

WESTERN

CONSTRUCTION

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JUNE 1959



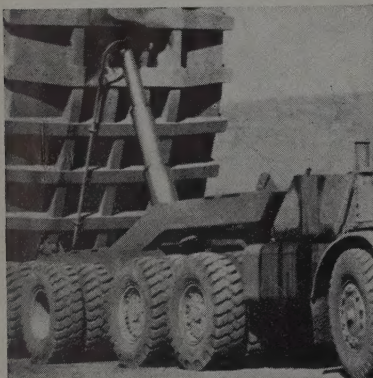
1. NO HARMFUL DEPOSITS, no stuck rings or valves in diesels lubricated with Texaco Ursa Super Duty, a series 3 oil because Ursa is refined and processed specifically to keep engines clean and on the job with minimum maintenance.



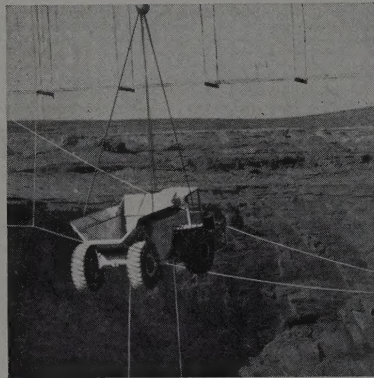
2. DUST AND DIRT STAY OUTSIDE when you lubricate wheel bearings, chassis and water pump with Texaco Marfak Multi-Purpose. 2. Marfak stays put despite shock, vibration and moisture.



3. SHOCK AND STRAIN won't break the tough film that Texaco Universal Gear Lubricant 1 puts on differential and transmission gear because Universal Gear Lube is designed to take highly concentrated extreme pressure loadings.



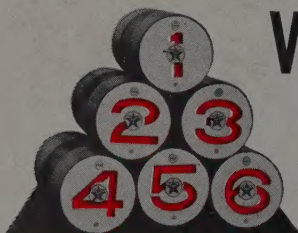
4. HYDRAULIC SYSTEMS STAY CLEAN, give steady, powerful hydraulic action, with Texaco Regal Oil R & O. It's inhibited to prevent rust, minimize oxidation and foaming. Keeps air compressors on the job longer, too.



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The Texaco Simplified Lubrication Plan combines special and general-purpose lubricants to handle the greatest variety of equipment with the fewest possible lubricants.

Every Texaco Simplified Lubrication Plan is organized for a particular job. That way you get top performance from every piece of equipment, plus all the advantages of low lubricant inventory: fewer manhours spent in storage and handling, less paperwork in ordering, less chance for mistakes in application. A Texaco Lubrication Engineer will be glad to develop a Texaco Plan to meet your needs. Just call the nearest of the 2,000 Texaco Distributing Plants, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.



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NEVADA: Sierra Machinery

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Los Angeles,
Calif.



0 YEARS OF SERVICE and still going strong!

► The picture above shows an old veteran Model 5 Northwest bought 30 years ago by the Blue Diamond Corporation of Los Angeles, Calif. Beside it is a new Model 6, the ninth Northwest bought by this well-known California supply dealer. Thirty years is a long time and it is not through yet. When the Model 6 takes over, the old machine is to be mounted on concrete and is expected to give 10 years more service. We built them tough in those days—but they are tougher today.

Go through the whole Northwest Machine—any model from the big 95 to the Model 25-D! Booms!—sturdier for workhorse lifting—Uniform Pressure Swing Clutches for smooth swinging, and accurate spotting...cool running, trouble-free!—the "Feather-Touch" Clutch Control with the "feel-of-the-load", free of the complication of delicate mechanisms, valves, pumps and compressors,—a choice of Boom Hoists including the Northwest Independent High Speed Boom Hoist, a rugged unit capable of double-free service in hour-after-hour operation—a wide range of other equipment including Pivoted Gentries, Removable Counterweight, Sectional Boom Hoist Rigging and Pendant Lines, Telescopic Boom Struts, Adjustable Jibs, extended Boom Joint Sheave Shafts, and 3rd Drums that make possible three load lines.

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Mr. Charles D. Johnson operator of the new Model 6 was formerly the operator of the old Model 5. He says, "I have been a crane operator for Blue Diamond Corporation for five years and formerly operated their 30 year old Model 5 Northwest. What I like best about the new Model 6 is the "Feather-Touch" Controls. Still, maybe the brakes are the best feature—so smooth and soft. Another thing I like is the Murphy engine—it supplies plenty of power. You can't bog it down—I've tried!"

NORTHWEST... always ready to GO!

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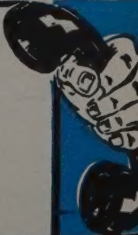
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WESTERN

CONSTRUCTION



JUNE

1959

Vol. 34

No. 6

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FRONT COVER—Boulder is 'dozed down a steep slope by a Caterpillar D8 at the site of world's biggest highway cut near Los Angeles. Belt loaders keep fleet of 80 earth haulers moving fast. Story starts on page 45.

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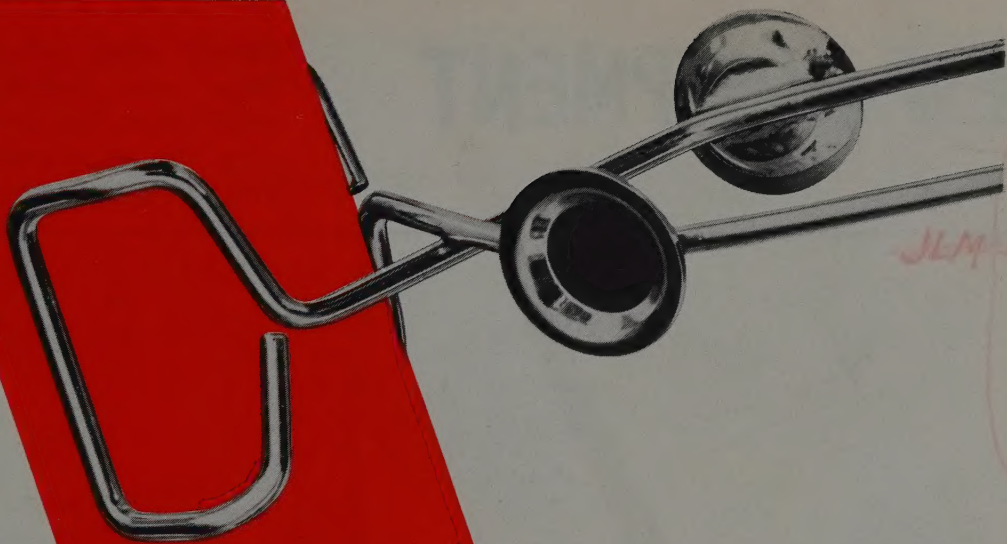
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... for more details, circle No. 9 on Reader Service Postcard

NEW EQUIPMENT

Obtain more information on these new developments in construction equipment by circling the corresponding numbers on reply postcard.



L-W introduces big truck line

Three big off-road trucks incorporating "earth-mover" rather than "automotive" type components have been introduced by LeTourneau-Westinghouse Co.

Line, designated "Haulpak," consists of two end-dump trucks with capacities of 27 and 32 tons and a bottom-dump model of 80-ton capacity. The over-slung engine trucks have a wheel base of 130 in. and a turning radius of 44 ft. which is comparable to a large passenger car. Trucks have an air-oil piston suspension system which eliminates springs and conventional axles. All steering components are located within or above the frame to give the Haulpak line nearly twice the front-end ground clearance of conventional trucks. Chassis grease fittings have been eliminated by use of factory sealed bearings which need regreasing only if disassembled.

The 27-ton Haulpak is powered by a Cummins 335-hp. turbocharged engine and operates at 35.4 mph. The 32-ton model is equipped with a Cummins 375-hp. with a top speed of 38.8 mph. The big 80-ton bottom-dump model has a Cummins V-12, 450-hp. engine and a top speed of 40 mph. All three models have torque converters which provide four forward ranges and two reverse. They incorporate automatic

lock-up to eliminate torque converter slip. Power steering and power brakes are standard equipment and the option list includes cab air-conditioning.

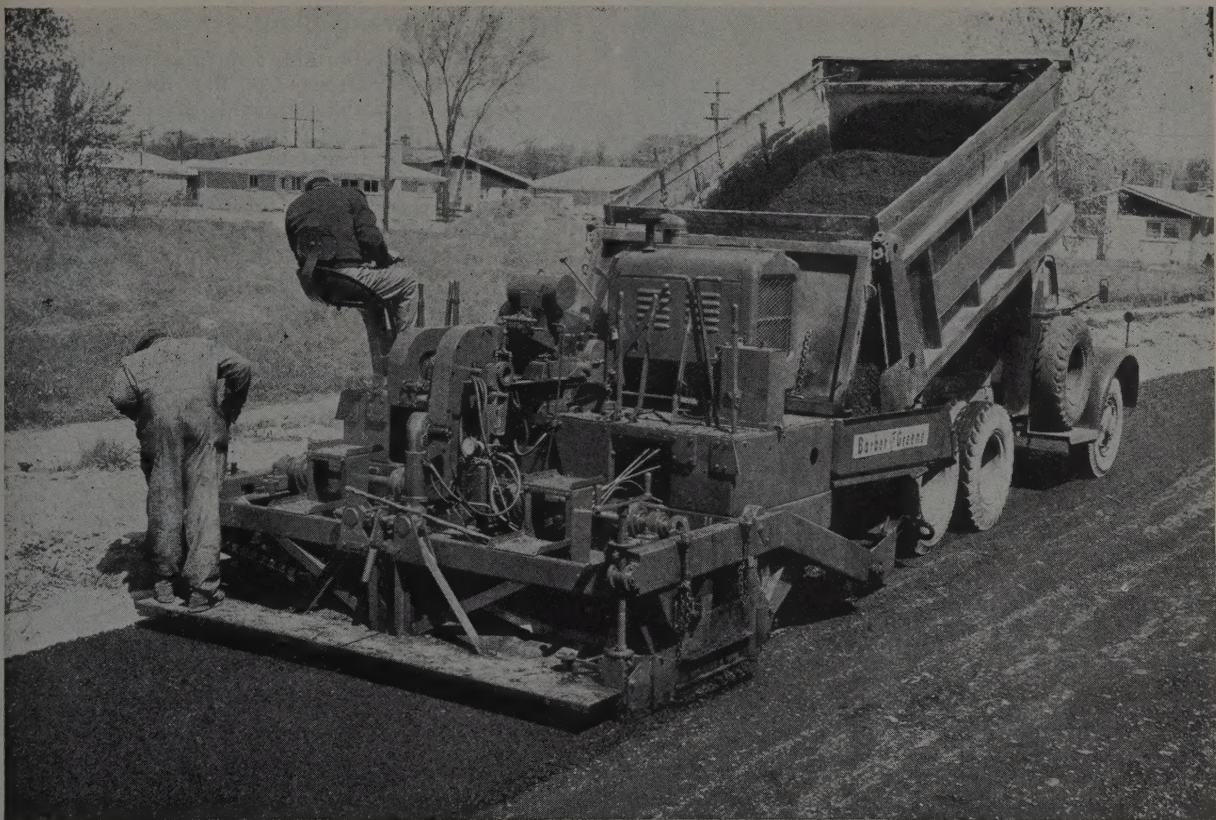
The L-W power-transfer differential, in use on scraper equipment for the last 10 years, is incorporated in the new trucks. Using a simple friction principle it automatically transfers the bulk of engine power from a slipping drive wheel to one on the best footing.

The low set box-beam body can be elevated to 70 deg. by twin hydraulic hoists to dump full loads in 15 sec. Body is heated by an exhaust circulating system through the hollow box beams to keep wet, cold loads from sticking. Braking system includes a torque retarder which is an integral part of the transmission as well as multiple-disc air brakes. Both systems are controlled from the same pedal. Disc brakes are air cooled and cleaned by filtered air under pressure from an independent compressor. Angular cab has a canted windshield to cut glare and reduce clinging of moisture or frost.

Prices of the Haulpak line are: Model 27 end-dump \$54,605; Model 32 end-dump \$60,963; and the Model 80 bottom-dump \$87,500.

... Circle No. 13

(Continued on page 20)



Barber-Greene Model 879-B—the universal finisher for any size job—shown paving street for housing development. Write for information on this famous finisher.

The asphalt finisher for all jobs large or small

... Barber-Greene 879-B

With introduction of the Model 873 finisher, which paves on crawlers and travels on rubber—and with the recent Barber-Greene announcement of two new heavy-duty finishers for the ultimate in high-capacity, continuous operation—there have been many questions about selection of the *right* finisher.

Whatever the job, the new, improved Barber-Greene Model 879-B is the universal asphalt paving machine. Unmatched for jobs of all types and sizes, this famous finisher is the paving standard of the world. Its exclusive tamping-leveling principle gives unequaled mat quality while laying any asphalt mix. New improvements include: 25% more power, new transmis-

sion, 60% greater hopper capacity, 45% faster paving speed, faster travel speed, new tamper design, improved screed for longer life, and new crawler design.

FOUR DIFFERENT FINISHERS

Model 873—paves on crawlers . . . travels on rubber. Designed for scattered jobs, from driveways to highways.

Model 879-B—the universal finisher for all types and sizes of jobs.

Models SB-60 and SA-60—pneumatic-tired or crawler-mounted—heavy-duty, high-capacity, high-speed machines.

These are just the high spots. Ask for complete information on all four.

59-11-F

Barber-Greene

AURORA, ILLINOIS, U.S.A.

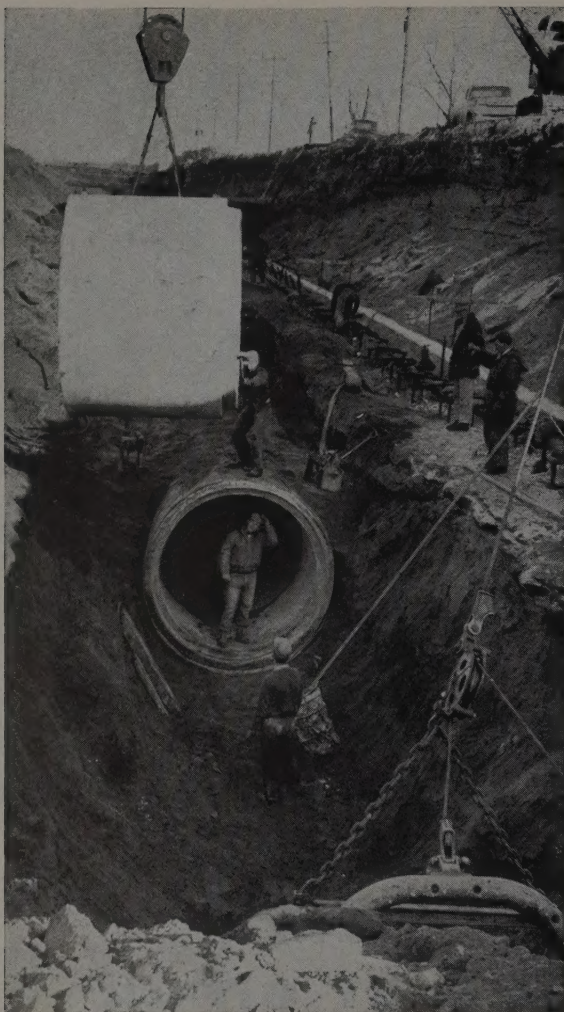


CONVEYORS...LOADERS...DITCHERS...ASPHALT PAVING EQUIPMENT

... for more details, circle No. 13 on Reader Service Postcard

WESTERN CONSTRUCTION—June 1959

19



STANG LOWERS THE WATER TABLE 20 FT. IN -15° WEATHER

Sub-zero weather, yet business as usual—thanks to the reliability of a Stang Wellpoint System. In any weather, under all conditions, you can depend on Stang engineered dewatering systems. Call on the John W. Stang Corporation next time you have a dewatering problem. They're first in engineering, first in equipment, and first in service.

PROJECT: STORM DRAINS FOR MINNESOTA STATE HIGHWAY DEPT., BLOOMINGTON, MINNESOTA. CONTRACTOR: BARBAROSSA & SONS, INC., ST. CLOUD, MINN.

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... for more details, circle No. 14 on Reader Service Postcard

Portable screening plant

A simplified, truly portable screening plant has been marketed by **Barber-Greene Co.** The plant, Model PS-70, consists of a portable belt loader, receiving hopper and feeder, with a vibrating screen attached. The entire unit can be folded up and towed on its way on trailer mount without disassembly. The screen is folded under the conveyor for travel. Because the plant screens while it loads, it allows the two operations to be performed simultaneously. The unit is



powered by a gasoline engine with belt and chain drive linkage. The entire operation is controlled by means of a head pulley clutch located at the head end of the conveyor. This clutch controls feeder and conveyor, but allows the screen to operate continuously. The screen is driven by a positive chain drive from the clutch shaft. Screen angle is adjustable to regulate capacity and to accommodate various truck heights. Conveyor has all welded side panels of Warren truss designed with bolted lateral bracing and steel decking to protect the return belt from falling material. Sectionalized construction permits lengthening or shortening in the field. Reciprocating plate feeder is an integral part of the conveyor foot but is easily removed. Heavy steel dozer trap readily bolts to the feeder frame or an all-welded steel plate hopper may be substituted when plant is to be fed by shovel, front-end loader or drag-line. PS-70 portable screening plant literature is available.

Conveyors also are available separately in widths of 18, 24, 30, and 36 in. and in lengths of 33-60 ft. in 3-ft. increments. They are offered in three types of drives, torque arm powered by an electric motor, V-belt and countershaft drive powered by gasoline engine, and line shaft drive powered by gasoline engine.

... Circle No. 151

Lock aligns highway forms

A cam locking device which pulls form into alignment is incorporated in the new Cam-Lok Road Form manufactured by **Heltzel Steel Form and Iron Co.** A simple quarter turn of the cam draws treads and faces of both form sections into alignment. The resulting joint can't shake loose regardless of vertical stress imparted by weight of machines or horizontal thrust of spreaders and finishers. Locking unit eliminates slogging and resulting form damage. Heltzel forms are built of 1/4-in. steel plate with channel stake pockets welded to the form to provide maximum sup

(Continued on page 24)

Haulpak[®]



Hauls more tons per man-hour!

This LW Haulpak is all new from the wheels up. It is the result of more than 3 years of research and development by LeTourneau-Westinghouse engineers — pioneers of a long list of earthmoving and hauling equipment. Although brand new, Haulpak is a fully-proven truck. All three models have been put through rugged tests under the toughest working conditions for over 14 months — in mines, quarries, and on construction jobs. Its various parts and assemblies — some of them tested and proved by *millions of hours* on LW Tournapulls all over the world — are much stronger than those on ordinary haulers. With the all-new LW Haulpak truck you can be confident your truck maintenance, repair, and operating costs will drop to a new low . . . and your hauling tonnage will climb to new highs!

Check the job-tested Haulpak features listed here. Then visit your nearby LeTourneau-Westinghouse Distributor . . . let him give you detailed specifications on the new Haulpaks. Call on him soon!

*Trademark HP-2099-G-2

LW Parade of Progress continues:

The new Haulpak truck is the latest addition to an impressive line of new and improved earthmoving and hauling machines being unveiled by LeTourneau-Westinghouse Company. They're part of LW's continuing program of product development to give you highest production equipment at lowest ownership-operating cost.

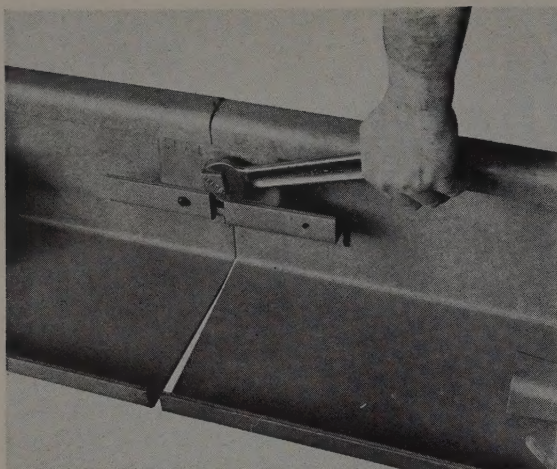


LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

for more details, circle No. 16 on Reader Service Postcard



port. Cam-Lok casing is formed from $\frac{3}{16}$ -in. rolled steel plate and rides in a heavy Z-bar slide. Lock guides are provided at each end of the form so that the Cam Lok may be interchanged. Cam-Loks are easily positioned by hand. An open end wrench is the only tool needed. One size lock fits all Heltzel forms, and it is possible to lock two different sized forms together with treads and faces in alignment. Forms are available in single or double wedged types with or without upturned base flange. One cambered base end on each form permits curves of 75-ft. radius.

... Circle No. 152

Steam unit for on-the-job cleaning

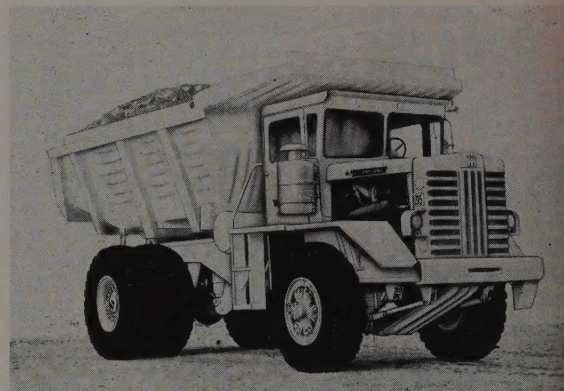
A portable oil-fired steam-jet cleaner with 100-gph. capacity has been introduced by **Pantex Manufacturing Corp.** Identified as the Speedysteam 100, the unit is completely enclosed and mounted on four rubber-tired wheels. The machine has built-in soap tank and controls. It can be operated on kerosene or fuel oil



and has fully automatic ignition. Heating coils are $\frac{1}{2}$ -in. diameter, continuous wound and produce cleaning pressures of 50 to 150 psi. in 90 sec. It can operate six to seven hours with one soap filling. The unit is equipped with a $\frac{1}{2}$ -hp. motor, 20 ft. of wire-braided $\frac{1}{2}$ -in. steam hose, and has racks for hose and power cord. Cleaning gun is insulated and designed for ease of handling. Literature available. ... Circle No. 153

Rear-dump trucks feature ribbed body

Two rear-dump, off-highway trucks featuring new International diesel engines and exclusive corrugated bodies are now in production by **International Harvester Co., Construction Equipment Div.** The units are: Model 95 Payhauler, with heated body, struck capacity of 18 cubic yards and 27-ton payload; and Model 65 Payhauler, struck capacity 12.5 cu. yd. and a 19-ton payload. Both are powered by an 817 diesel engine, the most powerful ever built by International. In the big Model 95 the engine is turbocharged and has a rating of 375 hp. In the smaller Model 65 it is naturally-aspirated for a 250 maximum hp. The engine is 6-cylinder, 4-cycle direct-start, with a compres-



sion ratio of 16:1. The corrugated bodies eliminate as much as 30% dead weight without sacrificing strength. Wear floors, side and front sections are formed of $\frac{3}{8}$ -in. corrugated steel plate with corrugated subfloors to provide passageways to heat the body. The rock ribbed corrugations are designed to absorb shocks while resisting wear and distortion. Model 95 has speeds up to 38 mph. and a choice of torque converter or 9-speed air-shift transmission. The 19-ton Model 65 has a top speed of 36.5 mph. and a 10-speed, constant-mesh transmission. The exclusive inverted hoist action on both models permits 11-second dumping and keeps the pistons clean. Twin hoists on the Model 95 Payhauler are of two-stage design, while the single hoist of the Model 65 Payhauler has three-stage design. New power system provides 20% increase in mechanical leverage. Improved braking system includes Torqmatic brake on the "95" for greater downgrade safety. Both trucks are available in either federal yellow or International Harvester red.

... Circle No. 154

Dodge introduces diesel truck series

A series of Dodge trucks powered by Cummins diesel engines has been announced. Although slated for its 1960 line, the first of these diesel units, a tandem tractor, went on display last month. The trucks will use four Cummins engines, NH-220, NH-180, C-175 and NH-195. They will be available on three basic Dodge truck models with gross vehicle weight range from 27,000 to 53,000 lb. and a gross combination weight range of 50,000 to 76,800 lb. The trucks will go on sale at Dodge dealers this fall. The engines include the C-175 turbo-diesel, a light engine weighing 1,575 lb., which offers greater fuel economy, a weight-per-horsepower ratio of only 9 lb., and less

New **ROTOPAMIC** air cleaner saves over 80% of maintenance costs!



RotoPamic air cleaner installation on 18 units is saving a company in Boron, California, over \$20,000 a year in air cleaner maintenance costs. Total cost of RotoPamic installation was less than \$4,700.

The 18 units included:

- 1—Michigan 480 Dozer
- 1—Michigan 310 Scraper
- 1—Winter-Weiss Core Drill
- 3—D12 Caterpillar Graders
- 2—D9 Caterpillar Dozers
- 1—D8 Caterpillar Dozer
- 9—Euclid SS24 Scrapers

Farr RotoPamic air cleaners remove over 99% of all dirt and dust from intake air under all operating conditions. The RotoPamic is not affected by operating angles or by wet weather. There is only one absolute air seal used, and it is automatically renewed at each service. No daily or weekly service necessary, no dust cups to empty. The first stage is self-cleaning. The second stage has 30% more aftercleaner area. Together, they have a pressure drop of only 3.5" wg. The Farr RotoPamic offers greater operating range, much longer life, and more complete protection than any known air cleaner—oil bath, dry-type, or combination.

(Farr air cleaners—standard on railroad diesels for more than 12 years, over 1,000,000,000 miles of rugged service.)

For full information write to:

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... for more details, circle No. 17 on Reader Service Postcard



power loss at high altitudes. Engines also include the exclusive PT fuel system, the chief advantage of which is simplicity of operation and low number of working parts. Company spokesmen said the diesel trucks which are offered in addition to the Dodge's regular gasoline powered models are particularly suited for operation in states west of the Mississippi River.

... Circle No. 155

Rake attachment uproots trees

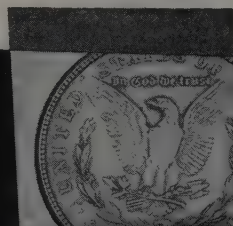
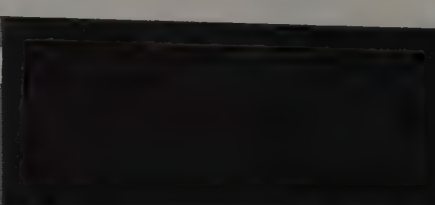
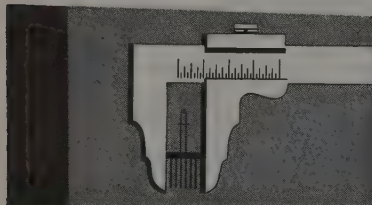
Shunk Manufacturing Co. offers a rake attachment for rubber-tired or crawler-type front loaders. The



unit, known as the Shunk-Winget Bucket-Type Brush Rake, is interchangeable with the loader's bucket. It is designed to speed land clearing jobs by raking out brush, hedge rows and trees with minimum displacement of soil, and piling them as high as 8 ft. for disposal. Rooting out a tree is accomplished by making a pass along both sides of the tree to sever the lateral roots. Then the rake is raised aloft and its teeth used to push the tree over. The extra high lift on a bucket loader provides excellent leverage for pushing over high trees. Tests have shown that this mechanical advantage enables crawler bucket-loader units to clear as much as 50% more land.

... Circle No. 156

(Turn to page 174 for more new equipment.
New literature can be found on page 164.)



Are you certain no holes exist in your Builder's Risk Insurance?

A loophole can lead to a loss, and so it makes good reliable sense to have protection with a policy created by National Surety Corporation—a company backed by the *Fund of Experience*. Talk to your independent agent or broker. Ask him to explain the many advantages you gain with National Surety Corporation.

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WESTERN CONSTRUCTION—June 1959

Pushing the highway cost curve to 1975

THE YEAR 1975 seems to be an accepted target for planning the future highway needs of these Western states. The required studies and the resulting program will be founded on research into: (1) the volume and types of traffic in 1975 with designs which will be adequate, and (2) the cost of building these highways of tomorrow.

Engineers in state highway departments who are assigned the responsibility of these predictions of the future are forced to deal with more unknown factors than solid facts. Their work must be based on elements beyond their control and trends which defy the experts. For example, population growth has been a scientific study for years, but the experts find difficulty in evaluating the exploding economy of the Western states and the automotive demands of the coming generation. It is more than fifteen years to 1975 and a backward look shows the problems of anticipating speeds, weights, sizes, and traffic problems with any degree of certainty for such a period of time. The results of such planning as was attempted fifteen years ago are enough to dismay any highway planning engineer as he looks toward the future.

As if these uncertainties were not enough in attempting any prediction, they are tied directly to the cost of building these highways in coming years. Today's prices represent the best way of establishing the base for such an estimate. Right at this point, all other uncertainties lose significance as the planner wrestles with the question of pushing the cost curve into the next decade. Four Western states maintain and make available highway cost statistics based on contractors' bid prices. Although the systems may differ, and the

base years may vary, the general objectives are similar. Combining some of the significant bidding elements it is possible to establish a cost figure for a composite highway mile which is adequate for demonstrating a price trend curve.

Contradictions begin to develop, particularly on a quarterly basis, and interpretations are required which point out the influence of unusual weather, volume of work load on the contractors, projects with varying degrees of traffic interference, or other modifying factors. Such interpretations can adequately explain the rises and dips in a quarterly curve at the time, but become somewhat obscure when the curve is used in future years.

In spite of such quarterly kinks, a broader view of these cost curves shows long-range trends and represent the best basis for estimating future highway costs. The projecting of the trend is the critical problem of the highway planner.

In spite of this recognized obvious problem the cost statistics maintained by these Western state highway departments represent the best hindsight for looking at the cost of our highway system during the years to 1975. They are the foundation for predicting what the West must spend for its highway system for tomorrow.

Jim Ballard



Walter Ware, president and general manager, Tru-Mix Concrete, Inc., Portland, Oregon

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WESTERN CONSTRUCTION—June 1954

Colorado's use of slip-form paver

Since first used in the state during 1955, this method of laying portland cement concrete paving has advanced until the entire 60.8 mi. of 24-ft. concrete paving to be placed this season will be by slip-form. Details of machine handling, base preparation, mix, finishing and rideability are reviewed.

A NEW ERA of concrete paving construction began in the State of Colorado in 1955, for that summer the slip-form paver made its debut in this state. The slip-form paver had been used previously in Iowa; however, its use on the project between Evans and La Salle on US85 marked the first use of the traveling form machine on a primary road. Acceptance of this method of placing concrete pavement on a primary road, subsequent improvements in the riding characteristics, development of means of placing reinforcing wire mesh, and savings in cost of operation have created additional interest in the machine and procedure for placing concrete without side forms.

By **LAWRENCE C. BOWER**

District Engineer,
Colorado Department of Highways

A good portion of this interest is evidenced by the visiting engineers from Nebraska, Wyoming, Utah, New Mexico and California. Because of that interest and the increasing use of the slip-form paver, this discussion reviews some of the problems that have arisen with the use of this machine, what has been done to overcome these problems, and what has been accomplished with this machine within the State of Colorado since its introduction.

Since the introduction of the slip-form paver in 1955, a total of 68.2 mi. of 24-ft. width pavement has

been laid using this method of placement. During that time the state has let 70 mi. of 24-ft. width concrete pavement, all of which have been contracted leaving the choice of method of placement to the contractor. Of this total, therefore, 97% has been done by slip form. This would certainly either indicate the acceptance of this new tool by the contractor or that competitively as to cost of operation it is forcing a change in the method of concrete paving. Of the concrete paving contracted to date for the coming construction season, a total of 60.8 mi. of 24-ft. width, the entire total will be built using the slip-form paver from the present indications of the successful bidders.

Description of the machine

Since the slip-form paver is comparatively new a brief description seems logical. The slip-form method differs primarily from the conventional method in the elimination of the side forms which served both to hold the edges of the concrete and as the tracks or rails for the paving train. This paving train usually consisted of the spreader with vibrator, the longitudinal float, and the transverse float.

The slip-form paver has combined the operations of the three machines into a single unit traveling on its own tractor crawlers. No support is provided for the sides or edges of the concrete slab after passage of the machine; however, trailing forms can be attached behind the paver to provide working space for hand finishing of the slab. These trailing forms come in 16-ft. lengths and usually three sets are used making a total of 48 ft. and do provide an additional time for the concrete to set.

From front to back the paver consists first of a hydraulic ram which works back and forth to spread the concrete. This spreader was not a part of the original ma-



FINAL RIDEABILITY is tied directly to the base and its preparation. This is particularly true since the crawler treads of the paver ride directly on the base. Binder may be needed to stabilize for proper traction of the paver.



FRONT end of paver moves ahead without the usual forms. Concrete is spread by a hydraulic ram followed by a vibrator. A cam-actuated tamping bar follows, moving just ahead of the screed.

REAR view of paver, with slab emerging between the slip-form. These trailing side forms usually extend 48 ft. and carry the bridge for the finishing crew. Note the crawler tread of the paver.



chine and when it was first added during the paving of the Wiggins-Fort Morgan project, the improvement in the rideability of the concrete was immediately evident.

Following the hydraulic ram is the vibrator which may be of the pan or tubular type, both of which have been used on Colorado projects. Next is the cam-actuated tamping bar which sets within a few inches of the steel float or screed. The object of the tamping bar is to provide additional consolidation to the concrete to that provided by the vibrator and to push the rock down below the immediate surface for easier finishing and the prevention of voids in the surface. Finishing of the concrete is done with a 36-in. steel float followed by a 24-in. rubber transverse belt.

The machine is carried along on

crawlers, 22 ft. in length and 10 in. wide, running on rollers over a continuous length steel rail. Power for each crawler truck is provided individually by separate master gear head motors for which the electricity is provided by a 10-kw. engine generator mounted on top of the paver bridge. In addition, this gasoline powered generator produces the power for all other operations including vibrators, tamping bar, and belt with the exception of the hydraulic ram, the power for which is provided by a separate gasoline engine.

In addition to the standard equipment provided with the slip form paver, a unique innovation was added during the last construction season. Up until last summer it appeared that the machine would be limited to paving only non-reinforced concrete slabs.

However, in following the policy of the Colorado Department of Highways to stress the end result rather than the means, a project was let between Denver and Castle Rock calling for a mile of reinforced concrete leaving the method of placing the wire mesh to the contractor. The specifications called for two sections—one using a light or regular 1 x 4-gage mesh and the other a heavier 00 x 4-gage mesh—to be placed 2 in. from the top.

The contractor, Roberts-Western developed a sled-like device that

This paper by Lawrence Bower was presented at the Annual Highway Engineering Conference at the University of Colorado. The article contains all of the information on the slip-form paver, and omits only the section that discusses the use of the profilograph for measuring smoothness.

was attached to the front end of the paver to pick up the wire mesh and hold it at the required height in the slab while placing the concrete. This device and the field procedure were described in an illustrated article appearing in *Western Construction*, Sept. 1958, p. 40. It is of interest to note that some of the smoothest concrete on this project was in the sections placed with the wire mesh.

Different mix used

During the last construction season the department also had its first experience paving with a Class AX mix. The Class AX mix differs from the usual mix used in the state for paving in the size of aggregate and cement ratio. The pavement mix ordinarily used up until this time employed a design calling for six sacks of cement per cubic yard of concrete and a three-bin set-up for the aggregates. The aggregate as used was a blend of sand grading from $\frac{3}{8}$ -in. to the #100 screen, a fine aggregate grading from 1-in. to the #4 screen, and a coarse aggregate grading from a maximum of 2 in. to 1 in.

To permit the greatest use of local aggregates, the department modified the specifications which permitted the contractor, if he so desired, to use what is classified as Class AX mix. This mix allows the use of pit run materials or blends provided it met the gradation requirements from a maximum size of 1 in. down through the 100 screen. In addition to the usual requirements for soundness, abrasion and strength, the mix calls for seven sacks of cement per cubic yard of concrete.

Since this mix with finer aggregate and increased cement content had never been used with the slip-form paver, or for that matter in any pavement in Colorado, it was unknown what problems would be encountered. However, it was found that as far as workability through the paver was concerned, the problems were lessened. The concrete seemed to flow more easily and uniformly, there was less tearing and open voids in the surface, it was easier for the finishers to work the surface to shave off high spots and fill low spots, and there was less slumping of the edges.

Problem of cracking

One problem that was greatly magnified in use of the Class AX



INNOVATION of last season by contractor Roberts-Western was this sled pushed ahead of the paver. This device allows reinforcing mesh to be inserted in the slab.

mix which, although not related to the operation of the slip-form paver, was the problem of preventing random or uncontrolled cracking with sudden changes in temperature. One afternoon during the construction of the project between Roggen and Wiggins, a sudden thunderstorm hit the project in the middle of the afternoon, dropping about 1 in. of rain and hail on the newly laid pavement. Immediately after the storm, an inspection of the slab was made and 35 random cracks were noted in the left or lower lane and 24 noted in the right or upper lane.

All of the cracks were within an area of 500 ft. laid between the hours of 8:15 to 10:30 in the morning. Since the rain hit the project just before 4:00 p.m., some of the pavement was only $5\frac{1}{2}$ hr. old, whereas, in normal sawing operations, sawing would not have begun until the pavement was 8 hr. old. This represents the most extreme case encountered, however, it shows that either because of the increased cement content or, less likely, because of the smaller sized aggregate, an extremely short period of time is reached between the point where the slab is too green to saw and the point where it has set up enough that a sudden cooling will crack the concrete by contraction.

A repetition of this serious consequence was prevented by very close control of the sawing and in the event of threatening weather, sawing every joint that could possibly be sawed without undue raveling and tearing of the joint. However, in this case there is considerable spalling, and because of the finer mix there is also considerable abrasion and undercutting of the edges of the joint; which, in future freezing and thawing cycles, will further spall out to a wide and undesirable

joint. Thus it becomes debatable which is the most detrimental and costly for maintenance in the future—the random cracks or the joints sawed in the green concrete.

One detail, of the above described section where the cracking was strictly voluntary, that is of interest to note, is that the distance between the random cracks was very close to the 15-ft. joint spacing which was set up for sawing the joints.

Types of bases used

The types of bases which have been used control, to a considerable degree, the rideability of the finished slab. The question often arises as to what type of base produces the best results. Since this has not been the primary consideration in the selection of the base material, but rather the economics of cost and future stability, we find a considerable variation in the bases upon which the paver has operated.

In the Greeley area where granular material was available in terrace deposits along the Platte River, the material used consisted of a rather fine gravel of pea size. It was felt that this material would provide a good base; however, because of the uniform size of the material and a shortage of fines, it was necessary to add a soil binder. On one project very satisfactory results were obtained with this material. However, on the other project, there was less control of the addition of binder, and in the spots where there was insufficient binder to hold the material together, the base was loose and provided poor lateral and shear support. Consequently, in traversing these places the paver would either sink or in extreme cases the tracks



FINISHERS work from bridges that span between the trailing forms. On this first bridge two men are cutting the wire mesh at joints which later will be sawed.

would spin, digging out the material and lowering the paver.

In the Wiggins-Morgan area of the sand hill country, the choice of base material is limited to blow sand, unless one goes into a long and costly haul. However, to keep the equipment from getting stuck all the time, it was necessary to add binder material to the sand. This material although extremely fine, when properly handled, provided an excellent base and one of the finest riding concrete slabs within the state was placed on it.

Equally good results were obtained on the latest project paved south of Denver where the slab was placed on a granular base treated with cement to bring up the bearing value of the material. The only objection to the use of the cement-treated base was that it was quite difficult to recompact and tie to the existing base, any portion of the base requiring reworking after the initial laydown.

However, no matter what type of base used, the problems encountered have not been so much the material involved, but rather the care and attention given to adding a proper and uniform amount of binder to the material and subsequently to the placement and compaction. With close attention given to these details, it is felt that a satisfactory rideability could be obtained with any of the types of bases hereto mentioned.

Rideability is the key

Since the rideability or smoothness of any finished project is the criteria by which the traveling public judges the project and is the item over which an engineer hears the most criticism it is one of which he becomes acutely aware. Therefore, it has always been the goal of all highway engineers to build the smoothest highway possible, and

since it was discovered that the slip-form paver might provide a means of building a smoother concrete highway and at a reduced cost, we have pushed toward that goal.

One of the first things that was evident was the necessity of a smooth base for the paver to operate upon. Since the grading operations begin with the setting of grade stakes, let us go back to that phase of the operation. On most of the projects constructed to date it has been noted that the contractors have chosen a system of grading using a string line stretched at a uniform height above the blue tops as a control line. The blue tops are set 2 ft. outside the edge of the concrete and at 25-ft. stations. It has been found that setting blue tops at this close interval helps eliminate the swales so common between blue tops. It has also been found that setting the grade stakes with a transit and target rod, using the level only to set control stakes, helps to establish a truer grade line and reduces considerably the time required for the setting of grade stakes.

After setting the grade stakes, the track lines are cut to grade using the string line for control. It is here that with a little more care many subsequent problems might be overcome; for if the track line is once cut below grade it becomes quite a problem to replace the material, bind it to the existing material, recompact it to the original density, and once again cut it to the proper grade.

Uniform density and mix

The factor of uniform density in the base material does not receive the attention to which it is entitled considering the importance. For if the base is not uniformly compacted, lacks uniform aggregate gradation, and uniform moisture

content, one can hardly expect the base to be of a uniform bearing ability. No matter how smooth the trackline is graded, the paver will sink in soft or loose spots and ride higher in the tighter or denser spots without corresponding variations in the finished surface. Thus attention must be given to the rudiments of good construction long before the paver appears on the job.

Likewise, this same attention to uniformity must be carried out in the concrete mix, for the paver will tend to ride high on the dry batches and sink on the wet batches producing waves in the surface in addition to the variations produced by the differential shrinkage between wet and dry batches. The production, therefore, of continuously uniform batches of concrete to the paver is without a doubt one of the most important steps in producing a smooth riding surface whether it be with a slip-form paver or the conventional side-form method. However, it becomes doubly important when using the slip-form paver, for this is a single pass machine and there is no opportunity to come back and rework any portion of the slab. With the absence of side forms to establish a grade or any means of moving the concrete backwards or forward to fill a low spot or knock off a high spot, outside of that which the cement finishers are able to do with their floats, the necessity of uniform slump can readily be seen.

Surging behind the float

From the beginning of the use of the slip-form paver it was noted that there was a surging or boiling up of the concrete immediately behind the metal float. At times it was quite prevalent, at other times hardly noticeable, at other times it was localized and appeared only at certain points along the float. However, whenever it appeared, it showed as a high spot when the finishers pulled their straight edge across it.

Since it was more prevalent at certain points along the float, study was made to determine the cause and it was found that at these points there was more up-and-down pumping of the float than at the points where the surge was not so prevalent. As the points of greatest surge or pumping occurred in the spans between the reinforcement, it was thought that if additional reinforcement was added to

(Continued on page 104)

Methods highlights

- Professional guards control traffic
- Truck load spray stops dust
- Big mirror speeds truck loading
- Hydratarder saves brakes on 19% grade
- Careful records pinpoint sore spots
- Compacted fill shortens bridge shoring
- Dry air filters cut engine maintenance



Carving the biggest highway cut

SEPULVEDA BOULEVARD in Los Angeles slants northward from the airport, twists through the Santa Monica mountains, plunges through a short tunnel, and emerges into the San Fernando valley. This is approximately the same route that the California Division of Highways has chosen for the San Diego freeway, an 8-lane, divided Interstate route of which about 5.5 mi. is completed. Just north of the mountains it will join the Ventura freeway (US 101) which is also under construction.

The biggest barrier to this link-up are the mountains, which stand 1,500 ft. high and 8 mi. wide. It is here that two contractors on separate contracts have massed a swarm of nearly 100 construction machines to carve a notch through which the San Diego freeway will pass. Nearly 20,000 cu. yd. a day are being removed.

All of the dirt at present is coming from the mammoth Mulholland Borrow Area, located at the crest where Sepulveda intersects the scenic ridge route, Mulholland Drive. Future contracts will bring the total taken from this one cut to nearly 8,700,000 cu. yd., making it the largest highway cut in history. The current record holder is the famed Carquinez "big cut" at 8,500,000 cu. yd. (*Western Construction*, October 1956-April 1957). The Carquinez cut, however, was carried out under a single contract, by contractor Ferry & Crow.

The first big dent in the Mulholland Borrow Area was made by Oberg Construction Co., which took 1,100,000 cu. yd. for its now-

Nearly 8,700,000 cu. yd. will be moved in five separate contracts to forge key link in Los Angeles freeway network. Total yardage will top Carquinez cut, now the nation's largest. Plenty of know-how needed to keep 80 trucks rolling fast.

completed Ventura freeway contract. The two current contracts total about 3,600,000 yd., and two future contracts will total about 4,000,000 yd., for a sum of about 8,700,000 cu. yd. The total amount of earthmoving necessary in the 8-mi. section through the mountains will be around 13,000,000 cu. yd. The date for inviting bids on the two future jobs depends not only on the completion of earthmoving

on the current projects (about 1 year) but also upon what Congress does to step up funds for the Interstate System.

The two contracts currently under way are held by Guy F. Atkinson Co., and Peter Kiewit Sons' Co.

Atkinson contract

Guy F. Atkinson Co. received a \$4,957,000 contract in October of



KO-CAL belt loader on Atkinson job loads Kenworth truck with tandem trailers. Loader hopper is fed by six crawler tractors. Belt operator signals truck driver with loud auto horn.



WATER SPRAY is applied to loads as trucks leave pit. Spray helps stop dust and spillage, important because trucks travel city streets. Material is light, but loads can't be heaped.

1958 for construction of 2.32 mi. of the San Diego freeway, four lanes in each direction, including nine bridges and twenty-one retaining walls. The contract includes everything from clearing and grubbing to final concrete paving. The center of the job is about 12 mi. south of the Mulholland Borrow Area from which all imported borrow must come.

Major quantities include:

1,089,000 cu. yd. imported borrow.

42,500,000 gal. applying water.

101,300 tons imported sub-base material.

85,000 sq. yd. mixing, spreading and compacting cement-treated sub-grade.

25,000 sq. yd. mixing, spreading, compacting cement-treated base.

6,770 bbl. portland cement.

19,600 tons plant-mixed surfacing.

21,200 yd. Class B concrete for pavement.

A typical section of the San Diego freeway shows a 22-ft. median strip and two 48-ft. concrete lanes with 12-ft. shoulders. A cross section at the heaviest point shows 0.67-ft. imported sub-base, 0.58-ft. untreated base, 0.33-ft. cement treated sub-grade, and 0.75 ft. of portland cement concrete.

Specifications state that the roadway fill material must be removed from the borrow pit within 280 days, with the entire job to be completed in 380 days. Liquidated damages are stated to be \$800 per calendar day.

All bridges to be constructed are of reinforced concrete box girder design. Of the nine bridges, the

one at Port road is the shortest with a single span length of 62 ft. 7 in., while the longest is over Ballona Creek, a 3-span structure with span lengths of 84 ft. 8 in., 88 ft. and 73 ft. 2 in.

Equipment organization

The material in the borrow area is mostly soft sandstone and shale which can be bulldozed easily. Rippers eliminate the need for blasting. In the cut Atkinson installed a Ko-Cal (Koehring of California) belt loader which in this material should average around 1,000 cu. yd. an hour.

The hopper of the belt loader is kept supplied with material by six Caterpillar tractors with bulldozer blades, four D8s and two D9s. Two of the D8s are the brand new higher horsepower models. The gigantic U-dozers on the D9s are the largest of their kind. Two of the tractors have rippers equipped with Double J breakers, small horizontal fins which increase fracturing (*Western Construction*, April 1957).

From the borrow area to the current fill operation-it is about 10 mi. This will increase to a little over 12 at the maximum as the job progresses. Between cut and fill are five miles of the existing Sepulveda Boulevard, a 4-lane heavily traveled route, and 5 miles of completed San Diego freeway. Because on-highway rigs would be used for dirt hauling Atkinson decided to make use of readily available rented trucks. A total of about



UNIFORMED GUARDS control traffic, an important contractor innovation. Atkinson found that traffic is much more easily controlled by

professional guards with uniforms than by laborers. Stop-go swivel signs were provided by contractor. Haul road crosses streets nine times

50 tandem trailer bottom-dump trucks and six end-dumps are at work, half supplied by the Asbury Trucking Company and half by Hess-Mace Trucking Company. The Hess-Mace rigs are International Harvester, 200-260 hp., both diesel and gas, with both Cook Bros. and Fruehauf trailers.

Asbury has Kenworth trucks working, with Trailmobile and Fruehauf trailers.

The trucking firms are not subcontractors; they simply rent their rigs to Atkinson by the hour. Asbury and Hess-Mace have two mechanics and two supervisors on duty on the job to keep the big fleet rolling. The trucks as well as the rest of Atkinson's crew work 10 hr. a day, 5 days a week.

Even though the material is comparatively light the trucks can't be given high heaping loads because of the dust and spillage problem. Sideboards are used on the trucks not to increase the load but to cut down the spillage. For dust control the trucks drive under a manually-operated water spray before leaving the pit. The spray is manually operated but investigation is being made to see if a photo electric cell can be used which would free the laborer for more productive activity.

In the fill an 8-in. lift is the goal.

The trucks dump on the move in a windrow and the material is spread out with several Caterpillar crawlers and dozers along with a No. 12 grader. Compaction is handled by a DW20 Caterpillar tractor pulling a Hyster tamping roller and a DW21 pulling a 50-ton pneumatic. Sprinkler trucks move over the fill bringing the moisture con-



DOZING BOULDERS away from belt loader is job for these two Cats. D9 at left has largest dozer blade available. Specs allow rocks up to 2 ft. in longest dimension to go in fill.

tent of the material up from 16% to the optimum of 22%. End result compaction specifications call for a 90% relative compaction.

Traffic control

At present traffic control is needed at only one intersection but as the job stretches out control will be needed on up to nine intersections.

Atkinson is trying out an unusual idea on this job, the use of professional uniformed guards to handle traffic. The men are employees of the General Protective Agency and are normally hired for such purposes as handling traffic at large sporting events. Many are retired policemen with considerable experience in working with traffic.

The idea is working out very well. The men are professionals and need practically no instruction. More importantly, traffic is much more obedient when confronted with a uniformed guard than with an obviously temporary flagman. The stop-go swivel signs were constructed for the guards by the contractor.

Personnel

For the California Division of Highways, Spencer Hoppe is resident engineer, with Rod Clark as principal assistant.

Gordon Bawden is area superintendent for the Guy F. Atkinson Co. Job superintendent is Bob Wunderlich, job engineer is Glenn Johnston. Dick Vail is office engineer and John Schultz is office



KIEWIT TRUCK FLEET is parked at maintenance yard at end of shift. Trucks face each other for ease of engine maintenance. Thorough

system of preventive maintenance and record keeping keeps track of operating costs and keeps downtime to absolute minimum.



KIEWIT TRUCKS are used on off-highway haul road. At top is a Mack, one of 20. Below is a Cook Bros. Earthking. Both are pulling 20-yd. Cook Bros. trailers. Job also has 10 Peterbilts.



COMPACTION is handled by variety of rigs. Shown at top on Atkinson job is a Cat DW20 with a Hyster tamping roller. At bottom is DW20 pulling Hyster grid roller on Kiewit fill.

manager. Excavation superintendents are Charles Gonzales and Grant Hood.

Kiewit contract

Also taking dirt from the Mulholland borrow area is Peter Kiewit Sons' Co., holder of an \$8,395,000 contract awarded in June of 1958 for 4½ mi. of the Ventura freeway.

The two projects are similar in that both contractors are using belt loaders to load trucks in the same giant cut and are building very similar types of freeways. The important differences are obvious. The Atkinson project is located 10 mi. south of the cut with existing highways as haul roads and has uniformed guards controlling traffic. The Kiewit project is 3½ mi. north of the cut over a specially-built haul road to accommodate off-highway vehicles and featuring temporary bridges over existing streets to eliminate traffic control.

Kiewit took over the haul road and two temporary bridges from Oberg Construction Co., which was just finishing its Ventura freeway project as Kiewit was beginning. Six additional temporary bridges were built for hauling purposes. At two intersections where temporary bridge construction would have been excessively difficult traffic signals were installed, synchronized with signals at adjacent city intersections.

The existence of a good off-highway haul road led the contractor to employ a fleet of off-highway trucks for hauling dirt. A fleet of big rigs along with nearly 2,500,000 cu. yd. of earth to be moved combined to make it worthwhile to construct temporary bridges wherever possible rather than attempting to control traffic manually or with signals.

This is an Interstate job with 400 working days for completion from the date of contract award, and a liquidated damage figure of \$1,000 per day past the stipulated deadline.

The major quantities on the project are as follows:

- 78,900,000 gal. applying water
- 2,450,000 cu. yd. roadway excavation
- 50,400 cu. yd. structure excavation
- 41,700 yd. structural backfill
- 7,950,000 mi. yd. haul
- 217,000 tons imported sub-base material
- 164,000 tons untreated base
- 215,500 sq. yd. mixing, spread

ing and compacting cement-treated sub-grade

14,000 bbl. portland cement
2,092 tons paving asphalt
39,935 tons mineral aggregate

In the borrow area the contractor has installed a Ko-Cal belt loader with a 5-ft. wide, 5/8-in. thick belt. The loader is kept supplied with material by 6 Caterpillar tractors with dozers and rippers, some with Double J breakers. The belt operator controls the motion of the belt, counts the loads, and controls the movement of the trucks with a horn (one blast means stop, two—ahead, 3—back). Assisting the loading of the trucks is a large mirror through which the truck operators can watch the truck position under the belt.

The truck fleet consists of 20 Mack tractors and 2 Cook Earthkings, all pulling Cook Bros. 20-cu. yd. bottom-dump trucks. All 22 trucks have Cummins 220-hp. engines. The fleet is supplemented by 10 Peterbilt trucks rented from Oberg Construction Co.

Because the haul road has grades up to 19% all trucks are equipped with Parkersburg Hydratarders to help dissipate energy and save brakes on the down-hill run. The Hydratarders permit the vehicles to operate at speeds up to 30 mi. per hour and remain under good control by the operators. This control is well worth the 1,000 lb. which the Hydratarder and water tank add to the weight of the vehicle. And the cost is quickly made up by the number of brake relining jobs that are saved. The unit can absorb about 1,000 hp.

The temporary bridges for the haul road are constructed generally of timber columns and used bridge steel beams. The specifications require that maximum speed over permanent structures be 12 mph. Specs also state that a 6-in. earth blanket must be maintained and kept smooth to reduce impact loads. Wheel guards are provided to keep wheel loads over the steel beams. Passageway in the supporting structure for the bridges is required to be 13 ft. 6 in. high and 28 ft. wide.

Several pieces of equipment are equipped with Farr dry-type air filters. More dry-type air filters would probably be used if it were not for the fact that some manufacturers won't stand behind their warranties unless the original air filters are used. However, several of the large manufacturers have re-

(Continued on page 126)



TRUCK OPERATOR gets this view from cab while parked at belt loader. He jots down time shown on clock, and he watches mirror to position truck properly under belt loader.



