similar steel tongs. Furthermore, its design provides for instant span adjustment and positive span lock in one simple operation. This engineered spring-action eliminates any need for bolts, pins or other removable parts normally required for making span adjustments and locking. The brick-gripping surfaces are of specially alloyed magnesium to insure longer wear, and they are grooved to prevent brick slippage.

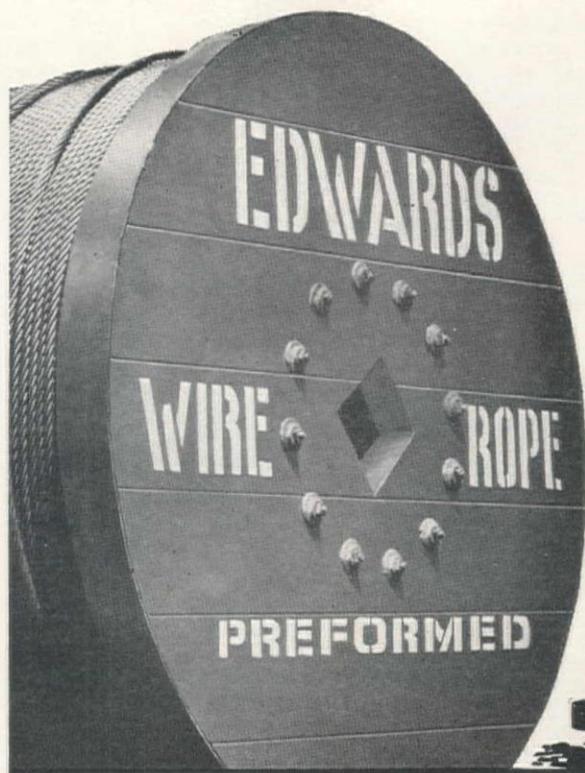
1136

Here's the latest design for exhaust protectors

Curious insects are only one of the many intruding elements which may enter the vertical exhaust pipes of en-



gines of all types. Canton Cast Products Co. has improved its Cancap exhaust protector in three noteworthy ways: The cap (1) is now a lightweight cast aluminum alloy fused around the top of a malleable tear-shaped hinge (2) affording extra lightness to open with first puff of exhaust, and giving the hinge strength for long life. Wider opening action is maintained by use of a cadmium plated



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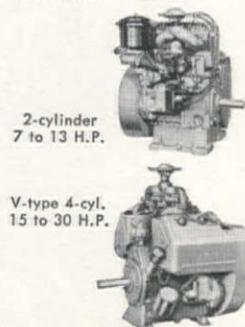


WISCONSIN Air-Cooled ENGINES

Fit the Job and the Machine

Because Wisconsin Air-Cooled Engines are supplied in a complete power range, from 3 to 30 H.P., in 4-cycle single cylinder, 2- and 4-cylinder types, there is an ideal size to fit all types of machines and power applications within this range, without wasted power and with maximum power service benefits. Heavy-duty construction, combined with extremely compact design and light weight are added advantages—and dependable AIR-COOLING permits trouble-free service under all climatic conditions.

Specify Wisconsin Heavy-Duty Air-Cooled Engines for the utmost in power satisfaction. Write for descriptive data.



WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 46, WISCONSIN

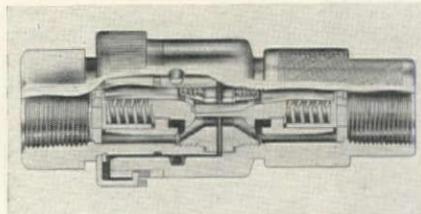
A 7111-1/2-R-5

set screw with shakeproof washer as pin of the hinge. A malleable mounting bracket (3) slips over pipe, held only by the set screw. Use of this exhaust protector is specified by the U. S. armed forces.

1137

A make and break double shut-off valved coupler

Henry Valve Co. has designed a make and break double shut-off valved coupler which was built originally for either ammonia or Freon refrigerants in connection with refrigerated trucks but also has wide industrial applications wherever pneumatic or hydraulic lines are in-



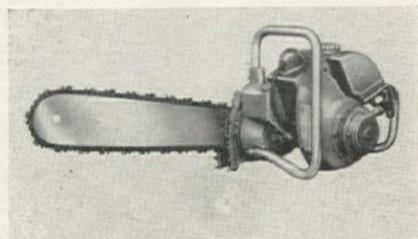
volved. As the two halves of the unit are coupled together, the two piston valves open by moving away from their respective seats. A soft molded insert, mechanically held in place, forms the seat in each half of the coupler. True alignment of pistons is insured by long guides. An "O" ring in socket half provides positive seal during connection. Protector caps are provided for cover-

ing coupler halves when disconnected. The Henry Wave-Flow Quick-Coupler is available in $\frac{1}{2}$ -in. FPT connections.