MAINTENANCE YARD on Kiewit job consists of two parts-vans spanned by light roof. Trucks are cared for in one yard, other equipment in another. Both are models of efficiency.

LONG AUGER (below, right) for pile holes is used by Macco, sub to Kiewit for foundations of

Mulholland Bridge. Ka-Mo Tools makes auger, sold through Fornaciari. Auger is 65 ft. long for this application, is turned by steam Eimco motor. Compacted fill under 70-ft. high bridge will reduce shore length to 10 ft.

Major Equipment

Peter Kiewit Sons' Co. Ventura Freeway contract

- 20 Mack trucks
- 2 Cook Bros. Earthkings
- 22 Cook Bros. 20-yd. trailers
- 10 Peterbilt trucks (rented)
- 19 Pickup trucks
- 11 Chevrolet trucks
- 8 Caterpillar D8 tractors
- 3 Caterpillar D9 tractors
- 5 Caterpillar No. 12 graders
- 1 Caterpillar DW21 tractor
- 2 Caterpillar DW21 scrapers
- 1 John Deere tractor
- 3 Southwest sheepfoot rollers
- 1 Southwest 50-ton pneumatic roller
- 1 Hyster grid roller
- 5 Ateco rippers
- 2 Double J Breakers
- 1 Lorain 35-ton crane
- 2 American 40-ton cranes
- 3 Parts vans
- 1 Noble mobile batch plant
- 4 Michigan loaders
- 1 Ko-Cal belt loader
- 1 Fairbanks scale
- 5 Air compressors
- 6 Welders
- 13 Light plants



Colorado's trans-mountain tunnel

Another engineering study of this highway bore piercing the Continental Divide is under way to select location, and to determine cost without considerations of "pressure or politics." The long history of this project is reviewed. It represents the key to the Interstate link between Denver and the Utah state line.

THE ANSWER to the question of whether Colorado will have a highway tunnel or tunnels under the Continental Divide remains unsettled. The beginning of a final solution may be forthcoming in about a year. The Colorado Highway Commission, on Feb. 20, 1959, approved a contract with the E. Lionel Pavlo Engineering Co. of New York for a study to determine the best location of the new section of the Interstate System west of Denver.

This study specifically is to determine the location between Empire Junction, west of Idaho Springs—where US 40 turns north over Berthoud Pass and US 6 goes south over Loveland Pass—and Dotsero, about 15 mi. east of Glenwood Springs where the Colorado River meets US 6. The route between Denver and Empire Junction already has been set to follow, generally, the present location over Mt. Vernon Canon, through Idaho Springs to Empire Junction. On the western end the route will follow the general location of US 6.

The tunnel problem, almost as formidable as the Continental Divide itself, lies between Empire Junction and Dotsero. Previous studies have strongly favored a tunnel at what is known as the Straight Creek site, a few miles north of the summit of Loveland Pass.

The study by the Pavlo firm, which will cost \$296,200, is to establish the best of all feasible routes, according to engineering and economic consideration, determine whether the Interstate should go through a tunnel or tunnels, and where such tunnel or tunnels should be located, and set up construction costs for the entire Empire Junction-Dotsero section. Pavlo has a year in which to complete this study, from Feb. 20, 1959.

The tunnel question has been "hanging around" for so long no one can remember when it started. A pioneer bore was drilled under Loveland Pass in 1941-1943, for \$280,963. Bids on 2,000 ft. of a 32-ft. tunnel were called on Sept. 16,

1947. Only one bid was received and this indicated the cost of the complete tunnel would be \$10,000,000, although this bid never was opened officially.

Subsequently a joint tunnel study was conducted by the Department and the Bureau of Public Roads. This study estimated the cost of a two-way tunnel at \$7,200,000 and of two one-way tunnels at \$8,100,000. The Bureau, however, wrote that it would not participate in a two-way tunnel because of the cost, and that it would not approve a one-way tunnel.

Bids again were called for on Dec. 17, 1947, but no bids were received.

Studies made in 1954 and 1956 by the consulting firms of Howard, Needles, Tammen and Bergendoff, and Singstad and Baillie, reported that a Straight Creek tunnel would be 7,605 ft. long at an elevation of 11,100 ft. and would cost a total of \$18,136,000. A Berthoud Pass tunnel would be 13,329 ft. long at an elevation of 10,100 ft. and would cost a total of \$48,012,000. Governor Johnson selected his own site for a tunnel under Berthoud Pass in 1956. This tunnel would have been between 17,000 and 18,000 ft. long.

At the insistence of the then Governor Johnson, the Highway Commission called for bids on tunnels at both Straight Creek and Berthoud Pass on April 16, 1956. Two bids were submitted but one was rejected as defective. The bid that was opened set the cost of the Straight Creek tunnel at \$7,596,835, and of the Berthoud Pass tunnel at \$16,465,440. Both bids provided unit prices with a statement that the contractor would be paid for the "actual unit quantities of work performed, based on actual measurement at the appropriate unit prices proposed." Following the opening of the bid, the Department estimated the total cost of the Berthoud Pass tunnel at \$35,183,580.

Construction of a tunnel under Berthoud Pass would take traffic

on US 40 through Granby, Hot Sulphur Springs and Kremmling, and thence down the canyon of the Colorado River to Dotsero.

More history

Colorado's general assembly adopted a resolution on Mar. 24, 1953, directing the Highway Commission to make a complete report showing cost and economic benefits of a toll tunnel. This requirement was met by the Howard, Needles, Tammen and Bergendoff—Singstad and Baillie reports.

The general assembly, in 1954, passed a bill authorizing bonds for a toll tunnel not to exceed \$16,000,000. In 1955, the general assembly passed another bill pledging the Highway Department's funds as support for a bond issue based on revenue from tunnel tolls.

In 1956, the legislature passed a bill authorizing a toll or free tunnel not to exceed \$18,000,000. A maximum of 3.75% interest was established. This act specifically permitted the one bid already received to become valid. The entire bill was based on the possibility that Colorado would receive the Denver-Utah line designation on the Interstate.

In 1957, the general assembly repealed previous bills and provided that \$18,000,000 in bonds could be issued for a toll or free tunnel. This statute said that if Colorado received an Interstate designation for this route, which it now has, a tunnel or tunnels could be built at a location approved by the Highway Commission and the U. S. Bureau of Public Roads, if the Bureau would participate in the cost.

It would seem that this tunnel situation has, for some years, been involved in at least as much political intrigue and manipulation as has been in engineering and economic facts. When the Pavlo contract was awarded, great emphasis was made by Gov. Steve McNichols, Highway Commission Chairman Joseph J. Marsh of Denver, and Chief Engineer Mark U. Watrous in the presence of the commission, Pavlo and the press, that the conclusion of the study, and particularly recommendations concerning a tunnel or tunnels, must be solely on the basis of engineering and economic facts, completely devoid of pressure, politics or bias.

That is the situation.

Progress on the Interstate System

Continued increase or slowdown? Congress will soon decide.

HIGHWAY CONSTRUCTION in the West on the Interstate System has reached a record level with further increases in sight. Last year at this time less than 2% of the West's 11,016 mi. was completed as compared to 7.5% now. Construction is under way on another 9.7%. In terms of dollars, there was \$344,000,000 worth of construction under way on the Interstate System in May of 1958. In May of 1959 the figure stands at \$450,000,000, a tremendous increase of 31%. A further increase of 27% in the coming year is planned; as the 11 Western states hope to have a total of \$571,000,000 under contract on the Interstate System by May 1960.

These figures were obtained by a state-by-state survey made of highway departments by *Western Construction* in May.

The hoped-for increase in the coming year is by no means a certainty. It all depends on the outcome of Congressional debates now going on. For unless Congress quickly finds more funds for highways the gigantic Interstate construction program will begin slowing down and may even grind to a complete stop in some states. But this isn't likely. Congressmen realize too well the political implications of a slowdown in highway construction which could radiate throughout the whole economy.

The shortage of funds is the result of increased authorizations made in 1958 in an effort to buoy the economy during the recession year, and suspension of the pay-as-you-go requirement without providing additional revenues. So, without legislation, expenditures in the next year or two will have to be cut back to compensate for the extra spending done last year.

The reasons for finding more funds are compelling: The manpower is available now; construction costs will be higher later; equipment manufacturers, contractors, and material suppliers are geared for a high level of output, partly because of last year's additional boost; and the sooner the highways are constructed the more gas tax revenues will be available. It seems fairly certain that one of the more than three dozen bills designed to solve the financial problem will be enacted, possibly in mid-June in time for the coming fiscal year. The time to make your views known to your Congressman is now, as the next couple of weeks are critical.

In the glare of publicity the Interstate System receives it is important not to overlook the rest of the highway construction scene. When the 1956 legislation was authorized for the 41,000-mi. national system of Interstate and Defense highways, increased money was also provided for the regular ABC roads (primary, secondary, and urban extensions). The states and the Federal Government split the cost of ABC roads, while on the Interstate System the Federal Government pays 90%. According to present projections ABC authorizations will be fairly constant for the next 10 years, at a level of about \$1 billion annually, many times the amount per year spent nationally a few years ago. In 1959 the amount of money spent on ABC roads will be very nearly the same as the amount spent on Interstate routes. Interstate authorizations are expected to increase for another year or

two and then level off for an estimated 6 or 7 years.

The 41,000-mi. Interstate System will link 90% of all cities of 50,000 population or more. It is designed to handle 1975 traffic volumes, when 50% more cars, busses and trucks are anticipated. The system includes about 1% of the nation's total mileage of roads and streets, but will carry 20% of the traffic.

Following is a brief look at each of the 11 Western states. (Alaska and Hawaii are not included in the Interstate System.)

Arizona

Of the 1,161 miles of the Interstate System in Arizona, about 50 mi. have been completed since July 1956 to full Interstate standards with control of access, interchange structures and pavement. About 127 project miles are under contract. (The term "project mile", as used by the Bureau of Public Roads, is merely a measure of length and does not indicate whether or not the project being measured will bring the highway up to full Interstate standards. For example if a 10-mi. section of highway is constructed under two contracts, one for grading and one for paving, the project miles would be recorded as 20.)

The dollar value of the work under contract now is about \$26,000,000 as compared to \$20,000,000 a year ago. A year from now may be as high as \$35,000,000. Large sums of money are being spent on the Interstate route in the vicinity of Phoenix where 10 Interstate structures are under construction. It is anticipated that \$4,000,000 of additional work will be contracted this calendar year between McDowell Road and 7th Avenue. Within the 1959-60 fiscal year, \$7 million of additional work will be contracted between Northern Avenue and 16th Street. Late in April the Valkenburgh Construction Co. of Phoenix was low bidder at \$995,261 for construction of 5.2 mi. of 96-in. storm drain along the Phoenix Interstate Freeway. Another major contract has been awarded to Osborn Co., and O. B. Pierson, Inc., Pasadena, Calif., on their low bid of \$995,957, for construction of the bridge over the Colorado River at Ehrenberg on U.S. Highway 60. This is a joint Arizona-California project and the cost will be shared equally between the two states. Later a parallel bridge will be constructed so that each can carry traffic one way.

Bids will be opened on May 29 on what may be the biggest contract ever let by the Arizona Highway Department. The project calls for building and paving 10 mi. of divided Interstate Highway between Mountainview and Tanpano on U.S. 80. The estimated cost is \$2,570,000.

California

Of the 2,189 mi. of the Interstate System in California, about 226 mi. have been completed to freeway standards. About 129 mi. of this will require additional lanes to meet the extremely heavy traffic conditions in California. There are 127 mi. under construction to multi-lane freeway standards, of which 40 will eventually require additional lanes.

The dollar volume of work under contract now is

\$204,000,000, compared to \$196,000,000 under way a year ago. A year from now there may be \$235,000,000 worth of construction work under contract, provided Congress acts to continue appropriations.

Of the many large projects under way is one which features what will eventually be the world's largest highway cut. It is located in the Santa Monica mountains between Culver City and North Hollywood. About 8,700,000 cu. yd. must be removed from one cut area to allow the San Diego Freeway to make a connection with the Ventura Freeway. The project is described in an article in this issue starting on page 45.

The biggest project coming up is the Santa Monica Freeway viaduct, first portions of which are already under construction. This structure will connect the Santa Ana Freeway and the Harbor Freeway. It is over 3 mi. in length and has a total estimated cost of over \$30,000,000.

Colorado

Of the 964 Interstate miles in Colorado, 169 have been fully constructed. About 105 mi. of work is under contract. The value of construction now under contract is \$21,900,000, compared to \$20,000,000 a year ago. It seems likely that the volume a year from now will be below these peak levels.

Colorado faces the loss of \$19,000,000 in Interstate highway funds for the fiscal year beginning July 1, 1960 if Congress does not enact legislation providing increased Federal Aid money. This would represent a 38% cut in the construction budget for that year, and the Department would have to start cutting back on contract awards in the spring of 1960. Colorado will be particularly hard hit if Congress fails to act for two reasons. First is the fact that funds are now allocated to the states on the basis of need rather than the old population-mileage formula. And second, in the fiscal year ending in 1960, the state will be using the last \$6,000,000 from a \$35,000,000 anticipation warrant bond issue. This was described more

fully on page 84 of the May 1959 issue of *Western Construction*.

The longest construction project under way in Colorado at the present time is 20.6 mi. of concrete paving on U.S. 40 northwest of Limon. This project will be completed in December.

For a review of the location planning of the tunnel underneath the Continental Divide west of Denver, see page 50 of this issue.

Idaho

There are 611 mi. of the Interstate System in Idaho. About 23 mi. are complete and 70 mi. are under contract. The dollar value of the work under way is \$18,000,000. In May of 1958 it was \$6,000,000 and a year from now it is estimated that it will be about \$20,000,000.

The largest highway contract ever let in Idaho was recently awarded to Cherf Brothers & Sandkay of Ephrata, Wash. The \$3,000,000 contract is for 6.4 mi. of the Coeur d'Alene belt freeway on U.S. 10.

Montana

There are 6.5 mi. completed of Montana's 1,179 mi. Under contract now is 81.3 mi. with a total value of about \$18,000,000. Dollar value of work under contract a year ago was only \$8,200,000 and a year from now the estimated work will total \$45,000,000.

During 1958 the Montana Highway Department awarded in construction a total of \$12,500,000 on 49.5 mi. of Interstate highway. The \$45,000,000 worth of contracts which will be under way a year from now if Congress makes funds available will be distributed over about 108 mi.

Nevada

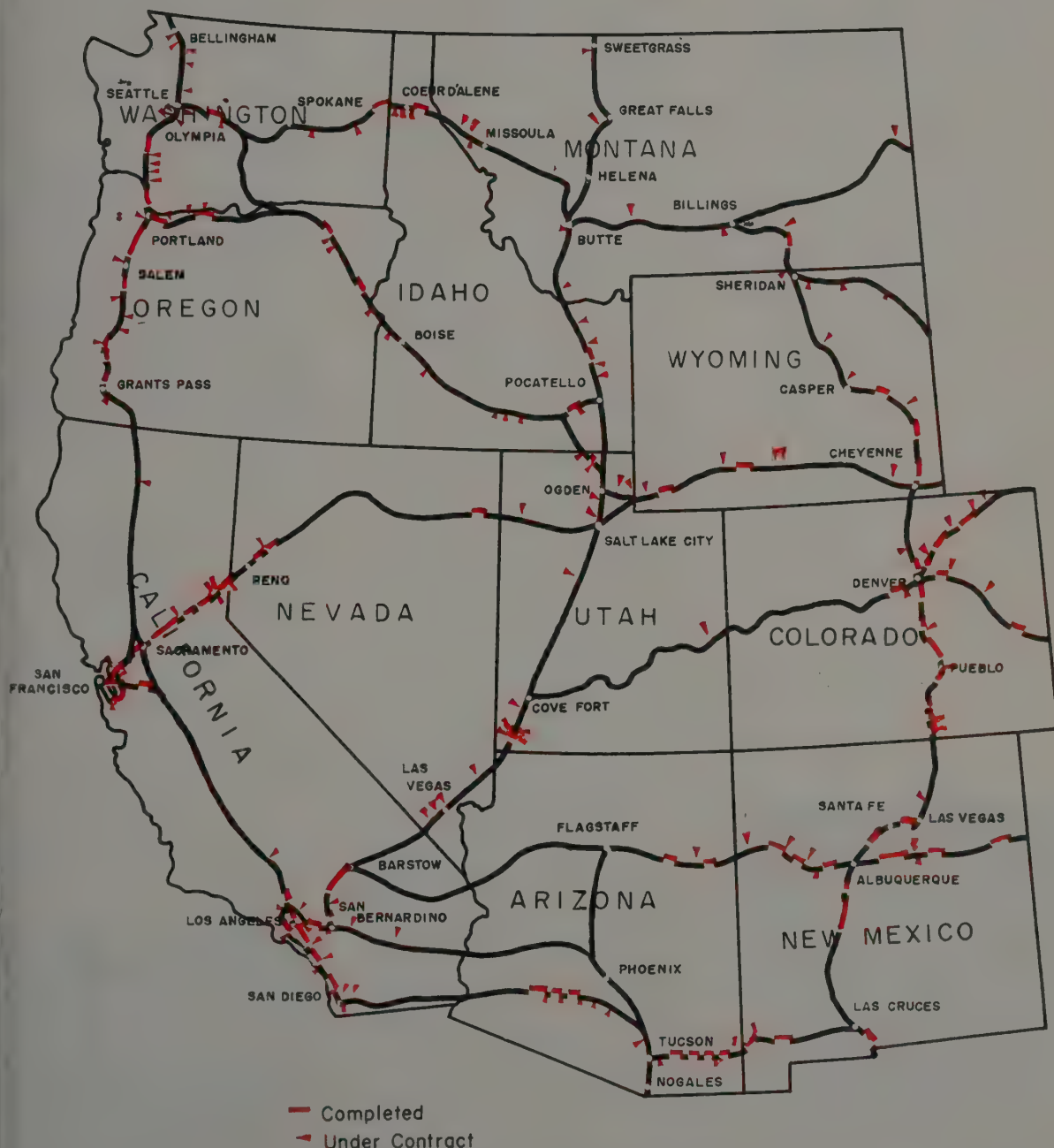
There are 533 mi. of Interstate highway in Nevada of which 15 are completed and 40 are under contract.

(Continued on page 204)

The Interstate Highway Program in the West

	Total (mi.)	Completed (mi.)		Under Contract (millions of dollars)			Under Contract (Project miles) May, 1959
		May, 1958	To date	May, 1958	May, 1959	May, 1960 (est.)	
Arizona	1,161	18	50	\$ 20	\$ 26	\$ 35	127
California	2,189	63	226	196	204	235	127
Colorado	964	30	168.7	20	21.9	19	104.7
Idaho	611	0	23	6	18	20	70
Montana	1,179	0	6.5	8.2	18	45	81.3
Nevada	533	5	15	4.3	7.8	22	40
New Mexico	1,003	0	151	24	20.1	25	78
Oregon	731	64	94	30	50	70	139
Utah	965	0	2.3	6	21	30	69
Washington	672	19	28.9	10.5	36.5	47	119.7
Wyoming	1,006.6	0	68.7	19.7	26.9	23	112.2
TOTALS	11,016	199	834	344	450	571	1,068

Progress and project locations on the Western Interstate System



EACH RED TRIANGLE points to the approximate location of a project under active construction on the Interstate System. Red lines show where work has been completed. Information for map and table

(opposite) was obtained by special survey of each of 11 Western state highway departments. Continuation of fast progress depends on early Congressional action.

Uses, design, construction and performance of—

SLURRY SEAL COATS

AN emulsified asphalt slurry seal coat consists of crusher dust and plaster sand mixed with water and emulsified asphalt, either in a transit mixer or a specially designed travel mix plant. The mix forms a creamy slurry which is applied in thin lifts by a rubber squeegee mounted in a sled-type spreader box. On dehydration the slurry forms a thin dense, flexible, mortar-like asphalt seal over the existing pavement.

To evaluate the use, construction and performance of slurry seal coats and to correlate laboratory test procedures, an extensive field survey and laboratory testing program was undertaken. Eighty-three projects were studied in 1956, 1957, and 1958. Samples of mix were taken from the pavement and extracted to determine grading and asphalt content. Aggregate samples were taken and grading and sand equivalent tests were made. Sample mixes were prepared in the laboratory to determine the wear resistance of the slurry mix. Engineers, maintenance personnel, and contractors were interviewed to determine the construction practices and performance of slurry seals. This report is a summary of the findings.

Used as a mass crack filler

One of the most extensive uses of slurry seal coats has been to fill



WITH squeegee riding on the surface, the slurry seal fills cracks and minor depressions, but wipes the high spots clean. After about six months of wear and weathering the surface tends to have a mottled appearance.

By W. J. KARI

Technical Supervisor
and

C. E. NEILL

Staff Engineer

American Bitumuls & Asphalt Co.
San Francisco, Calif.

cracks and seal badly cracked but stable asphalt surfaces. The primary advantages of slurry seals as crack filler are:

a. Weed growth, water permeability, and maintenance costs are reduced.

b. All cracks, even hairline cracks, are treated. It is virtually impossible to treat all cracks by other methods of crack filling.

c. There is some leveling of the street.

d. Ridges and bumps are not evident during hot weather.

e. Street sweeping is easier with a leveled street.

There are two methods for applying crack filler slurry seals. The most common method is to let the squeegee ride directly on the surface of the pavement. Slurry mix flows into the cracks and minor depressions, giving the desired leveling and crack filling action. However, the high spots of the pavement are wiped clean. The resultant surfacing has a mottled appearance after six months' traffic and weathering. The primary advantages of this "wipe clean" slurry method are low cost, effective filling of the cracks, leveling of the surface and the fact that repeated applications will not affect drainage or alter the gutter line.

Another method of crack filling with slurry seals is to apply an appreciable thickness of mix over the entire surface. This can be done with one or two lifts of slurry. The thicker slurry seals perform the same functions of leveling and crack filling as the "wipe clean" type and, in addition, have a uniform surface texture. Regardless of the crack filler method, the cracks reappear. They are, however, materially reduced in size.

This is a slightly condensed version of a paper presented at the Second Annual Highway Conference, College of the Pacific, Stockton, Calif., Mar. 4.

As a truly Western development the early experiments with slurry seal and many later improvements have been reported in detail in **WESTERN CONSTRUCTION**. This coverage has exceeded in number of articles and volume of material that published in any other magazine.

Because knowledge of materials and field procedures are beginning to reach a stage of standardization, it is logical to present a summary of information from an authoritative source. This article brings to date such helpful material and acts as an organized review of the information which **WESTERN CONSTRUCTION** has published as separate job articles during the past several years.

—Editor

Used as a void filler

Slurry seals have been used as a void filler for open-graded plant mix surfaces and "toothy" armor coats. Uniform appearance is obtained if the slurry seal is applied while the pavement is still level. If the armorcoat or open-graded mix is permitted to deteriorate to the point where patching is required, the project has a mottled appearance after weathering.

Slurry seals improve appearance, level the surface, reduce raveling and prevent further oxidation and



IN ADDITION to improving appearance, leveling the surface and reducing raveling, slurry seals prevent further oxidation and make streets easier to wash and maintain.

deterioration of the surface. The streets are easier to wash and maintain after slurry sealing. Normally, void filler slurry seals last two years or more.

Many other uses

Slurry seals have been used as surfacing for airports, shoulders, concrete streets and asphalt pavements. To obtain uniform appearance, thicknesses of 1/16 to 1/4 in. were used. In most cases the entire thickness was applied in one application although there were a few multi-application projects in Southern California.

Slurry seals are particularly effective for sealing airport surfaces. The premixed slurry contains no loose aggregate to damage aircraft engines and application proceeds rapidly with little interference to flying operations. Slurry seals are effective over an SC road mix. The slurry seal provides a tough, high tensile strength surface which reduces raveling due to traffic and street sweeping.

A new development has been to apply a slurry seal on an asphalt-treated base during stage construction. The projects were completed so recently that full performance data is not yet available. However, the results thus far have been encouraging.

"Wedge" construction is used to

level the edges of a city street that has been overlaid with asphaltic concrete. Here the slurry seal goes from a feather edge to as much as 1 in. of thickness. In two cities, thicknesses of 2 in. were applied. The results with wedge construction have been variable and further development work is needed to perfect this technique. Curing of the slurry has often been slow, requiring long periods of traffic control.

Slurry seals have also been applied over concrete surfaces. None of the seals on concrete were completely successful. In some cases, the slurry completely wore off the concrete surfaces. In others, the surfaces had a mottled, scabby appearance. One engineer stated, however, that slurry seals did increase skid resistance of a slick concrete surface which had a bad accident record prior to slurry treatment.

Slurry seals as surfacing have shown their best performance on airports and highway shoulders. These areas receive little traffic and the primary function of the seal is to enrich the surface, reduce raveling, improve appearance, improve drainage and reduce water penetration into the base and shoulder areas. Thin slurry seal surfaces cannot be expected to serve in place of an asphalt overlay. Asphalt overlays increase the

load carrying ability of the pavement and have a longer service life than a thin slurry seal surface.

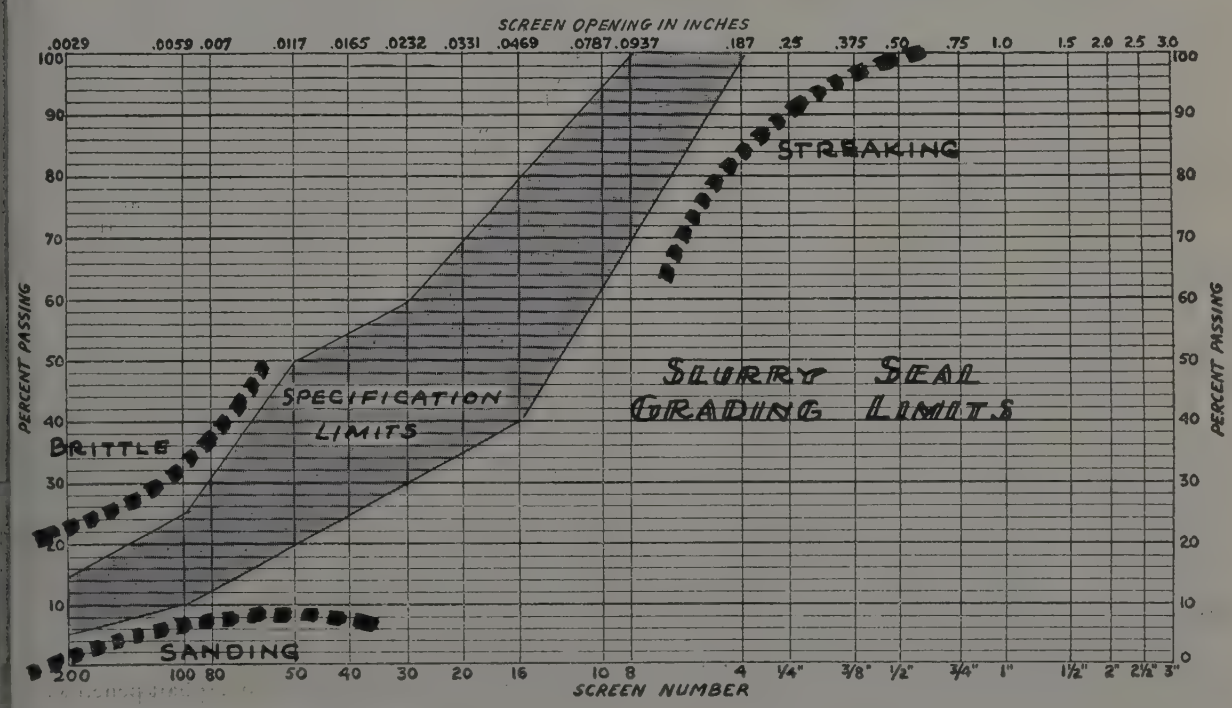
Badly cracked but stable pavements have been slurry sealed prior to overlaying with asphaltic concrete. The slurry fills the cracks and surface voids. Results thus far have been encouraging. Some hair-line cracking of the overlay was evident after three years' service but, according to the engineers in charge, much less than with overlays placed over untreated streets. Slurry seals have also been used as a low cost leveling course prior to conventional chip sealing.

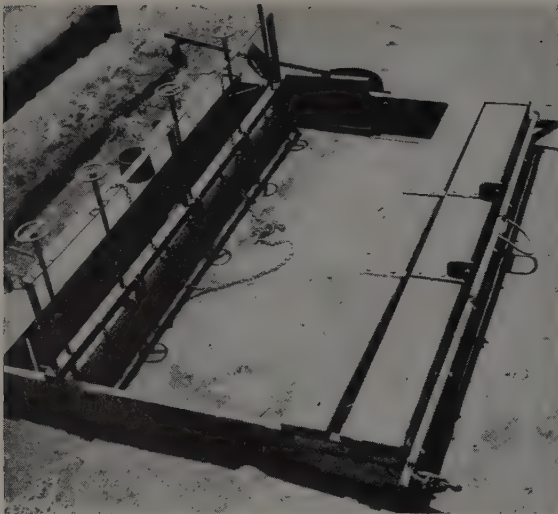
Slurry seal coat design

Early testing of slurry seal mixes consisted of construction of small test patches in the parking area of the laboratory yard. Proper emulsified asphalt content was determined by abrading the surface with the sole of the shoe, using both a rubbing and twisting action. Operator shoe repair bills increased rapidly and the test results were qualitative and subject to debate. To better test slurry seal mixes, P. E. McCoy and L. D. Coyne developed the Slurry Seal Wet Track Abrasion Test.

In this test samples of aggregate are mixed with 15%, 20%, and 25% mixing grade emulsified asphalt and water to form a creamy

AGGREGATE FOR SLURRY SEAL HAS LIMITS OR THE INDICATED DIFFICULTIES WILL DEVELOP





THERE ARE no "standard" designs for spreader boxes, but this one might be considered typical. Note the sprinkler pipe along the front edge of the box, the screws for adjusting the squeegee.

JOINTS between two applications present a problem sometimes, and one solution is to drag weighted sacks along attached to the corners of the spreader box, as shown.

slurry. Circular specimens are prepared $\frac{1}{8}$ in. thick and 11.25-in. in diameter on 60-lb. roofing felt. After drying to constant weight at 140 deg. F. the specimens are cooled, weighed, and placed in a 77 deg. F. water bath for 1 hr. Specimens are then placed in the machine and covered with water and abraded 5 min. The abrading action is produced by a rotating rubber hose mounted in a mixer. After abrasion the specimens are removed, dried, and weighed. The loss of material in grams per square foot is called the Wear Value.

Field correlation studies were started in 1956 and have continued to date. A total of 83 projects were rated on the basis of surface texture, uniformity, toughness of mix, raveling, crack filling, void filling and appearance. Samples were taken from the field and extracted to determine asphalt content and aggregate grading. Studies were made in the laboratory on the aggregates used in the field. Mixes showing excessive deterioration in the field also have high wear values in the laboratory test.

Effect of the asphalt content

Increasing the emulsified asphalt content increases the wear resistance of the slurry seal. Field data confirm the laboratory findings. The data from City of Santa Barbara studies are typical.

Grading:	*Rich Section	†Dry Section
$\frac{3}{8}$ -in.	100	
#4	92	100
8	82	88

16	62	61
30	45	44
50	24	25
100	12	14
200	7	9
Emulsion content (based on 58% residue)....	18.6%	14.6%
Laboratory test wear value (gm. per sq. ft.)	75	200

Field Observation:

*Uniform appearance; some cracks showing through. †Mottled appearance—excessive wear but some slurry deep in cracks.

The grading was essentially the same as were the traffic and application conditions. The raveled, mottled appearance of the dry section was the result of too low an asphalt content. Adjacent sections containing sufficient asphalt were in excellent condition.

The primary cause of slurry seal coat failure has been low asphalt content. Most aggregates need about $2\frac{1}{2}$ gal. of emulsified asphalt per 100 lb. of dry aggregate to prevent sanding, raveling and loss of cover sand.

The hardness of asphalt does not materially affect wear values.

Aggregate type and grading

Most slurry mixes which are giving good field performance were made from a blend of sand and crusher fines. Crusher dust is an essential component of the slurry mix. It materially improves the wear resistance of the slurry seal. There is a marked increase in

wear resistance on adding the well-graded, rough textured, angular crusher fines.

Coarse aggregate (material retained on the #4 sieve) causes streaking of the mix. Coarse aggregate also causes application difficulties. The coarse material will not pass under the squeegee but will collect in the box. When sufficient material has collected, the box rides over the coarse aggregate, leaving a hump in the road.

Mixes low in filler also present application difficulties. There is no filler matrix and the slurry tends to segregate during laydown. The sand sinks to the bottom while the asphalt tends to float to the surface. This segregation can be minimized by use of crusher fines.

High filler content aggregates (in excess of 15% passing #200 sieve) make brittle slurry mixes. These mixes dry out rapidly and have a short service life. Clay fines are deleterious in slurry seals just as they are in other types of asphalt surface mixes.

The abrasion test will not always fail an aggregate containing deleterious clay. The soaking period of one hour is not enough to cause complete swelling of some clays. Longer soaking periods delay routine testing of aggregates. Specifications, to exclude deleterious clay bearing aggregates, must include the California Sand Equivalent or the A.S.T.M. Plasticity Index Limit tests. The Sand Equivalent requirement should be set at 40 minimum or the P. I. requirement at "non-plastic."

The effect of asphalt penetration



***YOU NEVER SAW
SUCH A PERFECT MAT!***

IT WAS LAID AT 102 FPM on a Morrison-Knudsen job in Wyoming

Ask the Morrison-Knudsen crew about the mat they laid on U.S. 30 near Wamsutter, Wyoming. *Outstanding* is the word for it . . . perfect in uniformity, density and smoothness.

While you're at it, ask them about the over-all performance of the Cedarapids Paver that laid this perfect mat at laydown speeds up to 102 feet per minute. Once again, the word is *outstanding!*

And that's the word you'll find all over the country describing the Cedarapids Bituminous Paver. No need to make a trip to Wyoming! Just ask Cedarapids Paver dealers in your State (your Dealer will give you their names) about the speed, mat perfection, and inspector-acceptance this advanced-design Cedarapids machine will bring to your job.

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**BITUMINOUS
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High capacity—Paver easily handles 200 tons per hour—keeps your hot-mix plant going full blast.

Maximum density—3600 screed vibrations per minute assure maximum density at any paving speed. Rapid vibration "irons" the mat into uniform textured, smooth, dense surface, without tears or voids.

Automatic material-depth control—prevents voids—relieves operator from constant attention to depth of material in front of screed

Less maintenance required—efficient electrical controls and drives eliminate many troublesome wearing parts.

Easiest operation—Simple finger-tip controls on one panel—no confusing, fatiguing forest of levers and pedals—operator can concentrate on laying perfect mat!

Unique crawler action and oscillating track rollers permit paving over obstructions—manhole covers and uneven spots in the grade—with screed maintaining a level plane.



THIS MACHINE, developed by the California-Fresno Oil Co., is essentially a travel pugmill. Aggregate is fed by belt, mixed with the water and emulsion, and then deposited in the slurry box. Note the truck unloading aggregate.



IN MANY localities the mixing is handled by mounting a pugmill on the back of a maintenance truck. Tanks of water and emulsified asphalt also are carried on the truck and proportioned by volume. Over-mixing should be avoided.

on wear resistance was studied by formulating two emulsions, one made with 60/70 pen. asphalt, the other with 200/300 pen. asphalt. Asphalt crude source, processing, and emulsion formulation were the same. There was no appreciable difference in wear resistance between the two.

In the field, selection of base penetration appears to be mainly determined by climatic conditions and personal preference. Harder asphalts were used in the hotter areas to reduce tackiness during the early life of the slurry while softer asphalts were used in the cooler climatic regions to give more flexible mixes.

CONSTRUCTION

Preparation of the pavement

Power brooming of the old surface is required. If possible, the pavement should be thoroughly washed to eliminate loose material. Vegetation should be removed from all cracks and then blown out with compressed air. Failure to properly prepare the surface results in deterioration of the slurry seal coat. Large sections of slurry peel free from the pavement.

All potholes and major depressions should be patched prior to slurry sealing. A tack coat applied at a dilution of one part Bitumuls to 3-5 parts water by a conventional asphalt distributor, with a drag broom behind (to work the tack coat into the old surface) is recommended. This tack coat ties down the loose dust. It also provides some asphalt for coating the existing dry surface. Without a tack coat the dry, absorptive pavement absorbs some of the emulsified asphalt from the slurry mix.

On a very highly absorptive pavement this could leave the slurry surface mix deficient in asphalt.

Preparation of mix

Remember that the slurry seal coat is composed of three components: aggregate, emulsified asphalt, and water. Water serves two purposes. It aids in the dispersion of the emulsified asphalt and it is a means of obtaining the proper application consistency. The initial water content of most slurry seals is about 8-15% water, based on the weight of the aggregate. Use the water to adjust consistency. Do not adjust consistency by varying emulsified asphalt content. This changes the residual asphalt content of the mix, resulting in a deficiency of binder that should cause excessive traffic abrasion or an excess that would cause bleeding.

There are two ways to prepare the slurry mix.

Method 1:

a. Add the required amount of water and emulsified asphalt to the mixer, either pug mill or transit mix type.

b. Add the aggregate slowly with agitation.

c. Add additional water to obtain a creamy consistency.

Method 2:

a. Add approximately 75% of the required water to the mixer.

b. Add the aggregate.

c. Add the emulsified asphalt.

d. Add water to creamy consistency.

Method 2 is the preferred method. The addition of water to the sand cools the mix and overcomes the absorptiveness of the aggregate. Balling of the fine aggregate is

reduced to a minimum by this method.

Spreader boxes

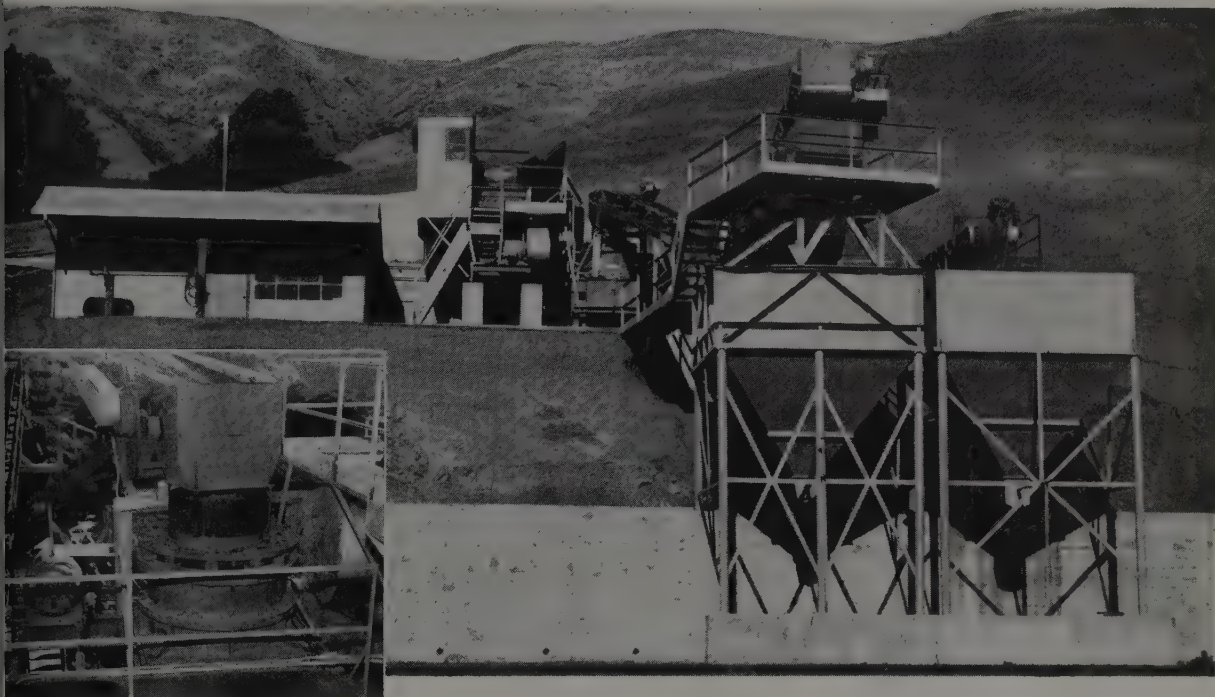
There are no "standard" designs for the slurry spreader box. Numerous types have been used successfully. These can be divided into two general types, dependent on construction of the squeegee. There are the removable or hinge type squeegees which ride directly on the surface. Weights on the squeegee blade insure firm contact with the pavement. This type has limited use. It is used primarily for the wipe-clean type of crack filling and void-filling operations. The second type box has an adjustable squeegee. In this type the blade can be adjusted to any height above the pavement. This makes the box more versatile since it can be used for both surface and wedge construction as well as for void and crack filling operations.

The best squeegee blade consists of two plies of 1/2-in. Neoprene belting, 6 in. wide and of 55-60 hardness. Thicker blades are too rigid and thinner blades are too flexible to give a properly uniform spread over the surface.

In addition to the squeegee, the slurry box should be lined with belting. This belting prevents the loss of the mix when grade changes occur such as at intersections or long, narrow depressions. The belting consists of 1/4-in. Neoprene, is nailed on both sides and front of the box so that about 4-6 in. rides on the pavement.

There are a variety of shapes and sizes for slurry seal boxes but the common types are about 8 x 10 ft. Some boxes contain slots for

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longitudinal dividers (either wood or steel plates) for adjustment of spread width. The tow chain must be long enough so the front of the box will not lift during operation. Some contractors attach the box to the front bumper of the transit mix truck with long tow cables to avoid side sway of the box.

For highway slurry sealing it is desirable to have 12-in. wheels on the sides of the box. Generally, a rugged wheelbarrow type pneumatic wheel is used. It is mounted on both rear corners of the box much like the rudder on a ship, with a handle toward the rear of the box. The wheel prevents the box from sliding down super elevated curves and gives a more uniform spread. Some boxes have a row of brooms about 2 ft. in front of the squeegee to distribute the slurry better in the box.

Adding a sprinkler bar

Additional features, such as sprinkler bar in front of the box, have been used. The bar is fed by hose from the transit mix truck water supply. This spray of water is used to pre-wet the pavement and dampen any dust remaining on the surface. This saves an extra piece of equipment. Another useful feature is a platform with hand rail just behind the squeegee blade. This permits adjustments in the blade during the motion of the box.

It should be remembered that the box must be transported and moved frequently. The box should be well built but not so heavy as to make handling and transport difficult.

Types of mixers

The conventional transit mix type truck is by far the most common method of mixing slurry seals. Difficulties with mixing have been rare and can, in most cases, be avoided by:

1. Adding a small amount of water after the mixer has been emptied before returning to obtain another load.

2. Thoroughly washing the mixer inside and out at the end of the day.

3. Preparing the mix using the techniques already outlined.

4. Avoiding over-mixing. Some makes of mixer have more vigorous agitation than others. One contractor used a counter on his mixer to avoid over-mixing. On long hauls it is desirable to stop agita-

tion shortly after leaving the plant and start mixing again just prior to arriving at the job site. Needless to say, the drum is operated at a low rate of speed.

Many cities have found it advantageous to mount a pugmill or plaster mixer on the back of a maintenance truck. Tanks of water and emulsified asphalt are mounted on the truck. The slurry mix is proportioned by volume to insure the constancy of the finished slurry. The California Fresno Oil Co. of Fresno, Calif., has developed a special slurry seal mixing machine.

Application of slurry

The pavement should be pre-dampened just ahead of the slurry spreader box—preferably in the form of a fine mist. This can be done with a separate water truck or with a spray bar across the front of the box fed by water from the transit mixer or tank on the truck. There should be no puddles of free water. Water cools the pavement, pre-wets small amounts of dirt not removed by sweeping and washing and improves bond to the existing pavement.

The slurry box is attached to the transit mix truck either by tow chains to the rear of the mixer or, preferably, by a long tow cable attached to a bar mounted on the front bumper. In some cases the slurry box is pulled by a rubber-tired tractor and slurry is fed from the side. This takes up more of the street but increases production because constant hooking and unhooking is avoided. The truck driver should first pull the slurry box on the left side of the road. He can see the slurry box in the left-hand mirror and guide the unit

in a straight line. This gives good straight longitudinal joints. The box should be uniformly pulled at a slow rate, not over 5 m.p.h. if possible. Slurry is fed into the box so that it is as full as possible without spilling the slurry. If there is too little, the slurry has to be shoveled to the high side of the screed to obtain a uniform spread.

Application by hand

Slurry seals have been applied by hand squeegees in patching operations and, in some cases, in city streets. In hand application avoid letting the slurry flow over the end of the squeegee farthest from the applicator. This leaves an unsightly ridge. It is best to distribute the slurry on the pavement in long, low windrows prior to hand squeegee application. Squeegee blades mounted on tractors or the blade of a motor patrol have also been used. Here again, avoid having the slurry form ridges in the pavement.

The slurry mix should not be applied at rates greater than 3,000 sq. ft. per ton of slurry. This is about 7 lb. slurry per square yard. Thinner applications are quickly abraded by traffic.

Traffic control

Emulsified asphalt slurry seals cure to an asphalt sand mix primarily by a dehydration mechanism. The slurry seal must be permitted to cure thoroughly. A minimum of 4 hr. should be allowed for drying in good weather and longer under less favorable conditions. The thicker the application of slurry the longer the curing time. Barricades or other controls should be provided.

Colorado studies its 70-mph. speed

WITH the new speed limit of 70 mph. on certain state highways now established by law, and going into effect July 1, engineers of the traffic section, Colorado Highway Department, are conducting further studies on current design plans.

Under the new law the department retains authority to post speed limits on all state roads based on engineering and traffic studies. The law provides authority to post a limit of 70 mph. on hard-surfaced roads, with the approval of the highway commission. In another

section, the law states that the 70-mph. speed will be lawful on 4-lane highways. There are sections of 4-lane highways in Colorado posted at less than 60 mph. because of traffic and design considerations. These postings were determined by engineering study and will not be changed. Where the present posted highway speed is 60 mph., engineering studies will be made to determine whether sight distance and other considerations would not permit the new higher speed.

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Double-width paving in California

Placing lanes of concrete more than 12 ft. wide is on the upswing in the West. Here is the story of how one contractor over the course of four jobs developed a train of equipment which places smooth concrete 24 ft. wide.

FULL WIDTH PAVING in California consists of placing lanes in widths wider than the customary practice of 12 ft. and, at the present time, consists of placing these lanes 24 ft. wide. The idea of wider paving lanes is not unique to California, and certainly is not new. Lanes of 25 ft. in width are common practice in airport construction and lanes of similar width for highway construction are currently being placed in many other states.

Specifications allowing 24-ft. widths of pavement began to appear in projects advertised for bid about two years ago. These specifications called for the use of similar type equipment to that which was currently being used for 12-ft. construction. The jobs allowing wider lanes were at scattered locations and there were actually few jobs advertised on that basis.

There was apparently very little interest in the contracting industry. This could possibly be attributed to the fact that most contractors were not used to wider lane work and did not have suitable equipment available. The problem of constructing the 4 in. of cement treated subgrade immediately under the concrete pavement also, no doubt, presented quite a problem

By J. W. VICKREY, JR.

General Manager
Gordon H. Ball Co.
Danville, California

to those people who might be interested. Therefore, progress toward 24-ft. paving was slow. One job south of Bakersfield was constructed in 1957 and turned out very well. Also a job was done near Visalia in 1958. Both of these jobs were constructed by Griffith Company using finishing equipment similar to what they were using on 12-ft. width work.

In 1958 the Division of Highways made a major change in its specifications in connection with the finishing equipment to be used for wider paving lanes in an attempt to develop greater interest in the idea. A freeway job in Orange County was advertised early in 1958, with a specification that the contractor could use equipment of his choice for finishing the pavement surface. The specifications stated that the contractor would be responsible for the riding qualities produced and would be required to grind the surface with a concrete grinder to meet the tolerances required if he were unable to do so during the placing and finishing operations. The specifica-

tions stated that the riding qualities would be measured by means of a profilometer, a device developed by the Division of Highway to measure the variances from a smooth surface in terms of inches per mile. The upper limit for variation was specified as 7 in. per mile.

These new specifications allowing equipment to be used at the contractor's option interested the Gordon H. Ball Co. We had extensive experience in airport construction utilizing 25-ft. paving lanes and had at our disposal the tools required and considerable know-how on the subject. We spent a great deal of time discussing the cement-treated subgrade problem and, at least on paper, designed equipment that would accomplish this operation in the wider lanes and produce a subgrade surface suitable for concrete placement. We had a substantial volume of concrete work to do during 1958 consisting of over 168,000 cu. yd. Some of the jobs to be done already specified that 24-ft. paving was allowable. This was sufficient volume of work to warrant the outlay of time and money to equip ourselves for the operation. Negotiations were entered into with the Division of Highways to modify the specifications on those jobs allowing the option of 24-ft. paving. Some trouble was experienced in those districts that had not considered this type of work but with the help of the Headquarters Construction Department, we were able

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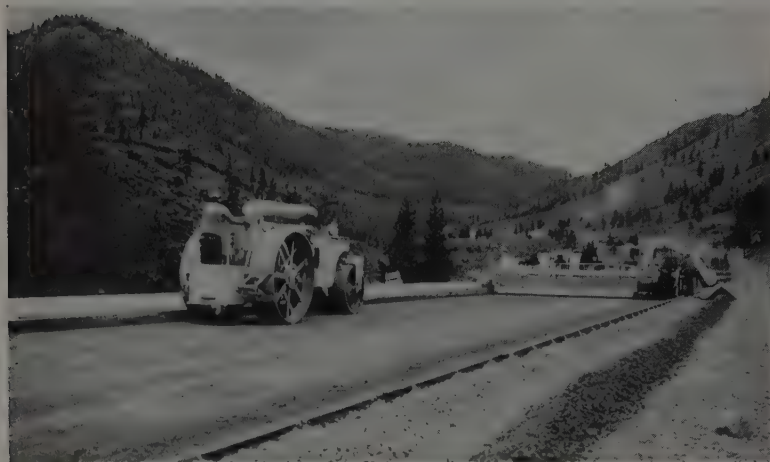
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WINDROW SIZER made by Koehring of California is first machine in wide paving train. It shapes subgrade material into two windrows with trough for cement, and discharges excess.



WOOD MIXER travels over windrow after cement is placed by bulk cement dispenser. Attached to travelling mixer is a spreader which levels mixed windrow to plane surface 12 ft. wide.



LEWIS SUBGRADER trims subgrade to exact depth. Note windrow of excess material deposited by conveyor outside forms at right. Steel wheel roller and pneumatic roller are next.

to obtain the green light on all of the work contemplated for 24 ft. paving.

The first job constructed was on U. S. 40, between Floriston and the Nevada state line. We were doing this work under subcontract to Gibbons and Reed Co., of Salt Lake City. As would be expected in any new operation, we encountered many difficult problems. Before we placed any concrete, many modifications were required in our cement-treated subgrade equipment to enable us to produce a satisfactory subgrade for the concrete paving. The terrain, the heavy traffic, the restricted work area, the very harsh mix resulting from an all crushed aggregate, all contributed to the difficulties we experienced. The finishing equipment did not function as designed and numerous changes were made in the equipment and certain substitutions of equipment were tried. The quality of the riding surface was not up to specifications and required considerable grinding on our part to meet the tolerances required.

The results on the Floriston job were not conclusive. Whereas the riding qualities did not suit us, we did save considerable time and had been able to make improvements in equipment; also, the cement-treated subgrade operation functioned very well.

With these facts in mind, we decided to continue the operation and moved on to our Crockett job. At Crockett, the concrete mix was much more workable in that there was not the high percentage of crushed material. The terrain was much better; in fact, there was only one curve on the whole job. The results obtained at Crockett were far better than had been obtained at Floriston. The riding surface was much better and required very little grinding; and, again, we saved considerable time on the paving operation. At Crockett we settled upon the type of equipment that we would use for the placing and finishing of the pavement. This consisted of a Blaw-Knox spreader, a Blaw-Knox transverse finisher, and a Lewis longitudinal float, which will be discussed in more detail later.

(Continued on page 68)

EDITOR'S NOTE: This article is taken from a paper delivered by the author at the second annual Highway Conference at College of the Pacific in Stockton, Calif.

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Attractive office of the Kvamme Construction Co., Moorhead, Minnesota. Note overhanging eaves and window-high masonry treatment.

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SCRATCH TEMPLATE checks final subgrade depth. Man with shovel corrects small irregularities. Photo taken on Floriston job, first 24-ft. wide paving project undertaken by Gordon H. Ball.



CONCRETE is placed by Koehring paver as evenly as possible in front of Blaw-Knox spreader. Towed by spreader is 25-ft. levelling attachment tried on Floriston project.



BLAW-KNOX transverse finisher follows spreader. Finisher has two transverse oscillating screeds and a tamping bar. This machine is self-propelled and has 10-ft. wheelbase.

Because of the encouraging results at Crockett, we decided to continue the 24-ft. operation on our job at Warm Springs. At Warm Springs, the first real progress was made. We found the major trouble in our finishing operation. It was finally discovered that considerable concrete was being left behind because the material tended to flow under our finishing screeds and was not being planed off. The material that was being left, although not substantial in depth, was irregular and was what was causing the variation in riding surface. The Warm Springs operation was accomplished in a minimum of time, and, as it turned out, the ability of our finishing equipment was our only limit to production. The riding surface produced at Warm Springs must be considered excellent by any standards. There was no grinding to be done and by that time it could safely be said that 24-ft. paving was here to stay.

From Warm Springs we moved to our job at Los Gatos and experienced similar results as compared to Warm Springs. The riding surface at Los Gatos is even superior to Warm Springs and I am sure is considerably better than the state average.

The paving train

The subgrade equipment consists of a train with each piece accomplishing a specific part of the work. The first machine rides on the headerboards; we call this machine a sizer. It scarifies the grade, planes the material to an exact depth of 12 in. below the headers and forms this material into two parallel windrows. This machine is pulled by a special heavily weighted and low-g geared D8 tractor. Next the cement is placed on the top of the windrows. This is accomplished using a bulk cement spreader with calibrated cement screws discharging cement on to each windrow at the same time. The cement spreader travels between the windrows and discharges out each side at the back of the machine. This bulk spreader holds 100 bbl. of cement and is refilled as required.

The material is then mixed with a Model 54 self-propelled Wood road mixer. This mixer has a spreader attached on the back which levels the mixed windrow to a plane surface. This mixer proceeds ahead alternately on the two windrows. The mixed and spread material is compacted with a three wheel, 12-ton roller.

(Continued on page 70)



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FINAL FINISHING is performed with a Lewis longitudinal float. Machine has 30-ft. wheel base and two oscillating screeds suspended midway. Note burlap drag at right above.

The subgrade is trimmed to exact depth, using a Lewis subgrader riding the headers pulled by a special low-gear D8 tractor. The subgrader trims the material and feeds the excess onto an endless belt which deposits this excess outside the forms. Final compaction is accomplished with a 3-wheel, 12-ton roller and a rubber tired tandem roller. After oiling with MC-2, the subgrade is ready for concrete placement.

The concrete is mixed in two dual drum Koehring pavers and placed directly on the grade. The first machine, a Blaw-Knox spreader, spreads and levels the concrete to grade and provides surface vibration. The operator of this machine must be experienced because his machine regulates the grade to the extent that there is sufficient material to finish and a minimum of excess. Finishing is accomplished with a Blaw-Knox transverse finisher. This machine has two transverse oscillating screeds and a tamping bar which tamps the concrete surface.

Final finishing and floating is performed with a Lewis longitudinal float. This machine has a 30-ft. wheel base with two oscillating screeds suspended midway between the front and rear of the machine. These screeds are at a fixed elevation and operate independently with respect to the variations in the headerboards. The outside edges of the screeds are hinged to allow movement in case the headers are high at any point. This machine has a shoveling device to pull the excess concrete uphill on superelevated curves. The screeds on this machine have vibrating attachments to vibrate the

screeds when necessary. Hand work is limited to edging and checking the surface with straight edges for irregularities. Excess material is handled by having the float and finisher back up and then the finisher carries all the material ahead which is then lost along the way as the spreader adjusts the grade.

Advantages and disadvantages

There are certain advantages and disadvantages to the 24-ft. operation. From the State's standpoint, a few of the advantages to be mentioned would be fewer random cracks, no center joint riding problems and apparent lower costs. The random crack problem occurs on 12-ft. paving in the lanes poured adjacent to previously poured lanes. It is very difficult to prevent the second poured lane from cracking opposite those joints which are cracked and open in the initial lane, before the concrete is hard enough to support the weight of a concrete saw. These circumstances do not occur on 24-ft. paving. It is difficult, in placing adjacent lanes, to keep the longitudinal joint smooth. On 24-ft. paving, the center line joint is perfectly flat and not detectible in riding over the pavement.

It appears to us that the State is now getting lower bid prices on concrete paving on those jobs where 24-ft. paving is optional. In addition to these advantages, the State is able to put their highways in service sooner than is possible using 12-ft. paving lanes. The only disadvantage that comes to mind from the State standpoint is the possible decrease in riding quality as other contractors perfect their methods.

From the contractor's standpoint, I see no apparent disadvantages but there are several advantages such as a contractor being more competitive if he is tooled up for 24-ft. paving; capabilities of a larger volume of work with the same tools; and most important, finishing much faster after the paving is completed. After the paving operation progresses through the job the completion of the shoulder on both sides of the pavement can be commenced and the job cleaned up. Therefore, not long after the paving operation is completed, the balance of the job is also completed. Generally speaking, on 12-ft. work, it is not possible to start the shoulder work until practically all of the paving is in place. Since the final stages of completion of a job is usually costly, this is an important consideration.

A result of cooperation

The development and use of full width paving is an example of the results to be obtained by the mutual cooperation between the contracting industry and the Division of Highways. Presently most specifications for freeway work are allowing the use of full width paving. I am sure there will be a considerable increase in this method since there are many contractors now tooling up for this type of work and I anticipate this operation will soon be common. There will no doubt be a variety of tools and methods employed. Full width paving will not entirely replace the present practice, however, since some jobs are not suited to this operation because of restricted work room. In the case of a six-lane divided highway, it may not be economical to move in two spreads of equipment. There can be more progress expected in full width paving in the near future of a slightly different type.

Slip-forms in Colorado

Slip-form paving work is being accomplished in other states, notably in Colorado. I personally visited a project under way in Colorado and was very much impressed with the operation. The riding qualities on that particular job appeared to me to be tolerable. Slip-form paving is an operation of placing concrete pavement without the use of stationary side forms. This operation could be varied in width fairly easily and it is possible to place 36-ft. widths of paving at one time.



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BUCKET auger drill rig set up by contractor on Dunsmuir site prepares to sink a 40-ft. drain well.

New drainage methods solve slide problems

Gravel-lined stabilization trenches, vertical drain wells tapped by spreads of horizontal piping, and vertical risers are being used by contractors to pin down moving ground in construction of two mountain highways.

MIX LIBERAL amounts of clay and water, plaster it on a steep mountain side, sprinkle it with a layer of solid earth, and top with a shelf for a modern highway, and what have you got? Instant trouble.

These conditions fairly well describe the 3.7 mi. of Dunsmuir Freeway project on US 99 in Northern California, and the 3.9-mi. Hatchet Mountain project near Burney, Calif.

Here two contractors and state highway engineers from Califor-

nia's District II are steadily pinning down a pair of slippery mountains.

The pinning is accomplished with stabilization trenches, horizontal drain wells, and vertical drain wells, the last an adaptation of the old "sand pile" method of squeezing water out of swampy ground.

Dunsmuir Freeway

Old US 99 winds through the town of Dunsmuir, forming its main street. It is being replaced

with a modern 4-lane freeway by contractor McCammon-Wunderlich Co. & Wunderlich Contracting Co. In order to get enough room for 4-lane freeway construction the new right-of-way had to be moved several hundred yards up hill.

Work must be carried on at close quarters. The town straddles the road, and below it, at the foot of the mountain, an extensive Southern Pacific railroad yard skirts the Sacramento River.

All three, town, highway and railroad rest on unstable ground varying in depth from 30 to 100 ft. A good slide will bring down the uphill houses; a big slip will take out the city's main street; and too much spoil dirt in any one disposal area will cause unsightly bulging in the railroad tracks.

A condition of the original contract was to hoist the Dunsmuir high school football field, which adjoins the right-of-way, back up hill where it belonged and pin it there. The contractor accomplished this by driving fifty-two, 40-ft. H piles, installing horizontal drains and building a concrete retaining wall.

The entire job involves 1,500,000 cu. yd. of cut and fill, and 8 bridges over steep ravines. These ravines and fill areas require extensive de-watering preparation, usually in the form of stabilization trenches.

Stabilization trenches

Stabilization trenches vary from 30 to 40 ft. deep, below original ground level, and run across the slope, close to the highway center line. They are cut in key shape and both ends slope toward the middle where an outlet trench is cut.

Bottom of the trench is filled with 3 ft. of gravel, and a 3-ft. gravel blanket is laid against the up-slope face. Outlet trench also has 3 ft. of gravel covering a metal drain pipe which leads downhill to a safe disposal point. Remainder of the trench is backfilled and compacted with native material. Effect of the trench is two-fold. It provides a man-made curtain of gravel to carry off water flowing in underground strata, and an insert of solid material at a critical point in the roadway.

Drain wells

At other points, often in cut areas, an unusual vertical and horizontal well system is being used. Verticals are drilled on both the



Overpass at Albany—Steel girders will be placed on top of these steel-reinforced concrete piers to form an overpass at Albany, California. USS *Di-Lok* Concrete Reinforcing Bars are used for all types of concrete work; and Universal Atlas Cement Division of United States Steel, offers a wide variety of portland cements. *Tiger Brand* Wire Rope is used on cranes, pavers, shovels, ditchers, trenchers, derricks, mixers and road scrapers.

Steel Bridges at Magra—The USS *Di-Lok* Bars in the right-hand side of these bridges at Magra near Gold Run, California, are ready for concrete. The next step in the construction of the left-hand bridge is to place the decking on top of the continuous girder span.

2,194 miles of Interstate Highways

with products from United States Steel

CALIFORNIA'S HIGHWAY COMMISSION has planned 2,194 miles of Interstate Highways to be completed by 1975. 1,453 miles have already been located; 73 miles have been completed, and 170 miles are under construction. Several hundred miles of California's own Freeways are near to meeting the rigid requirements for the Interstate System; when they do, the number of *completed* miles will rise rapidly.

Steel is high on the list of products being used to speed construction on the eighteen highways in California's Interstate System: 3,186 bridges, overpasses, underpasses, and traffic-controlling clover-leaves will be built; 123 bridges are already completed and 194 are now under construction.

United States Steel supplies a complete line of products for highway construction: Structural carbon steel and special high-strength and constructional alloy steels for bridges; steel H-piles, sheet piling and tubular piles for bridge foundations; drainage products; reinforcing bars, welded wire fabric, cements, slag and other pavement construction

products; wire rope, cable, tubing and special steels, and steel products for construction equipment; and a complete range of items including fence, beam and cable guardrail, steel for signs, markers, and other accessories. Write for the *free* 54-page booklet, "Keep Our Roads on the Go." This booklet lists all the products and services available from United States Steel to help you cut costs and speed operations in every phase of highway construction. United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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The highway market is served by the following divisions of United States Steel: American Bridge Division, Pittsburgh, Pa. • American Steel & Wire Division and Cyclone Fence Department, Cleveland, Ohio • Columbia-Geneva Steel Division, San Francisco, Calif. • Consolidated Western Steel Division, Los Angeles, Calif. National Tube Division, Pittsburgh, Pa. • Tennessee Coal & Iron Division, Fairfield, Alabama • Universal Atlas Cement Division, New York • United States Steel Supply Division, Steel Service Centers, Chicago, Illinois.

... for more details, circle No. 35 on Reader Service Postcard

up-slope and the down-slope side, each group in two ranks, on 10-ft. centers and offset, so that there is a well every 5 ft.

Each well is 30 in. in diameter and 40 ft. deep with a 6-in. perforated pipe placed in the center and backfilled with gravel. Vertical wells on the up-slope side serve much the same function as the gravel curtain in the stabilization trenches, to intercept the pervious strata, and to serve as a drain. Outlets for these verticals are spreads of horizontal drains drilled on 3 to 5-deg. slopes from far enough down the hill to intersect the well bottom. Horizontals are 2-in. perforated pipe which feed into a main 8-in. or 10-in. collector pipe.

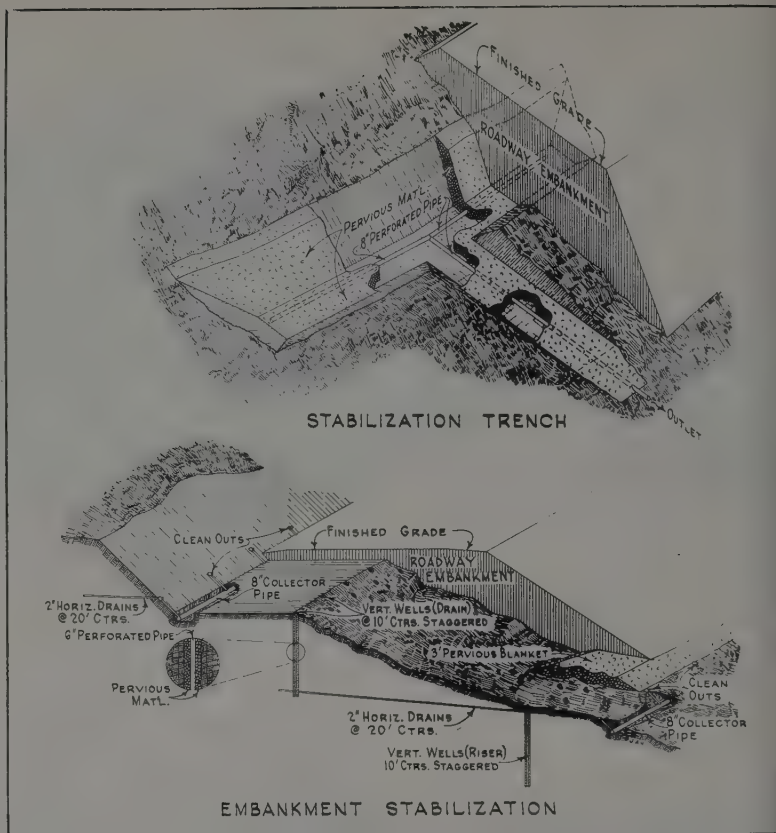
Similar lines of vertical wells placed at down-slope locations (i.e. at the toe of the fill) have a different function. Here it is not practical to drain the verticals with horizontal pipes, so the wells serve as risers. The head of water seeping down the mountain side, augmented by pressure from the weight of fill, causes water to rise in the wells. The well line is covered with a thick layer of gravel which acts as a wick leading the water out from beneath the fill, and into a surface collecting system.

Hidden springs

Both well systems and stabilization trenches are set at or below original ground level, and must function properly in drying out the area before fill operations and bridge erection can proceed. This has delayed the job somewhat behind anticipated completion. Although previous nearby construction and test borings along the right-of-way had shown the nature of the ground, subsequent pioneering turned up numerous hidden springs and much more soft earth than expected.

Asked how many areas of swampy ground were covered in the 3.7-mi. stretch, District construction engineer George Barry replied, "One!" This observation was echoed by Sam Martinelli, McCammon-Wunderlich project manager, who was asked how many slides he had to contend with, "At least one on every cut."

Sam indicated that Barry was stretching things a bit, however, because the area is intersected by at least one outcrop of honest rock sufficient to require some 20,000 yd. of drilling and blasting. Balance of the cut and fill is done with rippers and scrapers. For this purpose he has an earthmoving fleet



SKETCH prepared by California Division of Highways, District II shows details of stabilization trench and drain well installations. Note pervious gravel blanket, in upper sketch.



OUTLET for stabilization trench descends ravine too steep for earthmovers, and must be backfilled from haul road. Portion of drain pipe can be seen at right of scraper.

of 8 Caterpillar D9 tractors, 12 Caterpillar DW20 scrapers, 5 International Harvester D24 tractors, tractor and scraper units, and 4 Caterpillar graders. Crew now totals 125 men including crusher plant, maintenance shop and office personnel.

Martinelli's crew moved about 500,000 cu. yd., and has another 1,000,000 to go. Material ranges from mud to boulder fields embedded in the soft clay.

Drilling operations

Drilling of the vertical wells is handled by Al Rogers, drilling operator at Ukiah, on a sub-contract. He will sink about 400 40-ft. holes. Rogers originally used lengths of fiber pipe to form the well cores, but these proved difficult to align, and too brittle to withstand pounding of the gravel backfill, and he has switched to perforated steel. Gravel for the wells is furnished by the contractor (no easy task at some locations where trucks must be encouraged up pioneer roads with tractors) and dumped in the wells with a front-end loader. Drilling is done with a 30-in. truck-mounted bucket auger. Unit bid for this work was \$6.50 per ft., including pipe and gravel fill in place.

Horizontal drilling is done on another sub-contract by Eric A. Anderson, Petaluma, Calif. Anderson uses rigs of his own manufacture, consisting of a side-mounted hydraulic drill frame on a small crawler tractor. Contractor benches out drill sites for Anderson's rig. Drill holes, which fan out from the site like spokes, are located by lin-

ing up the drill stem with a target flag set at the vertical well location by Resident Engineer Mark Cessna. Angle of the bore is checked by attaching a hose to the drill steel and measuring the height the water will reach in hose held vertically. Drill hole is 3 in. in diameter, and perforated pipe liner is 2 in. Ten-foot lengths are welded and shoved in with a truck-mounted winch. Pipes which clog with mud washed in through perforations are back-flushed with water under high pressure. Bid price for horizontals was \$2.50 per ft. Anderson says he has a better and faster way to clean out these pipes, but is deterred from putting it into practice by a shortage of black powder—which others connected with the job consider a blessing. The cleanout device is cannon coupled to the outlet end of the pipe, literally blowing out dirt and mud.

In constructing vertical-lateral drain combinations, it is essential that the verticals be drilled first. Otherwise the big auger is likely to encounter the 2-in. horizontal pipe, as happened once, and roll it up like spaghetti on a fork.

Drain effect checked

Effect of the well installations is immediate—like turning the spigot in a beer barrel. Nevertheless, careful check of the area including measurement of draw-down in the vertical drains is necessary before construction can proceed. In some cases drain areas were observed for 3 months before placing the fill. Engineers Mark Cessna and George

Barry, and the District's new test drill rig continue to make up the advance guard of the job, testing each area for its drainage needs.

The team also is testing capabilities of disposal areas where some 300,000 cu. yd. of slide dirt must be deposited—gently to keep the surrounding landscape in place.

The job originally specified 69,000 ft. of horizontal drains, and 15,400 ft. of drain wells. These quantities will be exceeded by the maximum 25% and perhaps more by the time the job is finished. Completion date is set for September 1960.

Key personnel for the contractor include: Sam Martinelli, project manager; Ralph McCall, structure superintendent; Tim Gage, engineer; Don Haney, office; Robert H. Graham, grease foreman; Art Stewart, grade foreman; Lloyd Portlock, grade foreman; Roy Monk, crusher foreman; Gayland Olson, excavation foreman; Ken Haddox, labor foreman; Lee Sample, Ralph Franklin, and Reed Hollingshead, carpenter foremen; Cliff Sheffield, master mechanic; and Eugene Babcock, mechanic foreman.

District engineer of California Division of Highways, District II, at Redding, is H. S. Miles. Construction engineer is George Barry; project engineer, Ellis Engle, and resident engineer is Mark Cessna.

Hatchet Mountain

CONSTRUCTION forces of M. W. Brown Co., of Redding, are hacking away at the slopes of Hatchet Mountain near Burney,



EXCAVATED stabilization trench ready for gravel blanket and backfill. Trench is 40 ft. deep at center and about 400 ft. long.



GRAVEL placement in trenches is done with loader which piles rock against steep side. Trench then is backfilled to that level.

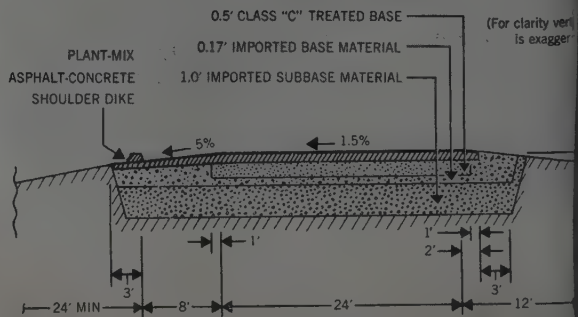


**... solves problem of extreme variations of
sub-soil bearing values, too.**

The project . . . 29.335 miles long . . . is one section in the planned conversion of U. S. 66-91 to Interstate Highway 15. Opened to traffic

In the desert country between Victorville and Barstow, temperatures of pavement surfaces sometimes vary by as much as 140°F by day to freezing at night. Here, too, "R-Values" of the soil vary as low as 10 to as high as 75.

CROSS SECTION OF VICTORV



DESERT-COLD BY NIGHT

California Interstate 15 has ruggedness and drastic temperature changes

provide a pavement of **predictable** strength and the durability and up under heavy traffic in the face of these drastic conditions, the engineers stripped top cover and constructed subbases of required thickness and quality from nearby borrow.

is heavy-duty but lower cost pavement, the wearing course is 3 inches of open-graded hot-mix Asphalt surfacing and the leveling course is 3 inches of dense-graded hot-mix Asphalt concrete placed in courses 1½" thick. An Asphalt prime coat binds the leveling course to the base.

Construction speeds proved excellent...only 17 months to open highway...only 14 weeks to lay the 250,000 tons of Asphalt concrete. The pavement is superbly smooth-riding.***

Modern Asphalt-concrete pavements...engineered and constructed like the Victorville-Barstow project...are **reputation builders** and **tax savers**. Sure to benefit you and your state for years to come! Specify Asphalt concrete for **your** Interstate highways.

*Based on comparable pavement costs in the same highway district.

**California-developed standard which compares soils on basis of their resistance to plastic deformation under load.

***Average Profile Roughness Index 2 inches per mile.

Ribbons of velvet smoothness...

ASPHALT-paved Interstate Highways

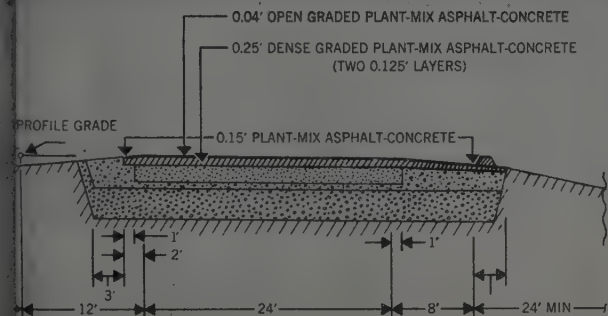
THE ASPHALT INSTITUTE

Asphalt Institute Building, College Park, Maryland

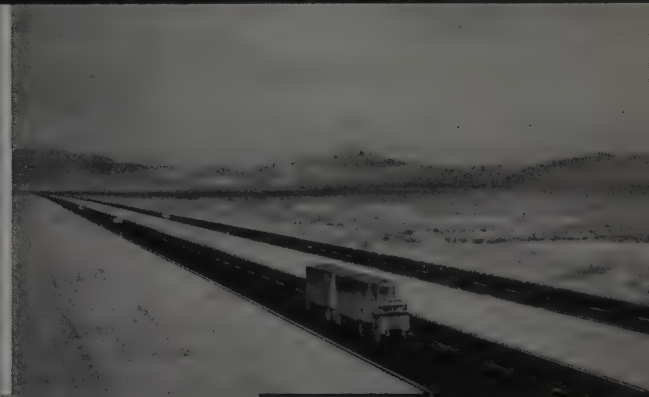


The 23½-inch pavement structure is low cost material imported from a local source. This same source supplied aggregate for the Asphalt plant mix at a relatively low cost.

BARSTOW PROJECT, CALIFORNIA



Set of "doubles" speeds along Asphalt-concrete pavement in comfort and safety. Modern tax-fund-stretching Asphalt pavements are now being specified for many of the nation's heaviest-duty roadways. Experience (with the New Jersey Turnpike, with jet plane runways, for example) proves these rugged, durable Asphalt pavements stand up under heaviest traffic.



Calif., on a \$1,498,000 road straightening project that includes three large economy-size drainage problems.

The problems are three deep water courses cut in the steep mountain shoulder by spring runoff, and compounded by sub-surface water which creates squishy mush to a depth of 100 ft. in places.

The hacking takes the form of stabilization trenches 35 to 50 ft. below original ground, and several hundred feet in length.

In one area the slippery footing is so extensive that four trenches have been cut. Three of these are side by side and the fourth runs along one end, linking the others together.

At another point, a steep canyon with a big rock outcrop at the bottom prevents moving material down the floor of the outlet trench, and a circuitous half-mile haul road has been built to bring material to the bottom of the outlet—a linear distance of about 150 ft.

Gravel placement

Stab trenches are similar in design to those at Dunsmuir. They are lined with 3 ft. of gravel at the bottom of both the lateral and outlet trenches. The up-slope face of the trench also has a 3-ft. gravel blanket.

Placement of the up-slope rock blanket represented a problem for Chick Dwyer, construction superintendent, since sides were too steep and terrain too uneven to dump it off from the top. Instead, he delivered piles of gravel to the bottom of the trench, distributed it against the trench face to a height of 4 or 5 ft. with a front-end loader, and backfilled to that depth. Thus lining was accomplished in 4-ft. lifts.

Exploration delayed

Original contract for the 3.9-mi. job was let under a recession-inspired federal emergency program, at a time when the area was covered with its usual 6-ft. blanket of snow. Consequently the state highway department was unable to complete its testing of the area. Subsequent explorations have shown the right-of-way is deeper and muddier than expected, resulting in an additional \$300,000 in stabilization work which was later added to the original contract that

was about \$1,200,000.

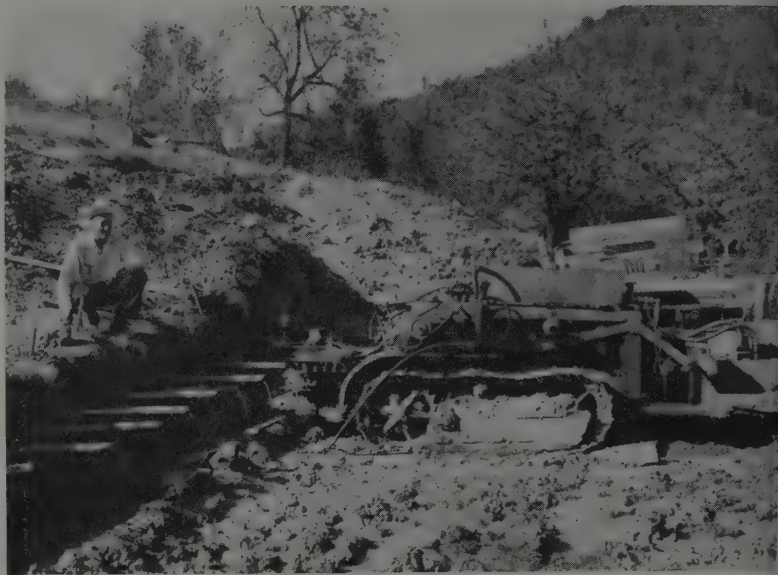
This additional work will cover a group of vertical and horizontal drain wells which District construction engineer R. J. Felton and resident engineer Wesley J. Jones plan at one location. These, too, will be patterned on the Dunsmuir installations. Verticals will be 24-in. or 30-in. bores, with perforated pipe running down the center, and gravel backfill. Test borings at the location of the horizontal drains are being made.

Total job will cover some 690,

000 cu. yd. cut and fill. When finished it will provide a 2-lane asphalt paved road from the flat Burney Creek valley up the mountain to the 4,366-ft. Hatchet Mountain Summit.

Personnel

Contractor key personnel are superintendent Chick Dwyer; grading foreman Leo Noltamy; labor foremen Humphry Jordan and Lee Stephens; and master mechanics Orvel Bird and Wayne Keller.



HORIZONTAL drains fan out from benched drill site. Drilling sub-contractor Eric Anderson checks flow of water from completed set of 2-in. perforated pipe drains. Crawler mounts drill.



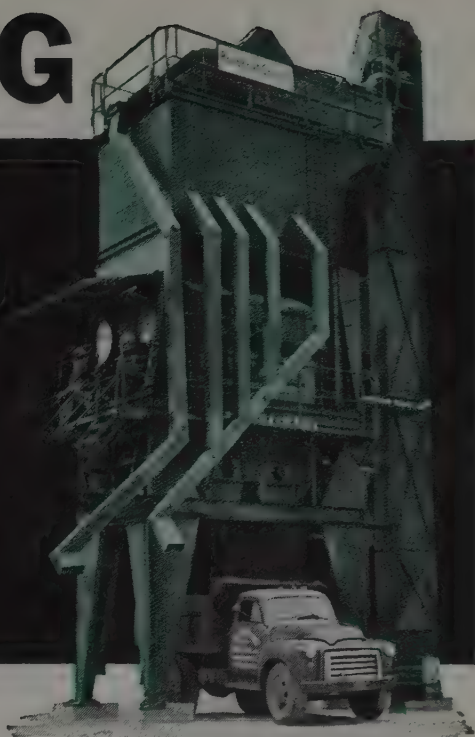
COMPLETED line of vertical wells marked by line of pipes inspected by Resident Engineer Mark Cessna. Flagpole in background is used as target to line up drill for horizontal drain holes.

INTRODUCING

NEW-IMPROVED

BatchOmatic

AUTOMATIC ASPHALT PLANTS



OUTSTANDING PERFORMANCE, widespread use, and record tonnage production of BatchOmatic plants, of all sizes, have proved their revolutionary principles and features, first introduced in 1955:

First inherently automatic design . . . simultaneous measuring of all aggregate gradations . . . new principle of asphalt measuring . . . pre-set proportions . . . larger screening area, including full deck for fine material, and new adjustable directional throw . . . exclusive material flow selector . . . new Dyna-Mix pugmill for faster mixing, faster discharge . . . fast-stacking, self-contained sections with quick-disconnect couplings . . . and many others.

Now Barber-Greene announces the new BatchOmatic series, incorporating more outstanding advances—improvements based on the experience of all BatchOmatic plants operating on every type of job, producing every type of mix, including the abnormally rigid specs of the AASHO Test Road. These new features and improvements further increase ease and flexibility of operation, and daily tonnage output.

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New electric-over-hydraulic main controls—Controls electrically actuate hydraulic valves located directly on the rams, greatly reducing hydraulic piping, fittings and valves. Simpler construction and maintenance.

25% more weigh-hopper capacity—The unique multiple BatchOmatic weigh-hopper, which permits simultaneous measuring of all gradations, has been enlarged. Adjustable sidewalls are hydraulically controlled separately or simultaneously. Unlimited flexibility for handling all extremities of gradation percentages.

Multiple pre-set mixes—Easily switch to any pre-set mix. Pre-setting is instantly cancelled hydraulically for special mix. Automatic return to pre-set to resume production.

New, faster change of asphalt content—The unique, adjustable suction pipe measuring principle can now be quickly dial-set to the required number of pounds.

New fines control with fast change of proportion—Immediate dial-setting of fines content for any percentage of bulk or bagged mineral filler through new special vane feeder.

Also available with single weigh-hopper and power controls—These power-control towers have most of the BatchOmatic features, including interlocked dry and wet mix timers, and the asphalt measuring system. Available as 2- 3- 4- 5- and 6000-pound plants.

New, improved auxiliary units: New, improved Barber-Greene Dryers, Portable and Stationary Dust Collectors, Aggregate Feed Systems, and completely new Wet Scrubbers further increase production of all asphalt plants.

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WESTERN CONSTRUCTION—June 1959

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Low-cost road-building for the AEC

Despite fact that engineering is often just one step ahead of bulldozers, road building costs are kept low at Atomic Energy Commission test area.

By **GUY T. KUNTZ**

Civil Engineer
Plant Engineering Department
Lawrence Radiation Laboratory
University of California
Livermore, California

SITE 300 is an experimental test area operated by the Lawrence Radiation Laboratory of the University of California for the United States Atomic Energy Commission. The site is located about 10 miles southwest of Tracy, Calif.

At present over 10 sq. mi. of land are included within the site boundary, several hundred people are employed, and 19.5 mi. of road have been constructed to serve the 50 permanent structures located throughout the area. When the site was purchased by the AEC in 1955 there were almost no improvements on the land.

The topography of the area varies from rolling hills with relatively flat benches and valleys to steep hills and rugged canyons. Elevations range from 450 to 1,725 ft. above sea level. The land was formerly used for stock grazing and is almost devoid of trees and brush.

Main site road construction

Construction of the first major road, known as the Main Site Road, was undertaken in the summer of

1955. The road is 3.85 mi. long and was built to connect the existing county road, which borders the site on the south, to building areas within the site.

Time did not permit the preparation of formal plans and specifications for the construction of the Main Site Road and location work and construction staking was done literally one jump ahead of the bulldozers. All of the construction was accomplished by equipment rented on an hourly basis from various contractors.

The cross section for the Main Site Road is an 18-ft. wide roadway section with 6-in. thick base and graded shoulders of varying widths. All of the base material for the Main Site Road was hauled in from the Tracy area. Most of the road is in side hill cut and the section is pitched into the hill. Side ditches with hand-placed-rock check dams draining to cross drains were constructed where required. Pipe installed for cross drains and culverts was corrugated metal pipe, the largest size being 36 in. in diameter.

Most of the water for road construction had to be pumped into trucks at the Delta-Mendota Canal and then hauled 6 mi. to the site; therefore, in order to limit fills to those required by culverts, the en-

tire 18-ft. wide road bench was set in cut. This technique eliminated the need for water which would otherwise have been required for fills, provided a very stable road and was economical because earth moving operations consisted only of bulldozing. Road alignment is sacrificed in the hilly terrain by keeping all of the road bed in cut, and in sections where cuts were heavy the side casting resulted in what appears to be a very wide road because almost all the side cast material stayed in place. No blasting was required to excavate material on the Main Site Road nor has it been required on any of the subsequent roads built on the site. Much of the native material is a sedimentary rock which can be ripped with relative ease. The steepest grade on this road is approximately 12%.

The surface of the Main Site Road consisted of a penetration treatment of SC-1 put on the base in two applications, the first at the rate of 0.25 gal. per sq. yd. and the second at 0.15 gal. per sq. yd. The penetration-treatment surface was used for about a year before the road was resurfaced. The total construction cost of the road was less than \$3 per lin. ft.

After nearly a year's use it was decided to resurface the Main Site Road with a double seal coat applied in accordance with State of California, Division of Highway Standard Specifications. The road was first prepared by patching a



60-foot long Blaw-Knox tunnel form in position inside east diversion tunnel at Glen Canyon Dam. Each linear foot of the 33-inch tunnel wall required 20 cubic yards of concrete. Blaw-Knox Forms consistently met accuracy requirements.

Blaw-Knox Steel Forms ease concreting of Glen Canyon Dam Tunnels

Two 60-foot long, 41-foot diameter, non-telescopic tunnel forms met required standards of accuracy in the concreting of 6,000 feet of diversion and spillway tunnels at Glen Canyon Dam on the Colorado River. Their special design permitted the lining of curved or tangent sections within radii as small as 165 feet.

A total of 140,000 cubic yards of concrete was used in constructing 33-inch thick tunnel walls. Preassembled outside the tunnel, the Blaw-Knox Forms were mounted on rails. After the form was placed, a series of hydraulic jacks expanded the unit to match the "A" line grade. Concrete was pumped into place, vibrated to eliminate honeycombing, and cured for 16 to 24 hours. Merritt-Chapman & Scott Corporation, prime con-

tractor for Glen Canyon Dam, employed a 20-man crew to set, strip, and reset the form. A specially designed Blaw-Knox screed was used to pave inverts of both tunnels. This method, combined with the accuracy of the Blaw-Knox Forms, pour after pour, helped to considerably reduce time and costs.

Blaw-Knox Steel Forms Consultation Service is available to contractors on all types of concreting. For more than forty years, Blaw-Knox Forms Engineers have made their experience available to enable contractors to save time and cut costs on dams, bridges, and tunnels. Contact us early in your planning for a profitable engineering contribution, or you may wish to write for a copy of technical report 2571 covering this project.



BLAW-KNOX COMPANY

Blaw-Knox Equipment Division
Pittsburgh 38, Pennsylvania

STerling 1-2700

holes and rebuilding small portions where the base had failed. The cost of repairs and seal coat for the 3.85 mi. of road was about \$14,000. This seal coat is still in place and in good condition. There was originally some uncertainty about using a seal coat on the steep portions of the road, but this uncertainty has been dispelled by the good service the seal coat has given on all grades.

312 and 330 roads

Following the Main Site Road the next major road building at the site was the Building 312 and Building 330 access roads. The need for these two roads was anticipated under one lump-sum contract. The plans and specifications called for the same type of construction as was described above for the Main Site Road. A major difference, however, was that all the base material came from a pit on the site. The 330 road is 0.57 mi. long and the 312 road 3.10 mi. long, with side hill cuts ranging up to 28 ft. deep. The low bid for these two roads totaling 3.67 mi. in length was \$45,500. These roads were constructed under AEC contract.

Pit-run rock for road base

Early in the Site 300 construction program, excavation for a building structure uncovered material which appeared to be suitable for road base. The potential value of this material was recognized and upon obtaining physical tests it became apparent that the material from the pit very nearly met all the requirements of the State of California Division of Highways Standard Specifications for Untreated Rock Base. The only major deviation from the Standard Specifications was that there were oversize rocks in the pit. Material from this pit was used with good success for the construction of some of the secondary roads on the site, some of the rock areas around buildings, and some of the parking lots.

When the material in the original pit appeared to be nearly exhausted, an exploration program was undertaken to develop another supply of base rock for construction of the 312 and 330 roads, and for other construction. An auger of the type used to drill holes for power poles was rented and holes were bored at locations where base material was believed to exist. The locations of all holes were logged and the type of material therein

recorded. When promising material was uncovered, several borings were made in the area to try to determine the extent of the pit. Typical samples from potentially good areas were then sent to a testing laboratory to determine the physical characteristics of the material. From the borings and tests one area was selected and a pit made ready for use by removing the overburden with a bulldozer. To date five pits have contributed material for roads and paving jobs.

Pit-run rock is economical and has proven to be a satisfactory base material for roads and parking areas at Site 300. However, there are several disadvantages to its use. Some pits are spotty and material must be carefully selected. This means close supervision of pit operations. All of the Site 300 pits contain oversize rock and it is difficult to work large pieces in a 6-in. thick base. Pits at Site 300 are not always found in locations which are conveniently accessible and the cost of access roads must be considered in overall costs. Perhaps the greatest disadvantage to pits is that the quantity of suitable material contained therein is always unknown and a pit can be exhausted in the middle of a construction job.

Because of the foregoing reasons a contract is now under way to crush and screen 50,000 cu. yd. of river gravel to meet California State Division of Highways Specifications for Untreated Rock Base. The rock is being taken from Coral Hollow Creek bed within the Site 300 boundaries and will be stockpiled for use as needed.

Other road operations

As Site 300 took on a more permanent character and traffic increased, roads of a higher quality have been constructed. Grades on major site roads have been limited to 10% maximum (except on tangents in short stretches where 12% is permitted), the minimum radius of curvature has been established at 100 ft., shoulders of the roads are constructed of 6-in. thick base material, road widths are widened on curves, and surfaces of major roads are given a penetration treatment and then a double seal coat. Also on some steep portions of roads side ditches have been paved with plant mix instead of using rock check dams. Inlet boxes for culverts and cross drains have been made of concrete rather than wood.

The refinements mentioned

above have resulted in road costs as high as \$7 per lineal foot for an 18-ft. wide paved road in rugged side hill terrain. Since the site now has a dependable water supply, it is planned in the future to allow the use of more fills if it should appear economical.

Road usage and maintenance

There have been no traffic counts taken on Site 300 roads but the average number of cars is probably less than 50 per day on most of the roads. However, the first 1½ mi. of the Main Site Road are rather heavily traveled and have borne construction traffic almost continually since the road was first built. In general, volume of traffic throughout the site is relatively low, but there is an inordinately high percentage of heavy construction vehicles using many of the roads.

On penetration-treatment surfaces it has been found desirable to make repairs soon after any signs of raveling are observed. Failure to repair the raveled area promptly will result in loss of fines in the road base and large areas of road surface may be damaged. If holes in the surface are cleaned and patched with cut-back or hot plant mix before they become too large, the road surface can be kept in good condition. The penetration-treatment surfaces have held up well at Site 300 and lesser-used roads at the site are still being constructed with this type of surface.

In 1958 some of the roads were striped in the center to define the two 9-ft. wide lanes. After striping, more of the traffic kept to the right and damage increased greatly at the edges of the road where shoulders were not constructed of base material. This experience demonstrates the value of constructing shoulders of base material wherever possible.

Current construction will add nearly 2 mi. of new road at Site 300. These roads have been planned in accordance with good engineering practice, aided by the experience gained in the construction and maintenance problems peculiar to the 19.5 mi. of existing road.

Site 300 planning is under the direction of R. S. Gould, head of Plant Engineering for the Radiation Laboratory at Livermore. Design and construction contracts are under the jurisdiction of J. E. Armstrong, Director of Engineering, San Francisco Operation Office of the AEC.

Compaction of asphalt paving

By W. R. LOVERING

District Engineer
The Asphalt Institute
Sacramento, California

ADEQUATE COMPACTION is an essential step in obtaining the best asphalt pavements possible. Its importance is frequently overlooked, or not recognized, because of a common belief that compaction will be obtained under traffic. While it is true that compaction may be achieved eventually under traffic, this compaction occurs only where the wheels travel and will, at best, result in depressions in the wheel tracks. This leaves the areas outside the wheel tracks at the original density obtained under rolling which, if inadequate, may result in a pavement that deforms under traffic (particularly with borderline stability aggregates) or possesses high permeability.

Basically, complete and thorough compaction of asphalt concrete should be both required in the specifications and achieved during construction.

Compaction versus performance

A poorly compacted pavement begins its service life with a number of shortcomings that seriously affect its performance. The most significant of these are low cohesion and stability (due to lack of intimate particle contact) and an open, porous texture, susceptible to the entrance of water and air. In the latter case, water will enter the pores of the mix during the winter rains and with each passing wheel the water will be forced, under pressure, through the void space in the mix. Loss of bond within the mix may result and the mix may ravel or possibly disintegrate completely.

The open texture will also facilitate greater and more rapid oxidation of the asphalt through circulation of air through the mix, which, in turn, will increase the brittleness of the mix and necessitate early maintenance seals. These factors all contribute to a shortening of the pavement life and an increase in maintenance cost.

Few construction and maintenance men, haunted by this condition, however, will realize that proper compaction could have produced a sound, long-lasting pavement, capable of carrying the traffic for which it was designed. If asphalt pavements are to develop the load-carrying capacity and durability necessary to assure the reasonable service life which we are justified in expecting, then complete and thorough compaction is required.

History of compaction

It appears that the compaction viewpoint has been influenced to a great extent by the history and development of asphalt pavements in California during the last thirty years.

Asphalt concrete, placed in the late twenties and early thirties, was thoroughly compacted usually by four to five coverages with heavy rollers. From my own experience, I know of one project in which the breakdown rolling was with a 15-ton steam three-legger. This was followed by longitudinal rolling with an 8-ton steam tandem which, in turn, was followed by two separate coverages of S-rolling with the same tandems. Rolling was completed by a longitudinal coverage

With proper compaction a key to success in asphalt paving, the highway engineers and contractors of the West will find exceptional value in this thorough discussion of the subject by a recognized authority. The article reviews the procedures of compaction and questions relating to time for proper rolling, temperatures of the material and types of mixes. The information is of equal value to contractors who carry out this work and the engineers who are responsible in securing satisfactory results.

For the convenience of WESTERN CONSTRUCTION readers we are presenting immediately following this article, a round-up of equipment (latest models) used for the compaction of asphalt paving.

—Editor

with the 8-ton tandem and the bumps were then rolled transversely with a 7-ton gasoline tandem.

On later projects, it was determined that the bump rolling was not effective in producing a smoother pavement and this practice was discontinued. It was also determined that the S-rolling, due to the turning of the roller on the hot mix, was causing bumps, and rolling on later projects was confined to straight longitudinal rolling.

The rolling equipment used on this project consisted of three steam rollers, a 15-ton three-legger, and two 8-ton tandems, plus a 7-ton gasoline tandem, for an average daily plant production of 479 tons, or an hourly production of 71.5 tons. It must be admitted that the mix used was more difficult to compact than the state highway asphalt concrete mixes presently being designed.

At about this same period, many secondary roads were being paved with plant-mixed surfacing, using light grades of liquid asphalt. These pavements were compacted entirely by traffic. The asphalt films used with the light grades of liquid asphalt were necessarily thinner because of the finer gradings used and compaction under traffic with occasional blading was fairly satisfactory. The most objectionable feature in the compaction of light asphalt mixes by traffic alone is the loss of a certain amount of coarse rock. The rock near the surface is dislodged during compaction and whipped off by traffic. This condition is aggravated by the blading necessary to maintain a smooth surface.

With the development of cutback asphalt, heavier and heavier grades of liquid asphalt were used in the plant mixes and rollers were used as a supplement to traffic compaction. With the heavier grades of cutback, higher temperatures were necessary and compaction before complete cooling was required.

This evolution has now progressed to the point that the present plant-mixed surfacing, using paving grade asphalts, is not appreciably different from the older asphalt concrete pavements, but the

(Continued on page 92)

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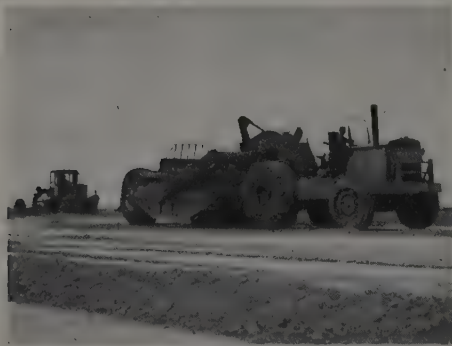
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Marshall Wylie (left) of Wylie Bros. Contracting Co. and Jack Seibert, C.I.T. representative, check over equipment financing details. C.I.T. financial backing helped get the modern, efficient equipment needed to keep the fixed time job moving smoothly ahead of schedule.



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Compaction

(Continued from page 89)

compaction procedure for plant-mixed surfacing evolving from the traffic compaction first used has not kept pace with the changing mix design.

It may be necessary to vary compaction procedure somewhat to fit the mix being placed. Certain fundamental principles of rolling should be followed, however, in any case, regardless of the mix.

1. The rolling should commence at the edges of the pavement and progress toward the center. Where the highway is super-elevated the rolling should commence at the low side and progress toward the high side.

2. The roller should always proceed into the mix with the large drive wheel toward the uncompacted material. The large wheel, because of its driving action, will tend to crowd the material together and this fact, together with the larger diameter of the wheel, will result in less surface checking than will be obtained if the small tiller wheel is placed ahead.

3. Initial breakdown rolling should be at as high a temperature as possible. If the material does not roll properly at the recommended temperature for initial compaction, the mix design should be checked and any necessary adjustments made that will improve the compaction.

4. Rolling should be varied so that points of reversal of direction will not form a transverse line across the pavement. Points of reversal of direction should be at staggered locations.

Recommended rolling temperature

As stated above, the initial breakdown rolling should be at the highest possible temperature without producing excessive checking under the roller. Checking under the roller probably does no serious harm but does detract from the appearance of the pavement and the cracks do permit the entrance of water, at least in the surface portion of the mix. Checking, if not too severe, will usually be eliminated by pneumatic-tired rolling. Excessive checking is frequently caused by a high sand content of the mix or may be caused by an insufficient amount of asphalt. If excessive checking occurs, the mix design should be studied before reducing the temperature of the initial or breakdown rolling. A re-

duction in the amount of sand, or a slight increase in the asphalt content, may eliminate the undesirable checking and lower rolling temperatures may not be necessary.

After the initial breakdown, later rolling coverages should be at successively lower temperatures so that the material is pressed together more and more firmly as the viscosity of the asphalt increases.

Variations in the rolling procedure may be required if the mix is of borderline stability. If good compaction is to be achieved, the density of the mix must be increased gradually to provide a support for the material directly under the roller, otherwise the mix will be displaced and the necessary compaction will not be obtained. Use of lighter weight rollers, or lower rolling temperatures, may be indicated, depending on stability characteristics of mix.

Initial breakdown rolling

The greatest amount of compaction is obtained by the initial or breakdown rolling, and this initial rolling must be done when pavement temperatures are relatively high. The importance of the later rolling should not be minimized, however. Intimate contact between particle faces must be obtained to develop maximum stability. The primary function of the asphalt is to serve as an adhesive binder that will hold the particles together and thus maintain the compaction provided by the rolling.

If the paving mix is too hot during the final stages of rolling or if, for any other reason, the asphalt films are not viscous enough to maintain this intimate contact, maximum compaction will not be obtained and resistance to rutting under traffic will be reduced. The material should quake or deform slightly under the roller but if lateral displacement occurs either rolling at a lower temperature or, possibly, use of a lighter roller will be necessary.

Tests demonstrate the point

A comparison of experience with laboratory testing may serve to clarify these points. If, when compacting Hveem stabilometer test specimens of asphalt concrete, the procedure is delayed, permitting a slight cooling of the mix, lower test values are obtained. This has been observed repeatedly when a new operator is learning the technique of specimen preparation. Even

though the operator has learned all the necessary movements and follows the procedure exactly, he usually will not obtain the proper stabilometer value until he has had sufficient practice to perform the operations in a minimum of time. This correlates with the breakdown rolling and illustrates the importance of high temperatures.

Laboratory confirmation

The importance of rolling at lower temperatures after the mix has been broken down may also be illustrated from laboratory experience. A number of years ago, when a large portion of the samples being tested consisted of liquid asphalt road mixes, it was standard practice in California to test two specimens, one dried in the oven and compacted at 140 deg. F., and the other compacted at room temperature without drying. This was done to determine if the mix contained sufficient moisture to cause instability. It was noted, however, that if the mix did not contain moisture the specimen compacted at room temperature invariably gave a higher stabilometer value. Tests showed that the observed difference was caused by the compaction temperature. In other words, complete compaction will not be obtained if the asphalt films are too fluid during the final stages.

From these data and observation of actual pavement compaction, it may be stated that initial, or breakdown, rolling must be accomplished when the asphalt films are sufficiently fluid to assure easy workability of the mix, but that final rolling must be at a temperature low enough to give the asphalt films sufficient viscosity to maintain the intimate contact between particles provided by the weight of the roller.

Influence of mix design

Compaction will also be influenced by both the mix design and the type of aggregate used. Mixes low in asphalt content are difficult to compact and will usually develop excessive cracking under the roller. Moreover, mixes composed of hard aggregates with smooth faces will, in general, be influenced more by the compaction procedure than will mixes consisting of rough crushed particles. An excessive amount of sand in the mix, because of the smooth faces of the quartz particles, will generally cause compaction problems.

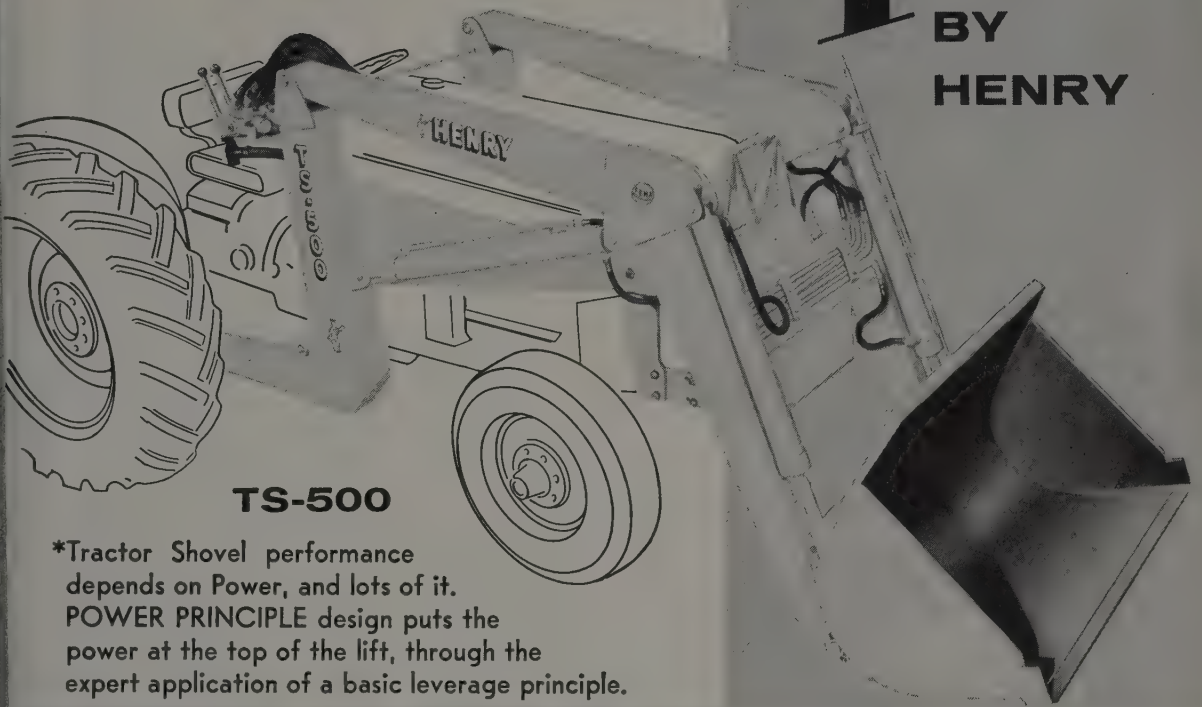
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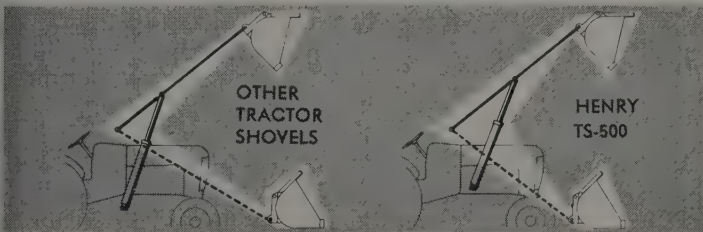
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tected most readily by plotting the grading of the mix. A bump in the grading curve will indicate an excess of sand. Adjustments in the mix should be made to eliminate any such bumps, either by reducing the sand content or by increasing the amount of the fractions on either side of the bump. Not the actual quantity of sand, but the relationship of the quantity of sand to the other fractions, seems to be the important consideration.

Typical rolling temperatures

Mix placed.....	290 deg. to 300 deg.
Initial Rolling (3-legger)	275 deg. to 285 deg.
Second Rolling (3-legger)	225 deg. to 230 deg.
Final Rolling (Tandem)	180 deg.

A pavement placed at Beale Air Force Base by Bragato Paving Co. in the summer of 1958, under supervision of the U. S. Army Corps of Engineers, used the following rolling procedure:

Breakdown—complete coverage with 12-ton Galion tandem	245 deg. to 260 deg.
Second rolling—one complete coverage with 10-ton tandem	175 deg.
Third rolling—roll with 10-ton pneumatic as soon as mix does not pick up for as long as possible and still keep up with paving	150 deg. to 163 deg.
Fourth rolling—iron with 10- or 12-ton tandem	124 deg.

In each of these cases, rolling produced densities of 98% of Marshall test density, or better.

Tentative rolling temperatures under consideration by the California Division of Highways, for inclusion in the new standard specifications, are as follows.

Temperature of asphalt mix when placed	250 deg. min.
Breakdown rolling, 12-ton roller—Temperature of mix plus atmospheric temperature	300 deg. to 350 deg.
Second rolling, 2 complete coverages with pneumatic roller—Temperature of mix at time of rolling	150 deg. min.
Third rolling, ironing with 10-ton tandem.	

Conformance to these specifications should produce adequate compaction of the California Division of Highways mixes.

Open-graded mixes

One cautioning note should be mentioned, however. Open-graded

mixes cannot be placed at too high a temperature. A thick asphalt film is required for these mixes and high temperatures cause the asphalt to drain off in the truck. Open-graded mixes are usually placed in thin lifts and are more easily compacted than dense-graded mixes. As a result, compaction temperatures may be reduced safely. A temperature of about 200 to 225 deg. at time of placing has been satisfactory.

In checking the temperature of the pavement, do not be misled by the variation in temperature throughout the depth of pavement. The temperature should be taken somewhere near the center of the mat being placed. Variations that will occur are illustrated by the following example:

Surface	220 deg.
1/4-in. depth	282 deg.
1-in. depth	300 deg.
2-in. depth	275 deg.
Bottom of course	220 deg.

Temperature of binder course before placing surface course	120 deg.
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If pavement temperatures are taken close to the surface of the pavement, do not be surprised if an increase in temperature is noted after the first breakdown rolling. After rolling, the heat from the interior will be conducted more rapidly to the surface through the partially compacted material and the surface temperature may rise.

Use of heavier rollers

Some recent experimental work has investigated the possibility of using very heavy rollers. On the asphalt concrete test strip placed at Columbus Air Force Base, experimental use of a 7-wheel 30-ton pneumatic-tired roller for breakdown rolling disclosed that specified density of 98.5% of laboratory density could be achieved with three coverages at lower mix temperatures. It was found that the mix temperature could be lowered from a range of 300-325 deg. to a range of 280-300 deg., with a corresponding decrease in breakdown rolling temperature from 270 deg. or higher to 260 deg.

These very heavy rollers must be used with caution, however, as they can be used only where the underlying base or the total structural section will support the weight. The 30-ton pneumatic roller was

Paper presented at the Second Annual Highway Conference, College of the Pacific, Stockton, Calif.

tried during the summer of 1958 at Camp Beale but it was found that the heavy weight actually disturbed the underlying base and caused cracking of the asphalt mix.