1138

Lombard announces speedy new 20-in. chain saw

A speedier and more powerful Woodlot Wonder saw for woodsmen and dealers is now available at the Lombard Governor Corporation. The Model 3



class of Woodlot Wonder Chain Saws now contains 16-in., 20-in., and bow saws.

1139

Sno-Blo attachment plows a clear trail

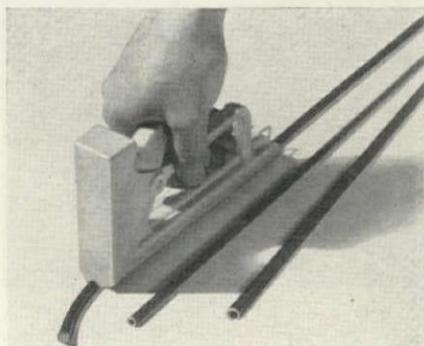
The Sno-Blo, a 52-in. propeller attachment for V snow plows and snow wings, is now available as added equipment for Adams Motor Graders. The new device blows snow off the right-of-way as it is delivered off the end of the snow plow. The Sno-Blo attachment can

completely dispose of snow falls as they occur or the wing with blower can be used to blow away snow banks built up by plows. It may be ordered as original equipment on Adams snow wings or it can be applied to any Adams wing of current design in the field. Manufactured by J. D. Adams Manufacturing Co.

1140

Automatic fastening gun shoots lines into position

This hand-operated yet powerful machine provides swift, easy and economical installation of cables and hollow



tube lines. One hand drives bands into anything from soft wood to cinder blocks, the other guides the lines into position. Developed by the Heller Stapler Co., the gun uses a special Heller extra-size band with leg lengths varying from $\frac{3}{16}$ to $\frac{1}{2}$ in.

MOVE IT HERE! MOVE IT THERE!...the

MURPHY Portable CONTRACTOR'S SCALE GOES Anywhere!

BUILT
TO
BE MOVED
AS ONE
UNIT!

ALL
STEEL!

BY OVERALL WIDTH SCALE TRUCK

This rugged, all-steel, heavy duty scale is a proven time saver and money saver for contractors, road builders, and material handlers! Scale can be hauled completely assembled by simply removing tip end of transverse lever at bolted splice and tightening hold down bolts (see photo). No dismantling or reassembling! No wasted motion in moving from job to job!

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30-Ton	24' x 9'
40, 50-Ton	34' x 9'
Other capacities and platform sizes built to suit.	

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NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Elsener now veep

L. A. Elsener, manager of the San Francisco office of Chicago Bridge & Iron Co., is now a company vice president. Elsener has been associated with the firm for 30 years, and has managed in San Francisco since 1928. He is a past president of the San Francisco Engineer's Club.