Over-rolling

A discussion of compaction would not be complete without some mention of "over-rolling" for this has been a controversial subject. Excessive rolling will not necessarily result in increased density and, in some cases, can be harmful. Two examples are as follows:

1. *Borderline stability mixes rolled with steel-wheeled rollers at high temperatures.*

Lateral displacement and "mushing" occur which make it difficult to achieve and maintain densification. Unless corrective measures are taken the resulting pavement cannot be expected to give the highest degree of performance.

2. *Any freshly placed mixture rolled with steel-wheeled rollers when cold.*

Both vertical and horizontal forces exerted by the roller on the pavement may cause disruption of the asphalt bond between particles, tensile cracking with possibly attendant slippage or a crushing of particles at the surface. If the recommended rolling procedure has been followed, however, compaction should be completed before these critical temperatures are reached.

Of course, if the pavement structural section is inadequate and excessive deflections occur under the roller, cracking will also result. Under any conditions, however, the objective should be to achieve the maximum amount of densification that is possible under construction conditions. A reduction in rolling should not be made until the engineer has first satisfied himself that adjustments in the mix design or rolling temperatures will not produce the densification required.

Nothing is to be gained, however, by rolling a mix especially with steel that is so cold that the particles do not migrate or shift under the action of the roller.

Summary

Finally, some mention should be made of mixes prepared for use in restricted areas where, because of hand-placing or for other reasons, compaction will be unavoidably delayed. For installations of this type consideration should be given

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RODS FOR MANUAL APPLICATION

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VICTORTUBE (TC) Bare 30-Down	Severest abrasion; moderate impact	Agricultural and earthworking tools. Suitable for acetylene application	Gas only
VICTORTUBE "SPECIAL" (Tungsten Carbide)	Severe abrasion with impact	Oil field tools - rock bits, drag bits, reamers; water well drilling tools	Gas only
VICTOR TUNGSMOOTH (Tungsten Carbide)	Maximum abrasion	Edged cutting tools - bits, blades, farm tools. Smooth, thin deposits on augers, screw flights, paddles.	Gas AC-DC Arc
VICTORITE	High abrasion; sliding friction	Earthmoving and agricultural tools, brick augers, conveyors, mill guides	Gas AC-DC Arc
TUBE VICTORITE	Abrasion and impact	Farm tools, crushers, grinders, mixers, scrapers, fan and screw conveyors	Gas AC-DC Arc
VICTORITE 1	Heat; abrasion, corrosion	Chemical & food machinery, cement pumps, brick dies, dry bearings & journals, expellers	Gas AC-DC Arc
VICTORITE 6	Heat; impact; corrosion; abrasion	Hot dies, stripper bits, exhaust valves & seats, dry bearings & journals, edging rolls, cams	Gas AC-DC Arc
VICTORITE 12	Heat; corrosion; abrasion; impact	Saw-blade inserts, shaft bearings, hot punches, flapper valves, needle valves	Gas AC-DC Arc
VICTORITE CARBON ARC	High abrasion; sliding friction	Farm tools, earth abrasion. Applied by gas. Deposits are exceptionally smooth.	Carbon Arc Gas
VICTORITE Plow Point Bar	High abrasion; sliding friction	Cast-to-shape, weld-on cutting edge for plow shares, digger teeth, pilot bits	Gas
VICTORALLOY	Severe impact; abrasion	Crusher & dredge parts, tamper feet, bucket teeth. A tough low-cost hardfacing.	Gas AC-DC Arc
VICTORALLOY #1	High abrasion; medium impact	Crushers, bucket lips & teeth, muller tires, dozer blades, dredge pumps	Gas AC-DC Arc
VICTORALLOY "A"	Angular shock; extreme impact	Clutch parts, gears, latches, pins & keepers; build-up for hardfacing	AC-DC Arc only
VICTORALLOY "B"	Heavy impact; moderate abrasion	Tractor idlers, sprockets, rolls, crusher parts, pump casings, impellers, liners	AC-DC Arc only
VICTORALLOY "C"	High abrasion; moderate impact	Cement screws, gudgeons, drag chains, pressure rolls, mixer blades & paddles	AC-DC Arc only
VICTOR MULTI-PASS (for Build-Up)	Severe impact; compression	Drill tools, crawler pads, crushers, mine rails; build-up for hardfacing	AC-DC Arc only
VICTOR Ni-Mn (for Build-Up)	Severe impact; compression	Hardmetal underbase for manganese steel parts on crushers, dredges, dippers	AC-DC Arc only
VICTOR Ni-Mn (for Attachment)	Severe impact	A low-cost "stainless" joining rod for crushers, dippers, crawlers, dredges	AC-DC Arc only

WIRES FOR AUTOMATIC & SEMI-AUTOMATIC APPLICATION

This Wire	For These Conditions	This equipment or use
VA 0	Severe abrasion; moderate impact	Crushers of all types, tool joints, mullers
VA 1X	Abrasion & compression with impact	Scrapers, bucket teeth, crushers
VA 2X	Severe compression & impact with abrasion	Steel mill rolls, dredge rolls, cable sheaves
VA 3	Severe abrasion & compression with impact	Mill guides, crushers, grinders
VA 4X	Severe impact & compression	Build-up on trunnions, tractor idlers & tracks
VA 5X	Severe metal-to-metal impact & abrasion	Shovel rollers, tractor rollers & idlers
VA 6X	Severe impact, high temp., dry bearing	Steel mill rolls, clutches, roll necks
VA 7X	Severe impact & compression with abrasion	Build-up on mine car wheels & tractor rollers
VA 8X	Earthworking abrasion & impact	Dozer blades, scraper blades, tool joints
VA 10	Extremely severe abrasion; moderate impact	Tool joints, crushers, scrapers, swing hammers
VT 60 (Tungsten Carbide)	Maximum abrasion; earth cutting, scraping	Tool joints, scraper blades, augers
Ni-Mn (Hadfield)	Wear, all types manganese steels	Build-up manganese steel parts for overlay or to size

the use of a softer grade of asphalt to permit adequate compaction at lower temperatures.

It has not been the intent to make this sound like a plea for the "good old days." Rolling equipment is vastly improved over that used even ten years ago and more important improvements are on the horizon. There is reason to believe

that vibrating rollers may completely revolutionize compaction. With conventional rollers, compaction will not be obtained, however, unless the required number of coverages are made at temperatures suitable for the mix being placed. Improvements in rolling equipment may permit, or even require, a change in procedure but any

change should be made only after a thorough investigation of the compaction being obtained. With present equipment, compaction will not be achieved with one or even two passes but will require initial rolling at high temperature, followed by at least two coverages at lower temperatures, to achieve the density desired.

Best rollers for compacting asphalt

To supplement the preceding article on achieving adequate compaction of asphaltic pavements, here is a round-up of the latest equipment available for doing the job.

Buffalo-Springfield

Providing a hydraulic lift cylinder for the walking beam, **Buffalo Springfield** has added versatility to its KX-25E, 3-axle tandem roller. By using the hydraulic lifting cylinder, it is no longer necessary to depend on the terrain to position and lock the walking beam that carries the guide roll. The operator can now raise or lower this beam as desired. This means that the roller with the center roll raised can be used as a 13-20 ton, 2-axle tandem with its long wheel base. This provides a conventional weight distribution of 1/3 on a steering roll and 2/3 on the drive. By raising the guide roll and controlling the ballast, the machine can develop equal compression on either roll.

... for more details, circle No. 157

Galion

Galion Iron Wks. & Mfg. Co. makes one of the most complete lines of steel wheel and rubber-tired rollers. Pictured is a 14-20-ton, 3-axle tandem roller. Highly efficient transfer of weight principle is obtained when



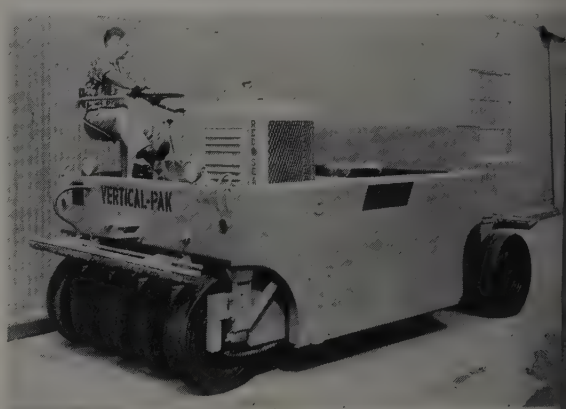
all 3 rolls are locked rigidly on the same plane. Weight is concentrated on high spots. The operator can unlock from the operator's platform the rear guide rolls so that it is free to float vertically—thus maintaining constant contact with the surface being rolled. Roll-O-Matic torque convertor drive with 2-range transmission is standard equipment. Hydraulic synchronized steering of twin guide rolls is provided as well as dual operating controls and a rugged straight-line spur gear final drive. The overall length is 22 ft. 6½ in. and

the overall width is 5 ft. 8½ in. Turning radius is 29 ft. 8 in. There are 2 brakes, one on the counter shaft and one on the side of the drive roll.

... for more details, circle No. 158

Southwest

The latest self-propelled, pneumatic-tired roller made by the **Southwest Welding & Mfg. Co.** is called the Model VP-11 Vertical-Pak. It has a rolling width of 84 in. and an overall length of 13 ft. 1 in. The ballast capacity is 105 cu. ft. and the maximum wheel load



is 2,000 lb. A single-lever control and full swivelling seat gives simplicity and ease of operation in both directions. Vertical oscillation of rear drive wheels give uniform compaction at all times. Individual chain drives with differential to all 5 rear wheels prevent slippage or scuffing. An open type ballast box makes it easy to load or remove ballast. Speeds vary in forward or reverse from 0 to 15 mph. Turning radius about 22 ft.

... for more details, circle No. 159

Browning

One of the largest rollers in the industry, a 33-ton self-propelled 7-wheel model is being manufactured by **Browning Mfg. Co.** The great weight duplicates heavy truck traffic while construction is still underway, detecting weak spots in base courses. With variable weight of from 11 to 33 tons, this roller can also be used in seal-coating. Water tanks are standard equipment on the roller with a capacity of 520 gal. All wheels oscillate independently. The roller is equipped with a diesel power unit torque converter and reversing transmission, and operates at the same speeds forward and reverse. Two steering wheels, two seats and two brakes are standard equipment. The

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1. TRANSMISSION—Some machines still utilize standard truck transmissions that waste power and require complicated shifting for speed and load changes. Gar Wood-Buckeye's power flow transmission is the modern way to harness power. It's a *ditcher transmission*—designed specifically to furnish more power to the digging wheel at less cost. Power for traction and digging are taken directly from engine transmission through separate output shafts. This system obsoletes open jack-shafts with inefficient chain drives.

2. EXCAVATOR DRIVE—Gar Wood's exclusive split-shaft design equalizes drive power to the digging wheel for smoother, cleaner ditch and a great reduction in maintenance time and expense. Old-fashioned solid-type shafts require a major machine tear-down when replacing drive pinions or bearings.

3. CONVEYOR DRIVE—Disposal of spoil is a function that vitally affects ditcher performance, yet some manufacturers leave it to chance—with rate of discharge governed solely by speed of the digging wheel. Gar Wood changed all that with a hydraulic conveyor drive that operates independently of all other functions. It has three speeds in either direction, with instantaneous control from the operator's seat. Now you can handle any volume of spoil regardless of digging wheel or traction speed.

4. CONTROLS—Handling a ditcher was a complicated process until Gar Wood-Buckeye first simplified operation of the machine, then put all controls within easy reach of the operator. Now speeds are easy to select and use. There are fewer levers, far less shifting and all adjustments can be made without leaving the seat. Exclusive Hi-Lo traction speed range lets the operator adjust instantly to changing conditions.

5. WHEEL HOIST—On a modern Buckeye machine you have instant and positive hydraulic control of digging depth. With this "live" hydraulic system you can adjust "on-the-go" for depth and grade completely independent of conveyor, travel or digging wheel speeds. You get greater accuracy and far more production than with machines with mechanical systems geared directly to the engine transmission.

Gar Wood has been first with these and all other important ditcher developments for more than sixty years. That's why production-minded contractors have come to depend on Gar Wood-Buckeye machines for "the most ditch at the least cost".

A-D Machinery Company, Inc., Elko, Nevada • Air Mac, Inc., Seattle, Washington
Buran Equipment Co., Oakland, California • Cramer Machinery Company, Portland, Oregon
Equipment Sales Company, Phoenix, Arizona • Industrial Tractor Sales, North Sacramento, California
• Reno Equipment Sales, Reno, Nevada • Seitz Machinery Company, Inc., Billings and Great Falls, Montana
• Shasta Truck and Equipment Sales, Redding, California
Smith Machinery Company, Inc., Roswell, New Mexico • Southern Idaho Equipment Company, Idaho Falls, Idaho
• Studer Tractor & Equipment Company, Casper, Wyoming
Warnock-Bancroft Equipment Company, El Monte, California • Western Machinery Company, Denver and Grand Junction, Colorado
• Western Machinery Company, Salt Lake City, Utah

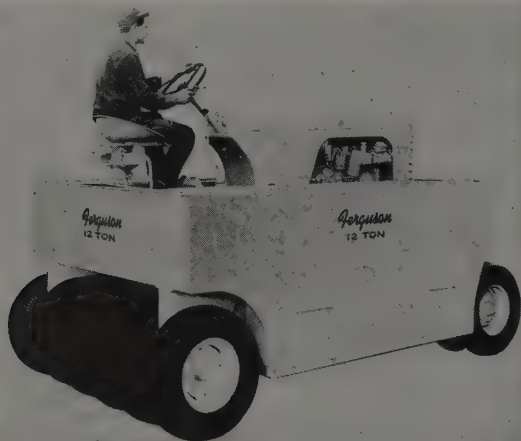
GarWood
INDUSTRIES, INC.
Findlay, Ohio • Wayne, Michigan

roller is equipped with 10:00 x 24, smooth tread tires. It has an open ballast box for ease of loading.

... for more details, circle No. 160

Ferguson

Among the many types and sizes of compaction equipment manufactured by the **Shovel Supply Co.** is a 12-ton Ferguson self-propelled, pneumatic. All 6 rear wheels drive. Front wheels oscillate from a large kingpin carried on oversize Timken bearings. Water



sprinkling tank and mats, providing water to all tires, are furnished when desired. Other features include 1-piece body, removable disc wheels, large grease seals, hydraulic steering, all moving parts running in oil, and good operator vision. The roller is 154 in. long, and 83 in. wide. Turning radius is 18 ft. Rolling width is 83 in. The engine is a Minneapolis-Moline, 4-cylinder, gasoline, 57 hp. at 1,900 rpm.

... for more details, circle No. 161

Standard

The model 55 roller manufactured by **Standard Steel Works Inc.** is rated at 1½ to 2½ tons and features the use of both water and steel ballast. The steel ballast



is in 75-lb. cast blocks and is carried in a special compartment which allows adjustment of weights in 70-lb. increments. The roll has scrapers and cocoa mats front and rear as standard equipment and achieves a maximum compaction of 123 lb. per lineal inch on the main roller, 40 lb. per lineal inch on the steering roll. An important feature is the clearance of only 2 in. on the driver's side, allowing close rolling near obstructions. The trailer (see photo) is so well balanced that

one man may lift the loaded roller and attach to towing vehicle. A 2-speed constant mesh transmission is provided and the 12-hp. engine is equipped with an electric starter.

... for more details, circle No. 162

Huber-Warco

A line of tandem rollers varying in weight from 5 to 14 tons is manufactured by **Huber-Warco Co.** Among the features of units in the company's tandem roller line are reinforced, all-welded frames; a final drive which is mounted in the frame, not on it; a combination of torque converter, tail shaft governor, and 2-speed transmission; adjustable guide roll assembly; clean-air cooling and ventilating; two independent braking systems; variable speed hydraulic steering; and close curb clearance.

... for more details, circle No. 163

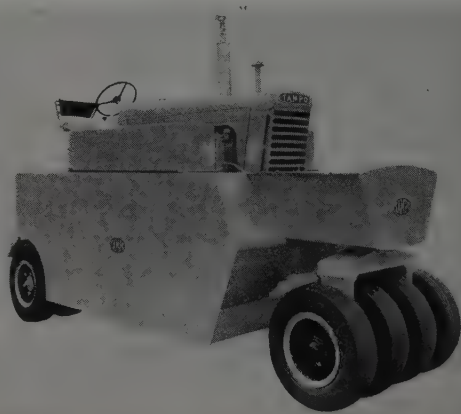
Essick

A 3½-5½-ton tandem road roller is available from **Essick Mfg. Co.** The roller is adaptable to a variety of jobs because both rolls can be water-ballasted to obtain compressions ranging from 124 to 190 lb. per lineal inch. Large diameter rolls eliminate pushing the material. A low center of gravity allows safe and easy handling on slopes. Rolls are kept clean regardless of material rolled by constant flow non-clog spray bars and self-adjusting steel scraper blades. Dual controls permit operation from either side. Sealed ball bearings on guide and compression roll eliminate all greasing in hard-to-get-at places. Also available is a welded steel trailer with ramp and integral locking tail gate for fast loading and unloading.

... for more details, circle No. 164

Tampo

A 9-wheel pneumatic-tired, self-propelled roller of 65 hp. which attains a ground pressure of 500 lb. per lineal inch of tire width and 85 lb. per sq. in. of tire



contact, has been made available by **Tampo Mfg. Co.** Designed for asphaltic mat compaction to a maximum density, this roller gives greater unit pressures than truck tire loads. Specifications include a gross weight of 28,000 lb., rolling width of 64 in. Automatic power reverse and torque converter drive has 6 speeds forward and 6 reverse up to 20 mph. Tires can be inflated to 100 psi. and accessory equipment is available.

(Continued on page 102)

Road construction

makes giant strides with

CLINTON WELDED WIRE FABRIC

In CF&I plants from coast to coast, this image stands for careful controls of *quality* in our steel products. One of the many steel products CF&I makes for the construction industry is Clinton Welded Wire Fabric. Highway departments rely on it to add both strength and long life to concrete roads and highways.

Use: CF&I-Clinton Welded Wire Fabric adds backbone to concrete . . . combines the strength of steel with the durability of concrete.

Result: The reinforced concrete greatly resists cracking and heaving due to temperature extremes and load stresses. And, because the fabric distributes shrinkage stresses evenly, the concrete is far less likely to crack during setting. If a small crack develops, the steel fingers of the fabric hold it together . . . prevent dirt or moisture from penetrating and expanding it.

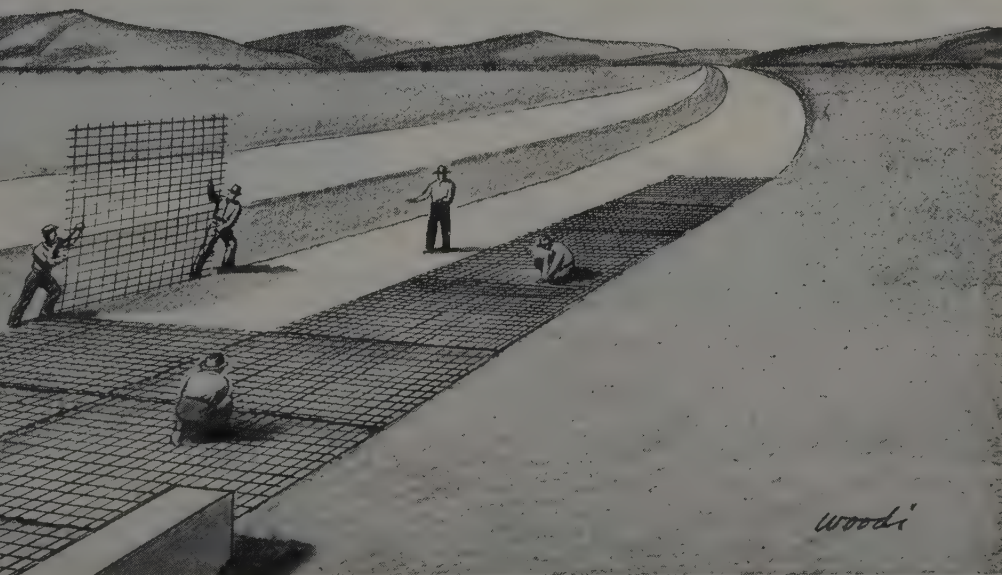
Contact our nearby sales office for complete price and delivery information on CF&I-Clinton Welded Wire Fabric.

CLINTON
WELDED WIRE FABRIC
THE COLORADO FUEL AND IRON CORPORATION



6615

In the West: THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise
Butte • Denver • El Paso • Ft. Worth • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Oklahoma
City • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Wichita
In the East: WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans
New York • Philadelphia • CF&I OFFICE IN CANADA: Montreal • CANADIAN REPRESENTATIVES AT: Calgary
Edmonton • Vancouver • Winnipeg



... for more details, circle No. 45 on Reader Service Postcard

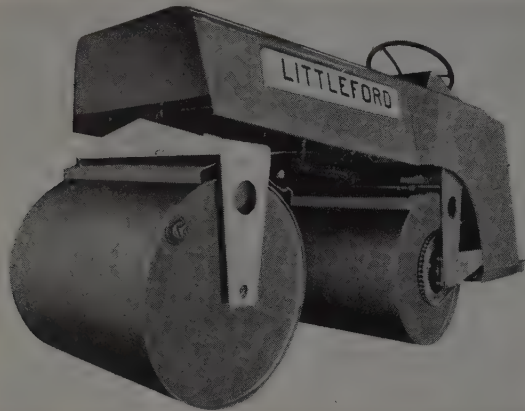
(Continued from page 98)

for asphalt or base rolling and for proof testing purposes. A single lever controls both forward and reverse motion in the throttle setting. Hydraulically-operated reversing clutches engage smoothly at engine idle speed with no need to stop roller completely. Optional equipment is available for every compaction purpose.

... for more details, circle No. 165

Littleford

A 1-ton roller is the latest addition to the line of portable tandem type rollers manufactured by Little-



ford Bros. Main features of the machine include the extreme ease of maneuverability and the location of the operator's platform which eliminates the need to climb down over or through the roller and permits quick access to tools. The roller in the photograph has a maximum length of 90 in. and a maximum width of 40 in. The weight varies from 1,350 lb. empty to 2,380 lb. with rolls and tank filled with water. Speed is about 1 3/4 mph. both forward and reverse. Optional equipment includes the tilt-type trailer.

... for more details, circle No. 166

Rosco

A powerful, fast, self-propelled pneumatic-tired roller is being manufactured by the Rosco Mfg. Co. A Ford 6-cylinder liquid cooled engine powers the rig, providing 78 brake hp. at 2,000 rpm. The ample



power with a torque converter plus the speed of the machine make it an excellent unit for towing an added rubber tired roller as shown in the illustration. Other features of the roller include a 1-shift lever which eliminates the clutch pedal, power brakes and power steering, and 4-speed transmission. The roller incorporates the advantages of both oscillating and nonoscillating wheels. The rear wheels don't oscillate for maximum traction and flotation. A solid compaction path 69 in. wide is provided. Ballast capacity is 100 cu. ft.

... for more details, circle No. 167

Bros

An improved 10-ton self-propelled pneumatic tire roller has been marketed by Bros, Inc. Ballast range can be varied to produce from 3 to 10 tons compaction load. Low body design permits increased operator



visibility for tight areas. The low center of gravity increases stability for shoulder work and on steep grades. Full machine height to top of steering wheel is only 91 in. Power hydraulic steering and hydraulic reversing clutch and transmission provide a new ease of operation and handling for back and forth rolling. In combination with torque convertor drive these features offer smooth starting and transmission of power through an infinite speed range from zero to 20 mph. Oversize wheel bearing allows 60% greater thrust than the maximum 10-ton ballast load. Other features are: individual brakes on all 4 drive wheels; parking brake directly connected to drive shaft, and independent of main service brakes; special plastic scrapers to keep tires clean; full oscillation of all drive wheels; and simple hook-on hood which can be removed in 5 sec.

... for more details, circle No. 168

American Coleman

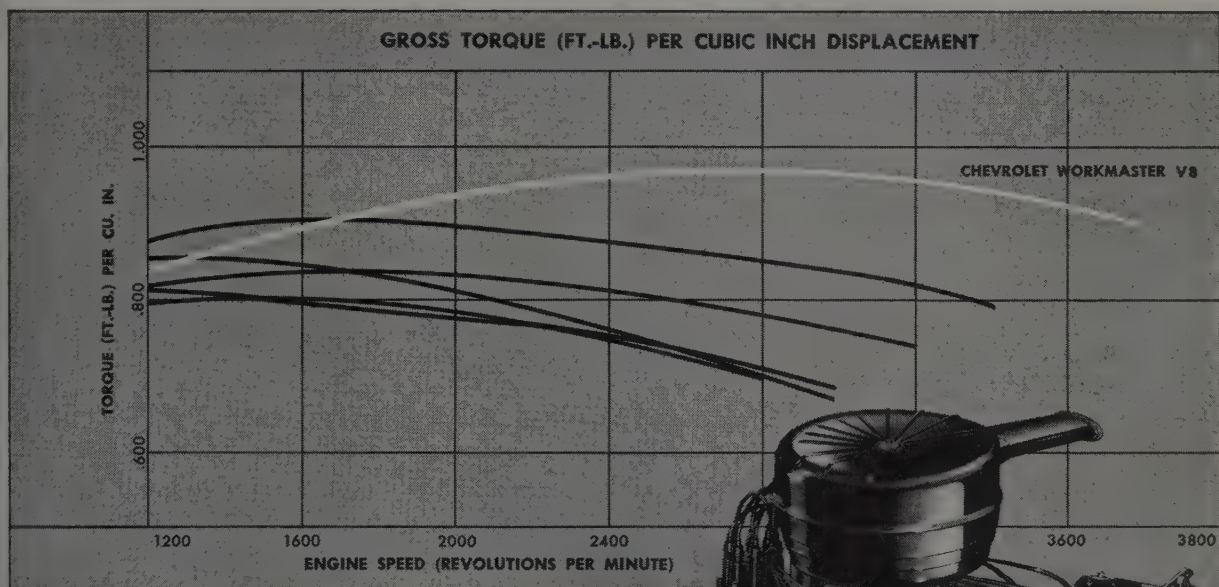
A self-contained patch roller kit that can be attached to any dump truck is available from the American Coleman Co. The roller attaches to the rear of the



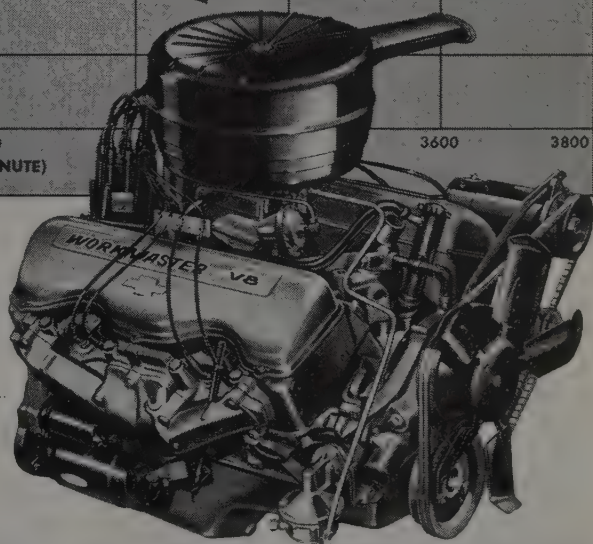
truck and uses the truck weight to compact the patching material. When not in use the roller is drawn up under the dump body. Except for the addition of a single control valve it can use the present hydraulic system on any regular truck making very little alteration necessary. An air compressor is offered with the roller and is front-mounted with an extra long air hose to allow chipping-out operations to proceed well ahead of the patching. Thus all patching operations can be combined on a single vehicle. The latest features are a 3-point suspension allowing the roller to follow a separate contour from the truck wheels, and an independent electric hydraulic control unit for finger tip control in the cab.

... for more details, circle No. 169

It's torque that beats tough jobs, and
this engine has it to spare!



Proof that the Workmaster V8 puts out plenty of torque. The white curve above shows that the Workmaster provides high torque throughout the *entire range* of operating speeds. The black curves accurately represent the torque output of typical heavy-duty 6-cylinder engines of between 330 and 390 cubic inches of displacement. Curves demonstrate actual torque efficiency, based on gross ft.-lbs. of torque per cubic inch of displacement.



CHEVROLET'S 348-CUBIC-INCH WORKMASTER V8

It's torque that gives a truck plow-horse pulling ability at low speeds and assures the power to keep big loads moving, whether it's through the rough or over the road. And Chevrolet's 230-h.p. Workmaster V8 puts out a brand of torque that's made to order for your toughest big-tonnage hauls.

High torque output is the natural result of the Workmaster V8's unique design characteristics. Short piston stroke and large piston area, for example, comprise a torque-producing advantage, and *this engine provides the shortest stroke in its class.*

Advanced Wedge-Head design, with its fully machined combustion chambers, means high torque, too. It assures high turbulence of the fuel-air mixture and balanced power output from each cylinder. The Workmaster V8 has high

volumetric efficiency . . . takes in the fuel-air mixture *efficiently* at all speeds. This, combined with a camshaft design that gives just the right valve lift and timing, assures high torque—extra pulling power to get you through the tough spots!

For the kind of torque and toughness you need to do big jobs better, see your Chevrolet dealer about a Workmaster V8, now standard in Series 90 and 100 trucks. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

No job's too tough for a Chevrolet Truck!



. . . for more details, circle No. 46 on Reader Service Postcard

Slip-form paver

(Continued from page 44)

the float, the surge might be eliminated. Consequently, angle irons were welded along the float, between the original reinforcement. When tested in operation there was considerable, although not complete reduction, in the amount of surge. With the reduction of the surge the riding characteristics of the concrete slab was greatly improved, especially in the reduction of short choppy bumps.

Since that time it has also been learned that this surge may be further controlled by adjusting the pitch of the float for the mix and slump being used. The greater part of the surge has now been eliminated and it appears mostly at isolated spots where one batch of concrete is wetter than the surrounding ones. Evidently, because of the non-compressibility of the liquid, it cannot be consolidated to the same degree as the drier material and, consequently, surges back up behind the float.

In discussing the variation in slump and the consequences, it is interesting to note that the lower lane of the slab, which unfortunately is the driving lane of a 4-lane highway, is as a rule the rougher of the two lanes. Since the slab lies on a slope and the concrete being in a plastic stage at the time of placement, the plastic concrete has a tendency to flow to the low side, with this tendency increasing with any increase in slump. If the slump of the batches were uniform, the plastic flow would be uniform, however, any variations in slump will cause variations in the flow, creating unevenness in the slab. Similarly, roughness tests have shown that as the gradient of a road increases, so too does the roughness. Even without variations in slump, there would be a plastic flow of the concrete down the slope.

It would seem that a stiff, harsh mix might answer some of these problems; however, since very little working is done on the concrete, there is also less opportunity to bring mortar to the surface for finishing operations. If the mix is too harsh or dry, open streaks are torn in the surface as rocks are pulled along beneath the float, or open spots appear beneath the trailing edge of the float indicating low spots in the surface caused by insufficient concrete or mortar working back up behind the tamping

bar, or the finishers' helpers are kept running carrying concrete back to the finishers to fill the holes along the edge.

Construction joint

In discussing factors that may affect the rideability, one cannot ignore the construction joint, for without a doubt one of the roughest spots in each day's pour is the construction joint at the end of the pour. As the slip-form paver moves over the last of the pour, there is no longer any concrete in front of the vibrators to keep the concrete from flowing forward.

This causes a tapering off in the thickness of the slab starting as far as 10 or 12 ft. from the end of the slab. To date the best method found for making the construction joint has been to put the timber header in place ahead of the paver. This helps to hold the concrete from flowing ahead of the vibrator, helping to keep the slab to its full thickness. Where the header is thus placed ahead of the paver, the height of the header must be less than the thickness of the slab to allow clearance for the maximum size of aggregate to prevent their becoming lodged between the float and header.

The problem encountered in the construction joint is similar to that of starting and stopping the slip-form paver. Each time that there is an interruption in the flow of concrete there is the same tapering in thickness of the slab as at the end of the day's pour, especially if the paver is pulled so far forward that there is insufficient concrete to hold the required thickness of slab. This situation is further aggravated if the vibrator and tamping bar are not turned off immediately each time the paver is stopped.

Finishing and smoothness

In the final finishing of the concrete slab several methods have been observed and considerable experimentation with aluminum and wood floats has been tried. However, the best results have been noted using a 10-ft. aluminum straightedge with a rectangular end section as a float. These 10-ft. straightedges cover two and a half to three times the width covered by the floats normally used, thereby detecting high and low spots which would not be located with a 4-ft. float.

Since the span is greater, the lev-

eling action is naturally greater and this helps to eliminate low spots that can be put into the concrete with careless or inexperienced handling of the 3 and 4-ft. floats. The advantage of the rectangular section over the tubular section is that the square edge on the rectangular section gives a cutting edge to shave off the high spots rather than gliding over them.

Since smoothness of a concrete slab is a vital aspect of its construction and one of the requirements that must be met under the specifications of this state, several methods of measuring the degree of smoothness or, conversely, the degree of roughness have been developed over the years. One of the latest used by the Colorado Department of Highways is a manually operated device called the Hi-Lo Detector. This device consists of a 12-ft. aluminum beam mounted on two wheels with a third adjustable floating wheel in the center.

The center wheel is connected by means of levers to a dial which shows on a greatly magnified scale below the plane established between the front and rear wheel. The center wheel is also hooked up to a battery operated electrical system consisting of a buzzer and bell, which by means of adjustable breaker points can be set to ring or buzz at a prescribed deviation, using the bell to indicate high spots and buzzer to indicate low spots. Also mounted on the detector is a tank containing a marking dye which can be released from a valve by the operator when a high or low spot is detected either by listening to the bell or buzzer or by watching the dial.

The Hi-Lo Detector being a light, one man operated device provides an early means of evaluating the pavement surface as it can be used the following day after pouring of the slab. A study of the location, size, and sequence of any irregularities in the surface might then indicate their cause and possible methods of correcting or improving the paving operation the very next day. The methods then employed in attempting to correct the irregularities can be checked the following day as to their effectiveness. Thus a day by day evaluation can be made while the project is still in operation in time for improvement and study.

In a general summation, it is sincerely believed that the slip-form paver along with proper care and use of base and paving materials,



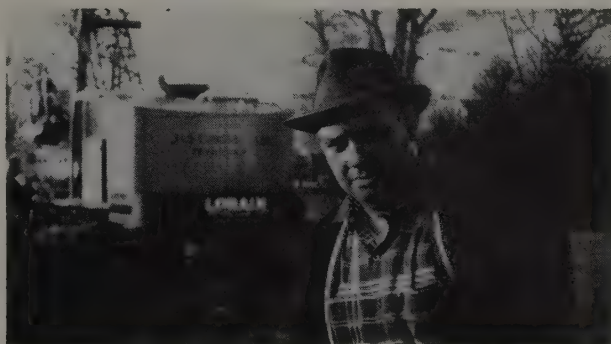
Working on a \$1,700,000 sewer job...

4-YARD LORAIN-26 HELPS COMPLETE UP TO 600 FEET OF PIPE DAILY

For 24 miles of 8-inch to 30-inch pipe, plus 10,000 feet of each laterals, will be installed by J. & S. Construction Company, Inc. of Eatontown, N.J. Their Lorain-26 helps trenches ranging from 6 to 26 feet deep, 3 to 4 feet wide. The L-26 lines the bottom with stone, lowers pipe into the trench and backfills. Average production ranges from 200 to 600 feet of pipe each 9-hour day, depending on pipe size. "Joy-Stick control boosts production up to 5% over lever control," reports Albert Payakovich, operator of all Lorain equipment for 12 years. "With two-lever, 'Joy-Stick' control, I do as much work during the last few hours as I did at the start of the day."

Get this Lorain-26 performance. Whether you buy it as a shovel, dragline, clamshell, hoe or crane you select the "package" best suited for your needs. You'll get more for your money. See your Lorain distributor for a quotation.

THE THEW SHOVEL COMPANY, LORAIN, OHIO



"This Lorain loads 6-yard trucks in 2 to 3 minutes." So reports J. Sprague, owner. "Ever since I started in business 15 years ago I've been using Lorains. They are fast machines, economical to run, need little maintenance. They're good for our type of work."

ORAIN®

IN THE MOVE

For more details, circle No. 47 on Reader Service Postcard

ANDREWS EQUIPMENT SERVICE
Spokane, Wash.

ATLAS EQUIPMENT COMPANY
Salt Lake City, Utah

CENTRAL MACHINERY CO.
Great Falls, Havre and Lewistown, Mont.

COAST EQUIPMENT CO.
San Francisco 3, California

GENERAL EQUIPMENT CO.
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HATTEN MACHINERY COMPANY
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MOUNTAIN TRACTOR CO.
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LEE REDMAN EQUIP. CO.
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SOUTHERN IDAHO EQUIPMENT CO.
Idaho Falls, Boise and Twin Falls, Idaho

TRACTOR & EQUIPMENT CO.
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YUKON EQUIPMENT INCORPORATED
(for Alaska)
Seattle, Wash.
Fairbanks, Anchorage and Ketchikan, Alaska

coupled with proper evaluation of tests results for corrective measures, will provide a concrete pavement that will meet the standards required by the engineer and the rideability desired by the traveling public. To achieve that end, it is

hoped that some of these observations and suggestions will be of help and value.

(EDITOR'S NOTE—In Mr. Bower's original presentation, but omitted in this article, was a description of the California Division

of Highways' profilograph and the use of this instrument to measure the smoothness of the pavement laid in Colorado. In general the results showed that the smoothest concrete laid to date in Colorado was with the slip-form paver.)

WINNERS OF THE "DR. L. I. HEWES AWARD"

THIS MONTH, at the annual WASHO Conference in Billings, Mont., another highway engineer of the West will be honored as the recipient of the "Dr. L. I. Hewes Award" for 1959. Following is a list of the previous winners and a brief description of the award.

The award was originated and is financed by *Western Construction* to commemorate the memory of Dr. L. I. Hewes, for many years the Western Regional Director of the Bureau of Public Roads, and active in the founding of WASHO.

1952

HERBERT W. HUMPHRES

District Soils Engineer,
Washington Department of Highways

"... for his outstanding work in soils mechanics and soils stabilization, with particular emphasis on meeting the needs of counties and cities."

JAMES T. McWILLIAM

Assistant Engineer,
California Division of Highways

"... exceptional work in developing gyroscopic survey methods for rapid road inventory."

1953

PERCY V. PENNYBACKER

Supervising Field Engineer, Bridge Division
Texas Highway Department

"... outstanding contributions in the use of welding for the repair and construction of highway bridges."

1954

ARNOLD H. CARVER

Departmental Communications Engineer,
California Division of Highways

"... for outstanding work in developing a state-wide radio communications system for highway maintenance."

1955

J. AL HEAD

Assistant Traffic Engineer,
Oregon State Highway Department

"... outstanding work in traffic engineering, especially the analysis of urban highway problems and long range planning in this field."

1956

ROBERT C. O'CONNELL

Traffic Engineer,
Wyoming State Highway Department

"... has made numerous contributions to traffic control and safety in Wyoming and was instrumental in the preparation of the State's traffic code."

A. J. SACHSE

Senior Resident Engineer,
Idaho Department of Highways

"... in recognition of his outstanding engineering versatility in connection with construction of the mile-long bridge and hydraulic fill at Sandpoint."

1957

R. GLEN RYDEN

Chief Computer,
Arizona State Highway Department

"... award based on his outstanding work in pioneering the use of Univac for engineering calculations."

1958

ALBERT H. POLLARD

Supervising Field Engineer,
Texas Highway Department

"... for outstanding work in adapting radiography to the non-destructive testing of welds in field and shop."

The "Dr. L. I. Hewes Award" is presented annually at the conference of the Western Association of State Highway Officials. The recipient is selected by the Executive Committee of WASHO from official nominees presented by the highway departments of member states. These nominees are selected by each state highway organization as the outstanding engineer who has made a worthy contribution to the highway development of the West. A cash award of \$500 goes to the recipient, together with a suitable certificate.

Highway construction cost trends

Cost Index figures show variations that tend to obscure the trend curve. Interpretations explain many of these variations, but discount the validity of the figures themselves. However, these indexes remain the best base for predicting highway cost trends for the years ahead.

In spite of their known weaknesses as true cost statistics, unit bids remain the contractors' accepted estimate of direct and indirect costs. Representative unit bid prices appear in the following pages.

FOR ANYONE interested in analyzing figures to secure conflicting results, the available statistics on highway costs represent a fertile field for manipulation. They could be used to prove almost any desired result. Prices go up on some items and down on others; total cost may be lower than the corresponding figure for the previous quarter but higher than the same quarter one year ago; the average number of bidders may be bigger when the volume of work is low, or high; several items making up the total may go in one direction but be counter balanced by one item which will move sharply in the other direction and establish the composite figure.

Some of these vagaries can be secured directly from the actual figures, without benefit of interpretation. When logical and proper interpretations are introduced, covering a wide variety of causes that may affect an index, the results can diverge even further with such new factors.

However, in spite of the recognized problems in maintaining such statistics they do represent the best available source of information showing the overall trend in highway costs. They develop an annual curve that may be extended into the future to provide a rough basis for predicting highway costs which will have to be considered in the unfolding of the present national highway program during the next decade.

Without these cost statistics, and these broad, average figures it would be most difficult to plot the demand on our highway dollars in the future.

One basic comment applies to the data made available from four Western states, California, Nevada, Idaho and Colorado. This would be to look at the resulting curves from a distance, without trying to get close enough to see the sharp dips and rises that occur from quarter to quarter. It is the general trend that is significant and the figures for the short intervals are quite incidental.

For example a quick glance at the annual cost index figure for highway construction in California (the longest record available) shows that from 1940 used as the base of 100 to 1958 the trend has moved up to about 235 including some dips and dashes. If, in almost 20 years the highway construction cost has risen from 100 to about 235, would it be reasonable to assume that it would take a corresponding upward move of half this amount in 10 years, or repeat this rise in the next 20 years?

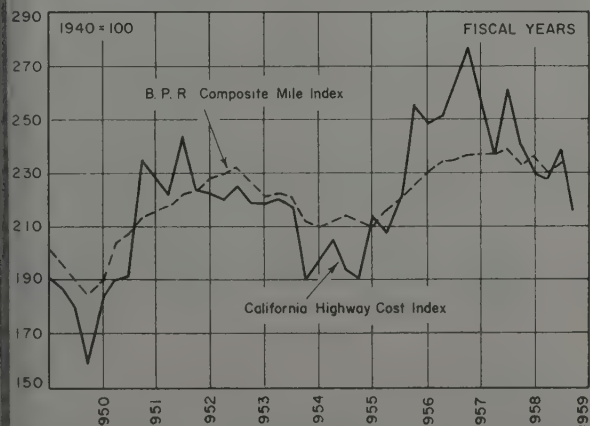
There is nothing in the trend of labor costs that would indicate this important factor will tend to slow this rise in the years ahead.

Possibly this overall and general conclusion is the most significant since individual items and details begin to develop peculiarities that need interpretation and this begins to obscure the quarterly figures.

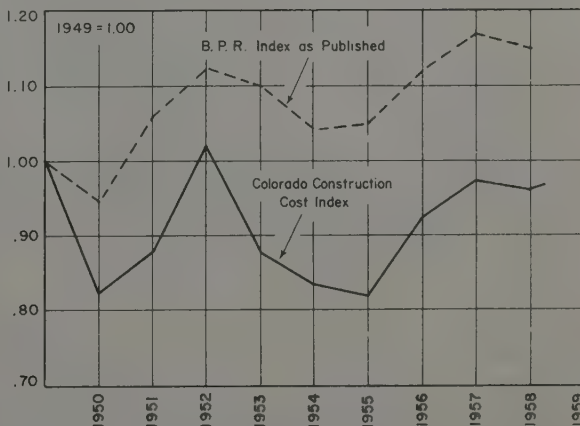
For example, there is the question as to whether the cost index figure for any 3-months period should be compared to the preceding quarter or the corresponding quarter of a year before. Normal variations between seasons would tend to obscure the first comparison and the difference between the construction program from year to year would cause a corresponding difficulty in going back to the previous year. In fact, the quarterly figures can be so materially influenced by a few major jobs that any direct comparison is unsatisfactory. One example will illustrate this point. The average cost of road excavation reported by the California Division of Highways for the first quarter of 1959 was \$0.41 per cu. yd. which was \$0.11 below the last quarter of 1958 when the price was \$0.52. This is a drop of about 21% in that major item—or is it? The interpretation of this figure dis-

(Continued on page 110)

CALIFORNIA HIGHWAY COST INDEX



COLORADO HIGHWAY COST INDEX



BIG•NEW

Exclusive "Balanced-Design"

This new H-120 "PAYLOADER" tractor-shovel is the result of years of development by The Frank G. Hough Co., combining the experience and "know-how" of the pioneer and leader in this field. HOUGH "balanced-design" provides proper weight distribution; ample power for both drive and hydraulic operations and maximum reach and dumping heights consistent with the handling of bigger, heavier loads.

Safety and Stability Emphasized

The new boom arm design and positioning insures complete operator safety since all moving parts and pivot points are located forward of the operator's compartment. The stability of this new H-120 "PAYLOADER" is helped by the use of special high strength, light weight "T-1" alloy steel in the boom arms. Capacity loads can be carried close to the machine with a 40° bucket tipback at ground level and a flat 75° position at average carry height.

Ease of Operation

With power steering, power air brakes and power-shift transmission, this big tractor-shovel operates easier than many smaller units.

The operator compartment features a canopy, front and rear windshields and windshield wiper. The bucket-type seat is positioned to give unlimited visibility of the load at all stages of operation.

Sensible Service Accessibility

Easily removed panels expose electrical connections and batteries on one side — give access to hydraulic system controls and reservoir on the other. Daily or periodic checking and servicing points are easy to reach.

Two-Stage, Dry-Type Air Cleaner

An important engine protective feature of the new H-120 is the Donaldson "Donaclone" two-stage, cyclonic precleaner and filter air cleaner. It keeps out 99.8% of the dirt — maintains high efficiency regardless of engine speed, temperature changes or dust accumulation, requires 75% less service time.

Power and Efficiency

The H-120 is powered by a CUMMINS NRT-6BI turbo-charged diesel engine developing 300 H.P. at 2,100 rpm. It handles full load of both torque-converter and hydraulic pumps without "lugging down".

The power-shift transmission has four speed ranges in both directions including travel speed up to 28 mph. Exclusive dual brake controls give driver the choice of braking with or without transmission engaged.

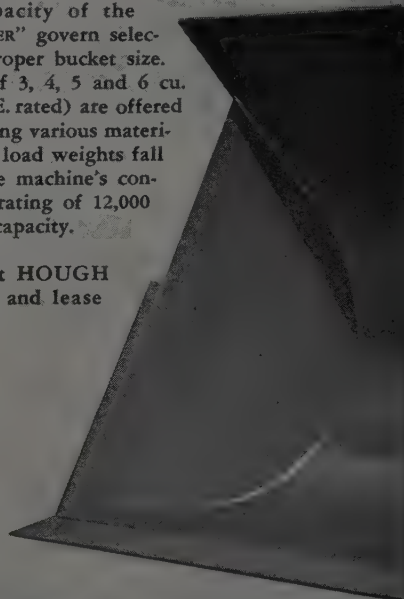
More Reach and Dumping Height

At maximum dumping height this new "PAYLOADER" has 14'6" clearance to the hinge pin and 10'10" clearance with the bucket dumped at 50° angle. In this position the reach from the front tires is 42'.

Bucket and Carry Capacity

For continuous operation without abuse, the weight of the material to be handled and the recommended carry capacity of the "PAYLOADER" govern selection of proper bucket size. Buckets of 3, 4, 5 and 6 cu. yds. (S.A.E. rated) are offered for handling various materials where load weights fall within the machine's conservative rating of 12,000 lb. carry capacity.

Ask about HOUGH purchase and lease plans.



THE FRANK G. HOUGH CO.

707 Sunnyside Ave., Libertyville, Ill.

Send complete data on the big new model H-120.

Name _____

Title _____

Company _____

Street _____

City _____

5-B-1R

State _____

HOUGH



THE FRANK G. HOUGH CO.

LIBERTYVILLE, ILLINOIS

SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY



... for more details, circle No. 48 on Reader Service Postcard

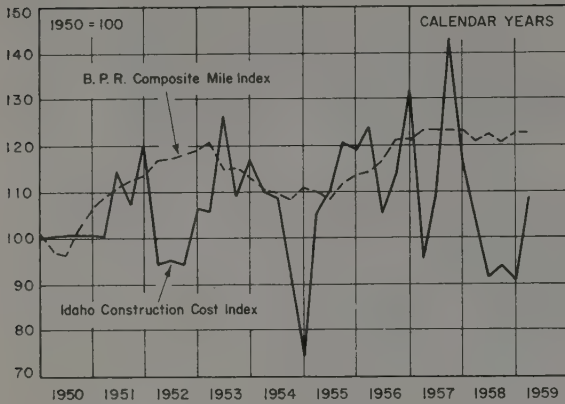
MODEL H-120

2,000 lbs.
carry
capacity



PAYLOADER®

IDAHO HIGHWAY COST INDEX



closes that there were several projects in the first quarter of 1959 involving large volumes of earth-moving in locations where traffic interference was at a minimum. Not only were these contracts unusually large which tended to reduce the unit price but the small amount of interference from existing traffic pulled down the figure even further.

Looking back over the past several years the overall annual figures seem to be relatively consistent for the 4 states making these records available. Highway costs showed a sizeable increase for the year 1956 over 1955. Three of the tabulations continued to show an increase in overall highway costs in 1957 over 1956 with the fourth state showing a very slight decline. In 1958 the annual average showed a reversal in trend and declined from the 1957 figure by a sizeable amount in three of the summaries, standing still in the fourth. Whether this dip during 1958 will be reflected further in 1959 will have to wait further figures for the current year.

The first quarter figures for 1959 probably could best be compared to the corresponding figure of a year ago in which case there was a sizeable drop in two of the states and a somewhat smaller increase in the corresponding comparison for the other two.

Selected bid prices

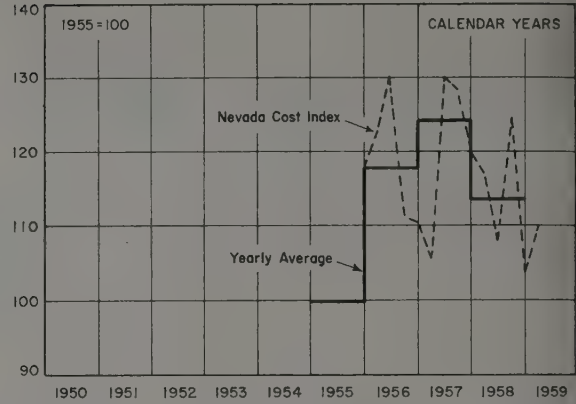
Arizona —

Grade and drainage for 5.5 mi.

Arizona—Pinal County—State. Heiskell Construction Co. has received a \$145,383 contract for 5½ mi. of roadway. Work consists of grading and draining portions of the roadway to eliminate dip sections, furnishing and placing select material and bituminous road mix, and furnishing and applying an emulsified asphalt seal coat.

(1) Heiskell Construction Co.	\$145,383	
(2) Krumtum-Dewar Construction Co., Ltd.	145,520	
D. M. Bradley & S. R. Dysart, Contractors.	148,364	
Western Constructors, Inc.	149,355	
75 cu. yd. Drainage excavation	.65	(2) .80
670 cu. yd. Structural excavation	4.50	2.00
21,370 ton. Borrow (CIP)	.366	.40
20,000 cu. yd. Stripping pits	.15	.10
Lump sum Provide water supply	500.00	500.00
3,150 M gal. Apply water	1.95	1.50
860 hr. Rolling	8.60	8.00
48,000 ton. Select material (CIP)	.60	.65
885 ton. Cover material for seal coat		
12,100 ton. Bituminous mix (Cl. I.R.d. mix)	5.50	5.50
(CIP except cost of liquid asphalt) ..	.74	.88

NEVADA HIGHWAY COST INDEX



560 ton. Liquid asphalt for bituminous rd. mix (Gr. RC-2, RC-3 or RC-4) (CIP) ..	44.00	44.00
130 ton. Emulsified asphalt for seal coat (Gr. B) (CIP) ..	46.00	45.00
846 cu. yd. Class A concrete (CIP) ..	38.00	38.00
91,950 lb. Reinforcing steel (bars) (CIP) ..	.12	.12
150 lin. ft. Road guard (Std. RG-1) (CIP) ..	4.00	5.00
26 ea. Guide posts (Std. C-8) (Type BR) (CIP) ..	6.00	5.00
40 ea. R/W markers (Std. C-1) (Type C) (CIP) ..	7.00	5.00

Six prestressed overpass structures

Arizona—City of Phoenix—State. Mardian Construction Co. was low of nine bidders for construction of 6 two-span precast, prestressed girder overpass structures on the Phoenix Freeway at the intersection of 19th, 15th, and 7th Aves.

(1) Mardian Construction Co.	\$403,296
(2) Royden Construction Co.	408,495
Western Constructors, Inc.	412,102
The Ashton Co., Inc.	416,071
Tanner Bros. Contracting Co., Inc.	423,501

	(1)	(2)
600 cu. yd. Roadway excavation	1.50	1.25
30 cu. yd. Drainage excavation	1.00	1.25
1,625 cu. yd. Structural excavation	5.00	1.50
5,200 ton. Borrow	.50	.70
280 M gal. Apply water	1.35	3.00
15 hr. Class I rolling	10.00	11.00
20 hr. Class II rolling	18.00	17.00
1,700 ton. Aggregate base	1.60	1.25
650 ton. Bituminous mix	4.10	4.00
28 ton. Paving asph. for bit. mix	38.00	32.50
71,860 lb. Structural steel	.30	.30
1,227 lin. ft. Aluminum handrail	5.50	6.00
2,650 cu. yd. Class A concrete	35.00	40.00
727 cu. yd. Class D concrete	48.00	43.00
108 ea. Prestressed concrete girders (reinforcing steel)	695.00	750.00
1,140 sq. yd. ½ in. pneumatically placed conc. ..	3.15	3.7
468,550 lb. Reinforcing steel (bars)	.11	.11
286 lin. ft. 24 in. reinforced conc. pipe	8.85	14.00
98 lin. ft. 30 in. reinforced conc. pipe	12.00	15.00
11,120 lin. ft. H-column piles	5.50	3.6
556 ea. Driving steel H-column piles	35.00	39.00
6 ea. Splicing piles	15.00	25.00
300 lin. ft. Road guard	2.90	3.2

4.1 mi. of grading, draining, and paving

Arizona—Gila County—State. Isbell Construction Co. of Phoenix submitted a low bid of \$1,348,215 for 4.1 mi. of grading, draining, placing base, bituminous paving and applying seal coat.

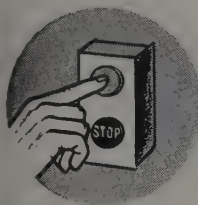
(1) Isbell Construction Co.	\$1,348,215	
(2) Copper State Construction Co.	1,371,895	
Wallace & Wallace	1,555,444	
Peter Kiewit Sons' Co.	1,769,720	
	(1)	(2)
435,000 cu. yd. Roadway excavation	1.96	1.88
20,000 cu. yd. Overbreakage	1.47	1.41

STANDARD

"THE WORLD'S FINEST"

ANNOUNCES...

revolutionary NEW self-erecting* asphalt plant

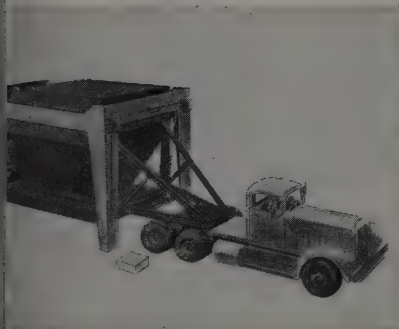


featuring:
**"PUSH BUTTON
ERECTION"**

*PATENT APPLIED FOR

STANDARD presents a big, really portable batch type, self-contained Asphalt Plant that produces the same high tonnages as conventional "stack-up" plants.

Exclusive "push button erection" mechanically erects this STANDARD Model S-E Self-Erecting Asphalt Plant — no expensive cumbersome crane is needed to "stack up" the plant.



1 MOBILE HOIST-AND-BIN SECTION IS MOVING INTO PLACE.



2 TRUCK HAS BEEN DETACHED. HOIST IS RAISING BIN SECTION.



3 MIX-AND-WEIGH SECTION IS MOVING INTO PLACE.

Entire plant is fully portable with each section mounted on its own wheels and axles — "a complete package on wheels."

This new STANDARD Model S-E self-erecting Asphalt Plant incorporates the same self-erecting principle and rugged design as is found in the well known STANDARD Model T-M trailer-mounted Asphalt Plants.



4 HOIST HAS RAISED BIN SECTION AND MIXING SECTION INTO FINAL POSITION. HOT ELEVATOR IS BEING RAISED.

5 MOBILE DRYER AND DUST COLLECTOR HAVE BEEN MOVED INTO PLACE. PLANT IS IN OPERATION.



THE MODEL **SE** PORTABLE SELF-ERECTING ASPHALT PLANT.
MANUFACTURED IN 4000, 5000, AND 6000 POUND BATCH CAPACITIES.

STANDARD STEEL CORPORATION

General Offices and Plant, 5049 Boyle Ave., Los Angeles 58, Calif.
Midwest Offices and Plant, Decatur 49, Illinois

... built to do a better job!

PARTS WAREHOUSES IN LOS ANGELES AND DECATUR, ILLINOIS

STANDARD

ASPHALT PLANTS

Attention Contractors!

The New STANDARD Portable T. M. Plant offers top production. A complete self-contained batch type Asphalt Plant...on wheels. One man operates! Has exclusive "SELF-LIFT" erecting device. RUGGED — ECONOMICAL — SIMPLE. Mixes up to 80 tons per hour!



10,000 cu. yd.	Slides	.94	.94
2,860 cu. yd.	Drainage excavation	1.00	2.00
1,500 lin. ft.	Grader ditches	.15	.15
13,700 lin. ft.	Crown ditches	.40	.44
2,270 cu. yd.	Structural excavation	4.50	5.00
42,600 cu. yd. mi.	Overhaul	.25	.36
22,000 ton	Borrow (C.I.P.)	.48	.60
1 lump	Provide water supply	10,000.00	10,000.00
21,150 M gal	Apply water	2.55	3.50
600 hr.	Rolling (class I)	8.00	10.00
2,200 hr.	Rolling (class II)	10.00	14.00
44,900 ton	Select material (C.I.P.)	.98	1.00
32,700 ton	Aggregate base (C.I.P.)	1.65	1.80
1,100 ton	Cover mat. for seal coat	5.00	8.00
14,200 ton	Bit. mix (cl. II-plant mix)	3.30	3.50
210 ton	Liq. asphalt for prime coat	52.00	49.00
42 ton	Liq. asphalt for tack coat	90.00	90.00
615 ton	Pav. asphalt for bit. plant mix	46.00	43.00
150 ton	Emul. asphalt for seal coat	54.00	52.00
391 cu. yd.	Class A concrete (C.I.P.)	75.00	100.00
30,100 lb.	Reinf. steel (bars) (C.I.P.)	.15	.18
122 lin. ft.	24" C.M.P. (C.I.P. except excavation)	6.50	6.80
16 lin. ft.	30" C.M.P. (C.I.P. except excavation)	7.75	8.00
158 lin. ft.	36" C.M.P. (C.I.P. except excavation)	11.75	12.50
1 lump	Misc. removal and other work	5,000.00	4,350.00
13,370 lin. ft.	Road guard	3.60	3.30
400 lin. ft.	Reconstruct road guard	2.25	2.00
62 ea.	Guide posts	6.00	8.00
70 ea.	R/W markers	12.00	12.00
9,000 lin. ft.	Placing bit. mixed curbs	.15	.15
3,150 lin. ft.	Placing bit. mixed gutters	1.25	1.50
1,048 lin. ft.	24" culvert pipe	6.50	6.80
273 lin. ft.	30" culvert pipe	7.75	8.00
830 lin. ft.	36" culvert pipe	11.00	12.50

35 ton	Emulsified asphalt, Type MS-1 (diluted)	45.00	40.00
333 ton	Liquid asphalt, Type MC-1	45.00	40.00
235 ton	Sand blotter	2.00	2.00
23 ton	Emul. asphalt, Type RS-2	45.00	40.00
427 ton	Screenings, one-half inch	4.00	3.00
1,463 ton	Asphalt cement, 120-150 penetration	38.50	37.00
21,266 ton	Plantmix surface aggregate	2.25	2.30
3,139 ton	Open graded plantmix surface aggregate	5.00	5.00
132 cu. yd.	Class AA concrete	95.00	85.00
13,300 lb.	Reinforcing steel	0.20	0.17
1,340 lin. ft.	24 in. corr. metal pipe (dipped)	7.00	6.00
188 lin. ft.	30 in. corr. metal pipe (dipped)	8.25	8.00
198 lin. ft.	36 in. corr. metal pipe (dipped)	12.00	10.00
170 ea.	Culvert markers & guide psts.	6.00	6.00
40 ea.	Right of way markers	6.00	6.00
40 ea.	Reference monuments	10.00	10.00
20 ton	Liquid asphalt, Type SC-2 or SC-3	45.00	40.00
380 ton	Premixed bituminous patching material	1.50	2.00

Idaho —

7.6 mi. of roadmix bituminous surfacing

Idaho—Twin Falls County—State. T & S Construction Co. has submitted a low bid of \$138,659 for constructing the surface and a roadmix bituminous surface on 7.6 mi. of the Rogerson-Cedar Creek res. road, Rogerson-Salmon Falls Dam.

(1) T & S Construction Co.	\$138,659
(2) Willis Bros.	154,898
Hoops Construction Co.	161,795

Nevada —

Construction of 15.4 mi. of highway

Nevada—Churchill County. A \$288,635 contract has been awarded to Silver State Construction Co. for construction of 15.4 mi. of highway.

(1) Silver State Construction Co.	\$288,635
(2) Heely Construction Co.	295,286
Central Paving Co.	324,425
Dodge Construction, Inc.	334,763

	(1)	(2)
Lump sum	Signs	\$ 500.00
1,700 hr.	Flagman	2.50
100 hr.	Pilot car	3.00
70 cu. yd.	Remove concrete	20.00
331 ton	Emulsified asphalt, type MS-1 (diluted)	40.00
151 ton	Emulsified asphalt, type RS-2	40.00
1,636 ton	Screenings, 3/8-in.	3.00
1,206 ton	Liquid asphalt, type SC-4	34.00
2,057 ton	Asphalt cement, 120-150 penet.	33.00
19,480 ton	Plantmix surf. leveling aggreg.	2.20
27,346 ton	Plantmix surface aggregate	2.35
7,060 ton	Open-graded plantmix surf. aggreg.	5.00
22.5 cu. yd.	Class AA concrete	90.00
920 lb.	Reinforcing steel	.20
120 lin. ft.	Remove and reset guard rail	1.00
394 ea.	Culvert markers & guide posts	6.00
Lump sum	Repair bridge	2,000.00

	(1)	(2)
2 ea.	Removal of bridges	\$ 800.00
330 sq. yd.	Remove bituminous surface	1.00
1 ea.	Remove cattle guard	300.00
200 cu. yd.	Excavation for structures	5.00
1,490 M gal.	Watering	1.00
425 hr.	Rolling, power roller	7.00
125 cu. yd.	Mechanical tamping	2.50
18,000 cu. yd.	Stripping material deposits	.30
12,300 ton	Cr. gr. base course, type "B", 3/4 in. maximum	1.45
30,400 ton	Cr. gr. base course 2 in. maximum	1.35
9,700 ton	Cr. gr. surface in windrows, 3/4 in. maximum	1.50
26,600 gal.	MC-1 asphalt road material for pr. ct.	.18
535 ton	Blotter material, class "B"	2.50
7,569 mi.	Mix, fin. & rolling cl. "B"	850.00
420 ton	MC-3 asph. rd. matl. for rdmix	42.00
24,950 gal.	MC-5 asph. rd. matl. for seal ct.	.18 1/2
1,260 ton	Cy. ct. matl., "C" in stockpile	4.25
75 cu. yd.	Cy. ct. matl., "3" in stockpile	2.00
10,200 lb.	Concrete class "A"	85.00
2 ea.	Metal reinforcement	.16
1 ea.	Project markers	25.00
	24 ft. cattle guard	1,200.00

4.6 mi. of roadbed to be reconditioned

Idaho—Bear Lake County—State. Holmes Construction Co. has received a \$119,161 contract for reconditioning existing roadbed and constructing a roadmix bituminous surface on 4.6 mi. of roadway, and furnishing crushed gravel in stockpile.

(1) Holmes Construction Co.	\$119,161
(2) Olof Nelson Construction Co.	125,807
Aslett Construction Co.	128,714
Fife Construction Co.	128,921

Construction of 9 mi. of road

Nevada—Lander & Eureka counties—State. Dodge Construction, Inc. has been awarded a \$298,437 contract for construction of 9 mi. of road.

(1) Dodge Construction, Inc.	\$298,437
(2) Silver Construction Co.	306,849
Isbell Construction Co.	364,516
Hoops Construction Co.	378,133

	(1)	(2)
Lump sum	Signs	\$ 1,000.00
3,000 hr.	Flagman	3.00
120 hr.	Pilot car	5.00
Force account	Maintain base	5,000.00
1,358 lin. ft.	Remove culvert pipe	1.50
61 ea.	Remove headwalls	20.00
150,035 cu. yd.	Roadway excavation	0.22
20,492 cu. yd.	Drainage excavation	0.50
160 sta.	Channel excavation	0.27
458,355 yd. sta.	V-type ditches	0.21
8,646 yd. mi.	Overhaul, yd. sta.	0.015
502 cu. yd.	Overhaul, yd. mile	0.15
1,041 cu. yd.	Structure excavation	1.50
12,000 M gal.	Backfill	1.50
Lump sum	Water	0.25
126 hr.	Furnish water equipment	12,000.00
7,397 ft. hr.	Power roller	8.00
45,215 ton	Tamp. or pneumatic-tired roller	0.60
29,169 ton	Type 1 gravel base	0.42
	Type 2 gravel base	0.65

	(1)	(2)
10,250 cu. yd.	Uncl. Exc.	.40
470 cu. yd.	Exc. for str.	1.50
12,800 cu. yd.	Sel. bor. Class "A"	.70
1,750 M gal.	Watering base & surf. courses	2.00
250 hr.	Rolling, power roller	8.00
37,000 ton	Rolling, pneu. tire roller	8.00
9,800 ton	Cr. Gr. base course, type "B", 3/4" maximum	1.00
5,000 ton	Cr. Gr. in windrows, 3/4" max.	.95
33,000 gal.	Cr. Gr. in stkp., 3/4" max.	.90
275 ton	MC-1 asph. rd. material for prime coat	.17
4,630 mi.	Blotter material, class "C"	1.50
440 ton	Mix. fin. & roll, class "A"	1,000.00
45 ton	MC-3 asph. rd. mat. for roadmix	39.50
26,000 gal.	Mix & plac. bit. surface for apr. roads	6.00
1,300 ton	RC-5 asph. road material for seal coat	.18
680 lin. ft.	Cover coat material, class 3	3.50
570 cu. yd.	8-in. corr. metal pipe underdrain	2.00
4,630 mi.	Special backfill, class "B"	1.00
525 ton	Recond. & reshape exist. roadbed	700.00
2,300 lin. ft.	Rejects in stockpile	.50
70 ea.	Move and reset guard rail	1.50
	Move and reset guide posts	5.00

Reduce on-site labor by 85% Floor areas at low cost

FIR PLYWOOD COMPONENTS helped speed and simplify roof construction on this striking office-display-warehouse building. The multiple arch roof in the front of the building is composed of curved stressed-skin panels, each 4 feet wide, spanning 16 feet; the rear of the building is roofed with 4 x 16 foot flat stressed-skin panels. Both combine roof decking insulation and finish ceiling in one easily handled component.

In addition to reducing on-site labor by about 85%,

the fir plywood roof components provide superior structural values and permit large clear floor areas without supplementary support from purlins or trusses.

The in-place cost of the flat stressed-skin plywood panels came to 79c per square foot, the curved panels, \$1.10—or about 10 per cent less, locally, than comparable joist or truss construction providing the same clear floor areas with conventional decking, insulation and finish ceiling.

For more information about fir plywood—its uses and advantages—write (USA only):

DOUGLAS FIR PLYWOOD ASSOCIATION

TACOMA 2, WASHINGTON

—an industry-wide organization devoted to research, promotion and quality control

Always specify by DFPA grade-trademarks



Multiple arch roof composed of curved components creates unusual and attractive profile. Panels have 5/16" upper, 1/4" lower plywood skins glued to 3/4" honeycomb paper core, with 1 x 3 framing.



Flat stressed-skin panels used on rear section of the building have 1/2" upper, 3/8" lower Exterior fir plywood skins glued to light lumber framing.

Montana —

10.4 mi. of grading and surfacing

Montana—Lewis and Clark County—State. Naranche & Konda has received a \$1,058,369 contract for 10.4 mi. grading, aggregate surfacing, plant mix surfacing, seal coating, and drainage.

(1) Naranche & Konda.....	\$1,058,369
(2) S. Birch Inc. & S. Birch & Sons Construction Co.....	1,107,010
Robertson & Cave, Inc.....	1,108,726
Northwestern Engineering Co.....	1,115,694

	(1)	(2)
Lump sum	Clearing and grubbing	\$5,000.00
800,102 cu. yd.	Unclassified excavation	.57
3,540 cu. yd.	Culvert excavation	3.00
76,816 mi. yd.	OH unclassified excavation	.20
1,600 unit	Rolling embankment	7.00
893 unit	Rolling aggr.-surf. course	8.00
94 unit	Rolling seal coat	12.00
12,002 M gal.	Watering embankment	1.50
4,251 M gal.	Watering surf. course	2.50
70 hr.	Watering cover aggregate	10.00
191,004 ton	Selected BB course (3 in. Cr.)	1.10
21,532 ton	Ty "A" Cr. top surf., ¾ in.	1.45
2,339 ton	Cover material 3/8 in.	6.50
1,581.78 ton	150-200 P.A. cement	34.00
270.07 ton	MC-1 cutback asphalt	45.00
224.62 ton	RS-2 emuls. asphalt	45.00
28,777 ton	PMB surface, Ty. II ¾ in.	3.40
Lump sum	Rem. exist. structures	3,000.00
392 lin. ft.	Relay pipe culverts	3.00
861 cu. yd.	Aggregate backfill	5.00
144 lin. ft.	48 in. CMEP culverts, 8-gage... ..	40.00
134 lin. ft.	60 in. CMP culverts	50.00
138 lin. ft.	72 in. struc. PEP culverts, 10-gage ..	70.00
174 lin. ft.	90 in. SPEG culverts, 10-gage... ..	80.00
744 lin. ft.	18 in. RCP culverts	8.00
1,146 lin. ft.	24 in. RCP culverts	10.00
72 lin. ft.	30 in. RCP culverts	15.00
408 lin. ft.	36 in. RCP culverts	20.00
268 lin. ft.	48 in. RCP culverts	35.00
86 lin. ft.	60 in. RCP culverts	50.00
74 lin. ft.	73.5 in. S x 45 in. R RCA culverts ..	50.00
2 ea.	Project markers	25.00
55 ea.	Station markers	10.00
120 ea.	Right of way monuments.....	8.00

Grade, surface and drain 9.7 mi.

Montana—Park County—State. Eleven bidders were separated by only \$73,000 in competition for a 9.3 mi. grade, aggregate, surfacing, and drainage project. Low bid was submitted by Long Construction Co. of Billings, at \$507,106.

(1) Long Construction Co.....	\$507,106
(2) Holland Construction Co.....	515,258
Taggart Construction Co.....	528,333
Naranche & Konda	530,466

	(1)	(2)
L S	Clearing and grubbing	\$7,000.00
628 060 cu. yd.	Unclassified excavation	.32
1,439 cu. yd.	Culvert excavation	2.00
332,138 mi. yd.	Overhaul of unclas. excavation	.17
1,170 unit	Rolling embankment	6.00
590 unit	Rolling surface courses	8.00
3,776 mi. gal.	Watering embankment	.50
2,951 mi. gal.	Watering surfacing courses	1.00
26,830 ton	Select bor. base crse.—4 cru.	.70
64,424 ton	Select bor. base crse.—3 cru.	.80
56,270 ton	Select bor. base crse.—1½ cru.	.90
L S	Remove existing structures	500.00
74 cu. yd.	Hand laid riprap	8.00
3,075 cu. yd.	Type B random riprap	4.00
21 lin. ft.	Relay pipe culverts	3.00
544 cu. yd.	Gravel backfill	3.00
98 lin. ft.	18 in. cor. met. pipe—syph. 16G	7.00
153 lin. ft.	24 in. cor. met. pipe—syph. 14G	10.00
34 lin. ft.	36x22 cor. met. pipe arch—10G	12.00
300 lin. ft.	12-10 x 8-4 str. plate arch—7G	95.00
88 lin. ft.	16-7 x 10-1 str. plate arch—3G	145.00
72 lin. ft.	Struc. plate atkpass—DES B	75.00
246 lin. ft.	18 in. rein. conc. pipe culv.	6.00
1,792 lin. ft.	24 in. rein. conc. pipe culv.	10.00
204 lin. ft.	36 in. rein. conc. pipe culv.	18.00
64 lin. ft.	44 x 27 rein. conc. arch culv.	22.00
114 ton	Bentonite canal liner	70.00
1 each	Project marker	25.00
51 each	Station marker	10.00
56 each	Right of way monument	6.00
L S	Rem. & reset misc items	2,000.00

Oregon —

Grading section of Old Oregon Trail

Oregon—Umatilla County—State. Rogers Construction Co. of Portland was low of 14 bidders at \$1,658,362 for grading the Deadmans Pass—Meacham section of the Old Oregon Trail.

(1) Rogers Construction Co.....	\$1,658,362
(2) Miller Hutchins Contr., Inc.....	1,757,855
Peter Kiewit Sons' Co.....	1,823,065

S. S. Mullen, Inc.	1,950,794
Max J. Kuney Co.	2,005,231

	(1)	(2)
12 only	Clearing and grubbing....	\$200,000.00
1 only	Drainage excav., unclass.	4.00
6 only	General excav., unclass.	.47
1,200 cu. yd.	Short overhaul	.005
251,000 lb.	Long overhaul	.30
1,350 lin. ft.	Finish roadbed & slopes....	3,000.00
6,200 rods	Rounding cutbanks	.10
240 rods	24 in. concrete pipe.....	4.00
2 only	15 in. corr. metal pipe.....	3.25
2 only	18 in. corr. metal pipe.....	5.00
30,700 ton	24 in. corr. metal pipe.....	3.75
5,600 ton	36 in. corr. metal pipe.....	5.50
2,800 M gal.	36 in. corr. mtl. pipe, 8 gage ..	11.00
1 lump sum	36 in. corr. mtl. pipe, 10 gage ..	16.00
2,130 ton	72 in. corr. mtl. pipe.....	13.00
140 ton	15 in. culvert end sections....	34.00
40 ton	18 in. culvert end sections....	22.00
1 lump sum	24 in. elliptical inlets.....	25.00
9,000 cu. yd.	36 in. elliptical inlets.....	60.00
2,115,000 cu. yd.	72 in. elliptical inlets.....	90.00
6,640,000 yd. sta.	Concrete inlets Type D....	325.00
158,600 c. yd. sta.	Class A concrete	75.00
1 lump sum	Metal reinforcement	60.00
100,000 lin. ft.	Metal guard rail	3.00
40 lin. ft.	Type 1 fence	3.80
5,600 lin. ft.	Type 2 fence	5.25
5,330 lin. ft.	16 ft. 48 in metal gates....	7.00
900 lin. ft.	16 ft. cattle guard	100.00
1,900 lin. ft.	Coarse crushed mat. in base ..	900.00
780 lin. ft.	3 4 in 0 material in base....	1.75
		1.95

Grading and paving in Oregon

Oregon—Wallowa County—State. A \$542,665 contract has been awarded to F. L. Somers for grading and paving on a section of the Wallowa Lake highway.

(1) F. L. Somers	\$542,665
(2) Central Paving Co. and G. D. Dennis & Sons.....	\$27,189
McNutt & Sons, Inc.	523,902
Natt McDougall	666,375

	(1)	(2)
Lump sum	Clearing and grubbing	\$17,500.00
500 cu. yd.	Drainage excav. unclassified ..	3.00
344,600 cu. yd.	General excav. unclassified	.50
633,000 yd. sta.	Short overhaul	.01
5,500 yd. sta.	Long overhaul	.50
7.60 mi.	Finishing roadbed and slopes..	750.00
18,800 lin. ft.	Rounding cutbanks	.20
700 lin. ft.	18-in. corrugated metal pipe....	5.00
380 lin. ft.	24-in. corrugated metal pipe....	7.00
14 lin. ft.	36-in. corrugated metal pipe....	15.00
12 lin. ft.	60-in. corrugated metal pipe....	25.00
280 lin. ft.	12-in. concrete pipe	2.50
640 lin. ft.	18-in. concrete pipe	5.00
110 lin. ft.	24-in. concrete pipe	6.00
170 lin. ft.	36-in. concrete pipe	10.00
60 lin. ft.	7 ft. - 0 in. x 5 ft. - 1 in. structural plate pipe arch,	60.00
	Salvaging culvert pipe	2.00
240 lin. ft.	Metal guard rail	2.60
6,400 lin. ft.	Metal sight posts	3.00
Cont. sum (200)	Coarse crushed material in base ..	1.85
56,800 cu. yd.	¾ in. - O material in base.....	1.85
9,500 cu. yd.	Sprinkling	2.00
2,500 M gal.	Preparation of base	300.00
7.60 mi.	¾ in. - O mat. in binder course..	3.00
880 cu. yd.	MC-2 asphalt	50.00
145 ton	Asphaltic concrete mixture	3.65
23,000 ton	83-100 asphalt in mixture	40.00
1,380 ton	Extra for asphaltic	25.00
Cont. sum (30)	concrete approaches	5.00
	Type 1 fence	5.00
1,600 rods	Type 2 fence	6.75
470 rods	14 ft. x 48 in. metal gates....	100.00
Cont. sum (10)	¾ in. - ¾ in. crushed material ..	2.50
1,200 cu. yd.	in stockpile	2.50
	¾ in. #10 crushed material	2.50
1,800 cu. yd.	in stockpile	2.75

Utah —

6.8 mi. of roadmix surfacing

Utah—Uintah County—State. Germer, Abbott & Waldron has been awarded a \$226,123 contract for 6.8 mi. of 2½-in. road mixed bituminous surfaced road.

(1) Germer, Abbott & Waldron.....	\$226,123
(2) Wheelwright Construction Co.....	281,244
W. W. Clyde & Co.....	282,311
L. A. Young Construction Co. & Vernal Sand & Gravel Co.....	283,525

	(1)	(2)
768 ton	Bit. material, Type MC-3.....	\$ 36.75
136 ton	Bit. mat., Type MC-1 or MC-2..	36.75
88 ton	Bit. material, Type RC-4.....	39.75
205 gal.	Bit. additive (comm. grade)....	2.00
6,847 mi.	Scarifying and mixing	700.00



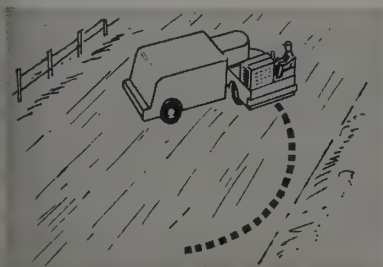
Let's outlaw tipping

tipping may be all right
in a restaurant . . .
or to a red cap but . . .

tipping is a too frequent operator hazard
when you're compacting shoulders. Get a couple
of outside wheels in space above a ditch and
over goes the roller — and the man.
Banish that danger!

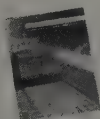


The Seaman-Andwall 5620 Pneumatic Compactor is ultra-safe. Its low silhouette and extra width (92") provide an unusually low center of gravity. It has actually worked day in, day out on slopes as steep as 2 to 1 as illustrated above, without the slightest tendency to tip.



The 5620 is usually maneuverable; turns a full 180° on an 18 foot road. Operator sits sideways to direction of travel, can see his work even in close quarters.

Weight ranges from 7 tons empty to 20 tons with ballast.



Send for this illustrated literature with complete specifications on the 5620 Seaman-Andwall Pneumatic Compactor. Just a postcard will bring it promptly.



7040



Here's how. The SEAMAN-ANDWALL 5620 Pneumatic Compactor provides super-safety with an extraordinarily low center of gravity. It has actually worked successfully on a 2 to 1 side-slope (levee construction near Jackson, Mississippi). *No holding cables to a bracing tractor at the top.* The 5620 didn't even slip.

Apart from the safety factor the SEAMAN-ANDWALL 5620 Pneumatic does the job faster with its extra wide rolling width of 92 inches.

And the "straight down" pressure principle provided by front wheel drive eliminates surface shear, scuffing or displacement of materials.



So for operator safety and for faster, lower cost compaction on the level, on steep grades or slopes — this season get yourself the 5620 SEAMAN-ANDWALL 7-20 ton Compactor.

SEAMAN-ANDWALL CORPORATION

A subsidiary of American-Marietta Company

Elm Grove 17, Wisconsin

. . . for more details, circle No. 52 on Reader Service Postcard

Cover material, 1,020 ton	Type "A", Cover material, Type "A" (in stockpile)	4.50	4.50	1,020 ton
34,400 ton	Gravel surface, Type "B"	.65	.90	
35,600 ton	Gravel base course	.55	.85	
99,000 cu. yd.	Unclassified roadway excavation	.36	.58	
38,000 cu. yd.	Imported borrow	.20	.25	
381,000 sta. yd.	Class "A" overhaul	.01	.01	
33,500 yd. mi.	Class "B" overhaul	.15	.15	
3,300 M gal.	Watering	1.50	1.50	
1,250 hr.	Rolling, tamping roller	8.00	10.00	
140 hr.	Rolling, pneumatic tire or power roller	9.00	6.50	
120 hr.	Self propelled pneumatic tired roller	9.00	8.00	
274 lin. ft.	15-in. C.M. pipe	3.40	3.40	
670 lin. ft.	18-in. C.M. pipe	3.95	4.00	
940 lin. ft.	24-in. C.M. pipe	6.10	6.15	
62 lin. ft.	30-in. C.M. pipe	6.50	7.35	
89 lin. ft.	36-in. C.M. pipe	11.70	11.75	
135 lin. ft.	48-in. C.M. pipe	16.00	15.60	
174 lin. ft.	C.M. pipe-arches, 22-in. x 13-in.	4.00	4.20	
88 lin. ft.	C.M. pipe-arches, 29-in. x 18-in.	6.50	6.55	
42 lin. ft.	C.M. pipe-arches, 43-in. x 27-in.	12.50	12.35	
389 cu. yd.	Concrete, Class "A"	61.00	75.00	
75,900 lb.	Reinforcing steel	.14	.15	
1,200 cu. yd.	Excav. for structures, unclass.	2.00	1.50	
1,000 cu. yd.	Small ditch excavation	.50	.75	
95 hr.	Mechanical tamping	8.00	6.50	
135 ea.	Guide posts	7.00	6.50	
1,190 lin. ft.	Deep beam highway guard rail (concrete posts)	3.75	3.75	
1,500 lin. ft.	Right of way fence, Type "A"	.30	.31	
1 ea.	16-ft. gate	40.00	42.50	
3,000 lin. ft.	Surface ditches	.10	.12	
34 ac.	Clearing and grubbing	20.00	20.00	
80 ea.	Right of way markers	7.50	6.50	
2 ea.	F. A. P. markers	30.00	35.00	
Lump sum	Furnishing water equipment	2,000.00	5,000.00	
Lump sum	Furnishing construction signs	2,000.00	2,000.00	

New Mexico —

15 mi. of highway construction

New Mexico—Socorro County—State. Henry Thygesen & Co. has been awarded a \$787,630 contract for construction of 15 mi. of road.

(1) Henry Thygesen & Co.	\$787,630
(2) Adams Construction Co.	798,227
Haake Construction Co.	827,353
Brown Construction Co.	852,548

	(1)	(2)
Lump sum		
267,800 cu. yd.	Clearing and grubbing	\$17,000.00
251,294 cu. yd.	Excavation—unclassified	.31
33,530 M gal.	Ordinary borrow	.21
1,580 hr.	Watering	.35
1,940 hr.	Rolling (tamping roller)	9.00
1,070 hr.	Rolling (pneumatic tired)	4.50
1,775 hr.	Rolling (steel tired)	6.00
1,653 hr.	Fifty (50) ton roller operation	11.00
1,176,865 sta. yd.	Mechanical tamping	4.00
608,107 3/4 mi. yd.	Station yard overhaul	.01
920,433 ton mi.	Quarter mile yard haul	.035
3.39 mi.	Ton mile haul	.055
3,385 lin. ft.	Grading	2,000.00
3 ea.	Contour ditches	.10
4 ea.	Cattle guard—18 ft. roadway	1,800.00
132,900 lin. ft.	Cattle guard—24 ft. roadway	2,000.00
25 ea.	Galvanized barbed wire fence	.20
130 ea.	Gates—standard type	40.00
95 ea.	Bracing	5.00
3 ea.	Right of way markers	6.00
50 ea.	Stand. fed. aid project markers, type I	50.00
28,300 ton	Treated tmb. warn. posts, refl. (6 in. diam.)	6.00
19,300 ton	Selected borrow sub-base	.43
	Selected material	
41,600 ton	controlled gradation	.51
35,600 ton	Crushed stone, 2 in. max. size	11.09
2,825 bbl.	Crushed stone, 1 in. max. size	1.31
425 bbl.	Bituminous mat, type MC-1	6.85
1,000 bbl.	Emulsified asphalt, AE-3	9.00
1,500 ton	Bit. mat, type 120-150	7.85
28,150 ton	Cover material	4.00
9,530 bbl.	Plant mix surface course	3.35
	Bit. mat, type 120-150 (plant mix)	7.30
710 bbl.	Bit. mat, type 120-150 (tack coat)	8.50
129.41 cu. yd.	Class "A" concrete	65.00
1026.20 sq. yd.	Class "A" concrete for blankets	9.00
5,202 lb.	Reinf. for concrete structures	.30
3,882 lb.	Wire fabric reinforcement	.25
71 cu. yd.	Grouted rock retardis	20.00
884 lin. ft.	Culvert pipe—30 in. diam.	5.80
620 lin. ft.	Culvert pipe—42 in. diam.	9.10
142 lin. ft.	Culvert pipe—54 in. diam.	12.50
132 lin. ft.	Corr. metal culv. pipe— 66 in. diam., bevel 2:1	20.00
78 lin. ft.	Corr. metal culv. pipe— 90 in. diam., bevel 2:1	37.60
86 lin. ft.	Struc. plate pipe—132 in. diam., bevel 2:1, gage 710-18	73.60

5.3 mi. of highway and a concrete bridge

Utah—Uintah and Duchesne Counties—State. Wheelwright Construction Co. has been awarded a \$212,486 contract for putting a 2 1/2-in. road mixed bituminous surface on 5.3 mi. of road and constructing a concrete bridge.

(1) Wheelwright Construction Co.	\$212,486
(2) Roberts & Anderson Construction	225,790
L. A. Young Construction Co. and Vernal Sand & Gravel Co.	231,739
W. W. Clyde & Co.	264,552

	(1)	(2)
697 ton	Bit. mat., type MC-3	\$ 40.00
123 ton	Bit. mat., type MC-1 or MC-2	38.00
80 ton	Bit. mat., type RC-4	40.00
184 gal.	Bit. additive (commercial grade)	2.25
925 ton	Cover material, type "A"	4.50
925 ton	Cover material, type "A" (in stockpile)	3.00
31,800 ton	Gravel surface, type "B"	1.00
21,100 ton	Gravel base course	.95
5,331 mi.	Scarifying and mixing	800.00
4,000 cu. yd.	Unclassified roadway excavation	.50
103,000 cu. yd.	Imported borrow	.30
515,000 sta. yd.	Class "A" overhaul	.01
79,000 yd. mi.	Class "B" overhaul	.12
3,400 M gal.	Watering	1.00
1,190 hr.	Rolling, tamping roller	10.00
110 hr.	Rolling, pneumatic tire or power roller	7.00
100 hr.	Self propelled pneumatic tired roller	8.00
46 lin. ft.	15 in. C.M. pipe	3.35
790 lin. ft.	18 in. C.M. pipe	4.05
657 lin. ft.	24 in. C.M. pipe	6.20
53 lin. ft.	30 in. C.M. pipe	7.70
73 lin. ft.	C.M. pipe-arches, 22 in. x 13 in.	4.20
138 lin. ft.	C.M. pipe-arches, 29 in. x 18 in.	6.50
62 lin. ft.	C.M. pipe-arches, 36 in. x 22 in.	7.85
106 lin. ft.	C.M. pipe-arches, 50 in. x 31 in.	14.45
60 lin. ft.	C.M. pipe-arches, 65 in. x 40 in.	21.00
7 cu. yd.	Concrete, class "A"	85.00
7 cu. yd.	Concrete, class "AA"	100.00
1,200 lb.	Reinforcing steel	.20
600 cu. yd.	Exc. for structures, unclassified	2.00
900 cu. yd.	Small ditch excavation	.50
75 hr.	Mechanical tamping	6.00
216 lin. ft.	Deep beam highway guard rail (concrete posts)	4.25
96 ea.	Guide posts	6.50
2 ea.	F. A. P. markers	35.00
Lump sum	Furnishing water equipment	2,000.00
Lump sum	Furnishing construction signs	2,000.00
	(1) Concrete Bridge—63.04 ft. 0. to 0. Sta. 91+85	
250 cu. yd.	Exc. for structures, unclassified	5.00
239 cu. yd.	Concrete class "A"	75.00
49,400 lb.	Reinforcing steel	.15
Lump sum	Rem. of existing structure	300.00

8.3 mi. of grading and paving

New Mexico—Guadalupe County—State. Adams Construction Co., Inc., of Santa Fe, received a \$1,398,674 contract for grading and bituminous surfacing of 8.1 mi. of Highway I-40.

(1) Adams Construction Co.	\$1,398,674
(2) Brown Construction Co.	1,408,411
J. W. Jones	1,422,680
Skousen-Hise & Skousen & Son	1,517,966

	(1)	(2)
Lump sum		
656,050 cu. yd.	Removal of old structures	\$2,500.00
8,160 cu. yd.	Excavation—unclassified	.39
42,356 M gal.	Excavation for structures	2.00
1,745 hr.	Watering	.50
2,786 hr.	Rolling (tamping roller)	6.00
1,800 hr.	Rolling (pneumatic tired)	4.00
2,436 hr.	Rolling (steel tired)	5.00
1,303 hr.	Fifty (50) ton roller operation	6.00
1,121,100 sta. yd.	Mechanical tamping	5.00
935,580 3/4 mi. yd.	Station yard overhaul	.02
2,268,940 ton mi.	Quarter mile yard haul	.04
0.2 mi.	On mile haul	.06
600 lin. ft.	Obliterating old road	100.00
717 cu. yd.	Contour ditches	.10
18,575 lb.	Wire enclosed riprap	10.00
158 cu. yd.	Wire fabric for riprap	.30
1,510 lin. ft.	Excavation for riprap	10.00
1 ea.	Steel stakes for riprap	2.00
962.5 lin. ft.	Cattle guard—18' roadway	2,000.00
41,080 lin. ft.	Steel plate guard fence	4.00
2 ea.	Galvanized barbed wire fence	.34
94 ea.	Gates standard type	50.00
29,010 lin. ft.	Bracing	6.00
37 ea.	Galvanized wov. wire farm fence	.44
1 ea.	Right of way markers	6.00
56 ea.	Std. fed. aid proj. mark's, type I	50.00
211,455 ton	Treat. tmb. warn. posts, refl. 6"	7.00
77,250 ton	Controlled gradation sub-base	.45
	Base course	.70



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Firestone off-the-highway tires cut costs by working extra hours on the roughest jobs! That's because they're built with Firestone Rubber-X, the longest wearing rubber ever used in Firestone tires. Tough Firestone treads and sidewalls defy cuts from rubble and shale. Exclusive Firestone S/F (Shock-Fortified) nylon bodies shrug off bruising shock and impact. There's a Firestone tread and tire design that is job-engineered for your job requirements. Call your Firestone Dealer or Store and ask about Firestone's full line of tubeless or tubed off-the-highway tires and on-the-job tire service.



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Wide Base

Rock Grip Excavator

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Firestone

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3,567 bbl.	Bituminous material, type MC-1	8.25	7.95	42,100 cu. yd.	Stripping and storing topsoil ..	.20	.25
1,131 bbl.	Emulsified asphalt AE-3	9.00	10.40	40,100 cu. yd.	Replacing topsoil	.30	.30
1,168 bbl.	Bituminous matrl., type 120-150	9.00	8.80	5,458 lin. ft.	24-in. C.M.P.	6.00	6.50
2,045 ton	Cover material	5.00	6.00	476 lin. ft.	24-in. C.M.P., 12 gauge	7.00	8.00
48,280 ton	Plant mix surface course	3.40	3.70	346 lin. ft.	36-in. C.M.P.	10.00	12.00
17,575 bbl.	Bit. mat., type 85-100 (plt. mix)	7.10	6.85	310 lin. ft.	48-in. C.M.P.	14.00	17.00
3,035 cu. yd.	Class A concrete	56.00	47.00	310 lin. ft.	72-in. C.M.P.	27.00	35.00
6 ea.	Concrete tables	200.00	200.00	83 ea.	24-in. C.M.P. FE section	33.00	46.00
456,839 lb.	Concrete benches	150.00	100.00	4 ea.	48-in. C.M.P. FE section	90.00	114.00
2,050 cu. yd.	Reinforcement for concr. struc.	.15	.15	2 ea.	108-in. struct. plate pipe 510 lb.	180.00	230.00
1,514 lin. ft.	Grouted rock retards	10.00	5.00	184 lin. ft.	Class. 1 riprap	64.00	77.00
540 lin. ft.	Culvert pipe—24" diam.	8.00	7.00	300 cu. yd.	Grouted riprap	12.00	15.00
170 lin. ft.	Culvert pipe—30" diam.	9.00	8.00	300 cu. yd.	24-in. perforated C.M.P., 12 ga.	18.00	25.00
804 lin. ft.	Culvert pipe—42" diam.	16.00	14.00	20 lin. ft.	32-in. woven and 3 BW fence..	15.00	11.00
240 lin. ft.	Culvert pipe—48" diam.	18.00	15.00	43,800 lin. ft.	End panels	.35	.30
3,952 lb.	Cor. met. culv. pipe—36" diam.	14.00	13.00	60 ea.	Brace panels	10.00	18.00
16 ea.	Structural steel	.40	.50	90 ea.	16-ft. galvanized steel gates...	8.00	17.40
2,530 sq. ft.	Remov., reset., reprot. R-W mrk.	5.00	6.00	2 ea.	7 ft. 9 in. x 24 ft. HD cattleguard	150.00	93.00
4,832 lb.	Extruded sign frames	2.25	3.10	4 ea.	Rein. conc. project markers	700.00	1,200.00
1,120 lin. ft.	Aluminum I beam posts	.80	1.00	1 ea.	Type D drop inlets	8.00	25.00
78 ea.	Tubular posts	1.00	1.90	10 ea.	Trash guards type B	60.00	82.00
	Footings for tubular posts	7.00	2.00	16 ea.		75.00	68.00

Wyoming —

3.1 mi. of grading and drainage

Wyoming—Sheridan County—State. Asbell Bros. Construction Co. of Riverton received an \$881,930 contract for grading and drainage on 3.1 mi. of 4-lane divided highway on the Sheridan-Ranchester road.

(1) Asbell Bros. Const. Co.	\$881,930
(2) J. H. Beckman Const. Co.	953,686
Big Horn Const. Co.	984,315
Knisely-Moore Co.	994,109

	(1)	(2)
2,151,000 cu. yd.	Excavation	\$.19 \$.25
1,625 hr.	Mechanical tamping	5.00 7.00
57,650 M gal.	Watering	1.00 1.00
1,000 cu. yd.	Excavation for pipe culverts	1.25 2.00
650 cu. yd.	Subexcavation	1.00 3.00
907,500 cu. yd.-mi.	Cubic yard mile haul	.12 .10
0.4 mi.	Old road obliteration	400.00 1,200.00
2,000 hr.	Sheeps foot roller operation	10.00 10.00
3,600 hr.	Pneum. tired roll op. type VII ..	11.00 11.00
75,000 cu. yd.	Stripping and storing topsoil	.16 .10
75,000 cu. yd.	Replacing topsoil	.25 .15
3,940 lin. ft.	24 in. cmp.	4.28 5.00
360 lin. ft.	24 in. cmp. 12 gauge	5.45 6.00
210 lin. ft.	36 in. cmp.	8.20 9.00
494 lin. ft.	42 in. cmp.	10.22 10.00
720 lin. ft.	48 in. cmp.	11.86 13.00
1,166 lin. ft.	54 in. cmp. 12 gauge	14.65 15.00
510 lin. ft.	54 in. cmp. 10 gauge	17.52 19.00
506 lin. ft.	66 in. cmp. 8 gauge	25.10 28.00
73 ea.	24 in. cmp. FE section	40.00 40.00
4 ea.	36 in. cmp. FE section	97.00 106.00
4 ea.	42 in. cmp. FE section	163.75 170.00
8 ea.	48 in. cmp. FE section	194.00 200.00
50 lin. ft.	58 x 36 cmp. arch culverts	13.27 13.00
28 lin. ft.	65 x 40 cmp. arch culverts	17.00 16.00
2 ea.	58 x 36 cmp. arch FE section ..	135.85 130.00
2 ea.	65 x 40 cmp. arch FE section ..	204.35 210.00
Lump sum	Removing existing structures	
400 cu. yd.	Class 1 riprap	11.00 8.00
200 cu. yd.	Grouted riprap	17.00 13.00
400 sq. yd.	Grouted rubble paving	10.00 10.00
35,500 lin. ft.	32 in. woven and 3 BW fence ..	.25 .28
35 ea.	End panels	14.00 25.00
55 ea.	Brace panels	12.00 20.00
4 ea.	7 ft. 9 in. x 24 ft. HD cattlelds.	900.00 3,000.00
30 ea.	Right of way markers	10.00 20.00
1 ea.	Rein. conc. project markers	25.00 30.00
1 ea.	Type D drop inlets	100.00 60.00
20 ea.	Trash guards type B	60.00 50.00
4,400 lin. ft.	Concrete ditch lining	21.97 10.00
1 ea.	7 ft. 9 in. x 16 ft. HD cattlelds.	750.00 2,200.00

HIGHWAY—Grading and draining 4-lane highway

Wyoming—Uinta County—State. Taggart Construction Co. submitted the low bid of \$859,900 for grading and draining, one structural plate pipe culvert and misc. work on 3.866 mi. of four-lane divided Interstate Highway on the Evanston-Ft. Bridger Road.

(1) Taggart Construction Co.	\$ 859,900
(2) Morrison-Knudsen Co., Inc.	985,564
Triago Construction Co.	1,071,405
W. W. Clyde & Co.	1,099,743

	(1)	(2)
1,758,500 cu. yd.	Excavation	\$.29 \$.33
920 hr.	Mechanical tamping	5.00 7.50
44,000 M gal.	Watering	1.56 2.25
880 cu. yd.	Excavation for pipe culverts ..	2.00 2.50
275 cu. yd.	Subexcavation	2.00 4.00
275 cu. yd.	Special rock fill	5.00 10.00
826,500 cu. yd.-mi.	Cubic yard mile haul	.12 .12
1,700 hr.	Sheeps foot roller operation	11.00 12.50
3,000 hr.	Pneum. tired roll op. type VII ..	12.00 12.50

Washington —

HIGHWAY—5.7 mi. of grading and paving

Washington—Pacific County—State. Osberg Construction Co. of Seattle submitted the low bid of \$1,069,758 for 5.722 mi. of grading and paving from the Cedar River to the North River in Pacific County.

(1) Osberg Construction Co.	\$1,069,758
(2) Strong & MacDonald, Inc.	1,308,422
Boeck Brothers	1,379,807

	(1)	(2)
65 acre	Clearing	\$1,000.00 \$1,800.00
40 acre	Grubbing	600.00 1,000.00
322,630 cu. yd.	Common excavation	.65 .70
220,000 cu. yd.	Common borrow	.65 .65
117,640 unit	Overhaul	.50 .50
4,960 cu. yd.	Common ditch excavation inc. haul	1.00 1.50
1,810 cu. yd.	Common channel excv. inc. haul	1.50 1.50
30,400 cu. yd.	Unsuitable found. excv. inc. haul	1.00 .85
6,210 cu. yd.	Structure excavation	3.00 3.50
1,550 M gal.	Water	.50 2.50
429,910 cu. yd.	Embankment compaction	.05 .05
430 hr.	Gang plow and tractor	12.50 18.00
430 hr.	Tandem disk and tractor	12.50 15.00
13,140 lin. ft.	Slope treatment class B	.15 .20
360 hr.	Pneumatic tired roller	8.00 10.00
895 hr.	Smooth wheeled power roller	8.00 8.00
283 sta.	Mechanical tamper	8.00 8.00
350 cu. yd.	Finishing roadway	20.00 20.00
44,760 ton	Special backfill for foundations.	10.00 9.00
370 ton	Gravel backfill for drains	10.00 11.00
27 cu. yd.	Special ballast	1.90 1.40
206 lin. ft.	Asphaltic conc. pavement class B	15.00 17.00
	Concrete class C	80.00 125.00
	Type 1 perforated metal drain	
	pipe 6" diam.	2.00 3.00
	Type 1 perforated metal drain	
	pipe 18" diam.	5.50 6.00
	Conc. or V.C. drn. pipe 8" diam.	1.00 2.00
	Conc. or V.C. drn. pipe 10" dia.	1.50 2.50
	Std. reinf. conc. culv. pipe 18"	
	dia.	6.00 6.50
	Std. reinf. conc. culv. pipe 24"	
	dia.	8.00 10.00
	Std. reinf. conc. culv. pipe 30"	
	dia.	12.00 16.00
	Std. reinf. conc. culv. pipe 36"	
	dia.	16.00 19.00
	Std. reinf. conc. culv. pipe 48"	
	dia.	20.00 23.00
	Plain metal culvert pipe 14 ga.	
	24" dia.	8.00 7.00
	Type 3 metal culvert pipe 16 ga.	
	18" dia.	6.00 6.50
	Type 3 metal culvert pipe 14 ga.	
	24" dia.	10.00 9.00
	Type 3 metal culvert pipe 10 ga.	
	60" dia.	40.00 50.00
	Type 3 metal culvert pipe 8 ga.	
	84" dia.	75.00 75.00
	Culvert logs	2.00 2.50
	Right of way markers	6.00 10.00
	Special loose riprap	4.50 6.75
	Hand placed riprap	20.00 20.00
	Wire fence type No. 2	.20 .65
	Salvaging existing boulders	2.00 5.00

HIGHWAY—11.9 mi.

Washington—Lincoln County—State. F. R. Hewett Co. has submitted a low bid of \$839,832 for construction of 11.9 mi. of highway from Davenport to Reardan.

(1) F. R. Hewett Co.	\$839,832
(2) G. H. DeAtley & Co.	869,728
Grant Construction Co.	875,291
Curtis Construction Co.	892,085



DUMP FAST... REVERSE FAST

Speed up that job with a JOHN DEERE CRAWLER-LOADER

Here's why you get efficient work and top handling ease with a John Deere Crawler-Loader. After bucket is dumped at full height position, operator can return it to digging angle by use of boom-control only. And there's no need to shift gears to back away from the truck and head for the spoilheap—the clutch-type direction reverser takes care of that. Clutch-control steering adds to the unit's unmatched maneuverability.

Both Diesel and gasoline units are available, each with a new heavy-duty transmission and new working speeds to give you most efficient use of this low-cost power.

See your John Deere Industrial dealer for a demonstration—discover for yourself why this loader gives you top work-capacity per dollar.

Basic Facts on the 831 Loader

Bucket Capacity . . .	7/8 Yard, Heaped
Roll-Back	35 Degrees
Pry-Out Pressure . .	8500 Pounds
Dumping Clearance .	7 Feet, 10 Inches
Dumping Angle at Full Height	50 Degrees
Engine Options . . .	Gasoline or Diesel

More facts? Write:

John Deere Company Industrial Division
Dept. 543

215 S.E. Morrison St. - Portland 14, Oregon
651 Brannan St. - San Francisco 19, Calif.

JOHN DEERE



"Specialists in Low-Cost Power with a Heavyweight Punch"

... for more details, circle No. 54 on Reader Service Postcard

	(1)	(2)
Lump sum		
11,000 cu. yd.	Clearing and grubbing.....\$3,000.00	\$ 500.00
95 cu. yd.	Common excav. incl. haul......55	.35
54,470 cu. yd.	Common ditch excav. incl. haul 1.00	2.00
2,040 cu. yd.	Common borrow incl. haul......45	.35
	Unsuitable foundation excavation including haul	.35 .50
9,000 cu. yd.	Stripping quarries and pits including haul	.10 .10
480 cu. yd.	Structure excavation	5.00 2.50
9,370 M gal.	Water	2.00 1.50
39,300 cu. yd.	Embankment compaction	.05 .05
30 hr.	Grid roller	15.00 20.00
1,495 hr.	Pneumatic tired roller.....7.50	6.00
1,495 hr.	Smooth wheeled power roller..7.50	6.00
29 hr.	Mechanical tamper	6.00 6.50
759 sta.	Finishing roadway	3.00 4.00
148,370 ton	Crushed surfacing top course..1.00	1.03
191,730 ton	Ballast	.85 .95
	Mineral Aggregate for Bituminous Surface Treatment Class C in Stockpile	
6,000 ton	Crushed screenings ¾ in. to 1 1.15	1.10
4,000 ton	Crushed screenings ¾ in. to 0 in stockpile	1.15 1.10
	Bituminous Surface Treatment Class A	
12.6 mi.	Processing and finishing	300.00 175.00
430 ton	Asphalt cement MC-3	45.00 47.50
3,160 cu. yd.	Mineral aggregate from stockpile 1.50	1.50
5,245 ton	Crushed cover stone in stockpile 1.05	1.10
	Cement Treated Base	
190 ton	Emulsified asphalt SS-1	41.00 55.00
10,750 bbl.	Portland cement	4.40 4.25
55,860 ton	Cement treated base	1.75 2.20
30 cu. yd.	Prime coat aggregate	2.50 2.50
	Asphaltic Concrete Pavement	
4,490 sq. yd.	Prep. of untreated roadway......05	.10
7 ton	Asphalt cement MC-3 prime coat 45.00	60.00
50 cu. yd.	Prime coat aggregate	2.50 2.50
39 ton	Asphalt cement for tack coat....41.00	55.00
30,950 ton	Class B	6.00 5.75
310 ton	Mineral filler	10.00 25.00
	Other Items	
7,670 sq. yd.	Remov. cement conc. pavement..60	.70
8,828 lin. ft.	Asphaltic concrete curb	.45 .75
23 ea.	Concrete inlets	91.00 55.00
102 cu. yd.	Concrete class E	40.00 45.00
22,940 lb.	Steel reinforcing bars	.16 .15
1,456 lin. ft.	Type 1 metal drain pipe 8 in. diameter	2.80 2.50
348 lin. ft.	Standard reinforced concrete culvert pipe 18 in. diameter.....	5.00 4.75
54 lin. ft.	Relaying plain metal culvert pipe 18 in. diameter	2.00 3.00
10,225 lin. ft.	Beam guard rail	2.45 2.40
12 ea.	Right of way markers	10.00 8.50
133 ea.	Guide posts	3.75 3.00
36 ea.	Monument cases & covers.....35.00	30.00
810 cu. yd.	Light loose riprap	1.00 2.00
25 cu. yd.	Hand placed riprap	10.00 20.00
16 ea.	Access control gates	35.00 36.00
5 ea.	Remov. concrete pipe headers..20.00	10.00
552 lin. ft.	Remov. precast concrete traffic curb	1.00 .50
550 lin. ft.	Removing cable guard rail......70	.50
Est.	Flagging estimate \$2,000.00..2,000.00	2,000.00

Colorado —

5.322 mi. of grading and surfacing for BPR

Colorado—Montezuma—Bureau of Public Roads. Harrison Construction Co. was recommended for award on the basis of its low bid on a road project at the entrance of Mesa Verde National Park. There were 10 bidders.