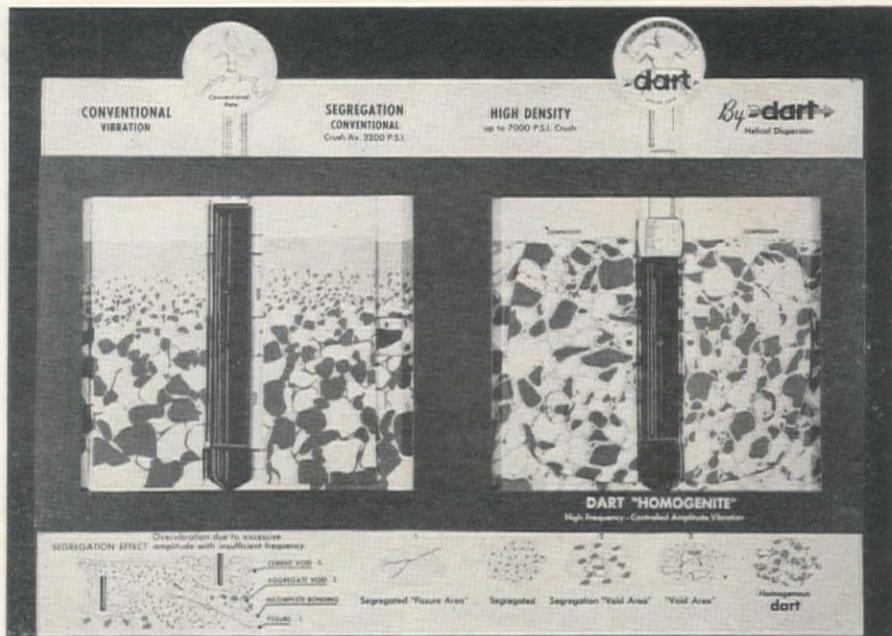
Elsener

Larkin

Lull west coast rep

Lull Manufacturing Co. announces the appointment of Frank Larkin as West Coast District Representative, with territory in California, Nevada, Arizona, Utah, Idaho, Oregon, Washington, Montana, Wyoming, Colorado, and British Columbia and Alberta in Canada. Larkin formerly had been associated with Industrial Equipment Co. and Link-Belt Co. He will now promote the sale of Lull equipment, including the complete Shoveloaders line as well as Traveloaders, tilting-tower Universal Loaders, four-wheel drive Tractor-Shoveloaders and fluid-driven Sweepers. Larkin's headquarters will be in Los Angeles.

NEW SPOKANE FACILITIES for Cummins Diesel Sales, Inc., are shown below. The building is 80 x 180 ft., with four drive-through truck bays. The truck repair area will accommodate 12 truck chassis at one time. The Cummins headquarters are directed by John Cannon, president, and John Peters, manager, who will see that Cummins users in western Montana, northern Idaho and eastern Washington will be served at this address, 3904 East Trent Ave., Spokane.



A NOVEL ADVERTISING DEVICE is this animated display board 24 x 36 inches exhibited by Dart Manufacturing and Sales Co., manufacturer of Dart concrete vibrators. It illustrates the principle of concrete vibration, one section showing the dangers of over-vibration, and the other section with the Dart vibrator head showing how high frequency, controlled amplitude vibration causes the head to remain in continuous contact with the aggregate.

Stoody Co. distributors

Stoody Co., Whittier, Calif., manufacturer of hard-facing alloys, announces the appointment of the following Western distributors: Balaam-Raymond, Welding Supplies, Emeryville, Calif., covering Alameda and Contra Costa counties; Harry T. Hanover, San Francisco, covering San Francisco, Napa, Solano, San Mateo, Contra Costa and Alameda counties; H. M. Parker & Son, Glendale, Calif., covering Inyo County and portions of Kern, Los Angeles and San Bernardino counties; General Distributing Co., Great Falls, Mont., covering northern Wyoming and Montana, with the exception of the

northwest portion; E. Cosgrove, Inc., Silver City, N. Mex., covering Catron, Grant, Sierra, Hidalgo and Luna counties; Western Oxygen Co., Hobbs, N. Mex., covering Eddy and Lea counties in New Mexico, and Andrews, Gaines and Winkler counties in Texas; Wear-Weld Products Co., Portland, covering a 150-mi. radius of Portland.

International Harvester has new lab and engineering building

The International Harvester Co. announces the opening of its new engineering building and laboratories in Fort Wayne, Indiana. The spacious, well-equipped \$8,000,000 structure houses facilities for the motor truck division, and will permit completion of engineering and research projects more quickly and efficiently. The company now has tripled the floor space available for the work, and has quadrupled the test facilities.

L. C. "Pete" Petrie promoted at Erbco

L. C. "Pete" Petrie has been promoted from the position of field salesman to manager of the Edward R. Bacon Co.'s Oakland plant. He will be in charge of the shop, warehouse and office sales. Petrie has long been associated with the Erbco organization.

Hewitt-Robins, Inc., opens in L. A.