(1)	Harrison Construction Co.....\$532,583
(2)	R-W Construction Co.....555,722
	Z. H. Lowdermilk, Inc.562,421
	Colorado Constructors, Inc.571,821

	(1)	(2)
Contingent sum		
290,000 cu. yd.	Misc. force account	\$10,000.00 \$10,000.00
1,500 cu. yd.	Unclassified excavation	.61 .725
26,000 ton	Excavation for structures.....4.00	3.20
500,000 sta. yd.	Special subbase, grading B 1.90	2.10
32,000 yd. mi.	Overhaul	.02 .0125
2,600 units	Overhaul	.30 .10
Lump sum	Water	3.00 2.65
600 hr.	Prov. & maint. water plant or plants	L.S. L.S.
14,000 ton	Rolling	15.00 12.25
20,000 gal.	Crushed aggregate base, grading D	3.00 3.55
2,000 gal.	Asphalt, grade Mc-0 or 1, prime coat	.22 .20
100 ton	Emulsified asphalt, grade SS-1, tack coat	.35 .25
13,000 gal.	Cover aggregate, gr. D, type 3 seal coat.....12.00	9.45
10,700 ton	Emulsified asphalt, grade SS-1 seal coat	.30 .23
600 ton	Plant mixture	5.30 6.05
6,600 lin. ft.	Asphalt cement, 150-200 penetration, plant mix ..40.30	41.00
85 cu. yd.	Bit. raised shoulders	.40 .45
30 cu. yd.	Class A concrete	110.00 117.00
13,000 lb.	Cement rubble masonry ..110.00	71.00
	Structural steel-furn., fabricated and erected ..35	.255
526 lin. ft.	8 in. galv. corr. metal pipe 3.50	2.40

754 lin. ft.	18 in. galv. corr. metal pipe 7.00	4.25
714 lin. ft.	24 in. galv. corr. metal pipe 9.10	7.10
46 lin. ft.	30 in. galv. corr. metal pipe 12.00	9.40
78 lin. ft.	36 in. galv. corr. metal pipe 16.00	12.65
163 lin. ft.	Removing, cleaning and stockpiling salvaged culv. pipe 6.00	2.00
2 ea.	Metal end sections for 24 in. pipe culverts....	60.00 40.00
1,100 cu. yd.	Hand-laid rock embankment 12.00	12.25
400 lin. ft.	8 in. perf. corr. metal pipe underdrain	6.00 2.55
800 lin. ft.	12 in. perf. corr. metal pipe underdrain	7.00 3.10
200 cu. yd.	Porous backfill material, pipe underdrain	8.00 9.00
2 ea.	Adjusting manholes	50.00 50.00
350 sq. yd.	Concrete & rubble paved waterway	35.00 12.25
1,100 sq. yd.	Bit. paved waterway	3.00 3.50
8,700 lin. ft.	Concrete curb and gutter, 6 in. depth	3.00 2.35
1,400 lin. ft.	Stone curb	1.25 3.30
1,050 sq. yd.	Bituminous sidewalk	1.00 2.00
250 ea.	Guideposts, type 1.....6.00	9.00
2,550 lin. ft.	Beam-type guardrail	4.00 4.00
25 units	Turf shoulders	50.00 80.00
1.14 mi.	Repairing existing road...1,500.00	2,600.00

California —

Concrete freeway and structures

California—San Bernardino County—State. Winston Bros. Co. Monrovia was low of nine bidders for a 4.4 mi. project involving construction of grade separation structures and paving portions of freeway with concrete on cement treated base.

(1)	Winston Bros. Co.	\$1,467,980
(2)	Fredericksen & Kasler	1,507,025
	Griffith Co.	1,527,446
	Matich Constructors	1,536,502
	Charles MacClosky Co.	1,547,762

	(1)	(2)
32,500 sq. yd.	Remove concrete pavement.....\$ 69	\$ 2.6
	Clearing and grubbing.....50,000.00	48,000.00
	Deer wat. sup. & furn. wat. equip. 20,000.00	35,000.00
	Applying water	1.00 .0
	Compact. original ground	.04 .0
25,500 M gal.	Roadway excavation	.48 .5
53,000 sq. yd.	Structure excavation	1.30 1.7
30,000 cu. yd.	Structure backfill	2.60 3.2
8,500 cu. yd.	Ditch & channel excavation...1.00	.9
7,950 cu. yd.	Imported borrow	.32 .4
6,700 cu. yd.	Imported base material	.74 .8
690,000 ton	Prepar. excavation slopes (eros. cont.)	.05 .0
53,000 ton	Straw	49.50 60.00
52 ton	Seed, Type A	.18 .2
3,800 lb.	Seed, Type B	.40 .5
1,650 lb.	Commercial fertilizer	145.00 165.00
12 ton	Mix. spread & compact C.T.S..	.21 .3
32,700 sq. yd.	Portland cement	4.10 3.8
1,000 bbls.	Asphalt emul. (pt. bdr. & fog sl. ct.)....	38.00 65.00
44 ton	Liq. asph. MC-2 (cur. sl.)....	38.00 42.00
27 ton	Liq. asph. SC-2 (pr. ct.)....	38.00 40.00
87 ton	Pav. asph. (P.M.S.)	5.50 5.6
915 ton	Min. aggr. (P.M.S. Type B)...	5.50 5.6
17,500 ton	Min. aggr. (P.M.S. open gr.)..	5.50 5.6
450 ton	Place. P.M.S. spillway d'ndrains..	1.55 1.0
90 sq. yd.	Place. P.M.S. median gutters..	1.55 1.0
400 sq. yd.	Place. P.M.S. dikes	.25 .2
6,800 lin. ft.	Sterilizing soil	.18 .2
1,050 sq. yd.	Cl. B conc. (pavement)	14.00 15.0
7,300 cu. yd.	Pavement tie assemblies	.55 .5
9,800 ea.	Cl. A conc. (structures)	58.60 48.0
1,300 cu. yd.	Cl. A conc. (foundations)	40.00 33.0
35 cu. yd.	Cl. A conc. (bridges) (4,580 cu. yd.)	253,480.00 193,000.00
	Furn. precast prestres. conc. gird. (81 in.)	1,455.00 1,500.00
30 ea.	Furn. precast prestres. conc. gird. (68 in.)	1,190.00 1,250.00
52 ea.	Erect. precast. prestres. conc. girders	50.00 130.00
82 ea.	Air blown mortar	40.60 45.00
	Rubber waterstops	1.70 3.0
145 cu. yd.	Bar reinf. steel	.14 .1
970 lin. ft.	Bar reinf. steel (bridges) (715,000 lb.)	84,000.00 87,000.00
153,000 lb.	Mesh reinforcement	.93 .3
1,700 sq. yd.	Furn. conc. piling	3.50 4.0
4,130 lin. ft.	Furn. steel piling	63.00 65.00
2,105 lin. ft.	Driving piles	.27 .2
294 ea.	Misc. iron and steel	28.00 30.00
19,000 lb.	Cl. B conc. (curbs & gutters)...	13.00 15.00
940 cu. yd.	Survey monuments	3.75 3.3
41 ea.	Metal plate guard railing.....7.25	7.00
3,983 lin. ft.	Steel railing	6.00 6.00
1,316 lin. ft.	Guide posts marker and horizontal refl. units	1.30 1.1
109 ea.	72 in. chain link fence	6.25 5.5
48,300 lin. ft.	18 in. R.C.P.	7.80 7.0
280 lin. ft.	24 in. R.C.P.	9.80 10.0
540 lin. ft.	30 in. R.C.P.	11.40 10.0
20 lin. ft.	33 in. R.C.P.	13.00 12.00
70 lin. ft.		
406 lin. ft.		

"WE DRILL 15% MORE...AND DRILL IT FASTER... WITH TIMKEN CARBIDE INSERT BITS"

Special report from
H-E Lowdermilk, Inc.

LOCATION: U.S. HWY. 287,
LARAMIE, WYOMING

Operating conditions:
granite and schist

H-E Lowdermilk, Inc. of Virginia Dale, Colo., had to drill through hard abrasive ground—mostly granite and schist—in constructing U.S. Highway 287 between Ft. Collins and Laramie. So they chose Timken carbide insert bits and drilled 15% more feet-per-bit! And they drilled faster, too, because the Timken bits stayed sharper longer than other bits they had used.



Which Timken Bit should you use?

The Timken carbide insert bit is your most economical bit in hard, abrasive ground. But in softer ground, use the low-cost Timken all steel multi-use bit. And because both bits are interchangeable in the same thread series, you can switch bits when the ground changes. Dozens of different Timken bits fit the same drill steel. Both are made from Timken electric-furnace fine alloy steel, have special shoulder unions that protect threads against drilling impact. For help in selecting the right Timken bit for your job, phone or write: The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

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ROCK BITS

... for more details, circle No. 55 on Reader Service Postcard

304 lin. ft.	42 in. R.C.P.	16.00	15.50	710 ea.	Guide posts, markers and			
38 lin. ft.	12 in. C.M.P. (16 ga.)	3.00	3.30		horiz. refl. units	6.00	6.60	
42 lin. ft.	18 in. C.M.P. (16 ga.)	4.00	4.60	34,500 lin. ft.	72 in. chain link fence...	1.45	1.50	
124 lin. ft.	24 in. C.M.P. (14 ga.)	6.00	7.00	350 lin. ft.	Remov. & reconstruct.			
1 ea.	Entr. taper for 8 in. met. pipe.	40.00	70.00		chain link fence	.90	1.10	
48 lin. ft.	8 in. C.M.P. downdrains	3.00	2.30	1 ea.	Chain link gate (12 ft.).	100.00	110.00	
1 ea.	Downdrain slip joint for			1,056 lin. ft.	12 in. R.C.P. (Class III)	3.25	2.50	
	8 in. metal pipe	40.00	30.00	264 lin. ft.	12 in. R.C.P. (Class V)	3.00	2.70	
1 ea.	Downdrain pipe anchor for			3,960 lin. ft.	18 in. R.C.P. (Class III)	3.85	4.00	
	8 in. metal pipe	19.00	30.00	428 lin. ft.	18 in. R.C.P. (Class V)	4.30	4.40	
100 lin. ft.	Salv. 18 in. C.M.P.	1.30	1.15	1,192 lin. ft.	24 in. R.C.P. (Class III)	4.80	6.40	
927 lin. ft.	Salv. 24 in. C.M.P.	2.00	1.15	1,156 lin. ft.	24 in. R.C.P. (Class V)	5.50	6.50	
	Finishing roadway	4,600.00	2,200.00	1,444 lin. ft.	27 in. R.C.P. (Class III)	5.30	6.70	
670 lin. ft.	Raised traffic bars	1.50	2.20	1,484 lin. ft.	30 in. R.C.P. (Class III)	6.30	8.30	
1,487 sq. yd.	Bridge shoulder treatment	1.00	.35	96 lin. ft.	30 in. R.C.P. (Class V)	7.30	8.60	
	Steel sign structures	7,700.00	8,000.00	324 lin. ft.	39 in. R.C.P. (Class III)	10.00	11.90	
2 ea.	Transplanting palm trees	150.00	165.00	72 lin. ft.	39 in. R.C.P. (Class V)	13.50	14.00	
1 ea.	Adjusting manhole to grade	80.00	110.00	248 lin. ft.	48 in. R.C.P. (Class III)	12.80	14.80	
	Hwy. light & sign illum. sys.	27,660.00	32,000.00	572 lin. ft.	12 in. C.M.P. (16 ga.) ..	2.90	2.90	
	Traffic sig. sys. & hwy. lighting.	15,000.00	14,000.00	230 lin. ft.	18 in. C.M.P. (16 ga.) ..	3.95	4.20	
				130 lin. ft.	18 in. x 11 in. C.M.P.			
					arch (14 ga.)	4.40	4.50	
				22,520 lin. ft.	8 in. P.M.P. underdrains	1.80	1.90	
				41,000 ton	Filter material	2.20	2.40	
					Finishing roadway	5,000.00	14,300.00	
					Raised traffic bars	1.95	2.00	
					520 lin. ft.	10 in. vitrified clay pipe.	3.75	3.20
					656 lin. ft.	18 in. vitrified clay pipe.	6.95	7.00
					1,456 lin. ft.	30 in. vitrified clay pipe.	15.50	18.00
					36 lin. ft.	27 in. casing pipe	11.00	15.00
					13 ea.	Adjust. manhls. to grade	55.00	85.00
					71 lin. ft.	Standard brick manholes	35.00	37.00
					41 lin. ft.	Special sanitary		
						brick manholes	53.00	41.00
						Highway light and sign		
						illumination system ...	88,000.00	88,000.00
						Modify. traffic signal systems		
						and highway lighting..	10,000.00	8,200.00
						Temp. traffic signal systems		
						and highway lighting..	8,000.00	7,800.00
						Drainage pumping equip.	24,400.00	24,000.00
						Pump house elec. equip.	9,000.00	8,200.00
						Engine-generator set ...	11,500.00	11,400.00

4.1 mi. of concrete divided freeway

California—Santa Clara County—State. Gordon H. Ball, Gordon H. Ball, Inc., Ball & Simpson & Lew Jones Construction Co., a joint venture, was low of 9 bidders at \$3,870,610 for 4.1 mi. of divided 4-lane freeway in and near San Jose. Project includes grading, surfacing with Portland cement concrete, plant-mix surfacing, and 10 major structures.

(1) Ball, Simpson, & Jones	\$3,870,610
(2) Fredrickson and Watson & Ransome	3,915,333
L. C. Smith, Caputo, & Cambrian Gateway	3,978,065
Stolte, Inc.	4,114,970
Peter Kiewit Sons' Co.	4,164,901

	(1)	(2)
100 ea.	Portable barricades	\$ 40.00 \$ 40.00
13,000 lin. ft.	Remov. traffic stripes ..	.12 .13
85 lin. ft.	Remov. raised traffic bars	.20 .54
4,100 sq. yd.	Obliterating detour	.10 .15
1,200 sq. yd.	Shattering conc. pavement	.25 .30
	Clearing and grubbing ..	8,800.00 50,627.28
	Dev. wat. sup. & furn.	
	wat. equip.	110,000.00 64,300.00
39,000 M gal.	Applying water	.01 .01
425,000 sq. yd.	Comp. original ground ..	.04 .04
685,000 cu. yd.	Roadway excavation	.41 .44
22,650 cu. yd.	Structure excavation	2.30 3.80
14,500 cu. yd.	Structure backfill	3.15 5.00
5,450 cu. yd.	Ditch & channel excav.	.50 1.17
23,000,000 sta. yd.	Overhaul	.003 .0038
475,000 ton	Imported borrow	.90 .73
219,000 ton	Imported subbase mat.	1.27 1.30
55,000 ea.	Ice plant cuttings	.02 .03
2,600 lb.	Seed	.22 .24
56 lin. ft.	2 in. galvanized pipe	1.00 1.40
353 lin. ft.	2½ in. galvanized pipe	1.35 2.00
120 lin. ft.	3 in. galvanized pipe	1.55 2.50
1,200 lin. ft.	4 in. asbestos pipe	1.15 1.60
89,500 sq. yd.	Mix., spread, & compact.	
	cem. tr. subgrade	.23 .25
63,000 sq. yd.	Mix., spread, & compact.	
	0.58 ft. thick or	
	less C.T.B.	.31 .26
126,000 sq. yd.	Mix., spread, & compact.	
	over 0.58 ft. thick C.T.B.	.38 .36
15,800 bbls.	Portland cement	4.00 4.50
212 ton	Asphaltic emulsion (cur. sl.	
	pnt. bdr. & sl. etc.)	47.00 48.00
90 ton	Liquid asphalt,	
	MC-2, (cur. sl.)	55.00 55.00
60 ton	Liquid asphalt, SC-1	
	(pr. ct. & pen. tr.)	50.00 40.00
1,590 ton	Paving asphalt (P.M.S.) ..	6.30 36.00
31,800 ton	Min. aggregate (P.M.S.) ..	6.30 4.00
1,200 sq. yd.	Placing P.M.S. median paving,	
	dwdnrm. & ditch lining	1.00 1.15
9,200 lin. ft.	Placing P.M.S. dikes	.25 .22
390 ton	Screenings (sl. etc.)	10.00 7.50
19,900 cu. yd.	Class B conc. (pavement)	
	Pavement tie assemblies	15.00 15.70
14,000 ea.	Class A concrete (bridges)	
	(7,050 cu. yds.)	.28 .43
580 cu. yd.	Class A conc. (struc.)	374,750.00 369,000.00
2,675 lin. ft.	Rubber waterstops	69.00 65.00
	Bar reinforcing steel (bridges)	
	(975,000 lbs.)	120,960.00 118,000.00
57,000 lb.	Bar reinforcing steel	.13 .14
440 sq. yd.	Membrane waterproofing ..	4.00 4.00
435 sq. yd.	Protective covering	2.00 1.70
34,425 lin. ft.	Furn. concrete piling	3.96 3.80
766 ea.	Driving piles	67.50 74.00
	Structural steel	
	(2,650,000 lbs.)	415,000.00 423,000.00
	Steel sign structure	64,387.00 66,000.00
	Pump, plant met. work.	3,000.00 3,700.00
34,500 lb.	Misc. iron and steel	.28 .30
	Cleaning and painting	
	structural steel	40,000.00 27,220.00
2,920 cu. yd.	Class B concrete	
	(curbs and gutters)	33.00 35.00
390 cu. yd.	Class B concrete	
	(sidewalks & isl. pav.)	31.00 27.00
1,400 ea.	Curb dowels	.10 1.00
3 ea.	Stand. curb openings	22.00 27.00
23 ea.	Survey monuments	17.50 18.00
10 cu. yd.	Broken concrete riprap ..	15.00 22.00
5,514 lin. ft.	Steel bridge railing	8.00 8.20
2,755 lin. ft.	Met. plate guard railing	
		3.15 3.40

Precast, prestressed bridge and approaches

California—Mendocino County—State. Bos Construction Co. of Berkeley submitted the low bid of \$295,664 for the construction of a prestressed bridge and approaches totalling about .6 mi. in length across Pudding Creek at Fort Bragg.

(1) Bos Construction Co.	\$295,664
(2) Thomas Construction Co.	305,642
Ben C. Gerwick, Inc.	315,234
Forde-Peletz	339,291

	(1)	(2)	
Removing bridge	\$ 2,000.00	\$ 5,000.00	
Obliterating roadway	.10	.10	
Clearing and grubbing	200.00	850.00	
Dev. water supply and furn. water equipment.....	6,000.00	8,000.00	
560 mi. gal.	Applying water	3.00	3.00
39,000 cu. yd.	Roadway excavation	1.00	.60
325 cu. yd.	Structure excavation	4.00	4.00
210 cu. yd.	Structure backfill	3.00	4.00
200 cu. yd.	Ditch and channel excavation..	1.00	2.00
1,180 ton	Imported borrow	2.00	3.00
7,700 cu. yd.	Trench excavation	1.00	.70
6,200 ton	Untreated base	3.00	2.90
6 ton	Asphaltic emulsion (pt. bdr. and sl. ct.).....	100.00	90.00
21 ton	Liquid asphalt, SC-2 pr. ct. & pen. treat.).....	50.00	60.00
113 ton	Paving asphalt (P.M.S.).....	12.00	11.00
2,220 ton	Mineral aggregate (P.M.S.).....	12.00	11.00
600 lin. ft.	Placing P.M.S. dikes	.40	.40
23 ton	Sand cover (pr. ct. and penetration treat.)	10.00	10.00
6 cu. yd.	Class A concrete (structures) ..	100.00	150.00
	Class A concrete (bridge) (235 cu. yd.)	20,500.00	27,000.00
80 ea.	Furn. precast prestressed reinfr. conc. deck units.....	1,000.00	870.00
80 ea.	Erect. precast prestressed reinfr. conc. deck units.....	100.00	140.00
673 lin. ft.	Concrete railing	7.00	7.00
320 lbs.	Bar reinforcing steel	.20	.20
	Bar reinf. steel (bridge) (23,500 lbs.)	4,000.00	5,000.00
1,735 lin. ft.	Furn. concrete piling	11.00	10.00
420 lin. ft.	Furn. steel piling	6.00	6.00
28 ea.	Driving concrete piles	1,000.00	1,660.00
5 ea.	Driving steel piles	300.00	275.00
21 ea.	Right of way monuments	6.00	10.00
128 lin. ft.	Metal plate guard railing	4.00	6.00
54 ea.	Guide posts, markers & horiz. reflector units	6.00	7.00
10 ea.	Removing & resetting guide posts	4.00	3.00
900 lin. ft.	New property fence	1.00	1.00
58 lin. ft.	8 in. C.M.P. (16 gage)	3.00	3.00
90 lin. ft.	12 in. asbestos bonded C.M.P. (16 gage)	5.00	6.00
194 lin. ft.	18 in. asbestos bonded C.M.P. (16 gage)	6.00	7.00
140 lin. ft.	24 in. asbestos bonded C.M.P. (14 gage)	9.00	10.00
524 lin. ft.	8 in. P.M.P. underdrains	2.00	3.00

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... on all type jobs be they
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mining or logging...

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deliver far more than your
money's worth in time-saving,
cost-saving performance
day in... day out!



Specify GENERALS on your new equipment

THE GENERAL TIRE & RUBBER COMPANY, AKRON, OHIO

BIGGEST CUT

(Continued from page 49)

cently announced dry air filters as part of their original equipment. The dry-type filter requires less maintenance than the oil bath type.

Equipment maintenance

An outstanding feature of the project is the manner in which the contractor has organized the maintenance of the equipment. The system was worked out by Leo Ryser, Kiewit's equipment maintenance supervisor for all projects in the area.

Two maintenance yards are set up on the project, one for the fleet of off-highway trucks, and one for the rest of the equipment. The preventive maintenance and record keeping is very similar for both groups of equipment.

The equipment management program depends partly on the truck operators who are required to keep track of several things during the day on a special form. A clearly visible clock at the belt loader enables them to record the time they drive up for a load. They

are also asked to make a note of any allied information, such as belt downtime. The fill is divided into 4 areas, A, B, C, and D, and the operator notes in which area each load is dumped. Notes are also made to call the mechanics' attention to anything peculiar the operator notices about the truck.

A cross-check on the total number of loads hauled in a day can be obtained from the belt loader operator who also makes a load count.

From the daily operator's reports a sheet called the Daily Truck Report is made out.

A record book is kept on all repairs made to each truck and this book travels with the truck to each job so that the mechanics know what has been done to the machine.

Engine maintenance

A detailed series of check lists are used by the mechanics for maintaining the truck engines. In general the various maintenance operations are carried out on the basis of fuel consumed rather than engine hours or miles, as it is thought that fuel consumed is a better index of engine wear. Each

of the mimeographed check lists has space for the date, shift, time in, time out, unit number, mechanic, and inspector. The reverse side of the sheets is used for remarks and notes.

One other feature of the Kiewit project which deserves mention is the bridge which will carry the relocated Mulholland Drive over the new San Diego Freeway. The structure will be a reinforced concrete box girder bridge with a gracefully curved soffit. The overall length will be 578 ft., with a main span length of 235 ft., one of the longest spans of this type in the West.

For the California Division of Highways, F. E. Sturgeon is resident engineer, assisted by P. T. Tayrien. C. M. Otero is principal field assistant. Carl Verner is Bridge Department representative.

Thomas Paul is district manager for Peter Kiewit Sons' Co., with headquarters in Arcadia. Al Galbraith is job sponsor. Job superintendent is Ward White, and Russ Davis is job engineer. Leo Ryser is equipment maintenance supervisor, with J. D. Brown and Van Wingle as master mechanics on the Ventura Freeway contract.

Maximum SAFETY

plus SAVINGS

1. Matched set of angular contact bearings.
2. Practically friction free.
3. Seal keeps grease in, foreign matter out.
4. Faster hoisting due to non-spinning loads.
5. Faster load placement due to easy load turning.
6. Faster rigging due to elimination of cranky wire rope performance.
7. Elimination of twists and kinks means longer wire rope life.
8. Safer load placements due to non-spinning loads.

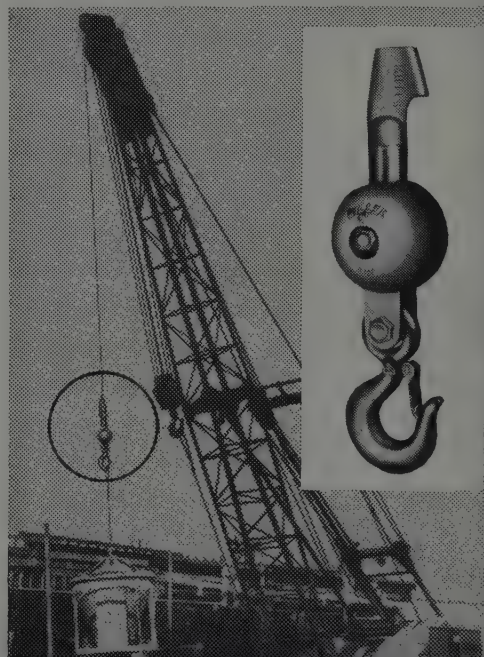
21 standard types available from
½ ton to 250 ton working load

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Miller Swivel Products Inc.

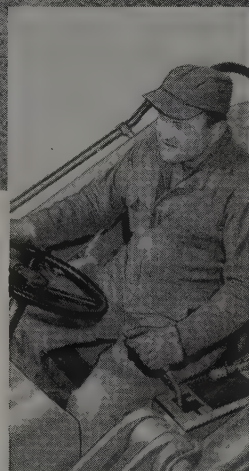
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MILLER SWIVELLING HEADACHE BALL

Swivel properly located to absorb twisting effect of wire rope and eliminates spinning loads. Available in four types: Clevis, Eye, Wedge and Thimble. 65-450 pounds; 5-30 Ton Capacity.

Ask your Allis-Chalmers dealer to show you "...And a Great Deal More"



SINGLE-LEVER speed and direction control makes it easy for operator to work fast

If a loader operator has to move one lever for forward and reverse, and another lever to get into a higher working gear, chances are he's going to stay in low gear.

Recognizing these limitations on your achieving faster loading, Tractomotive developed Single-Lever speed and direction control to speed up the work cycle. It's on the big TL-20 TRACTOLOADER*, the TL-16 and TL-14.

est possible working gear every time he shifts. He can go into second gear just as easily as first—and get there on the double. Moreover, when there's loading to be done down the road or across the pit, he power-shifts right into high (road speed), and does the job in a hurry.

Let your Allis-Chalmers dealer show you how this exclusive One-Lever control of speed and direction alone will add many extra yards to your daily production.

Other TRACTOLOADER working

advantages include: Longer Reach; Strong, Pin-Connected Planetary Axles; Extra Stability; Safe Dump Cylinder Location; Extra Hydraulic Protection; Hydraulic Torque Converter Drive; Tip-Back Bucket; "Hi-Traction" Differentials; Power Steering; Ignition Key-Type Starting; 4-Wheel Power Brakes; 6-Way Adjustable Seat; Rear-Axle Disconnect; Bucket Position Indicator.

*TRACTOLOADER is a registered Tractomotive trademark.

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Route for 630-mile aqueduct picked

CONCLUDING a 2½-year study to determine the best route for transporting surplus water from Northern California to the southern areas of the state, the engineers of the Department of Water Resources propose a 630-mi. aqueduct system designed to meet the growth of the state for the next 60 years. The project would provide for picking up Feather River and other waters now wasted into the ocean through San Francisco Bay at a point in the Delta Area.

At the foot of the Tehachapi mountain range blocking the aqueduct at the southern end of the San Joaquin Valley, the water would be lifted over these mountains by a pumping plant or plants discharging through four tunnels with an aggregate length of 6½ mi. On the

south side of the mountains the aqueduct would branch. By 1971 one of these legs would reach the San Fernando Valley, from which distribution point it could serve Los Angeles and the coastal areas from Ventura to Orange County. The other line would reach into the Mojave Desert Area first and later be extended to a point southeast of Riverside by 1982, with subsequent deliveries to Riverside and as far south as San Diego.

Branching west from the main aqueduct in the San Joaquin Valley, a coastal line would extend through Avenal Gap to serve San Luis Obispo and Santa Barbara counties by 1971.

This program is based on a forecast which suggests that Southern California will be approaching its

full economic and population potential by the year 2020 with 28,500,000 residents. They will require 5,500,000 ac. ft. of water from the northern part of the state per year in addition to all other sources of supply.

Completion of this aqueduct system over a 55-year period would represent a total of \$1,900,000,000, and this anticipates a Federal investment of about \$100,000,000 through the U. S. Bureau of Reclamation in the San Luis reservoir. As an indication of the possible cost of this water at points of delivery, the acre-foot price at the canal would be from \$10 to \$24 in Kern County, \$38 per acre-foot in the Mojave area, \$43 in San Diego County and \$46 in Santa Barbara County.

Power required to lift this volume of water through the aqueduct's pumping plants would represent an oil consumption of 14,000,000 bbl. per year. Plans for power could be changed to nuclear energy if that was found feasible.

This entire construction program is based on the completion of the Oroville reservoir on the Feather River, which is required to firm up the water supply in the Delta Area where the intake for the aqueduct will be located. This timetable assumes that a prompt start will be made and construction activity pushed on the Oroville Dam.

Permanente to build cement plant in Hawaii

PERMANENTE CEMENT CO. will build a cement manufacturing plant in Hawaii. The Island of Oahu's Waianae area will be the site both for a dust-free plant and for utilizing a large deposit of the principal raw material for cement making.

The new industry will raise Permanente's investment in facilities in Hawaii and other islands of the Pacific to \$20,000,000. The plant will have an initial annual capacity of 1,700,000 bbl., and the facilities are far along in the design stage.



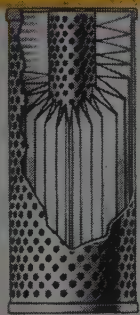
SPILLWAY GATES AT ICE HARBOR LOCK AND DAM

Above is Ice Harbor Dam on the Snake River, showing the six spillway gates held in elevated position as seen from the lower apron powerhouse deck. U. S. Army Corps of Engineers, Walla Walla District, work schedule calls for the entire flow of river to be through these spillway bays during the time construction is under way behind north shore cofferdam. The \$30,000,000 south shore construction contract of Montag-Halvorsen-Austin and Associates is about 98% complete.

SPECIAL REPORT TO CATERPILLAR OWNERS:



LOW MAINTENANCE COSTS...EXTEND EQUIPMENT LIFE BY CHANGING OIL AND FILTERS AS RECOMMENDED



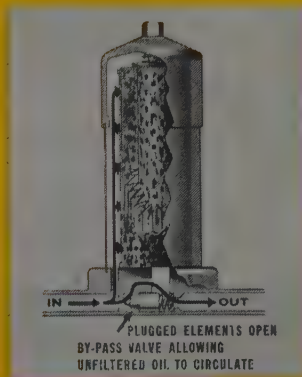
How often should lube oil and filters be changed? The answer is obvious—when the lube oil and filter can no longer do their jobs. But how do you know when that time comes? Can you afford to guess?

Guessing can be costly. The cost of oil changed *more frequently* than necessary adds up to big sums during a work season. *Delayed* oil changes can bring about premature overhauls with more parts replacement costs.

Manufacturer recommendations are based on sound principles. Rapid advancements have been made in perfecting "additive" lube oils that can reduce wear. The familiar ridge left in liners by the piston rings can be practically eliminated by the use of Series III Oils and proper maintenance practices! These oils also allow longer periods between changes.

I benefit and savings from new oils cannot be had without proper filtering. Caterpillar Engines have an emergency by-pass valve that opens and allows unfiltered oil to circulate if the elements become clogged. And elements become clogged when their dirt-holding capacity is reached. Caterpillar elements have ample dirt-holding capacity to keep the by-pass *closed* over the recommended period.

aren't the dirt-holding capacities of all makes of filters about the same? To protect the long life reputation of Cat Diesel Engines, Caterpillar continually tests all brands of elements offered for Cat Engines. Below are the *surprising* results, based on tests of filters purchased on the open market during 1957 and 1958. During these tests commercial test dust was gradually added to clean oil until each filter clogged and the emergency by-pass valve opened. The amount of dust added is recorded in the "Sediment Index" column.



HOW CAT FILTERS COMPARE WITH OTHER BRANDS

Brand	Filtering Area (Square Inches)	Sediment Index (In Grams)	Comparison
CATERPILLAR	1450	75	Used as basis for recommended oil and element change periods.
BRAND A	1450	13	Cat element lasted nearly 6 times longer.
BRAND B	1170	22	Cat element lasted 3 times longer.
BRAND C	1000	34	Cat element lasted more than twice as long.
BRAND D	Not measurable	No oil flow	Opens by-pass immediately even when new.
BRAND E	1450	26	Cat element lasted nearly 3 times longer.



SERVICE TIP:

Get your copy of "Crankcase Lubricating Oil Change Recommendations," Form 32421-1W, from your Caterpillar Dealer right away. Keep pace with the new lube oil developments.

Your Caterpillar Dealer has the complete story on the advantages of changing lube oil and filters as recommended. Ask him to figure your annual engine oil costs for you, and see how much you can save. See him today!

Caterpillar Tractor Co., San Francisco, Cal.; Peoria, Ill., U. S. A.

CATERPILLAR

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... for more details, circle No. 59 on Reader Service Postcard

Target date for the start of cement production is August 1960.

An area of 208 ac. on Oahu's fast-growing industrial side is being acquired by Permanente. Out of the property will be developed a 25-acre manufacturing site and a huge deposit of coral. Earth-moving equipment will load the calcium carbonate rock in the form of coral.

Finished cement will be hauled 28 mi. from Waianae into Honolulu points. Kaiser Engineers Division of Henry J. Kaiser Co. will engineer, design and supervise construction of the facilities which will feature efficiency and dust-free operation.

ARBA drafts statement on road consultants

A FORMAL "statement of policy" which sets forth in detail the position of the American Road Builders' Association with regard to the use of consultants by state highway departments has been approved by the Board of Directors of ARBA's Engineering Division. Text of the statement was not released, but no change in ARBA policy is proposed. The statement is intended only to clarify and more closely delineate ARBA's position regarding consultants.

The association has many times recommended the use of consulting engineers to supplement highway department staffs during periods of peak work loads and for specialized assignments. A major part of the Engineering Division's effort has been concerned with describing the scope of highway consulting work, setting up fee criteria, and establishing procedures for the effective use of consultants in highway engineering work.

Plans are advanced for \$8,000,000 motor hotel

PLANS are well advanced for a project which will provide a 400-room motor hotel in San Francisco on the site of the famous Crystal Palace Market at Eighth and Market Sts. One of the principal owners will be Del E. Webb of Phoenix, Ariz. The four-acre downtown site is only about one block from the Civic Center. Construction of the new hotel will not begin for several months. Actual building plans are nearing completion. The building will be of reinforced concrete with a present maximum of five stories, and plans for an ultimate height of ten or twelve.

Pioneer engineering contractor Ford J. Twaits dies at 72

FORD J. TWAITS, 72, pioneer construction engineer, contractor and industrialist, died April 18 at Pasadena, Calif. He was a founder and partner of Twaits-Wittenberg Co., Los Angeles constructors and engineers. Born in Lansing, Michigan, he lived there until graduation as a civil engineer from Michigan State College in 1908.



After several years of engineering work in the Los Angeles area, he founded his own construction engineering firm in 1919 and built many outstanding landmarks in Southern California. During the 1930's he assisted in the formation of Consolidated-Western Steel Corp. and was executive vice-president. He also served as president of Consolidated Rock Products Co.

He was considered an elder statesman among American construction engineers, and was a founder of the Southern California Chapter of the Associated General Contractors, having twice served as its president.

He had a devoted interest in civic and educational affairs, serving as a director of the Los Angeles Chamber of Commerce and as chairman of its Construction Industries Committee, and in 1954 was awarded the Chamber's Construction Industry's Outstanding Achievement Award.

One of his most memorable undertakings was his disaster work following the flood caused by the breaking of the St. Francis Dam in 1927. He was placed in complete charge of all emergency assistance and rehabilitation by the City of Los Angeles, and organized a vast network of contractors, men and equipment, working for months to repair the immense damage.

During World War II, he played a vital role in accelerating the construction of military facilities.

Highway relocation around Terminus Dam reservoir

TO RELOCATE the California state highway around the future reservoir to be formed behind Terminus Dam, bids have been called by the Division of Highways. Of the total of more than \$5,000,000 available for this project an estimated \$4,720,000 will be paid by the U. S. Corps of Engineers, as part of the overall dam project, and \$320,000 by the state. Bids were scheduled for opening June 3. The work includes grading and surfacing 7.6 mi. of state Route 198 beginning about 1½ mi. north of Lemon Cove in Tulare County.

Design calls for a 2-lane highway including a 253-ft. bridge over Horse Creek. Three short sections of 4-lane highway will be provided in the relocation to facilitate passing on the new route.

ARBA committee endorses Fallon highway bill

THE Executive Committee of the American Road Builders' Association endorses the Fallon Bill designed to firm up the Interstate System authorization of Federal funds for 1962. Endorsement followed serious consideration of the present condition of the Highway Trust Fund which will make it necessary to reduce funds apportioned to the states for work on the Interstate System during fiscal 1961, unless legislative action is taken.

The Fallon Bill (H.R. 5950) is considered an important step in approaching this financial problem since it fixes the 1962 authorization at the same level established for 1960 and 1961 and prescribes a basis for apportionment. This pinpoints the financial situation which must be met by action in the House of Representatives.

Boise bidder is low on Idaho highway headquarters

WITH a low bid of about \$1,800,000, R. E. Rice Construction Co. of Boise is scheduled to build the new headquarters for the Idaho State Department of Highways and the Department of Law Enforcement. The structure is located on a 37-ac. tract and will include a 3-story steel frame housing the highway headquarters and a 1-story wing to be occupied by the law enforcement group.

The plant was estimated at about \$2,000,000 by the architects in Boise. Ten bids were submitted

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Highways have been called the arteries of the nation. Today, every facet of life in the U.S. is increasingly dependent upon highways and motor vehicles.

We at Symons Brothers Co., are proud to have played a part in the development of highways, a program involving about four billion dollars. Ever since the first SYMONS SCREEN separated aggregates in specified sizes, contractors and builders of paving plants have increased their investments in Symons products.

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F. SCREEN. Symons F Screen is the most versatile machine in the line. It is used primarily for accurate segregation of crushed rock and gravel in rock and paving plants. Due to its high accuracy, it is often used for re-screening. *There's a SYMONS SCREEN for every screening requirement.*

Arizona lets its biggest highway construction contract

LATE last month the Arizona State Highway Commission opened bids on a project scheduled to be the largest contract for highway work to be awarded in the state. The job is located in Pima County on the highway connecting Tucson with Benson on U. S. 80 with a length of about 10 mi. The work consists of grading, draining, base and bituminous plant mix with an emulsified asphalt seal coat, together with the construction of two interchange structures. Time allowed calls for completion date in December, 1960. The engineers' estimate was about \$2,500,000.

Improvement on U. S. 40 over Nevada mountains

ONE of the most hazardous sections of U. S. 40 across northern Nevada is the steep and curving section over Golconda Summit. Preliminary plans are now under way, according to Edward L. Pine, State Highway Engineer in Carson City, for a new Interstate Highway route over the summit, with actual construction to start late this year. Plans call for a 4-lane freeway with a cost of more than \$4 million to replace the existing route, which has a bad record of traffic accidents. The 10-mi. length of project will be the longest Interstate construction job undertaken by Nevada on U. S. 40.

Location will be about 1,000 ft. south of the present road, taking advantage of better terrain with lower grades and fewer curves.

Work starts with ceremony on Stanaker Dam in Utah

CONSTRUCTION of Stanaker Dam, which is a major feature of the Vernal Unit in the Central Utah project, was started with the usual ground-breaking ceremony conducted by the Bureau of Reclamation last month. Under a \$1,600,000 contract held by Morrison-Knudsen Co., work on this structure represents part of the first operations in the participating projects located in the Upper-Colorado River Basin.

Work also represents the start on the Vernal Unit which will bring additional water to about 15,000 ac. of irrigated lands now subject to water shortages.

L. A. freeways must have guard rails in divider strips

THE Los Angeles City Council has voted unanimously to require the California Division of Highways to install guard rails to prevent head-on collisions across freeway divider strips. The councilman who introduced the motion said that guard rails must be installed that are "strong enough to prevent a vehicle from crossing into a completely different traffic route."

"This mandates the state to put

guard rails on freeways under construction and already existing," the counselman declared. He added that the new policy would prevent the city from signing future contracts for freeways unless provisions were made for center strip guard rails.

The city council action was taken after a report was submitted by the council's public works committee. At the hearing City Traffic Manager S. S. Taylor said his department did not consider any freeway complete until a "separation" guard rail was installed between opposing lanes of traffic.

Consulting firms selected for rapid transit project

CARRYING FORWARD the plans for a rapid-transit system to serve the San Francisco Bay Area, consulting engineers have been selected to prepare detailed designs and cost estimates. The plans prepared by these consulting firms must be completed by May 1960, so that a proposed bond issue could be placed before the voters of the district that fall.

The Bay Area Rapid Transit District covers an area of five counties, as now established and will call upon the voters to approve a multi-million dollar bond issue to finance the project, as it is planned by the consultants.

Selected from many firms considered for this design study the board selected the three firms of Parsons, Brinckerhoff, Hall & Macdonald of New York City, the Bechtel Corporation of San Francisco and Tudor Engineering Company of San Francisco. These firms are scheduled to establish a project office and begin work immediately. The study is to include routes to be used in the initial system, the type of equipment and location of stations, together with the necessary traffic studies and an outline of operating procedures.

Boating center opens

DEVELOPED by Pacific Bridge Co., well known Western contracting organization, a \$2,500,000 recreational boating center has been opened on the Alameda Estuary of San Francisco Bay. The yacht harbor occupies about 19 ac. of water and 14 ac. of land, and when completed will have fourteen piers with 500 berths.



GIANT SIPHON NEARS COMPLETION

Working on a sandy lake bottom behind a temporary dam, a Model 3500 Manitowoc crane sets a huge pipe section in place near Pasco, Wash. The work is part of the Bureau of Reclamation's Columbia Basin irrigation development. The siphon is 15.4 ft. in diameter and 3 mi. long. Individual sections vary in weight from 25 to 40 tons and are up to 40 ft. long.



Equipment that Serves.

2 BIG

MADSEN ASPHALT PLANTS

...handle bituminous mixing for

DALEY CORPORATION

San Diego, California



PLANT No. 1
6000-LB. BATCH CAPACITY

PLANT No. 2
8000-LB. BATCH CAPACITY

Our Plant No. 2 alone, has turned out in excess of 300 tons per hour

— says Dave Rogers, Daley Corporation, San Diego, California

Here are some of the engineering features and specifications of the MADSEN Asphalt Plants shown above:

- PLANT MODELS AND CAPACITIES
Model 481 6000-lb. Batch Capacity
Model 481 8000-lb. Batch Capacity
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The WEST from WASHINGTON

By E. E. HALMOS, JR., Washington, D. C.

It's a safe-enough bet that there will be no slackening in the pace of federal-aid highway construction — even though Congress is taking plenty of time deciding what to do about the serious impending deficit in the Highway Trust Fund. The political implications of letting the highway program falter are just too dangerous to be faced by most Congressmen.

You know the situation: Because Congress last year (in a jitter over recession) authorized spending of an extra \$1,000,000,000 on highways, and made no provision for repaying the Highway Trust Fund, the fund is beginning to run out of money. Without help, only \$500,000,000 could be allocated to the states in calendar year 1960; thereafter, apportionments could only amount to about \$1,700,000,000 yearly—about three-quarters of the amount authorized by the 1956 Highway Act.

Congress has several choices: It can raise the gasoline tax (as proposed by the Administration) 1½ cents; it can borrow from the general fund; it can authorize issuance of bonds; it can suspend the Byrd "pay-as-you-go" amendment and permit deficit financing.

Best bet: Borrowing, by means of notes against the Trust Fund, out of the general funds. A storm of protest has already been stirred up by tax-increase proposals—both by highway users, and by states, which look on gasoline and diesel taxes as a major share of their own revenues.

There are something more than three dozen different bills before both houses of Congress to deal with this situation, or parts of it. Hearings on one of them (Rep. Fallon's proposal to firm up fiscal year 1962 authorizations) started early in May, the others haven't yet been taken up by committees of either house.

Mid-June seems to be about the right time to expect real action on the problem—just in time to take care of Fiscal Year 1960 (starts July 1).

* * *

But while the highway program itself is in immediate financial trouble, legislators are happily submitting other proposals that would

commit even more money to highway purposes. For instance, two newly-proposed measures (S.1714 and HR 6303) would disburse a total of \$4,300,000,000 to the states over a 17-year period, to repay them for money spent on toll and free roads already built and now included in the Interstate systems.

Biggest amounts, of course, would go to Eastern states with big toll-road mileage—New York would get the largest share, \$799,100,000, to cover cost of its 568.6-mi. Thruway System.

But most Western states would get some share of the money. Specifically, under the bills, the disbursement would run this way: Arizona, \$14,500,000; California, \$260,600,000; Colorado, \$17,000,000; Idaho, \$3,400,000; Montana, \$2,600,000; Nevada, \$700,000; New Mexico, \$4,800,000; Utah, \$3,900,000; Washington, \$61,400,000; Wyoming, \$5,900,000. Alaska and Hawaii would get nothing.

The money would have to be used for additional highway work.

* * *

Restrictions on foreign-made materials for highway construction can be imposed by the states—under six specific conditions—according to a circular memorandum issued by the BPR. It concerns administration of the "Buy American" act of 1933, giving preference to domestic products.

These are the key conditions: Bidders must be informed of restrictions; bidder must indicate in his bid whether he proposes to furnish foreign-made materials; the bid price must include duty and all costs incurred after arrival in the U. S.; the total bid price on the entire contract, if it includes foreign-made materials, is to be increased by 6% of the bid price for the foreign-made articles.

* * *

Bid prices on highway construction seem to be stabilizing. BPR's index of average bid prices for Federal-aid highway construction have shown extremely minor fluctuations, although the net is a very slight uptrend.

For the first quarter of 1959, for instance, the index dropped 0.6% from the last quarter of 1958. His-

tory during 1958: A drop of 2% in the first quarter, rise of 0.8% in the second quarter, drop of 1.7% in third quarter, rise of 1.7% in fourth quarter.

Net result: Index for the first quarter of 1959 is 140.8; compared to 140.4 for the same period in 1958.

* * *

Be careful about buying "surplus" construction machinery brought in from abroad by importers. Chances are very good that the importer won't be able to get it released to you.

There's a lot of such equipment available — some of it in new condition — that was taken abroad by Armed Forces, then declared surplus. Importers buy it at junk prices, ship it to the U. S. under bond, "for re-export, unless a shortage can be proved in the U. S."

Point is that the Department of Commerce knows of no shortage of machinery in the U. S., is opposing the release of bonds on the machinery in most cases.

* * *

Appointment of Floyd E. Dominy as Commissioner of Reclamation, to succeed the retiring W. E. Dexheimer, got almost unanimous support from Western Congressmen, who felt that Dominy's Nebraska birth, his agricultural teaching experience, and tenure with the Bureau fitted him well to understand the water problems of the Western states.

But there's an undertone of some alarm in professional engineering circles. Dominy is not a civil engineer — as Dexheimer is — and many memories go back to sometimes bull-in-a-china-shop operations of ex-newspaperman Mike Straus.

* * *

Department of the Interior is still considering locations of those five experimental plants for desalting ocean water, authorized by Congress this year. The plants will test processes developed since 1952 some of which, according to Secretary Seaton, can produce potable water at a cost of about \$1 a thousand gallons.

* * *

Two of the biggest money bills affecting the West — Reclamation and Army Civil Works — are still in House Committees, probably won't come out on the floor until early June for action. When they do, they'll be in the middle of a renewed budget battle, which has been quiescent for some months.

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ALASKA Newsletter

By CLIFFORD S. CERNICK, Fairbanks

CRUCIAL DAYS—These are crucial days in Alaska — crucial and precious. In the North, daylight and sunlight are quickly-spent treasures which, to my way of thinking, are being spent recklessly with very little of value to show for their passing. I refer to the apparent delay in settlement of contractor-union negotiations, still deadlocked at this writing. The thorny problem snarling the talks is one of hiring. Neither the contractors nor the unions have shown any apparent relaxation of their stands: the union contention being that Alaskans must be given preference in hiring; the contractors' stand being that they should retain full right to select their own personnel. Without going into the merits of either side to this dispute, one thing is clear: time's a wasting. The precious, fast-fleeting hours of Alaska's short construction season are being squandered. If the dispute is not settled by the time this reaches print, then the 1959 Alaska construction season will have been dealt a serious blow.

MIGHTY RAMPART—Subject of much bar-room and even considerable drafting-room conversation in Alaska these days is the possibility that plans for the mighty Rampart hydroelectric dam on the Yukon river may soon move a step closer to reality. Rampart dam would be the world's largest. Interest in the matter has been revived with the announcement from Washington that a congressional resolution is being drafted to authorize the Corps of Engineers to begin planning studies on the project. The Engineers estimate Rampart would generate 4,700,000 kilowatts. Grand Coulee on the Columbia, now largest in America, generates just less than 2,000,000 kw. The Eklutna project, largest in Alaska, generates 32,000. A conference on Rampart has already been held in Washington, and was attended by Maj. Gen. Emerson C. Itschner, chief of engineers; Alaska Senators E. L. (Bob) Bartlett and Ernest Gruening and Representative Ralph Rivers. Discussion at the conference encompassed the whole problem of river development in Alaska. The congressional resolution calls for an authorization of \$130,000 to initiate engineering studies for the

mammoth power project, the total cost of which would be more than \$900,000,000. According to word from the Alaska congressional delegation, greater attention is being given the Rampart project because it is seen as a way to meet the challenge of similar huge Soviet projects in Siberia. "We must not lag behind in the development of our natural resources to the fullest possible extent in the face of these Soviet developments," Senator Gruening stated recently. "In these times, to stand still is in reality to fall behind."

JOB RUSH, 1959—A growing army of newcomers to Alaska is already pouring into the new state by land, sea and air. An indication of the magnitude of this influx is offered by William J. Harper, immigrant inspector at Tok, Alaska, for the Immigration and Naturalization Service. Tok is the U. S. Customs station on the Alaska Highway. Between April 1 and April 30 of this year, a total of 1,310 vehicles carrying 3,087 passengers entered Alaska. The figures for April of last year are 963 vehicles and 1,720 passengers. Airlines likewise report a sizable increase in newcomers. The 1959 job rush is on.

JOB LOWDOWN—Because of the implications of the 1959 job rush—and in an effort to stem the tide, at least partially, M. E. Weir, who heads the Employment Service in Alaska, has issued a special statement on the matter. He urges newcomers to "save themselves heartache and needless loss of money and time" by not setting out for Alaska unless there is a job waiting. Weir points out that the national rate of insured unemployment is around 5% or less while Alaska's rate for mid-March was nearly 20%. He adds that the resident work force in Alaska is more than adequate for most employer requirements and the only shortages are in some professional categories as well as secretaries and stenographers. Weir advises: "Spend a vacation in Alaska and look at the scenery as well as the job situation. If you've a skill needed here, you couldn't be more welcome. If not, it's much wiser to wait."

THE LION'S SHARE—The Fairbanks area can expect the lion's share of military defense construction expenditures this year according to Col. W. C. Gribble, Jr., Alaska District Engineer. Colonel Gribble estimates that about \$42,000,000 of the \$70,000,000 total represents construction in the greater Fairbanks area—including Clear and Fort Greely. Projects for which hiring and supply will be initiated primarily in Fairbanks include the big Clear missile detection site, the nuclear power plant at Fort Greely, family housing projects at Ladd and Eielson Air Force bases, a Nike site, and several smaller defense contracts.

HIRING FOR CLEAR—News that Fairbanks would be the hiring center for the big Clear project was enthusiastically received here, particularly since there had been rumors to the effect that hiring would be centered elsewhere. Any fears on this score were allayed by Dick Huntington, official with Baker & Ford Co., contractor of Bellingham, Wash., which so far has received most of the construction contracts for the job. Huntington said he does not expect hiring for Clear to get under way actively until about the last week in May. Hiring will reach a peak some time in July, at which time Baker & Ford alone expects to have more than 400 men on the Clear job. Other contractors and sub-contractors are expected to swell this total to over 1,000 at Clear at the peak of this year's construction season.

OPTIMISTIC OUTLOOK—Pending a possible labor dispute, the current construction season bears all the earmarks of being a record breaker. A person who keeps a fairly close check on trends in Alaska construction is Joseph Nistler, manager of the Fairbanks office of the State Employment Service. Nistler tells me he anticipates an outstanding year in terms of construction employment, payroll and business volume. "We're expecting a 20% increase in employment this year over last year—and possibly an even greater increase than that," Nistler said. He added that increases in employment probably would not reach substantial proportions before the middle of end of May. At the present time 9,775 persons are employed in the Fairbanks labor market as compared with 8,298 for last year. Unemployment stands at 1,870—down 60 from last month and down 40 from April of 1958. Municipal and

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HAWAII Report

By ALAN GOODFADER, Honolulu

commercial construction within the Fairbanks area is expected to swell the employment total. City Engineer Harold Gilliam tells me the city of Fairbanks plans to spend approximately \$850,000 during the current season for utilities and other construction. Commercial projects here will increase that total by several million dollars. In Anchorage, the same pattern of employment seems to be emerging, with commercial and residential construction moving skyward rapidly. The City of Anchorage plans to pave 89 blocks. Voters of the city have approved a \$3,000,000 bond issue for street paving and storm drains, with all but \$1,685,000 of this amount already expended. The overall construction picture in Alaska seems extremely rosy.

CONSTRUCTION NEWS NUGGETS—Alaska has lost over \$1,250,000 in federal construction grants for sewage treatment plants because no Alaska community has yet initiated construction of such a plant. Fairbanks plans to apply for a construction grant for a treatment plant in 1960 . . . C & R Builders of Seattle were low bidders (\$1,600,000) on the first academic building for the Alaska Methodist University in Anchorage . . . Petersburg's new municipal building contract in the amount of \$296,770 has been awarded to Berg Construction Co. of Juneau . . . A 27-home, \$1,000,000 development is planned by Alcan Pacific Contractors in Anchorage who ultimately will build 120 units in the west Turnagain area. Homes will sell for from \$27,600 to \$34,000 . . . Formal ceremonies in April inaugurated the Aleutian island section of the distant early warning line . . . The Chugach Electric Assn., a power cooperative in Anchorage, is considering construction of a hydroelectric project at Grant Lake on the Kenai Peninsula. The proposed project would have an installed capacity of 10,000 to 12,000 kilowatts . . . A labor union in Anchorage is picketing a downtown demolition job because the City of Anchorage used laborers from the city prison farm to help in salvage work. The commercial firm tearing down the buildings offered the City some of the lumber and fittings in return for help in tearing the buildings down. The union—Carpenters Local 1281—protested the arrangement as being unfair to labor.

CEMENT SCRAP—An approaching battle between two giant construction industry suppliers has taken the spotlight away briefly from the industry's production records here. The battle has as its prize the sale of cement to Hawaii's booming building trade. Early in March a new Hawaiian Cement Corp. announced it was about to build a \$12,000,000 cement plant in the Ewa district of Oahu. The plant would have capacity of more than 1,000,000 barrels a year and would be in operation in early 1961, the firm said. The new firm is owned by American Cement Corp., Cyprus Mines Corp. and three local outfits—Alexander & Baldwin, Gaspro, Ltd., and the Dillingham family. The firm announced its prices would be "competitive" with those of Henry J. Kaiser's Permanente Cement Co., which now supplies cement to the islands in bulk from its West Coast plants. The announcement brought a quick reaction from Kaiser. He announced that he too plans to build a \$12,000,000 cement plant on Oahu and that his plant would be in production by August 1960. And, Kaiser said, his plant's capacity will be 1,700,000 barrels a year. Both plants plan to use Hawaii's vast coral deposits as a raw material.

INDUSTRY CENTER—Incidentally, the cement plant story pointed up a new development here stemming from Hawaii's construction boom. The Ewa district at Oahu's southwest corner is becoming a center of production for construction supplies which have heretofore been imported to the Islands. A Standard Oil refinery now under construction will turn out fuel for cement making. Hawaiian Western Steel is going to manufacture reinforcing bars. And building rock has been taken from the area for years.

NEW SPURT—Meanwhile, statehood and its spate of publicity about the Islands appears to be giving the construction industry here yet another shot of vitamins. Tourist trade people say hotel space is growing inadequate and more rooms are urgently needed.