Hewitt-Robins, Inc., manufacturer of industrial rubber products, foam rubber products and conveyor equipment, is opening new Western Division headquarters in Los Angeles. Products to be stocked in the new offices and warehouse building will include belting, hose and conveyor and screening machinery. The

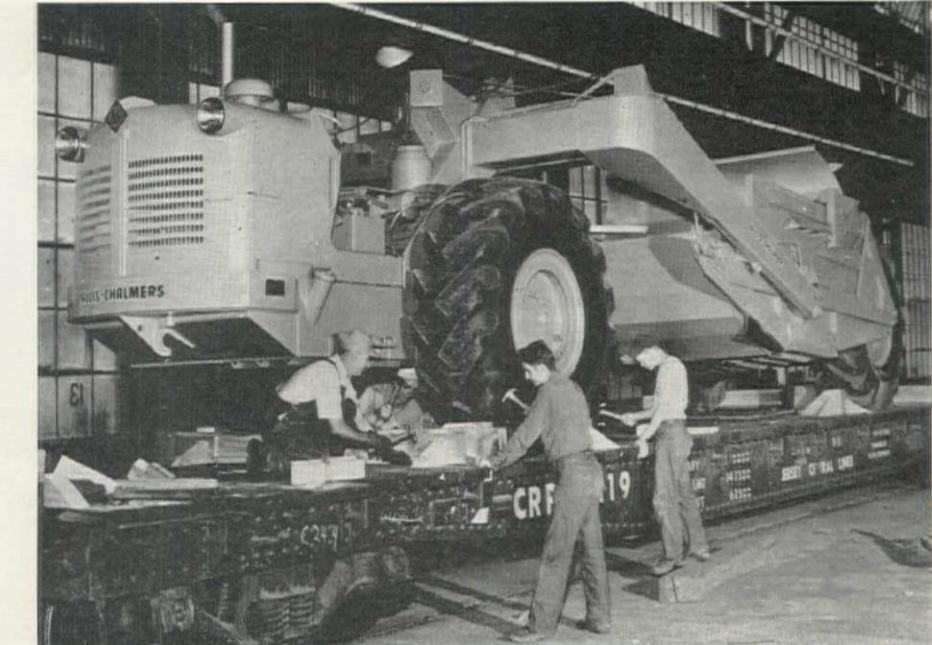
company has been developing its sales organization on the West Coast for the past two years. Western Division manager is G. V. Migula, assisted by district managers Marion D. Austin and James E. Van Stone.

Murphy-Campbell will distribute for "Cat"

Arrangements for Murphy-Campbell Co. to distribute for Caterpillar Tractor Co. in six southwest Washington counties call for the opening of a new specially-equipped building in Tacoma. The firm also has an office located in Centralia to provide service in that area. Meanwhile, Murphy and Campbell have been liquidating their Northwest Tractor & Equipment Co. in Seattle.

Allis-Chalmers acquires LaPlant-Cheote Co.

LaPlant-Cheote Manufacturing Co., Cedar Rapids, Iowa, is now operating as the Cedar Rapids Works of the Allis-Chalmers Tractor Division, following its recent acquisition by the latter firm. Products of the Cedar Rapids Works mark the entry of Allis-Chalmers into the motor scraper field. The earth-moving equipment developed during 41 years by LaPlant-Cheote includes: the TS-200 motor scraper with a capacity of 10 cubic yards struck and 13 heaped; the TR-200 rear-dump motor wagon with capacities of 18 tons or 11 and 15 cubic yards struck and heaped; the TS-



THE FIRST MOTOR SCRAPER (Model TS-300) with an Allis-Chalmers label shown leaving the production line (see item).

300 motor scraper (illustrated) of 14 and 18 cubic yards struck and heaped; and the TW-300 bottom-dump motor wagon of 22 tons capacity or 14 and 19 cubic yards struck and heaped.

A. D. Dennis, president of LaPlant-

Cheote, now is general manager of the Cedar Rapids Works. The LaPlant-Cheote works manager, Wallace Gates, and H. W. Rockwell, chief engineer, retain their same positions for Allis-Chalmers.

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**For Belt Conveyors
and Bucket Elevators**



**"PULLEY WITH THE
DRIVE INSIDE"**
Safe, compact, simple . . . no
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Pulley shell of this revolution-
ary head pulley rotates around
electric motor and reduction
gears, which are held station-
ary by torque arm attached to
conveyor frame. Quickly in-

stalled — requires no more
room than idler pulley. All
moving parts protected against
weather, grit, dirt. Diameters
16" to 48". 5 to 75 hp. for
voltages to 2300. Job proved.

Write TODAY for folder and name of nearest distributor.



YUBA MANUFACTURING CO.

Pulley and Sprocket Dept.

Phone 628

Benicia, Calif.

52

**Holman
(left)**



**Holman returns to Peterson
Tractor & Equipment Co.**

A. M. "Red" Holman is back with Peterson Tractor & Equipment Co., and will handle industrial sales at the company's headquarters in San Francisco. Holman, well known in the area, was sales manager for Peterson before leaving for the Northwest several years ago.



**Paul H. Hunter (left) P&H head in
Seattle, and "Bob" Ebersole (right) of
Interstate Tractor & Equipment Co.'s
construction equipment sales department.
Their names were reversed in the
last issue.**

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Cummins promotions

C. R. Boll, Jr., has been appointed general sales manager, responsible for engine, parts and contract sales, the company regional organization, and advertising and sales development for Cummins Engine Co., Inc. His former position as manager—engine sales, is now the position of sales manager—engines, and is headed by C. B. "Charlie" Foster, who had been manager—contract sales.

Thermoid Co. president

George S. Fabel, formerly vice president, has been elected president of the Thermoid Co., succeeding Fred E. Schulter, who recently resigned. Fabel began with the company over 30 years ago and was a vice president since last spring.

Caterpillar changes

Three new personnel changes have been announced by Caterpillar Tractor Co. Delmar R. Lammers is new service manager to assist in general service administration, his former position as eastern division service manager now filled by Merle W. Dargel, who has been promoted from service engineering man-

ager. Theodore M. Fahnestock is resuming management of the service engineering division after returning from military service.

Fairbanks, Morse transfer

Paul R. Flood, formerly manager of manufacturing of the Fairbanks, Morse & Co. Beloit, Wisc., plant, is now general manager of the company's Pomona (Calif.) pump works.

Lincoln Engineering Co. appointment

Carl H. Mueller, who joined the company in 1934, will assume full charge of engineering and research as director of engineering for Lincoln Engineering Co., St. Louis, Mo.

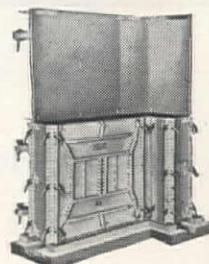
Masonite president

John M. Coates is the newly elected president of Masonite Corp., succeeding Eugene Holland, who recently resigned. Coates has been connected with Masonite since 1939, having served as legal counsel up to 1947, when he was made vice president of operations.

Westerners speaking in Chicago

Speaking at the Second Annual Short Course School of Instruction conducted by the American Concrete Pipe Assn. in Chicago from November 20 to 22, will be P. H. McGahey of the University of California and R. Robinson Rowe of the California Department of Highways. McGahey will talk on "Concrete Pipe in Sewer Construction," and Rowe will discuss "Concrete Pipe in Culvert Construction."

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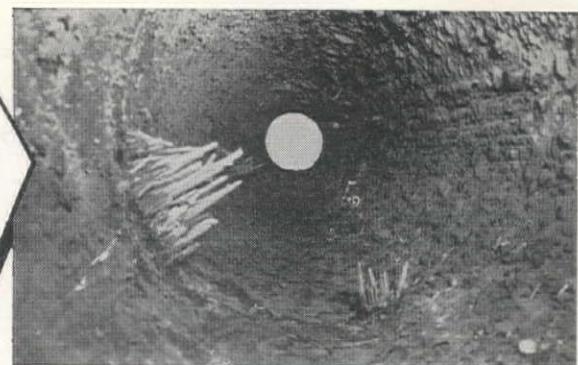
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AND...without appreciably disturbing present service!

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PIPE LININGS, INC....and a new, continuous, smooth surface cement mortar lining is applied...with only momentary interruption to install by-pass lines.

If your lines look like this...find out how you can get new pipe performance at much less than the cost of new line. Write TODAY!



CEMENT MORTAR LINING WILL...

Protect against discoloration and contamination
Protect against corrosion
Improve flow coefficients
Prevent leakage
Reduce maintenance costs
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Please send complete information on how we can obtain new pipe line performance from our old line.

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**TATE PROCESS USED
on Line 4" to 16"**
**CENTRILINE PROCESS
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South Gate, California
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140 Cedar St., New York 6, N.Y.)

Space is sold as advertisers' inches. All advertisements in this section are $\frac{1}{8}$ in. short of contracted space to allow for borders and composition.

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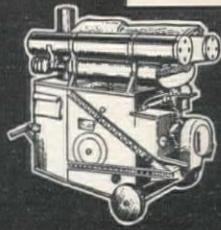
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