The president of Hawaii's Territorial Senate, Herbert K. H. Lee, favors a crash \$60,000 appropriation to entice hotel developers here. Local hotel operators are showing signs of being ready to expand again, with the construction of a 105-room hotel at Kona on the Island of Hawaii, slated for completion in 1960, as the first announced step in that direction. The hotel at Kona would cost \$750,000. Lippman and Rawson are general contractors. Hotel owner Roy C. Kelley, who does his own construction, has announced he will start work in September on a 300-room, 12-story addition to his Reef Hotel in Waikiki. The structure will cost \$1,200,000 and is scheduled for completion on Jan. 1, 1960.

ALSO IN THE WIND—Permanent residents also are creating new jobs for the construction industry. The Bishop Estate, Hawaii's largest private land owner, has announced plans for a \$10,000,000 suburban Honolulu hotel-apartment, business and residential development in the Waialae area of Oahu. The development awaits zoning actions by the Honolulu City Planning Commission. It envisions two 12 to 14-story apartment buildings and 18 smaller apartment buildings, eight business sites and two churches, as well as about 80 residential lots. And Henry J. Kaiser said he wants to take over a tract of Bishop Estate land for still another suburban area—this one to cost \$350,000,000 to develop. This project is further in the future, since off-site improvements are needed before the housing tracts can be opened. Kaiser said his plans are for a stage-by-stage development of the Koko Head area on southeast Oahu.

MEANWHILE, BACK AT THE SITES—Construction starts in the first quarter of 1959 stood at \$31,700,000, according to the General Contractors' Association of Hawaii. The association blamed a drop-off in government work for a \$28,300,000 drop from starts in the first quarter of 1958. The industry still

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is going at peak speed, however, and it looks like government work will pick up considerably as the year progresses.

BIGGEST ROAD JOB—Hawaiian Dredging & Construction Co. has offered a \$3,034,000 low bid on the largest road contract ever offered by the Territorial Highway Department. Included in the contract will be the construction of Hawaii's first 3-level traffic structure and two sections of superhighway in downtown Honolulu. The bid was the lowest of five submitted by Island firms.

NEW BUILDING BID—The Territory will open bids June 10 on a four-story, \$1,200,000 building for its Department of Health. The building is to be ready for occupancy in the summer of 1960. It's of reinforced concrete with light control panels across its front and back. Construction is to start by June 30.

PUBLIC HOUSING PROJECT—Bids will be invited early in August on a \$3,000,000 public housing project in the Halawa district of Oahu.

Low bids and contract awards

ALASKA

Baker & Ford Co. of Bellingham received a \$5,036,174 contract for construction of 2 radar transmitter buildings for the U. S. Air Force at Clear. **Manson-Osberg Co.** of Seattle, Wash. submitted a low bid of \$861,050 for construction of armories for the First and Second Alaska National Guard Scout Battalions at various villages. A \$198,000 contract was received by **American Service, Inc.**, Anchorage, for construction of support facilities for the U. S. Air Force at Northeast Cape Air Force Station. **Paul W. Speer, Inc.** of Los Angeles, Calif., submitted a low bid of \$264,800 for construction of a jet engine test cell for the U. S. Air Force at Elmendorf Air Force Base.

ARIZONA

T. M. K. Construction Co., Phoenix, submitted a low bid of \$1,074,872 for grading, surfacing, and construction of 4 overpass structures on the Yuma-Casa Grande highway near Yuma in Maricopa County. A low bid of \$493,551 was submitted by **Fisher Contracting Co.**, Phoenix, for 5.8 mi. of grading and surfacing southwest of Phoenix in Maricopa County. **Phoenix-Tempe Stone Co.** of Phoenix submitted a low bid of \$187,404 for 4.2 mi. of grading and surfacing on the Kirkland-Prescott highway near city of Kirkland in Yavapai County.

CALIFORNIA

Gibbons & Reed Co. of Salt Lake City, Utah, submitted a low bid of \$5,094,662 for construction of 4.4 mi. of freeway with frontage roads, ramps, and related work near the

Siskiyou county line south of Castella in Shasta County. **Peter Kiewit Sons' Co.** of San Francisco received a \$1,572,166 contract for construction of the Stillman Street ramp, a part of the San Francisco-Oakland Bay Bridge reconstruction project. A \$1,838,924 contract was received by **John Delphia** and **Fred J. Early Jr. Co., Inc.**, Patterson, for grading and paving to construct 3.3 mi. of 4-lane freeway and construction of 3 bridges near Soledad in Monterey County. **Gordon H. Ball & Gordon H. Ball, Inc.** of Danville received a \$1,392,945 contract for grading, paving and related work on 14 mi. of highway in Yolo County. A low bid of \$995,957 was submitted by **Osborn Co. & O. B. Pierson, Inc.** of Pasadena for construction of a bridge and related work east of Blythe in Riverside County. **Griffith Co.** of Los Angeles received a \$522,041 contract for resurfacing and reconstruction on sections of the Ventura Freeway, U. S. 101, west city limit of Los Angeles in Los Angeles and Ventura counties. **Charles MacClosky Co.** of Gardena received a \$416,621 contract to widen a bridge and construct approaches at East Tracy overhead in San Joaquin County. A \$409,445 contract was received by **Jesse H. Harrison**, San Ardo, for 3.3 mi. of grading and surfacing near Cottontail Creek in San Luis Obispo County. **Madonna Construction Co.** of San Luis Obispo received a \$376,159 contract for repaving the northbound expressway lanes for 3.9 mi. of U. S. Highway 99 between Berenda and Califa in Madera County. **Harms Bros.** of Sacramento received a \$371,348 contract for reconstructing 2.5 mi. of U. S. Highway 50 between Mays and Globins in El Dorado County. A \$294,151 contract was received

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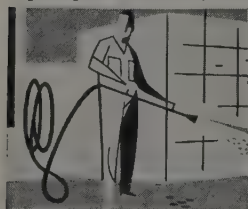
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by Hubbs Equipment & Construction Co., Rialto, for grading and surfacing to widen 2.8 mi. of Federal county road east of Upland in San Bernardino County. E. L. Yeager Co., Riverside, received a \$240,832 contract for resurfacing a total of 46.5 mi. of highway at different sections in Riverside and San Bernardino counties. A low bid of \$215,996 was submitted by G. S. Herrington of Auburn for construction of 2 bridges and approaches at Champus and Chippis creeks in Plumas County. John M. Ferry, Glendale, submitted a low bid of \$195,617 for repaving the north-bound expressway lanes for 3.9 mi. on U. S. 99 between Berenda and Califa in Madera County. Brown-Ely Co., Corte Madera, received a \$179,821 contract to widen to 4 lanes, in and north of Yuba City on U. S. 99E in Sutter County. Thomas Construction Co. of Fresno submitted a low bid of \$178,276 for grading, surfacing and construction of 1 concrete bridge west of Red Bluff in Tehama County.

COLORADO

Refinery Engineering Division, Vitro Corp. of America, Farmington, New Mexico, submitted a low bid of \$2,425,247 for upper and lower Molina power plants, penstocks and equalizing reservoir, Collbran Project. Herron Strong of Platteville submitted a low bid of \$346,855 for grading, stabilizing and structures on 15.3 mi. of State Highway 149 in Iola and Lake City, Gunnison County. Colorado Constructors, Inc. of Denver submitted a low bid of \$414,541 for construction of access roads, Auxiliary System, Lowry Air Force Base, Denver. A low bid of \$298,388 was submitted by Gardner Construction Co., Littleton, for structures, north and south of Aguilar on State Highway 1, Huerfano and Las Animas counties. Hunt Construction Co., Steamboat Springs, submitted a low bid of \$193,462 for 2.5 mi. of grading, structures and surfacing south from Carbondale on State Highway 133 in Garfield and Pitkin counties. A low bid of \$188,842 was submitted by Brannan Sand & Gravel Co., Denver, for street improvement, City and County of Denver. Peter Kiewit Sons' Co., Denver, submitted a low bid of \$176,990 for street improvement in City and County of Denver. A low bid of \$132,445 was submitted by L. J. Hesser of Greeley for 1.1 mi. of grading, surfacing, and structure on State Highway 291 in Chaffee County.

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Cutting down high ridges and filling in canyons to construct homesites in a 400 acre exclusive movie colony residential district overlooking the Pacific Ocean involved moving 6,500,000 yards of rocky decomposed granite for J. A. Thomson Company, Los Angeles. The job was started with a fleet of rubber-tired scrapers which had to travel a mile over steep grades. Then the Thompson Company installed a Kolman Model 303 belt loader 60" wide and 50' long at the base of the high ridges. Dozers were used to push material downhill to the feeder-trap, 29 feet in length, which allowed a huge live surge pile at the feed end of the unit.

Rubber tire scrapers having a capacity of over 20 yards were loaded in 17 to 18 seconds. The Kolman 303 eliminated 75% of the scrapers and tractors called for in the original estimate. The Thompson Company figures it saved the cost of the loader on scraper tires alone!

The KOLMAN 303 Belt Loader combines the economy of conveyor belt loading with the speed of dozer charging. Extra heavy duty construction throughout delivers top performance under even the most severe loads. The feeder-trap and tunnel completely enclose the rear half of the loader, which permits it to be covered by a huge surge pile as material is fed to the belt.



Kolman Portable 303 Loader.
Also available as a skid-mounted unit.

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DENVER—Faris-Moritz Equipment Co.

IDAHO
BOISE, POCATELLO—Intermountain
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MONTANA
BUTTE, BILLINGS, GREAT FALLS and
MISSOULA—Hall-Perry Machinery
Co.

NEVADA
LAS VEGAS—Clark County Wholesale
Mercantile Co.

NEW MEXICO
ALBUQUERQUE—Construction Machin-
ery Co.

OREGON
PORTLAND—Balzer Machinery Co.

UTAH
SALT LAKE—Rasmussen Equipment &
Supply Co.

WASHINGTON
SEATTLE—Sahlberg Equip., Inc.
SPOKANE—Intermountain Equip. Co.

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CHEYENNE, CASPER, ROCK SPRINGS
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Rock going over end of loader above
estimated to weigh over a ton.



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IDAHO

Morrison-Knudsen Co., Inc. of Boise submitted a low bid of \$2,171,771 for construction of 4-lane roadway, drainage structures and related work in Kootenai County.

MONTANA

A & B Construction Co. of Helena submitted a low bid of \$1,242,448 for Schedules 1 and 2, earthwork and structures, north and east side laterals and drains, Helena Valley Unit, Helena-Great Falls Div., Missouri River Basin Project. Peter Kiewit Sons' Co., Billings, received a \$1,360,740 contract for 4.2 mi. of grading, surfacing and construction of 3 overpasses on the Dillon-Butte road in Silver Bow County. Fred H. Slate Co., Oregon Ltd., Portland, Ore., received a \$961,523 contract for 9.7 mi. of grading, surfacing and related work on the Philipsburg-Maxville road in Granite County. Carlson Lien and Central Contracting Co. of Rapid City, S. Dak., received a \$762,435 contract for 4.1 mi. of grading, surfacing, and structures on the Glendive-East road in Dawson County. A \$496,894 contract was received by Norgaard & Hilling of Williston, N. Dak. for 9.8 mi. of grading and surfacing west of Wolf Point-North Dakota Line road in Roosevelt County. United Construction Co., Bainville, received a \$178,469 contract for 8 mi. of grading and surfacing on the Circle Northwest road in McCone County. Northwestern Engineering Co., Rapid City, S. Dak., received a \$172,265 contract for 15.6 mi. of plant-mix and surfacing on the Plentwood-Canadian Line road in Sheridan County.

NEVADA

Dodge Construction Co., Inc., of Fallon received a \$493,155 contract for construction of 17 mi. of highway between Eagle and Picher Mine and northwest of Lovelock in Pershing County. A \$444,587 contract was received by Silver State Construction Co. of Fallon for construction of a portion of State Highway System on U. S. Highway 50, west of Eureka in Eureka County.

NEW MEXICO

Brown Construction Co., Albuquerque, submitted a low bid of \$1,359,483 for grading and surfacing on 3.3 mi. of Route 10, U. S.

70, in Dona Ana County. Wylie Bros. Contracting Co., Albuquerque, submitted a low bid of \$1,032,601 for interchange structure on Interstate Route 25 in Bernalillo County. A low bid of \$888,239 was submitted by Adams Construction Co. of Santa Fe for grading, surfacing and related work on 9.3 mi. on the Lovington-Hobbs highway in Lea County. A low bid of \$349,960 was submitted by Haake Construction Co., Santa Fe, for 6.6 mi. of grading and surfacing on Eagle Nest-Red River road in Colfax County. Harry Trotz Construction Co. of Lovington submitted a low bid of \$136,184 for sealing in the vicinity of Clayton and Nara Visa, Union and Quay counties. Imperial Paving Co. of Oklahoma City, Okla., submitted two low bids for work in McKinley and Valencia counties. A low bid of \$232,194 for 7.9 mi. of grading, surfacing and related work near San Mateo in McKinley and Valencia counties and \$134,532 for 4.2 mi. of grading and surfacing near Crownpoint in McKinley County. D. D. Skousen & Son of Albuquerque submitted a low bid of \$296,638 for 10 mi. of grading and surfacing on N. M. 17, Apache Indian Reservation Line East in Rio Arriba County.

OREGON

Peter Kiewit Sons' Co., Medford, submitted a low bid of \$716,294 for 4.5 mi. of grading and surfacing on the Seven Oaks-Table Rock road section of the Pacific Highway near Central Point in Jackson County. Rogers Construction Co., Portland, submitted two low bids for road work in Malheur and Wasco counties: \$577,901 for grading and surfacing on 3.7 mi. on the Ontario-Idaho Line section of the Old Oregon Trail Highway near Ontario, in Malheur County, and \$548,037 for 5.5 mi. of grading and paving on the Rowena-Chenoweth Creek section of the Columbia River Highway, east of Mosier in Wasco County. Vernie Jarl, Gresham, submitted a low bid of \$574,469 for paving The Dalles-Eight mile Creek section on The Dalles California highway in Wasco County. A low bid of \$533,333 was submitted by Pacific Concrete and Otis P. Jordan, Jr. of Portland, for construction of 5 grade separation structures on the Ontario-Idaho Line section of the Old Oregon Trail in Malheur County. Earl L. McNutt Co., Eugene, submitted a low bid of \$477,817 for paving and 4 structures on the West Unit, Sius

NEW Hydra-Slide Positioning on the DAVIS 220 BACKHOE



GETS READY TO FLUSH DIG IN LESS THAN 5 MINUTES

To slide the Davis 220 into any one of five digging positions, you simply loosen four cap screws, then move the mast assembly on the slide rail by actuating the boom cylinder. Seat moves so you're directly in line with your work.

Keeps You in Line All the Time... WITH YOUR WORK

The Davis Backhoe—complimented by being copied by competition, and the first machine ever to dig flush, has many new features that give you more profit-making advantages than with any other backhoe.

The new Davis 220 now has "Hydra-Slide" that lets you move the entire digging assembly to any one of five positions. The operator's seat moves right with it, too, so you sit directly in line with your work—instead of being offset from the trench. Since the seat revolves with the boom, you're always facing the bucket instead of "neck-stretching" to see what you're doing.

With 14,000 pounds breakaway, 2,150 psi, and larger bucket cylinder shaft, this new Davis 220 remains the fastest, most powerful backhoe on the market. Write today for name of dealer nearest you.

Fits Ford, International, Oliver, and Allis-Chalmers tractors when equipped with a Model 101 or 102 Davis Loader.



NEW ECONOMY DAVIS MODEL "99" LOADER

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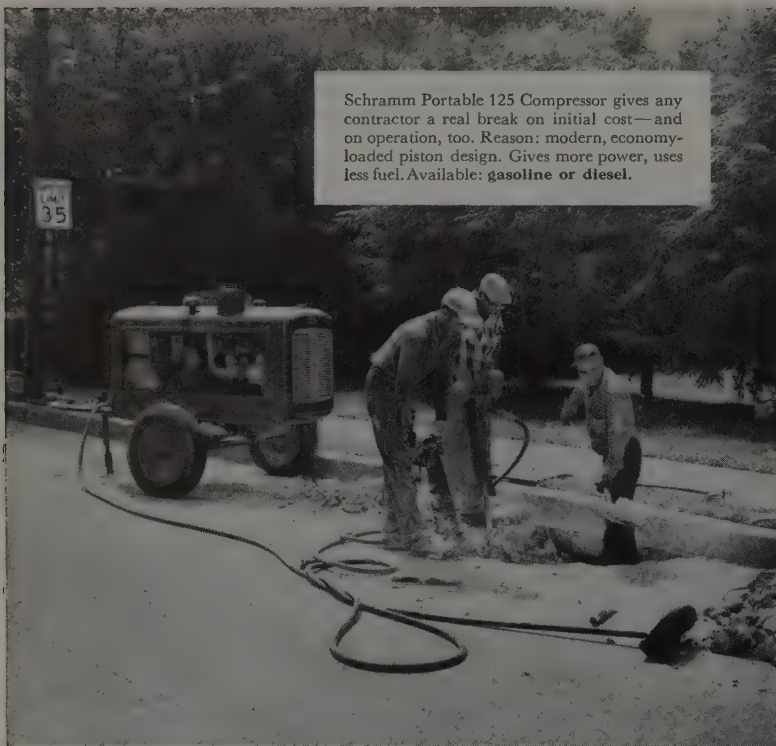
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Schramm Portable 125 Compressor gives any contractor a real break on initial cost—and on operation, too. Reason: modern, economy-loaded piston design. Gives more power, uses less fuel. Available: gasoline or diesel.

CONTRACTORS WHO WANT TO CUT OPERATING COSTS: Save up to \$1700 on Schramm 125 Compressors

Why pay more than necessary for a 125 cfm air compressor? Schramm gives you the lowest initial cost of any compressor manufacturer—plus additional cost savings in operation and repair. However, this lower cost is *not* from price slashing or quality cutting shortcuts, but is the result of lower manufacturing costs inherent in the production of piston-type compressors. It's a fact—you get superior quality at lower cost from the simplified design which can be manufactured more economically.

You also get increased savings with . . .

Lower fuel consumption Schramm Model 125 uses from 15% to 50% less fuel than competitive air compressors. Yet it delivers more power—a full 125 cfm of air, not just a fraction of it.

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Don't spend one cent extra for any size compressor until you can investigate *all* the facts. See your local Schramm Dealer, or write today for your copy of Bulletin SPB-58.

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Schramm Portable 125 powers two pneumatic tools with full 125 cfm of air . . . produces full rated power—increases workers' efficiency.



Consider the money saved when you drive a compressor instead of pushing it. It takes an average of 15 minutes and \$2 worth of manpower to push compressor ten feet; less than five minutes and 16¢ to drive Pneumatractor.

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law River-Walton section of the Richardson-Eugene highway in Lane County. C. M. Corkum Co., Inc., of Portland submitted 2 low bids for roadwork in Multnomah, Linn and Lane counties: \$396,927 for grading, paving and Harbor Drive structure on Harbor Drive-Washington County Line section of the Pacific Highway in Multnomah County; and \$274,455 for constructing 7 drainage structures and related work on the Twin Buttes-McKenzie River section, Pacific Highway in Linn and Lane counties. J. C. Compton of McMinnville submitted a low bid of \$261,405 for stone base and oiling, Halfway Junction-Copperfield section on the Baker-Homestead highway in Baker County. Arthur Simonsen & Co., Baker, submitted a low bid of \$182,163 for grading, oiling and rock production on sections of the Sumpter Valley and Baker-Unity highways near city of Baker in Baker County. A low bid of \$181,923 was submitted by Q. L. Rufener, Inc. of Portland for grading and oiling on 3.6 mi. of the Deep Canyon-Deschutes River section of the McKenzie Highway, east of Sisters, Deschutes County.

UTAH

Morrison-Knudsen Co., Inc. of Boise submitted a low bid of \$1,659,428 for construction of Stansaker Dam, Vernal Unit. A low bid of \$996,000 was submitted by Johnson Construction Co., Salt Lake City, for construction of dining hall and 2 dormitories at Hill Air Force Base. Vernal Sand & Gravel Co. and L. C. Stevenson of Vernal submitted a low bid of \$489,717 for 6.4 mi. of grading, surfacing and related work north of Vernal in Uintah County. General Contracting Corp. of Salt Lake City submitted a low bid of \$434,052 for construction of 2 bridges in city of Bountiful, Davis County.

WASHINGTON

Northwest Construction Co., Seattle, received three contracts for roadwork in King, Clark and Snohomish counties: \$628,006 for grading and surfacing on 2.6 mi., Factoria to Northeast 8th Street, in city of Bellevue, King County; \$532,250 for 1.1 mi. of grading and surfacing, Salmon Creek to PSH in Clark County, and \$202,635 for 3.3 mi. of grading and surfacing near Hartford in Snohomish County. Triangle Construction Co. and George L. Thompson, Kennewick

(joint venture) submitted a low bid of \$589,262 for earthwork, lining and structures, Block 201, Wahluke Branch Canal Laterals, Columbia Basin Project. **Strong & MacDonald, Inc.**, Tacoma, won a \$626,068 contract for constructing 3.2 mi. of roadway, east of Lake Crescent in Clallam County. A \$557,070 contract was received by **John E. Alexander, Inc.**, Seattle, for constructing 3 bridges north of Yakima on State Highway 3 in Yakima County. The **Harrison Bros. Co.**, Tacoma, received a \$233,854 contract for widening and repaving 4.4 mi., south of Puyallup to Graham in Pierce County. **Ostruske-Murphy, Inc.** of Tacoma received a \$186,986 contract for constructing twin concrete bridges for the Tacoma-Seattle Freeway in King County.

WYOMING

Blount Brothers Construction Co. of Montgomery, Ala. submitted a low bid of \$5,531,076 for all 4 schedules, construction of launch facilities and utilities, Squadron II, F. E. Warren Air Force Base, Cheyenne. **Forgey Bros. Co.**, Casper, received a \$823,929 contract for grading, draining, 5 culvert installations, and related work on 2.7 mi. of 4-lane divided highway west of Cole Divide in Crook County. A \$464,202 contract was received by **Wilbur Christensen Co.**, Rapid City, S. Dak. for grading, surfacing and 4 plate culvert installations and related work on 5 mi. of highway southwest of Gillette-West in Campbell County. **Rognstad-Olsen Construction Co.** of Casper received a \$216,214 contract for constructing 2 bridges, 2 interchange structures, 1 machinery pass structure and related work on 5 mi. on the Buffalo-Gillette road southwest of Gillette West in Campbell County. **Platte Valley Construction Co.**, Grand Island, Neb. received a \$225,138 contract for grading, surfacing and miscellaneous work on 6.5 mi. of the Centennial-Albany road in Albany County. A \$179,726 contract was received by **N. V. Lamb Construction Co.**, Lusk, for 4.7 mi. of grading, draining and surfacing on the Manville-South road in Niobrara County. **Knisely-Moore Co.**, Douglas, received a \$163,948 contract for 1 separation structure and approaches on the Wheatland-Glendo road in Platte County. **C. J. Abbott, Contractor**, of Laramie received a \$147,658 contract for grading, draining and surfacing on 4.1 mi. of the Horse Creek-Farthing road in Laramie County.



the Greatest Name in Buckets All Over the World

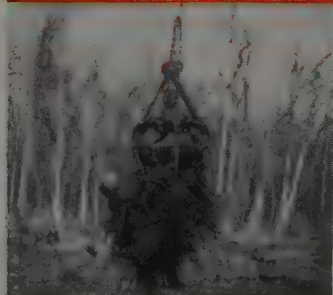
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OWEN MATERIAL HANDLING BUCKETS

OWEN'S new center line reeving principle, now incorporated in a completely redesigned line of material handling buckets, is one factor that increases cable life of these buckets up to 75%. A full line now available from 1/4 cu. yd. up to 10 cubic yards.



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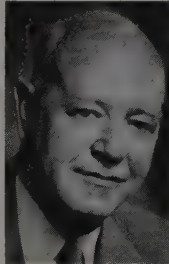
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ENGINEERS and CONTRACTORS

Assistant State Highway Engineer **B. W. Booker**, who has been responsible for state highway matters in nine San Francisco Bay area counties, retired May 1. He is succeeded by **J. P. Sinclair**, who has been district engineer under Booker in District IV, San Francisco, since Booker was named assistant state highway engineer in 1952.



Booker



Sinclair

Sinclair joined the California Division of Highways following receipt of his civil engineering degree, and except for a short time with the Metropolitan Water District of Los Angeles and service in the Navy during World War II his entire engineering career has been with the highway division.

* * *

James J. Campbell of Portland, Ore., who has been serving as port engineer with the International Cooperation Administration, is returning home from Vietnam after two and a half years in Saigon. Campbell joined the U. S. Corps of Engineers in 1925, assigned to the Portland District. He is being replaced in Saigon by another Portland dredging engineer, **Otto B. Coliman**, who has been assistant superintendent of the General Construction Co. of Portland.

* * *

Clarence C. Davis, former resident engineer at Ice Harbor Lock and Dam project on the Snake River, will replace **Oliver A. Lewis** as Chief of the Construction Division of the Corps of Engineers, Walla Walla, Wash. Announcement of Lewis' retirement was recorded in these pages last month.

Davis is a long-time staff member of the Army Engineers in both civil and military posts. He joined the Corps in 1927. When construction of Fort Peck Dam was under-



*Clarence
C. Davis*

way in Montana he served as assistant superintendent of construction. Two assignments in the Portland District followed overseas service, one before and one after the war. First, he was resident engineer in charge of levee construction and flood control, and later resident for air base construction in Boise and Pocatello, Idaho. Later, during 1950 and 1951, he served as resident on Detroit and Lookout Point dams in Oregon. He has been resident engineer at Ice Harbor since September, 1955.

* * *

George Boulter has joined the Highway Department of Montana as safety engineer, coming to the department with many years of experience in the safety engineering field in the West. Also announced by the Highway Commission is the transfer of **Paul Reynolds**, right-of-way administrator, to the legal staff. **Tom Johns** will be acting administrator in his place.

* * *

Col. Howard A. Morris will become district engineer for the Army Corps of Engineers at Sacramento, Calif., in July when **Col. Albert F. McCollam** leaves for an assignment in Europe. Colonel Morris is coming West from Washington, D. C., where he has been attending the Industrial College of the Armed Forces.

Recently Colonel McCollam was honored by the Engineering Council of the Sacramento Valley when **James J. Doody**, chairman, pre-



No. 955 excavates part of a total of 19,000 yd., preparing for base on area 20 ft. wide, 12-13 in. deep. Cuts are made by Cat No. 12 Motor Grader and windrowed. Job is part of a \$1,828,366 project by Gulf Bitulithic Co. on U. S. 75, to be part of the Interstate Highway System.



ays Operator F. H. Leggett: "I can move over 100 cu. yd. a day more with the side dump than with other loaders. It doesn't spill dirt because you don't have to jockey for position. A Traxcavator is easy to operate and I'm less tired at night. It's the best on the market."



Weather bad ... No. 955 terrific ... job on schedule !

Bad weather cut work days during the first six months to 20 per cent, but the highway project stayed on schedule. Reason: a Caterpillar No. 955 Traxcavator with Side Dump Bucket.

Gulf Bitulithic Co., Houston, Texas, first tried a drag line on a 2½-mile widening job on U.S. 75 at Conroe, Texas. Production was poor in the shallow cut. Switching to a No. 955, five-yd. trucks were loaded in an average time of three minutes; four buckets to the truck.

"We increased production 25 per cent," says Superintendent Thomas "Red" Brown. "I like that Side Dump Bucket. You can't beat it!"

In-line loading of trucks with the Side Dump Bucket paid off in less traffic congestion on the busy highway, and it also avoided tearing up the subgrade with twisting and turning.

Side Dump Buckets are available on all three Traxcavators: No. 977 (2¼ cu. yd.), No. 955 (1½ cu. yd.) and No. 933 (1¼ cu. yd.). Other buckets, teeth, 'dozers and forks help make a Traxcavator the most versatile excavator-loader.

Ask your Caterpillar Dealer to demonstrate on *your* job how a Traxcavator can make money for you. He stands behind every machine he sells with round-the-clock service and parts you can trust.

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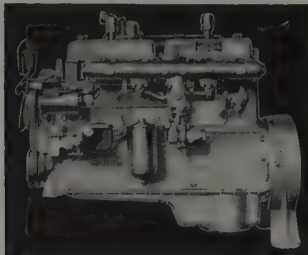
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MARION TRUCK-CRANE

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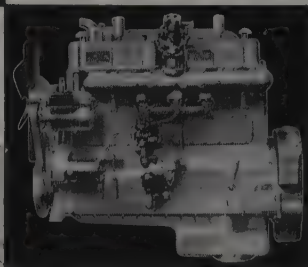
WAUKESHA

ENGINES



Powering the Carrier—145-GKB
Waukesha Gasoline, six cylinders,
5¼-in. x 6-in., 779 cu. in. displ.

Powering Crane (boom)—140-GK
Waukesha Gasoline, six cylinders,
4½-in. x 5½-in., 525 cu. in. displ.



Leonard Bros. Transfer of Miami—one of Florida's largest truck-crane users—has worked a wide variety of jobs quickly and profitably with their Marion Type 43-M mobile truck-crane. The upper frame has a Waukesha 140-GK Engine and Twin Disc torque converter; the Henderson Carrier has a 145-GKB Waukesha Engine. The truck crane is shown unloading a 2700 hp Diesel engine from railway flat cars to carry-all truck, later unloaded at power plant in Sebring, Florida. The huge engine with its two components, weighing 34½ tons and 31½ tons, took two separate lifts. Seven parts of line were used with the 43-M's basic 30 ft. boom working at a close radius. Get Engine Bulletins 1548 and 1553.

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN

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sented him with a citation for "exceptional service to the engineering profession and to the communities of the Sacramento Engineer District." The Council represents seventeen professional and technical societies with more than 2,200 engineer members throughout Northern California.

* * *

Appointment of four new field engineers to the California staff of the Portland Cement Association is announced by **Warren G. Burres**, district engineer in charge of the Los Angeles office. The new engineers are **John A. Bayer**, **H. Alan Johnson**, **Vernon E. Malley**, and **Robert E. Price**. Johnson will be based in San Jose and will work



Bayer



Johnson



Malley



Price

out of the new PCA San Francisco office. Price will reside in Bakersfield and cover Kern, Santa Barbara, and San Luis Obispo counties. Both Bayer and Malley are field engineers in the metropolitan Los Angeles area.

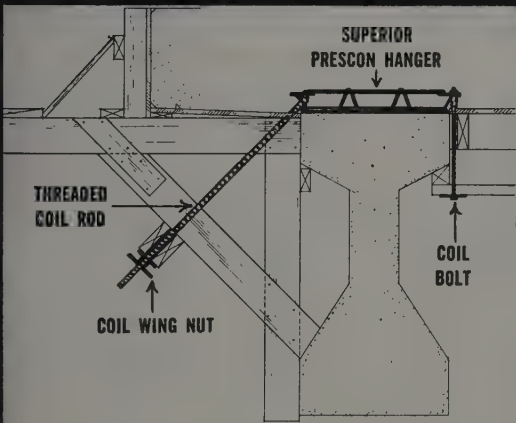
* * *

Stanley M. Bala, formerly project design engineer with International Engineering Co., and **Jesper C. Strandgaard**, formerly senior civil engineer with Sverdrup & Parcel Engineering Co., Inc., and chief engineer with Frank D. McEnteer Consulting Engineers, announce the formation of a partnership for the general practice of structural and civil engineering. The firm will operate under the name of **Bala & Strandgaard, Civil Engineers**, with offices in the Herzog Rake Bldg., San Rafael, Calif.

HANG DECK FORMS FROM PRECAST AND PRESTRESSED BEAMS



↑ **PRESCON HANGERS** with deck forms in position. Safe working loads up to 10,000 lbs.



Extended side or overhang can be suspended as shown. SUPERIOR Threaded Coil Rod of any required length is passed thru 45° hole in Hanger and adjustment is made with Coil Wing Nut. The use of Prescon Hangers eliminates hazardous, makeshift methods.

↓ **WITH SUPERIOR PRESCON HANGERS** the necessary adjustment to bring the deck form up to grade is made conveniently from the TOP.



with **SUPERIOR** **PRESCON HANGERS**

- ✓ **Adjusts From TOP of deck**
- ✓ **Broad Bearing Area**
- ✓ **Haunch Forming as required**
- ✓ **Vertical and 45° Suspension**
- ✓ **Safe Loads—6,000 and 10,000 lbs.**
- ✓ **Fast Erection—Easy Stripping**

Specially developed by SUPERIOR for hanging deck forms from precast and prestressed concrete girders, the Prescon Hanger provides hanging points cantilevered away from the girder sides. Provision is also made for haunch forming above the girder. The Hanger is designed with broad bearing area for maximum stability and to prevent any crushing of the concrete girder.

With the Prescon Hanger, form height adjustment is conveniently made from the TOP of the deck. The forms are hung from Coil Bolts* threaded into heavy, square coil nuts bearing on the flat top plate of the Prescon Hanger. Extended side or overhang forming is accomplished with the 45° coil rod and coil wing nut, as shown in diagram at left.

**Coil Bolts and Flat Washers are returnable for credit.*

SAFE LOADS

TWO CAPACITIES ARE AVAILABLE: 6M (6,000 lb. safe load)—10M (10,000 lb. safe load). These are safe working loads on the entire hanger. Either size can be furnished for any flange width.

FORM ENGINEERING SERVICE—SUPERIOR has competent engineers constantly engaged in the preparation of form layouts, estimates and quotations. This service is furnished without charge.

SUPERIOR Hanger Frames and Beams Saddles are also available for hanging forms from steel beams and girders.

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... for more details, circle No. 75 on Reader Service Postcard



TWO PROMINENT planning and engineering firms, Leigh Fisher and Associates of South Bend, Ind., a leading airport planner, and the Western firm of Wilsey and Ham, engineers and planners, have become permanently affiliated. With their combined talents and resources they will design airport facilities for the jet-age. Pictured above are **Lee E. Ham**, president of Wilsey and Ham, and **Leigh Fisher**, head of the new affiliate which will move its offices to San Francisco.

Edward J. O'Connell has been promoted to the position of executive assistant to **Charles F. Skinner**, vice president and general manager of Western-Knapp Engineering Co., San Francisco. He will serve as liaison between planning,

administrative, and operating segments of WKE's world-wide design, engineering, and construction organization.

* * *

T. M. Leps, chief civil engineer for Southern California Edison Co., for the past eight years, has been appointed manager of organization and procedures for the electric utility company. **R. W. Dennis** has been named chief civil engineer succeeding Leps, and **B. R. Laverty** has been designated assistant chief civil engineer.

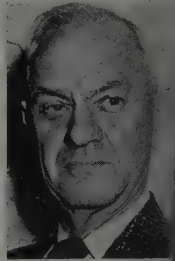
* * *

Ross Slye, a resident engineer with the Utah State Road Commission, represents the State on a 6.4-mi. stretch on Road 44 near Vernal, a 225-day contract in the hands of Vernal Sand & Gravel Co. and L. C. Stevenson. **Linden Fiack** is resident on a 100-day job under way by Allred-Mitchell Construction Co., on U.S. 6 and 50 near the Carbon-Emery county line. **Sherman Burton** has finished on the J. L. Christenson contract near Kaysville and is now on underpass construction on Interstate 15, a General Contracting Corp. job at Bountiful. Likewise, **Edward Kennelly** has moved to Paul Havens

Co.'s demolition contract on freeway in Salt Lake City.

* * *

Edward W. Ziegler, assistant city engineer and ex-officio assistant superintendent of streets of the City of Oakland, is retiring June 1 with 35 years of City service. Joining the Department as an engineering draftsman in 1924, Ziegler rose through all classifications until he



Edward W.
Ziegler

became in 1951 the assistant city engineer. A registered civil engineer in California, he is a past director of the East Bay Engineers Club, a member of the American Public Works Association, a charter member of the local American Federation of Technical Engineers, and a member of several civic organizations.



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Pacific Telephone



**YELLOW
PAGES**

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WESTERN CONSTRUCTION—June 1952

SUPERVISING the jobs

Wil Staring is project manager, and **Bob Brock** is project superintendent for A. Teichert & Son, Inc., successful bidder at \$4,787,742 on a highway job in Placer County, Calif. Work consists of grading and surfacing on 7.8 mi., with ramps, connections, frontage roads and three bridges east of Baxter. Night superintendent is **Warren Shields**. **Les Abshear** is master mechanic. Resident engineer for the State is **Edwin Whitnack**. Planned for completion November next year, construction started in April.

* * *

Cliff Christenson, crushing superintendent, **Niel Baker**, paving superintendent, and **B. L. Gilbert**, equipment superintendent, are Wyoming Paving Co.'s chief personnel on a \$153,459 contract now finishing in Rosebud County, Mont. Work consisted of 9 mi. of surfacing, seal coating, and related work on the Lame Deer-Colstrip road.

* * *

W. W. Wellman, long-time superintendent for Pacific Bridge Co., is in charge of concrete placing now under way for the arch railroad bridge over the Feather River 20 miles north of Oroville, Calif. Contract for the concrete arch structure was awarded to Pacific Bridge in February last year on a low bid of \$1,538,660. The project was reviewed in *Western Construction* in April 1959, starting on page 29.

* * *

Raymond L. Mason, general superintendent for R. R. Hensler, Inc., has charge of grading, surfacing, construction of one bridge and related work in relocation of 3.7 mi. of highway north of Ittners in Kern County, Calif. Foreman on the \$677,448 project, which has been under way since April, is **Woodrow Woods**. Job is set for December finish.

* * *

W. G. "Red" Rogers is supervising a \$216,361 award to Lewis Hopkins Co. from the Bureau of Reclamation for construction of pumping plant and discharge lines, etc., in the Columbia Basin Project,

Washington. Job started in April, scheduled for November completion.

* * *

John Vineyard, superintendent, **Dick Shuman**, clearing foreman, **M. Cernich**, foreman, and **Leon Judy**, master mechanic, are key men working for Northwest Construction Co. on a clearing and grading, 3.4-mile road job in Snohomish County, Wash. Costing \$202,635, the work started in April and will be finished in October.

* * *

Bill Rathburn is superintending job of grading and construction of bridges on a \$314,660 award to Husman Brothers, Inc. Located on the Buffalo-Gillette road in Johnson County, Wyo., the job covers interchange structures, bridges, separations, and related work on 4.7 mi. of 4-lane divided highway. A 7-month job, work started in early May.

* * *

Earl H. Davis and **Howard U. Motz**, superintendent and engineer respectively, are head men for Corn Construction, Inc., on this contractor's recent award for 1.4 mi. of grading, structures, and surfacing on State Highway 4 in Grand Junction, Colo. Grade foreman on the \$242,773 job, which has been going since March, is **Harold McConnell**; grade foreman, **George Lee**, pipeline foreman, and **Wilber Graham**, asphalt superintendent.

* * *

Fred Hartson is supervising the work of grading, draining, gravel surfacing and oil on 14.6 mi. of roads in Flathead County, Mont., for **Otto, William** and **James Baltrusch**, all partners in the firm of Baltrusch Construction Co. **Robert Erickson** is engineer, **Carl Baltrusch**, gravel foreman, and **Clyde Richardson**, master mechanic. Baltrusch received the contract on a low bid of \$666,851 and started on the job May 11.

Progress is also reported by Baltrusch on their subcontract with F & S Contracting Co. on the Shelby Interstate road in Montana. Project involves moving 1,284,151

yd. of dirt. Major equipment being used consists of 7 DW21s, 2 DW20s with No. 482 scrapers, 3 D8s with No. 80 scrapers, 5 push Cats comprised of 3 D9s, 1 D8, and 1 TD24, and 4 No. 12 motor patrols. Dirt moving started on March 30 and at the rate it has been going should be completed this month.

* * *

Ralph H. Raburn has been appointed project manager, and **Vernon J. Tregaskis**, office manager, by Utah Construction Co., recent recipient of a \$3,000,000 contract for construction of 9-level building with basement and parking garage in Seattle, Wash. Construction started the first of April and will probably be finished by the end of the year.

* * *

Harold Johnson, superintendent, aided by **Tom Bingham**, carpenter foreman, heads the crew of S. S. Mullen, Inc., on bridge construction in King County, Wash. The \$365,351 project got under way in March and is earmarked for September close.

* * *

Roy F. Johnson, project manager, **Thomas W. Barger**, project engineer, and **D. J. Thompson**, project supervisor, head the list of personnel working for Cherf Brothers & Sandkay Contractors, successful bidder for grading, surfacing and structures in and near Cour d'Alene in Kootenai County, Idaho. This is the largest highway contract ever awarded by the State of Idaho and covers 4-laning of 5.4 mi. of Federal highway, building 4 prestressed bridges, and other structures. Office work is handled by **Richard Downs**. Scheduled to be completed in 1962, project got under way in April.

* * *

Arthur B. Allen is project manager, and **M. Blair**, superintendent, on bridge construction on the Duncan-Alpine highway, crossing the San Francisco River in the city of Clifton, Ariz. A \$176,371 contract in the hands of Reeder Construction Co. and **Charles L. Jenkins**, structure is 5-span, 6-steel-girder bridge, reinforced concrete deck type, 365 ft. 8 in. x 42 ft., and replaces an old bridge erected in 1917. Contractor started work in April and expects to have the job finished by September.

* * *

D. W. Moen, general superintendent, and **D. Huber**, project engineer, two key men for the contract-

(Continued on page 190)

BIG PERFORMANCE

Hauling tremendous 230-ton transformers over soft roadways demands equipment capable of tremendous performance. Such performance is found in this new super Mack tractor recently purchased by Gerosa Haulage and Warehouse Corporation, New York.

Gerosa, noted for taking on the biggest, toughest and most unusual hauling jobs, for years has successfully teamed up with Macks . . . and found them equal to any job tackled. Mack transmissions, famous for built-in quality and stamina, stand up to the most demanding jobs. And for unsurpassed pulling power under the most adverse conditions there is nothing comparable to the Mack-built Balanced Bogie with exclusive Power Divider.

Big dramatic job—every-day bread-and-butter job . . . whenever it must be done efficiently, dependably, with the least downtime, there's a Mack that will best fill the bill.

See your Mack branch or distributor for all the facts on the most complete line of heavy-duty trucks available today. Mack Trucks, Inc., Los Angeles, Denver, San Francisco, Seattle, Portland, Salt Lake City, Albuquerque.

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ON THE *BIG* JOBS

230 tons of transformer for Consolidated Edison's new Staten Island, New York, power plant. A Mack LRVSW is handling the job.



CONSTRUCTION BRIEFS



Giant crane in Western Debut

THE FIRST Beatty-Pecco Construction crane, seventeen stories high, has made its debut at the site of the new Pacific Fidelity Life Insurance Company office building at Wilshire Blvd. and Westmoreland in Los Angeles.

Introduced in Los Angeles by Beatty Scaffold of Southern California, Inc., the giant crane put on a performance for the press and TV.

The crane's first act was to stretch itself from a horizontal position to its full height in less than ten minutes. At this height it can lift a $4\frac{1}{2}$ -ton load and place it 17 stories in the air in one minute. At lower height, up to about 10 stories, it can lift 9 tons.

The jib of the crane was then lowered to demonstrate that the giant can reach out about 100 ft. in any direction, pick up a two-ton

load, lift it high enough to clear a 10-story building, and swing it into place 100 ft. in the opposite direction. This feat was accomplished in less than one minute.

Spectators were reminded that this 200-foot carry represents the crane's reach when it is stationary, that it can also travel along its track while it is lifting and turning. Just enough track is laid to give the crane a base position, then it goes to work laying its own ties and rails to run a track completely around the building site if need be.

There are just two levers for the driver to operate, and all of the crane's actions—lifting or lowering, turning, luffing and traveling—can be carried out simultaneously or independently at a choice of four different speeds.

The operator can work from any of the three driving posts—at the

base of the tower, midway, or high up directly under the jib point—whichever position gives him the best view of the work at hand. Or, he can operate the crane from a position anywhere on or near the job site by means of a remote control unit small enough to carry under his arm.

According to Beatty Company spokesmen, the giant crane, because of its tremendous reach and maneuverability, can cut materials handling costs by 30% to 40% on any building job requiring the use of more than one standard crane.

The crane is being used by the McNeil Construction Company and Vinnell Steel at this Westmoreland site and is expected to take the place of two standard cranes and at least one materials handling tower, and to cut construction time on the job by more than twenty days.

The Beatty-Pecco crane was developed by one of Germany's oldest and largest steel companies in Peine, West Germany, and is now being made available by Beatty distributors in the Western states in seven sizes, the largest reaching 24 stories high.

The crane travels from site to site without dismantling. All but the largest crane can be towed by a heavy truck with rear cab steering such as is used by hook and ladder units. The largest size has its own prime mover. Removal of the transport axle is accomplished by the use of the luffing winch which raises the base of the crane off the axle. After the installation of the ballast, the same winch is used to erect the crane into working position. In $1\frac{1}{2}$ hr. after arrival on the building site the crane can be ready for operation.

Specs on Model 56/72

Lifting capacity—2 tons up to 9 tons.

Lifting speed—230 ft. per min.

Travel speed—154 ft. per min.

Slewing—1 complete revolution per min.

Luffing—raising or lowering jib from 15 deg. to 75 deg. in 40 seconds.

Height of pulley—196 ft.

Jib radius—98'3".

Wheel base—14'5".

Safety features

The crane is automatically switched off when: (1) the load on the hook is too great; (2) the hook is wound too high; (3) the jib is



**45 TON
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The Earthking is
made in models
with 30 to 45
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Cook Bros. NEW
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**Power Unit &
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Power Units for use with
Bottom Dump Trains have
4-wheel drive that supplies
full traction at dumping site.

The new "Earthking" is
the first power and trailer units of its
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especially for heavy construction service.

**Sets New Standards
For Hauling Larger Payloads
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Insure highway "Right-of-Ways" with **REALOCK FENCE**

Symbol for quality steel products, the Image of CF&I provides Realock Chain Link Fence for positive highway "Right-of-Ways."

Realock's top grade steel fabric is galvanized *after* weaving to make it corrosion-resistant, thus assuring a maintenance-free job. Sturdy posts are set in concrete, so you know that this fence won't sag. What's more, the neat, trim chain-link construction makes Realock pleasing to the eye.

You can select a Realock Fence in light or heavy construction . . . with or without barbed wire tops . . . in heights up to 13' overall.

For a free estimate, call the nearest CF&I representative. You'll find him listed in your classified telephone directory.

THE COLORADO FUEL AND IRON CORPORATION—Denver and Oakland
WICKWIRE SPENCER STEEL DIVISION—Buffalo, New York



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BRANCHES IN ALL KEY CITIES

6929

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luffed too high; (4) the jib is luffed too low; (5) the crane approaches the end of the track. The patented and fully automatic overload safety device limits precisely the permissible load in every position of the jib. It is designed to take into account the increased wind moments which come into play when the jib is in its higher position, and automatically reduces the load moment as the jib is raised, in order to compensate for this. The overload switch operates in the simplest way: The switch piston is mechanically pushed in by the jib. The overload switch also prevents the lifting on an excess load from the ground by the use of the luffing winch.

Mechanism

The 56/72 model of Beatty-Pecco crane is driven by five electric motors, the highest horsepower (60 hp.) being used for the hoisting action. In place of the usual dustproof guarding of the main hoisting gears, utilizing grease lubrication and bronze shaft bearings, the Beatty-Pecco cranes utilize oil bath gear trains throughout. All gears are hardened and ground and the shafts run in ball bearings. The highly efficient gear boxes give the user noiseless running and longer life, coupled with greatly reduced wear and repairs.

Undercarriage and turntable are fabricated from heavy rolled steel sections. The revolving connection is in the form of a hardened and ground precision-made ball thrust, bolted with high tensile bolts to the machined face of the substructure.

In contrast to many other makes of tower cranes, luffing is not carried out by releasing the load and overhauling with the hoist rope. The motors drive direct on to the gear flanges. The heavy double flanged brakes are mounted on motor shaft extensions, and are protected from rain and grease by detachable sheet metal hoods.

Rope drums of ample width allow for single layer winding.

Where sharp curves are to be negotiated special equipment can be acquired to enable the crane to take bends of down to 11-ft radius. All curve going Beatty-Pecco cranes have pairs of wheels mounted in bogies, two of which have a motor drive for both wheels. This arrangement means better distribution of weight on the track and an absolutely reliable traveling drive even in the sharpest track curves.

. . . Circle No. 17

Average footage on the Alberta Trunk Line pipe laid by Piggott was between 11,000 and 12,000 per day. Nearly 40,000 pounds of Airco Easyarc 10 were used, and 65,000 pounds of No. 93 Electrodes.

The contractors found that the uniformity of Airco electrodes reduced welder fatigue, which contributed to increased speed. All electrodes were purchased from Air Reduction Canada Limited.



“AIRCO ELECTRODES WERE IMPORTANT TEAM MEMBERS

when we cut 78 days from our contract schedule”

Piggott Construction Limited, Pipe Line Division, contracted to lay 144.5 miles of 24" pipe for the Alberta (Canada) Gas Trunk Line Company Ltd. On this job they switched to Airco Easyarc 10 and No. 93 Electrodes and finished 78 days ahead of schedule.

“On the front end and the firing line where X-Ray quality welds are

required, Airco Electrodes helped us immeasurably,” said H. C. Bauer, Vice President of Piggott. “Quality control and uniformity of Airco Electrodes reduced waste and saved welder fatigue. Those advantages had not been our experience in the past when using competitive electrodes.”

There's one Airco Electrode ex-

actly right for every welding job you have. For direct help in selection write for your copy of the new Airco Electrode Pocket Guide. It's free! Address your nearest Airco office. Ask for Catalog No. 1318. All Airco Electrodes are available through your Authorized Airco Dealer. You'll find him listed in the Yellow Pages.



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Air Reduction Pacific Company is a division of Air Reduction Company, Incorporated. Principal products of other divisions include: PURECO — carbon dioxide — gaseous, welding grade CO₂, liquid, solid (“DRY-ICE”) • OHIO — medical gases and hospital equipment • NATIONAL CARBIDE — pipeline acetylene and calcium carbide • AIRCO CHEMICAL — vinyl acetate monomer, vinyl stearate, methyl butynol, methyl pentynol, and other acetylenic chemicals • COLTON — polyvinyl-acetates, — alcohols, and other synthetic resins.

... for more details, circle No. 80 on Reader Service Postcard



World's largest ditcher

CUTTING ITS WAY through the black soil of the fertile Rio Grande Valley, a giant ditcher is setting new records in irrigation system construction. Manufactured by Gar Wood-Buckeye, the 55-ton ditcher digs trapazoidal irrigation canals in widths up to 22 feet.

Known as the Gar Wood-Buckeye 330, the trapazoidal ditcher will—over a five year period—dig irrigation canals to provide water for agriculturally-rich Cameron County. The entire program is financed by the Small Rehabilitation Projects Act.

When the desired compaction and grade is achieved, the Gar Wood-Buckeye ditcher takes over. Average speed of the ditcher is 7 ft. per min. Under full work load the ditcher will excavate up to 800 cu. yd. per hour.

A concrete boat, or slip-form, is attached to the ditcher by a cable, providing an interesting and effective method of excavating and lining simultaneously. M. T. Martin, district manager of the Cameron County Water Board, describes the technique as follows: "If the ditcher is running and concrete is being placed, the ditcher pulls the slip-form with the winch out of gear. If the ditcher isn't running, we use it as an anchor, and pull the slip-form up with the winch. Likewise, if the ditcher is running, and we want the slip form to stop, we simply put the winch in reverse and let the cable play out."

Concrete is brought to the job by

ready-mix trucks. When the slip-form is moved to another job site, a dragline lifts it out of the canal.

Laterals, providing water directly to the land, are dug by another Gar Wood-Buckeye ditcher a model 315.

The big ditcher is surprisingly versatile for a machine of its size. It can quickly be converted to a pipeline or deep sewer ditcher, digging straight ditch of mammoth proportions—up to 5½ ft. wide and 11 ft. deep. This version of the machine, in actual operation, has operated at speeds up to 35 fpm.

The ditcher can quickly be modified at the job-site to cut canals of varying widths and depths. Digging buckets on the main wheel and the rotary side cutters are changed as required by job specifications. The depth of cut is controlled by the digging wheel, which is hydraulically raised and lowered.

The ditcher can discharge spoil from either side of the machine, or from both sides at once. This is an important feature, as it allows spoil banks to be built to the required height. These banks will be compacted and later graded to form a maintenance and service road running the entire length of each main irrigation canal.

Equipped with an Allison torque-matic three-speed transmission and Allison torque converters, the big ditcher performs smoothly, even at full digging depths and widths. The ditcher is a semi-crawler machine, providing excellent grade control and traction.

... Circle No. 175

See These
BLAW-KNOX
Dealers



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HATTEN MACHINE COMPANY
Seattle, Washington
INLAND DIESEL & MAINTENANCE COMPANY
Spokane, Washington

WYOMING

STUDER TRACTOR & EQUIPMENT COMPANY
Casper, Wyoming



Blaw-Knox Road Widener lays aggregate for shoulders in conversion of U.S. Highway 31 to Interstate Highway 65 near Birmingham, Alabama. A. E. Burgess Company bought the Blaw-Knox machine especially for the 250,000-yard job.

We are laying over 2500 cubic yards per day with our Blaw-Knox Road Widener"

"This represents a 50% increase in production over any other system that we know of. Our current cost per-cubic-yard adds up to an approximate \$200 saving each day. And the machine requires only one man for its operation," says Sam Sheperd, project director, A. E. Burgess Company, Birmingham, Alabama.

"For example, the Blaw-Knox Widener charges and discharges simultaneously. This makes it possible for us to use 20-yard dump trucks, placing a 20-yard load in five minutes," Mr. Sheperd adds.

Burgess was able to achieve optimum operation

exactly one hour after the machine was delivered to the job. He said, "A Blaw-Knox engineer was on hand to instruct the operator and line up the equipment. And since that time, our Blaw-Knox distributor has been out several times to check the operation."

Specially engineered, rugged Blaw-Knox Wideners are delivering outstanding performance for contractors all over America. Equipped to lay aggregate, concrete, or bituminous materials, they can turn your next widening or shoulder-building project into a production line. See your Blaw-Knox distributor for details or write for a copy of Bulletin 2647.



BLAW-KNOX COMPANY

Construction Equipment • 300 Sixth Avenue, Pittsburgh 22, Pa.

... for more details, circle No. 81 on Reader Service Postcard

MASTER MECHANIC

Sealant tightens bulldozer tracks

KEEPING PAD BOLTS tight on the tracks of bulldozers is a construction job maintenance problem which the Construction Department of the Merritt-Chapman & Scott Corporation has solved by using Loctite sealant. Ira Davison, general maintenance superintendent, tried the new thread-locking sealant on the pads of heavy equipment. Because of the terrific impact loads experienced while working on rock and frozen earth, maintenance crews had to retighten the pad nuts and bolts every two or three weeks. This meant taking the equipment out of service for half a day while two men tightened each of the 344 nuts and bolts on the large tracks. Then Davison tried Loctite and after twelve weeks of operations, working 132 hr. per week, he found the bolts were still tight.

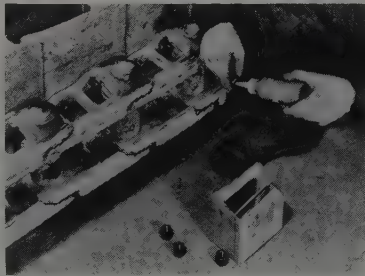
These special heat-treated pad bolts are $\frac{7}{8}$ -in. diameter, have a special high nut, and cost about \$300 per set. Loosening causes excessive wear on both the bolts and the track rails. Replacement rails cost from two to three thousand dollars. Merritt-Chapman & Scott uses Grade "C" Loctite which permits taking up on the nuts should stretching occur in the bolt.

The method of treating the parts with Loctite sealant is simple. The nuts and bolts are first soaked for a few minutes in a pail of degreasing solution (trichloroethylene preferred, gasoline will do). After they have dried, the bolts are inserted in their holes in the track which has been laid out flat. Then a man with a box of nuts and a plastic squeeze bottle of Loctite moves along beside the track first treating a nut by squeezing a drop or two of Loctite into the threads and then applying it to the bolt. The nut is just given a couple of turns to hold it on until tightened. After all the nuts are in place, the bolts are tightened with a power impact wrench. The Loctite sealant hardens in 3 to 4 hours at 70 deg. F (somewhat longer at lower temperatures) after which the nut is locked on the bolt.

(The above method describes treatment of new bolts and nuts

during track overhaul. Treatment of installed parts is possible provided bolt threads are clear enough to allow Loctite to penetrate.)

Success on the pad bolts has led to the use of Loctite on a variety of applications on several heavy construction vehicles. It is being used to retain engine bearings where wear has caused slippage. In this application Loctite acts as a



"liquid shim" and fills the clearance between the bearing and shaft or between bearing and housing. Loctite sealant is effectively used to lock in the studs on the differential carrier, the studs which hold the power take-off and on the track roll bolts. Loctite will lock track roller bushings in cases where wear has caused slippage.

Loctite is a thin liquid which hardens in a metal joint to form a tough seal. It comes fully prepared . . . no mixing and no heat are required. Catalytic action of the metal surfaces, aided by the absence of air, causes the sealant to harden into a tough heat and oil resistant bond. This tough plastic grips threaded fasteners so securely that no amount of vibration will shake them loose, yet they can be removed with ordinary tools. It comes in different strengths which apply any desired locking torque, ranging from a light drag suitable for adjustment screws to a locking force exceeding the torsional strength of large screws.

In addition to locking threaded fasteners, Loctite is used to mount bearings and bushings without press fits, to hold hardened sleeves to shafts, and to seal threaded and sleeve joints against fluids under high pressure.

Free sample and descriptive literature are available from the manufacturer, American Sealants Company, 103 Woodbine St., Hartford 6, Conn.

Loctite sealant is carried in stock by selected bearing distributors and industrial distributors throughout the country.

. . . Circle No. 176

EMSA chapter notes

NEW OFFICERS for the coming year have been elected at two chapters of the Equipment Maintenance Supervisors Association.

The Los Angeles Chapter has installed Sam Weatherby, Osborne Co., president; Bob Moodie, J. A. Thompson and Son, first vice-president; Ralph Currier, Shaw Sales, second vice-president; Dan Stoddard, Lincoln Engineering Co., treasurer; and Ira Shull, secretary. These men will be in office through March 1960.

The San Diego Chapter elected Fred Cody, Griffith Co., president; Allan Watson of H. G. Fenton Materials Co., first vice-president; Mel Chase, Western Metals, second vice-president; Ken Rhinehart, California Electric Co., secretary and William Stratton, Contractor Service Division, treasurer.

The San Francisco Bay Area Chapter has lost the services of its president, Ed Halm, Peterson Tractor, who is being transferred by his firm to its Redding, Calif. branch. Anyone interested in maintenance of equipment in the Redding area is invited to contact Ed Halm, P.O. Box 940, Redding, Calif., about a new chapter of EMSA which is being formed there. A meeting will be held soon by the Bay Area Chapter to elect a new president. The other officers are: Mel Walker, Peter Kiewit Sons' Co., first vice-president; Howard Gold, Buran Equipment, second vice-president; Bill Holloway, McGuire and Hester, treasurer and Bill Sorenson, Bassco Drayage, secretary.

No further information has been received about the chapter being organized in Portland, Oregon.

THREE BECOME FOUR— TO SUPPLY GLEN CANYON



Fresh strides forward...

Phoenix Cement Company joins American Cement Corporation as a separate division with construction of a new plant now underway at Clarkdale. Designed with more than sufficient capacity to supply 3,000,000 barrels of cement for Glen Canyon — Phoenix Cement is being geared to meet the future growth of Arizona. This dynamic expansion is backed by the capacity of other members of the American team who have served the Southwest for over 40 years.

PEERLESS CEMENT CO.
1155 Free Press Bldg.
Detroit, Michigan

RIVERSIDE CEMENT CO.
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Los Angeles, California

HERCULES CEMENT CO.
1530 Chestnut St.
Philadelphia, Pennsylvania

PHOENIX CEMENT CO.
3424 No. Central Ave.
Phoenix, Arizona

... for more details, circle No. 82 on Reader Service Postcard

NEW LITERATURE

To obtain free copies of literature described in this section circle the corresponding numbers on reply postcard.

Powder tool handbook

Uses of powder-actuated tools and fasteners in construction are covered in a special handbook for architects and engineers prepared by Ramset Fastening System, Olin Mathieson Chemical Corp. The 48-page loose leaf book discusses powder-actuated fastening in general and is not limited to the company's products. Book contains detailed line drawings of most common applications of powder driven fasteners. It also contains complete tables covering the working loads of fasteners under common conditions, shear values, tensile values, design limitations and physical properties. Data covers leading brands of powder driven fasteners.

... Circle No. 177

Additive brochure

Performance data on use of Pozzolith additive in concrete formulas is presented in a 6-page booklet, titled "Concrete Facts," by the Master Builders Co. Subjects covered in the folder include air entrainment, shrinkage, workability, bond strength, durability and other properties. Several charts and graphs are included.

... Circle No. 178

Testing machines

Ten new machines for testing concrete asphalt and soils are listed in an 8-page bulletin published by Soiltest, Inc. Apparatus described in the booklet includes tension-compression, moisture-humidity tester, sand equivalent kit, Levermatic unconfined compression, liquid limit, loading ram, universal mixer, kneading compactor and deformer.

... Circle No. 179

Steel bar benders

A line of hydraulic bending machines capable of handling a wide range of round and square steel bars is described in a 12-page catalog issued by Wallace Supplies Mfg. Co. The profusely illustrated booklet shows a number of step by step operations in bending, reinforcing and structural steel units. Capacities and specification data for the machines are listed as well as gauges, tables and other

accessories for the automatic bending machines.

... Circle No. 180

Concrete forms

Use of prefabricated modular concrete form panels and accessories is discussed in a 4-page folder prepared by Simplex Forms, Inc. Also described are the three sizes of concrete panels, patented tie wires and hardware accessories. Stacking methods and application techniques are discussed.

... Circle No. 181

Steel school buildings

Examples of steel school building construction are listed in a handsome 16-page booklet recently issued by United States Steel Corp. Booklet stresses design and color use in steel construction and shows a number of building details as well as views of several modern school buildings under construction or completed.

... Circle No. 182

Wire rope data

Sizes, weights and performance data of the Brown Strand line of wire rope are listed in an attractive 14-page catalog issued by the Wire Rope Corp. of America. Booklet is bound with plastic ring binding and contains illustrations and specifications tables for each type of wire rope produced by the company.

... Circle No. 183

Tire catalog

A 62-page catalog covering tires, wheels and axles for virtually every type of trucks, trailers and construction equipment has been issued by Harno Tire & Rubber Corp. Illustrated catalog shows specifications and prices of flotation tires for types of off-the-road vehicles.

... Circle No. 184

Construction Handbook

The 1959 edition of the "Horn Construction Data Handbook" is now available for distribution. The current edition of the pocket-size book contains 160 pages including more than 40 pages of tables and charts for estimating building material requirements. Also included are mensuration tables, construc-

tion details and data on painting and concrete work. Handbook published by A. C. Horn Company and includes descriptions of the firm's products for preservation and decoration of concrete metal and wood. Handbook is indexed for quick reference.

... Circle No. 185

Pocket blasting chart

Accurate records of blasting, production and costs are possible with the new hip pocket blasting chart issued by Atlas Powder Co. Printed on stiff paper for easy writing, the charts are small enough to fit in the hip pocket and big enough to contain necessary information. Charts provide a quick way to make orderly cost records while drilling, loading and shooting a blast at the site. Charts can be used to collect information for larger record-keeping facilities, or they will fit into any standard card file to become permanent records themselves. Three types of charts are provided: a blasting cost chart for complete data on each blast, a companion loading chart and a blast summary card for listing comparative data on a series of blast operations.

... Circle No. 186

Fibre concrete forms

Complete information on use of fibre forms for pouring round concrete columns is contained in a 4-page booklet published by Sonoco Products Co. Booklet describes the standard types of Sonotube form plus forms for use in water or dam areas which are available on special order. Data includes charts on labor requirements, sizes and weight, standard specifications and form details.

... Circle No. 187

Ground water control

Uses of perforated pipe for controlling ground water in various construction applications are described in a new 28-page booklet issued by Armco Drainage & Metal Products, Inc. Subjects covered are single treatment control, typical methods of solving sub-surface drainage problems, costs, selecting the right pipe, recommended methods of installation and a check list.

... Circle No. 188

TANKS OF STEEL

... still the most reliable for water storage



These two 2,885,000 gallon CB&I — built Reservoirs serve the Yuma, Arizona waterworks system, which is owned and operated by the Arizona Water Company.

All steel tanks are fabricated in accordance with a code established by the nation's foremost authority on water storage structures . . . The American Water Works Association. Only *steel* tanks provide the protective assurances established in this code.

A CB&I-built steel tank or reservoir is bottle-tight . . . will benefit your community because:

- *CB&I Tanks save you the cost* of expensive special interior coatings or sealing compounds often needed to stop or prevent leaks in other-than-steel tanks.
- *CB&I Tanks give you the peace of mind* which

comes with a performance guarantee. Few contractors will provide such a guarantee . . . unless steel is used.

- *CB&I Tanks give you the tangible economy* of trouble-free service life . . . which steel tanks historically provide.
- *CB&I Tanks give you the protection* of a code for maximum safety which is unobtainable on any other type of construction.

These protective assurances are yours with the purchase of a durable, bottle-tight CB&I steel tank or reservoir. Think it over and we believe you'll agree . . . *Your community is safer with steel.*



M588

Cooperating with the
Water Resources Council
and the Steel Plate
Fabricators Association

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Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston • Kansas City (Mo.)
New Orleans • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • South Pasadena • Tulsa
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY,
GREENVILLE, PA. and at NEW CASTLE, DELAWARE.

In Canada: HORTON STEEL WORKS LTD., TORONTO, ONTARIO

... for more details, circle No. 81 on Reader Service Postcard

Ranite Hardsurfacing Rods

are So Easy to Use
they've earned the title,

*"The
Welder's
Rod"*



NINE ADVANTAGES combine to make Ranite metallic-coated rods easiest to use:

1. Operation is equally good on AC and DC machines.
2. Application is practical in all positions—including vertical and overhead!
3. Arc is very quiet and stable.
4. Loss from splatter is eliminated.
5. There is no slag to remove.
6. Clear welding vision is maintained.
7. Arc can be re-struck instantly, if broken, because of metallic coating.
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9. Latitude is very broad—just five Ranite rods—A, BX, C, D and No. 4—handle the *great majority* of all jobs—makes selection quick and easy! (Other Ranite rods available to meet every requirement.)

GET FREE Ranite Select-O-Graph Guide—shirt pocket size—shows best rod to meet any wear condition. Ask your Ranite representative or write direct.



Originators and pioneers of metallic-coated rods—since 1938.



**RANKIN
MANUFACTURING CO.**
616 So. Marengo Ave., P. O. Box 631
Alhambra, Calif.

... for more details, circle No. 84 on Reader Service Postcard

Conveyor bulletin

Engineering data for use in estimating conveyor requirements are contained in a 4-page bulletin published by Western Machinery Co. Included are capacity charts, recommended belt speeds, horsepower requirements, maximum angles of inclination and required conveyor lengths. Brochure also includes descriptions of the custom engineered low cost belt conveyors produced by Western Machinery Co.

... Circle No. 189

Precast concrete forms

Steel forms for precasting reinforced or prestressed concrete in a multitude of sizes and shapes are listed by Food Machinery & Chemical Corp., Packing Equipment Division. The well illustrated booklet provides data on forms for manufacturing piling, bridge deck and structural shapes. Versatile forms may be used in combination to produce a wide variety of sizes and shapes. Booklet also covers accessories and illustrates application of precast products.

... Circle No. 190

Conservation contracting

Wide spread opportunities in construction of small dams and flood control projects are outlined in a public service booklet published by Allis-Chalmers. The 24-page illustrated booklet describes in detail the various programs under which more than half billion yards of earth are moved each year. A section devoted to opportunities in conservation contracting lists the type of structures involved in these programs. These include drop inlet earth dams, channel improvement, grading, concrete stream walls, and grading of terraces and grass waterways. Booklet also covers conservation farming opportunities.

... Circle No. 191

Rust prevention

Use of lead silico chromate in formulating rust preventive coating is discussed in an attractive 8-page booklet published by Eagle Picher Chemical Div. Booklet covers formulation of primer, intermediate and finished coat paints and lists a number of suggested formulas.

... Circle No. 192

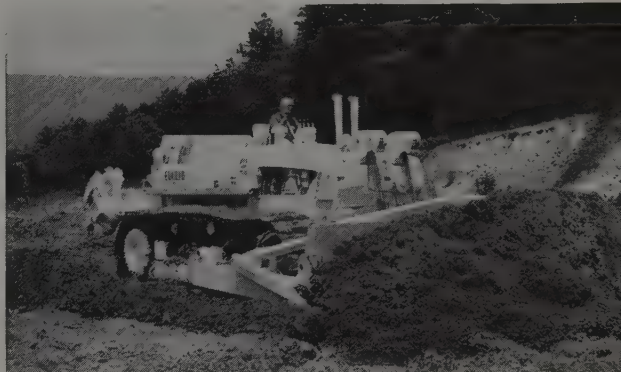
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on that next job...*

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*World's most powerful tractor...
two engines deliver 425 net h.p. to
power trains... separate Torqmatic
Drives and full power shift... in-
dependent track drives... 27"
standard shoes... 8 track rollers...
fast, easy operation... excellent
accessibility for servicing.*

*Unequalled work-ability for push-
loading big scrapers, bulldozing and
ripping earth, rock, coal and ore,
towing heavy equipment and other
big tractor jobs.*

TC-12 TWIN-POWER CRAWLER



*All-wheel drive... two engines
with a total of well over 500 h.p....
separate Torqmatic Drives... 24 cu.
yds. struck... 32 yds. heaped...
independent hydraulic controls...
NoSpin differentials... 27.00 x 33
tires with 33.5 x 33 optional.*

*Moves the cheapest dirt on big,
tough jobs as well as small yardage
projects... works under adverse
conditions that stop other scrapers.*

TS-24 "TWIN" SCRAPER



*30 cu. yds. heaped... 21 yds.
struck... 336 h.p. engine... 4-speed
Torqmatic Drive with converter lock-
up... independent hydraulic con-
trols for bowl, apron and ejector...
structural strength for push-loading
by biggest tractors... exceptional
service accessibility.*

*Years-ahead design with proved
productive capacity that outper-
forms every other big scraper in its
class... dependability that cuts
downtime and maintenance costs.*

EUCLID Division of General Motors, Cleveland 17, Ohio

S-18 SINGLE ENGINE SCRAPER



Big Power... Big Capacity... Big Performance for Bigger Return on Investment!



EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE



Lima Austin-Western 101-SE portable crushing and screening plant travels narrow mountain trails to reach such remote end-use site as this, where it produces high tonnage of low cost construction aggregate.

Portable Lima Austin-Western 101-SE crushes, screens 160 tons hourly for Colorado contractor

"There are many reasons why we like our Lima Austin-Western 101-SE portable crushing plant," says Dean McClellan, of Oliver & McClellan Construction, Cortez, Colo. "Features that have paid off especially well for us are portability, push button control and high production at low cost."

Portability a must

"In this part of the country, and in our operation particularly, portability is a must. We move our 101-SE in the mountains over nothing but Jeep trails. Yet we never worry about its upsetting."

"One-man push button electric operation is great, too. The operator sits where he can see the whole plant—he can control any operation all by himself."

"We are more than satisfied with the high production of our 101-SE. Colorado rock has a reputation for being mighty hard to crush. But with our crusher, it breaks up easily. On a recent

job our 101-SE produced 1½ in. minus base material, in 70% crush, at an average rate of 160 tons per hour! In my book, that's good production," Mr. McClellan said.

Diesel, electric power

The 101-SE is a completely portable, rubber mounted, self-contained crushing and screening plant. Diesel engine drives crusher and generator, which powers all other operations. Electric drives eliminate troublesome clutches, chains, sprockets and gearboxes . . . simplify maintenance, help reduce cost per ton. Portable plant capacities range from 25 to over 200 tons per hour.

Keep pace with your cost and progress estimates . . . keep haul cost and time low. There is a high-speed, profit-making Lima Austin-Western plant, portable or stationary, exactly right for your needs. Send for all the facts and the name and address of your nearest distributor.

Edward R. Bacon Company, San Francisco, California; Columbia Equipment Company, Portland, Oregon, Seattle, Washington, Spokane, Washington; N. C. Ribble Company, Albuquerque, New Mexico; Western Machinery Company, Salt Lake City, Utah, Idaho Falls, Idaho, San Francisco, California; Keremi Tractor & Equipment Company, Cheyenne, Wyoming, Casper, Wyoming; Engineering Sales Service, Inc., Boise, Idaho; Macdonald Equipment Company, Denver, Colorado; Graid Equipment Company, Reno, Nevada; Western Machinery Company, Phoenix, Arizona, Tucson, Arizona; Seitz Machinery Company, Inc., Billings, Montana, Great Falls, Montana; Smith Booth Usher Company, Los Angeles 54, California

LIMA AUSTIN-WESTERN Crushing, Screening and Washing Equipment
BALDWIN · LIMA · HAMILTON 5919
CONSTRUCTION EQUIPMENT DIVISION · LIMA, OHIO



. . . for more details, circle No. 86 on Reader Service Postcard

Stabilized base mixers

Complete information on two models of Cedarapids Stabilized Base Mixers is provided in a new 8-page bulletin issued by Iowa Mfg. Co. Models covered include a large stationary-type with capacities up to 600 tons per hour and a smaller highly portable model that will mix up to 300 tons per hour. Larger unit includes a wide range of optional equipment that allows it to be fed by bulldozer, or clamshell bucket. Smaller model is a completely integrated unit that includes a 5-yd. hopper over a conveyor and single shaft pugmill. It is mounted on a single truck frame with running gear. . . Circle No. 194

Heavy duty vehicles

Examples of a number of unusual vehicles produced by FWD Corp., to meet unusual problems are provided in a new 8-page booklet issued by the company. Entitled "World's Most Unusual Vehicle Facility", the booklet illustrates vehicles used in ready-mix concrete, logging, highway transport, road maintenance and a number of other industries. . . Circle No. 195

Diesel performance

Diagrams showing how a diesel engine works and data listing diesel advantages over gasoline engines are provided in a new colorful booklet published by General Motors. Among the advantages described are higher compression ratios, lower costs of diesel fuel, lack of ignition troubles and rugged construction. . . Circle No. 196

Steel plate manual

A catalog providing complete data on steel plates manufactured by Bethlehem Steel Co., has been published by the company. Included are sections on plate description, common standard specifications, grades and qualities, chemical requirements, manufacturing practices, standard tolerance tables, weight tables and miscellaneous estimating and design information. . . Circle No. 197

Screening information

Operation of El-Jay vibrating screens is described in a two-color 24-page booklet recently issued by El-Jay Manufacturing Co. The two-color brochure, illustrated with photos and drawings of components, discusses various features of the line, including even vibration

torsion springing, smooth operation and rigid construction. Booklet provides a concise review of screening operations and capacities under the heading, "What to expect of a screening machine." Action photos and specification tables are included.

... Circle No. 198

High-strength bolting

The subject of high-strength bolting for structural joints is covered in a 24-page illustrated booklet just released by Bethlehem Pacific. There has been much progress in the use of high-strength bolts, and this is a comprehensive review which describes and illustrates the use of these bolts, outlines specifications for assembling structural joints by this method and describes proper procedures for torquing. The booklet contains excerpts from ASTM standards describing the characteristics of these projects; there is also a section on washers and one on the procedure for ordering high-strength bolts. The booklet is well illustrated and contains valuable tabular material, representing the most complete treatment of the subject available at this time.

... Circle No. 199

Insley has several catalogs

Several new catalogs and brochures have recently been announced by Insley Mfg. Corp., illustrating and describing some of their new models in cranes and excavators. An 8-page, 2-color specification catalog provides information on Type WT, a 1-yd. excavator and 25-30-ton crawler or rubber mounted crane. A 10-page similar catalog carries information on Type M, a ¾-yd. excavator or 15-20-ton crawler or rubber mounted crane. An 8-page catalog carries similar information on the Type WB 35-ton Lorry Crane. Largest catalog of the group contains pictures and descriptive material on Type WB 1½-yd. excavator and 30-35-ton crawler or rubber mounted crane.

... Circle No. 200

Ford Motor literature

A brochure reviewing actual field records on its 332 V-8 truck has been released by Ford Motor Co. The release also contains a card which makes it possible to send for 10 booklets which Ford has available covering its '59 models with complete specifications for each of the units covered in the booklet. The booklets of particu-



LIMA Cranes, Shovels, Draglines designed to deliver top performance, low maintenance

Tops in their class! LIMAS cannot be surpassed for outstanding efficiency, ease of operation, really dependable service and low maintenance. The hard-working LIMAS are versatile machines. They can be used as shovels, cranes, draglines, clamshells or pull shovels by simply changing front end equipment.

Their big-job power, sturdy construction and low maintenance qualities combine to deliver reliably high output and high profits.

Air control is available on all LIMAS. Big, roomy cabs and ease of control mean greater comfort and safety for your skilled operators... minimum operator fatigue

for maximum high-speed production.

Even the biggest LIMAS will maneuver easily and travel safely over most types of ground. They have plenty of ground-gripping stability even when working long booms at low angles. There is a LIMA to fit your requirements—shovel capacities ½ to 6 cu. yds., crawler cranes to 110 tons. Cranes up to 70 tons capacity are available on rubber.

Get the full story on the 18 basic models of these tough, versatile machines. Learn for yourself why LIMA is the choice for big and little jobs everywhere! See your local distributor or write us today!

Our Seattle Office: 1932 First Avenue South, Seattle 4, Washington; Our La Mirada Office: 14120 E. Rosecrans Ave., La Mirada, California; Feenaughty Machinery Co., 112 S. E. Belmont Street, Portland 14, Oregon; Modern Machinery Co., 4412 Trent Avenue Spokane 10, Washington; N. C. Ribble Co., 1304 North Fourth Street, Albuquerque, New Mexico; Bay Cities Equipment, Inc., 2792 Cypress Street, Oakland 7, California; Bay Cities Equipment, Inc., 1178 West San Carlos Street, San Jose, California; McGaraghan Supply Company, 529 Broadway, Eureka, California; Evans Engine & Equipment Company, 4300 - 11th Avenue, Northwest, Seattle, Washington; Smith Booth Usher Company, 2200 S. San Gabriel River Parkway, Los Angeles 54, California; Evans Engine & Equipment Co., Inc., Post Road—Box 894, Anchorage, Alaska; Faris-Moritz Equipment Co., 5790 Colorado Blvd., Denver, Colorado; Shasta Truck & Equipment Sales, South 99 Highway, Redding, California; Reno Equipment Sales Company, 1510 West Fourth Street, Reno, Nevada; Western Machinery Company, 820 North 17th Avenue, Phoenix, Arizona; Western Machinery Company, 1111 West St. Mary's Rd., Tucson, Arizona; Western Machinery Company, 2300 South Main Street, Salt Lake City 15, Utah; Western Machinery Company, P. O. Box 197, 590 West 19th Street, Idaho Falls, Idaho

LIMA Construction Equipment Division, Lima, Ohio
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591*



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*Fast-Driving.
Versatile*

VULCAN DGH-100 PILE HAMMER speeds work on sewer project

The Vulcan DGH-100 Portable, Differential-Acting Hammer is driving 3" x 8" x 24' timbers to a depth of 20 feet to form bins 8' wide and 24' long used in the construction of a sewer line in Edina, a suburb of Minneapolis. Contractor: Phelps-Drake Co., Minneapolis. The Vulcan DGH-100 is a favorite with contractors everywhere.

Ask for full information



Manufacturers of Pile Driving Hammers and Piling Extractors Since 1852

VULCAN IRON WORKS INC., 327 North Bell Avenue, Chicago 12, Illinois

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DOTMAR
helps you
cut costs
2 ways!

1 DOTMAR CURB AND GUTTER PAVER

The only versatile paving machine on the market today! Lays up to 10' per minute of finished curb and gutter curb alone, combination gutter, curb and walk, median strip or drainage gutter. Saves 1/3 to 1/2 over old hand methods. Paves any curb and gutter section. Tamps, strikes-off and compresses concrete. Increases concrete yield. The original paver. Our 12th year serving the construction industry. Send for literature.



2 DOTMAR MAGNALITE FORMS

Cut costs because workers can handle and set up more forms per day with no strain. Magnalite Curb and Gutter Forms are made of tough magnesium alloy. A 12" x 10' form weighs only 47 lbs.—one third the weight of steel. More forms transported with lighter equipment. Send for data.



Dotmar INDUSTRIES Inc.

503 HANSELMAN BUILDING

KALAMAZOO, MICHIGAN

Distributed by: Air Mac, Inc., Portland; Andrews Equipment Service, Spokane; Andrews Machinery of Washington, Inc., Seattle; Booth-Rousse Equipment Co., Denver; C. H. Grant Company, Oakland; Kernal Tractor and Equipment Co., Cheyenne; Land Machinery Co., Salt Lake City; Western Construction Equipment Co., Billings.

... for more details, circle No. 89 on Reader Service Postcard

lar interest to the construction industry would be those describing the full line, the folder on medium and heavy duty trucks, the folder on tandem models, the folder on extra heavy duty and the 4-wheel drive folder.

... Circle No. 201

Repeater operation for mobile radio

A leaflet describing the function of a repeater unit for extending the communication range in using mobile radio units is available from Kaar Engineering. The leaflet describes the problems and the solution of communication between a base station and mobile units that may be interrupted by intervening obstacles.

... Circle No. 202

Plywood in structural shapes

Plywood prefabricated into shapes designed for roofs or ceilings, and also suitable for concrete form work is announced in a folder released by Berkeley Plywood Co. This general system, called "Trofidek," has previously been used in England and Canada, and the folder presents information including tables on sizes and strengths now available from Berkeley Plywood Co.

... Circle No. 203

Vibrators to empty bins

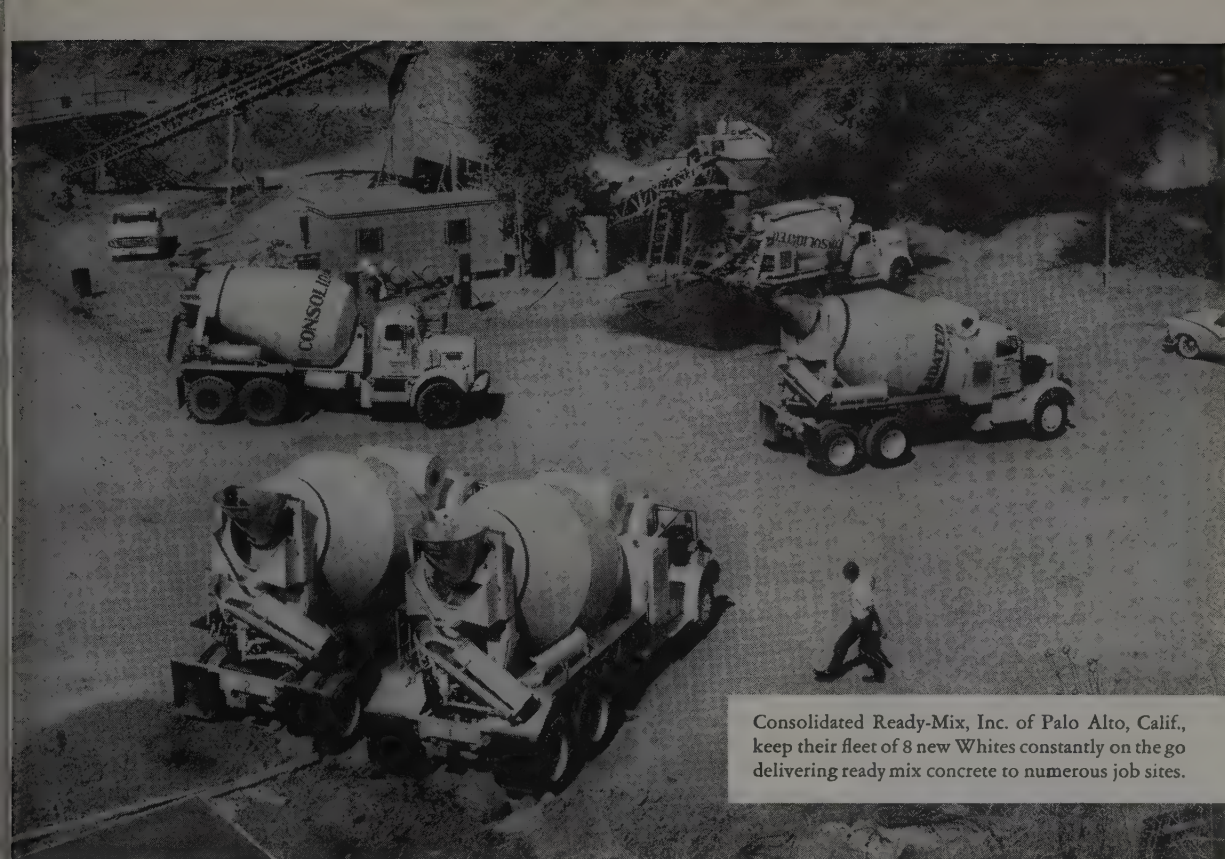
An illustrated 12-page folder giving complete descriptions, data and specifications on its 14 standard vibrators has been released by Syntron Co. These vibrators range from the small 2-lb. model to a 950-lb. model capable of vibrating bins having capacities weighing in excess of 150 tons. The catalog presents illustrations and information on characteristics, installation and use.

... Circle No. 204

New cure for concrete surface

Test information and application methods for a curing seal announced in a 4-page brochure put out by the Building Products Division of L. Sonneborn Sons, Inc. This product is designed for curing, sealing and dust proofing newly poured concrete surfaces in operation. The bulletin describes the material as a blend of synthetic rubber resins in fast evaporating solvents.

... Circle No. 205



Consolidated Ready-Mix, Inc. of Palo Alto, Calif., keep their fleet of 8 new Whites constantly on the go delivering ready mix concrete to numerous job sites.

Geared for the West's Billion Dollar Construction Industry...

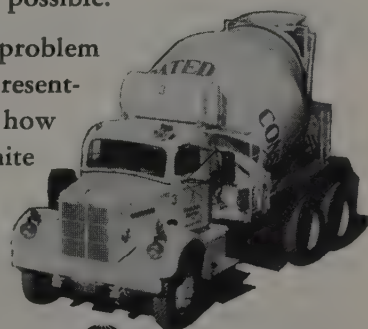
Consolidated Ready-Mix delivers daily maximum pours with White Truck fleet



White offers a complete line of construction trucks, each custom-engineered to perform its particular job most efficiently. Whether you require one or a fleet, mixers or dumps, haul aggregate or building supplies, White offers you money saving transportation.

White construction trucks are custom-engineered to meet the demands of the dynamic Western construction industry. That means White is designed to deliver more payload at lower cost... meet rigid schedules... stay on the job, day after day! That's why every component that goes into White vehicles has but one mission—to help provide the most efficient transportation possible.

Explain your hauling problem to your local White representative. He can show you how to earn more with White construction tandems.



WORLD LEADER IN HEAVY DUTY TRUCKS

THE WHITE MOTOR COMPANY

CLEVELAND 1, OHIO

Factory Branches, Distributors & Dealers Everywhere

WHITE

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WHERE TO BUY GORMAN-RUPP CONTRACTORS PUMPS

These distributors offer the full line of Gorman-Rupp Contractors' Pumps. Most have rental service, too.

Andrews and Andrews Equip.
Portland

Andrews Equipment Service of Washington
Spokane

Bay Cities Equipment Co.
Oakland and San Jose

Brown-Bevis Industrial Equip. Co.
Bakersfield

The Harry Cornelius Co.
Albuquerque

Delta Tractor Co.
Stockton

Paul Broscher Sales
Redding

Faris-Moritz Equip. Co.
Denver

Flaherty Manufacturing Co.
Pocatello

Industrial Tractor Sales
N. Sacramento

The Lang Co.
Salt Lake City

Mid-State Truck & Mach. Co.
Wenatchee

Northern Commercial Co.
Seattle

Pacific Hoist & Derrick Co.
Seattle

Reno Equipment Sales Co.
Reno

Shasta Truck & Equip. Sales
Redding

Standard Machinery Co.
San Francisco

Starline Equipment Co.
Boise

Studer Tractor & Equip. Co.
Casper, Wyoming

Western Construction Equip. Co.
Billings and Great Falls

Western Equipment Co.
Portland and Eugene

... for more details, circle No. 91

Leap Associates has issued 4 new catalog sheets covering tables of loading and physical properties of prestressed concrete "LeapTees".

... Circle No. 206

Allis-Chalmers has issued three new specification sheets covering its Model 45 motor grader and HD-16 and HD-16 DC crawler tractors.

... Circle No. 207

The Master Builders Co. has published a 24-page bulletin describing its "Masterplate iron clad" concrete floors.

... Circle No. 208

GM Euclid Division has published two new catalogs on its construction equipment:

16-page folder covering the Model S-18 scraper of 21-cu. yd. struck capacity.

8-page catalog covering Model R-10 Euclid rear dump of 10-ton payload capacity is also available.

... Circle No. 209

Topeka Highway Mower, Inc. has issued a 6-page bulletin on its 4-wheel rubber tired mowing machine.

... Circle No. 210

A 16-page catalog giving details on its line of "Hopto" hydraulic excavators has been issued by the Badger Div. of Warner & Swasey Co.

... Circle No. 211

Characteristics of the J-18, motor driven hand tamper are described in a new 4-page bulletin published by the Jay Co.

... Circle No. 212

Capacities, dimensions and specifications of the complete line of Allis-Chalmers fork lift trucks are listed in chart form in a new 4-page folder issued by the company.

... Circle No. 213

Components and operations of Clark "Trans-Plant" portable unitized batching plants are described in a new 4-page folder.

... Circle No. 214

"A Guide to Fire Extinguishers" is the title of a new illustrated booklet issued by Ansul Chemical Co.

... Circle No. 215

Nordberg Mfg. Co. has issued a revised bulletin describing Symons Intermediate Cone Crushers.

... Circle No. 216

Two new data sheets have been issued by **Pennsalt Chemicals Corp.** on its Penntrowel, a resinous, thermosetting mortar for coating concrete.

... Circle No. 217

A new catalog listing the complete line of Blastcrete Guns for pneumatic concrete application has been issued by **Blastcrete Company, Inc.**

... Circle No. 218

Hercules Motors Corp. has issued a 4-page bulletin describing its new line of lightweight, 2-cycle, air-cooled engines which the company imports from Germany.

... Circle No. 219

A bulletin describing 12 models of its line of "Pistonair" air motors has been issued by **Joy Mfg. Co.**

... Circle No. 220

Torque converters and their applications are described and diagrammed in a new booklet issued by **The National Supply Co.**

... Circle No. 221

Engineering data on "Space Headerduct" are offered in a new 28-page bulletin published by **The National Supply Co.**

... Circle No. 222

A new truck cab air conditioner is the subject of a 4-page bulletin issued by **D. W. Onan & Sons, Inc.**

... Circle No. 223

The **Joyce-Cridland Co.** has issued a 6-page brochure covering construction applications of heavy duty air motor jacks.

... Circle No. 224

An 8-page specification bulletin covering the new series 350 Bantam crane excavators has been issued by **Schild Bantam Co.**

... Circle No. 225

Diamond Expansion Bolt Co., Inc. has issued a new catalog on its line of masonry anchors.

... Circle No. 226

The new Lull, Model 7B loader which lifts 4,000 lb. up to 30 ft. is described in an 8-page bulletin issued by **Lull Engineering Co.**

... Circle No. 227

mobility and capacity



CELANESE CORP. • BISHOP, TEXAS



H. C. PRICE CO. • SOMASTIC DIVISION • BUSTLETON, PA.

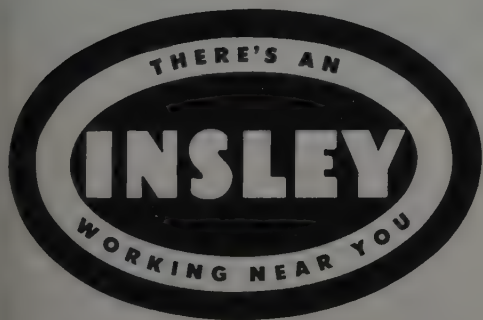


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CONSOLIDATED WESTERN STEEL • PROVO, UTAH
DIVISION OF UNITED STATES STEEL CORP.

• for the full range of lifts through 45 tons



- One man control . . . all controls at operator's station.
- Mobility and maneuverability . . . air brakes and hydraulic steering.
- Precision boom hoist control . . . through planetary gears.
- Independent travel and swing . . . travel and swing with the load simultaneously and independently . . . 360° swing.
- Power load lowering . . . permits safe accurate lowering of the load under power.
- Rugged Maxi carrier . . . "I" beam reinforced frame with 3 point suspension. Heavy duty 2-speed transmission with enclosed differential.
- Maxibrake® attachments for added safety and emergency.

INSLEY MANUFACTURING CORPORATION

GENERAL OFFICES—INDIANAPOLIS 6, IND.

WEST COAST DIVISION—LOS ANGELES 54, CALIF.

NEW EQUIPMENT

Obtain more information on these new developments in construction equipment by circling the corresponding numbers on reply postcard.

30-ton crane offers choice of components

Wide choice of bases, power plant accessories and attachments is offered in the new $\frac{3}{4}$ -yd. LS-78 shovel-crane announced by **Link-Belt Speeder Corp.** The 12½ to 30-ton capacity crane has three crawler bases varying in gauge from 7 ft. 10 in. to 9 ft. 8 in. and in length from 11 ft. 4 in. to 13 ft. 7 in. Shoe widths are available in sizes ranging from 24 in. to 42 in. Power choices include a number of gasoline and diesel engines. Features of the LS-78 include Speed-o-Matic



power hydraulic controls for reduced operator fatigue, and Full Function design of upper works machinery for maximum job flexibility. There are separate sets of shafts, gears and clutches that provide a separate power flow for each machine function providing independent swing and travel. For easier serviceability all horizontal shafts are splined and assemblies can be pulled piece by piece without removing major portions of the cab. Machine can be equipped as a shovel, crane, dragline or hoe. The optional long wide lower can be quickly dismantled for highway travel. The unit removes its own side frame assembly, including drive chains and sprockets, intact as complete units without aid of auxiliary hoisting equipment. New 24-page catalog available.

... Circle No. 228

Big loader has high reach

A 6-ton loader with a maximum height of 19 ft. 2½ in. has been added to its line of 4-wheel drive "Payloader" tractor shovels by **The Frank G. Hough Co.** The newest Payloader has a clearance at the center of the hinge pin of 14 ft. 7½ in. With the bucket dumped at 50 deg., clearance under the bucket edge is 10 ft. 10 in. The forward reach from the front tire is 3 ft. 6 in. It is powered by a 300-hp. turbocharged Cummins NRT-6-B1 diesel engine. The Model H-120 Payloader has a carrying capacity rated at 12,000 lb. Buckets from 3 to 6 cu. yd. are offered for handling various materials. For digging operations, the H-120 has a breakout force of 26,000 lb. and the bucket can be



tipped back 40 deg. at ground level. For complete safety, all moving members of the new loader design are out of the way of the operator. The unit features a 4-speed, forward and reverse power-shift transmission and matched torque-converter which provides travel speeds up to 28 mph. Equipment includes a Donaldson 2-stage dry air cleaner and canopy cab as standard equipment. Literature available.

... Circle No. 229

Lightweight trailer hauls 12 yd.

A 12-yd. capacity trailer weighing only 5,300 lb. has been introduced by **Hobbs Trailers**. Designated A-9000, it is a frameless single-axle cable dump unit. The new cable dump gets its light weight ruggedness from a series of steel U-shaped ribs which girdle the sides and bottom of the load-carrying body shell. Ribs



and shell are welded into a rigid 1-piece carrying member. It is rated for a design payload of 40,000 lb. Fast dumping is accomplished with wide-set lift arms which tie into the top rail on each side of the body. The angle thus created between the lift arms and the cable reduces line pull necessary to start the dump cycle by as much as 22%. Trailer raises to full dump position in 12 sec. A-9000 weighs up to 1,000 lb. less than units of comparable capacity.

... Circle No. 230

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Guides TO PROFITABLE HAULING

DAYBROOK Speedlift BODIES
DESIGNED-ENGINEERED
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For one or a fleet . . . Daybrook has the "right" hoist and body for the job. Ask your Daybrook distributor to mail copies of the above folders . . . "Modern Standard of Craftsmanship in Steel" and "Hoist Power Worth Looking Into" . . . to you, and your truck dealer, today!

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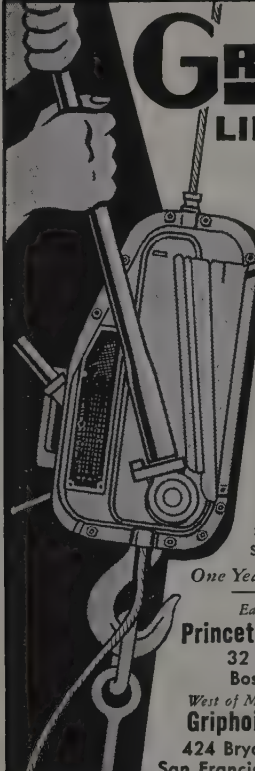
DAYBROOK DUMP BODIES • HOISTS • POWER LOADER • POWER GATE • POWER PACKER

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1 1/2" wire rope



... for more details, circle No. 94 on Reader Service Postcard

Screed for narrow spans

A lightweight vibrating screed which is ideal for striking off narrow spans has been marketed by Stow Manufacturing Co. The Stow DUS Screed unit consists of a DU vibrator with 3/4-hp motor and 1 1/4-in. head mounted on an aluminum or steel channel with



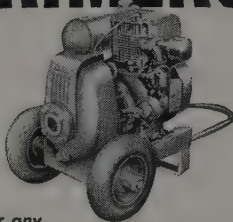
handles at each end. Its 9,000-12,000 vibrations per minute are transmitted evenly throughout the beam directly to the concrete. When not used as a screed, the vibrator can be unbolted and used separately. The screed is available in lengths of 4, 5, 6 and 7 ft. The weight of a 4-ft. screed with aluminum beam is 47 lb.; with steel beam it is 77 lb. Literature available.

... Circle No. 231

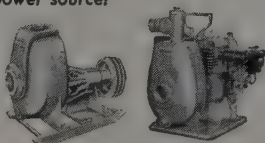
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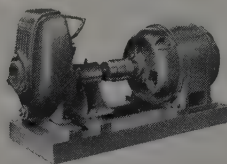
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... for more details, circle No. 95 on Reader Service Postcard

Looking for a new employment opportunity,
or for a man with specialized experience?

Have you used equipment to sell, or do you
need used equipment?

Your ad in the classified section of **WESTERN CONSTRUCTION** will reach 18,000 construction men in the West, and at a cost of only \$15.50 per column inch.

Send your copy today, enclosing check, to **WESTERN CONSTRUCTION**, 609 Mission Street, San Francisco 5, California. (If proofs are required, the closing date is the 5th of the preceding month of publication, or the 10th without proofs).

Half-ton economy-model loader

An economy-model wheel-mounted loader with 1,000-lb. capacity and 10-ft. 5-in. lift, has been introduced by J. I. Case Co. The new Utility unit on a Case 210 tractor dumps clean at 45 deg., has a 30-in. reach and 8-ft. 5-in. clearance. Close-coupled buckets of 11, 13 or 18-cu. ft. capacity will cut 5 in. below grade, roll

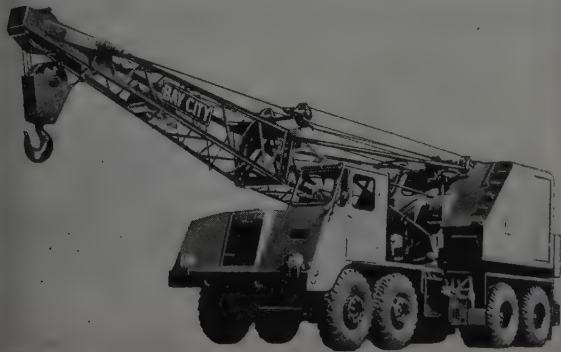


back 17 deg., and tilt 90 deg. forward for backfilling and finishing. Utility loader's 1,300 psi. hydraulic power is controlled by handy, feathered valves which include lift, lower, hold and float positions. Bucket is interchangeable with optional pallet form, bulldozer blade, crane boom, and sweeper. Tractor has 34 hp. with 4-speed transmission and is available with optional power steering and fast reversing transmission. The 210 tractor powers ten other Case-built tools and attachments.

... Circle No. 232

40-ton crane has integral 8x4 carrier

Bay City Shovels, Inc. has unveiled its new 40-ton "CraneMobile" mounted on an integrally-designed 8x4 carrier. The unit, model 610-T8440, features removable outrigger beams and supports, air brakes on all wheels, power steering, and variable speed transmission with 12 speeds forward and 3 reverse. The complete machine strips down to 17,270 lb. per rear axle and 13,120 lb. per front axle. Welded alloy steel pin-connected boom is shot-blasted for rust prevention. Interchangeable main boom and sections range from 30 ft. to 150 ft. with boom and jib. A two-speed transmission in the crane machinery reduces the raising or lowering speed of loads at the rate of 1/2 in. per second.



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HORNCURE 2B CURING COMPOUND

Is specially made for standard curing. It doesn't clog or settle in spray equipment. There is no waste, you use every drop. Horncure 2B produces a tough seal over concrete, insuring proper hydration. It retains a maximum of the original moisture for seven days. Dries quickly and uniformly, without pinholes. Available clear or with red or green fugitive dyes.

HORNCURE 40W

Is a white pigmented concrete curing compound designed to comply with the Corps of Engineers, U.S. Army Specification CRD-C-300. It also meets or exceeds most specifications for white pigmented curing compounds adopted by federal, state, city and county agencies.

HORNTRAZ

For concrete—cures, hardens and seals in one application. Designed to retain the necessary water for the proper chemical hydration of new concrete, Horntraz furnishes a positive seal against water loss insuring proper curing without unsightly discoloration. It provides for a harder concrete while at the same time, sealing the surface against dilute acids, oils, grease and other foreign matter.

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Is widely used in tilt-up and lift-slab construction because it is clean breaking, non-staining. After application its residue disintegrates (or can be easily removed) leaving surfaces suitable for chemical hardening, installation of asphalt tile, or painting with resin emulsion, oil or latex base paints.



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with every three drums of Horn parting or curing compounds you purchase. Complete with 5 ft. hose, heavy curved arm extensions, flat fan-spray nozzle and extra nozzle. We offer this because we're convinced you'll find Horn Parting or Curing Compounds more economical, more efficient and become a long time customer.



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Please send descriptive literature on:

- Horn Parting Compound (lift-tilt)
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The unit can lift and walk with a 63,000-lb. load and can handle 5,000 lb. over the rear on its 150-ft. boom at 100-ft. radius. Machine is convertible to crane, clam-shell, dragline or pile driver. Illustrated, 20-page catalog is available.

... Circle No. 233

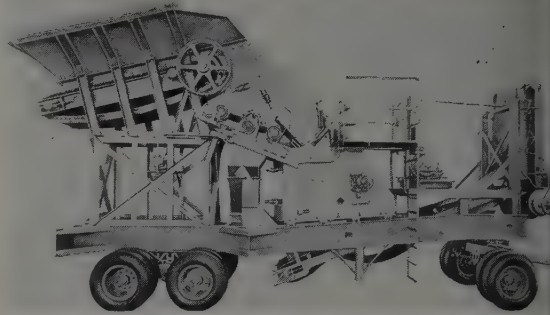
Trailer-mounted wet washer

A mobile Standard Cyclonic Wet Washer for asphalt hot mix plants has been introduced by Standard Steel Corp. Especially designed for use with Standard's new



self-erecting asphalt plant, this trailer-mounted unit is ready to operate after connecting an inlet duct and a light stack extension. The dust collector meets all known air pollution requirements and offers maximum dust collection efficiency coupled with high mobility. The self-contained unit is complete with spring-mounted wheel and axle assembly, jack legs and air brakes.

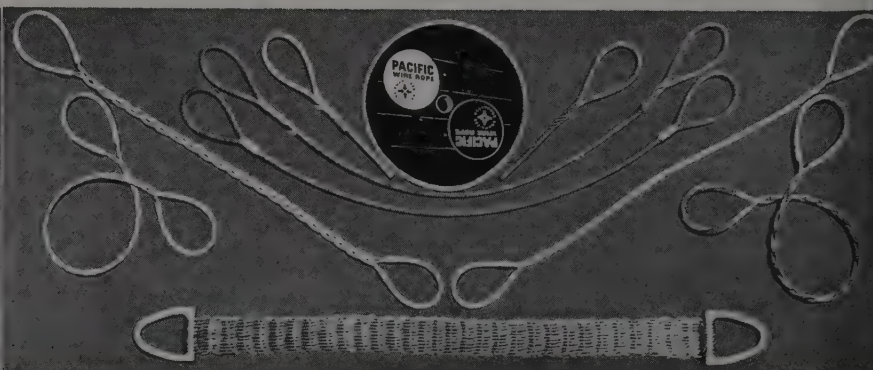
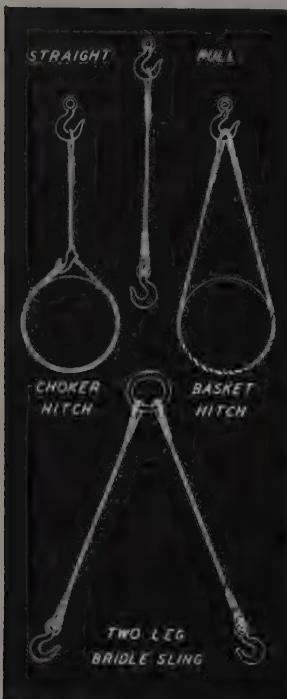
... Circle No. 234



PORTABLE primary crusher, latest in the line of Kueken crushers, introduced by Straub Manufacturing Co., Inc. The all-electric model shown here rigged for highway travel includes heavy-duty apron feeder, two deck vibrating grizzly, 210 jaw-crusher folding under conveyor, and push-button control. It can be furnished with diesel engine and side-mount generator. Engine drives crusher and generator provides power for feeder grizzly and conveyor.

... Circle No. 235

MAXIMUM *strength* MAXIMUM *savings* with **PACIFIC WIRE ROPE SLINGS!**



Only Pacific Wire Rope is "Equalized"—giving added flexibility to slings. Maximum strength right from the start—removes initial stretch, back twist and tendency to kink—compacts rope, resists bridging, strand nicking and crushing caused by sharp edges and right-angle bends. Complete range of sizes and types of splice for use in or out of plant.

Pacific Wire Rope Company has the largest rigging loft on the Pacific Coast with complete facilities for standard splicing, swaging and plastic coating of slings, fittings, etc.

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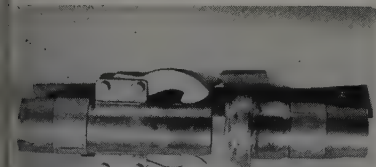
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WESTERN CONSTRUCTION—June 19

Pipe joined without tools

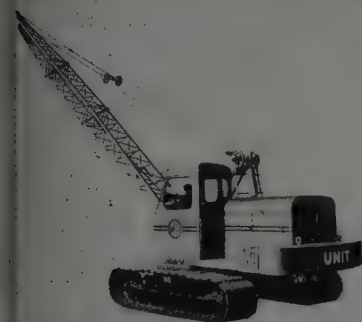
A lighter walled industrial steel pipe with factory installed couplings that can be joined quickly without use of tools has been marketed under the brand name of "Quick Pipe" by R. H. Pierce Mfg. Co. Available in outside diameter



sizes of 2, 3, 4, and 6 in., the pipe handles water, air, oil or chemicals. Coupling is accomplished with two latches on the spigot end of standard lengths, which engage a flared collar on the bell end. Spigots are tapered to fit bells. Smaller diameters up to 4 in. have a working pressure of 300 psi. while those above 4 in. are rated at 200 psi. Line includes a wide variety of couplers, fittings and adapters for use with standard threaded pipe or aluminum tubing. Literature available. . . . Circle No. 236

Unit adds 3/4-yd. excavator

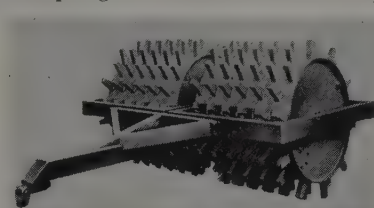
Model 1220—3/4-yd. excavator is the newest addition to the Unit Crane & Shovel Corp. line. Convertible to all attachments, it has a capacity of 16 tons when fully equipped for crane operation. Stan-



ard features such as 1-piece cast ear case, splined shafts, automatic traction brakes and twin hook rollers, together with many other unit features are included in the new Model 1220. Choice of power installation consists of a GM diesel engine with or without torque converter or a Chrysler 8-cylinder gasoline engine with torque converter. . . . Circle No. 237

Tamping roller has new feet

Tamping feet shaped to penetrate and withdraw from loose fill with a minimum of disturbance are featured on the model 170 tamping roller announced by



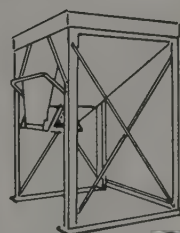
Koehring of California. Basic model 170 is 11 ft. wide and weighs 17,150 lb. empty and 24,650 lb. loaded. It is available with hollow feet, weighing about 2,000 lb. less and with non-directional feet for shuttle work. . . . Circle No. 238

Power buggy has new drive

A combination transmission, differential and drive axle assembly, completely enclosed in one housing and lubricated from a single oil reservoir, is featured in the Model 15-B powered buggy announced by

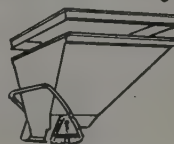
designed WITH CONCRETE IN MIND

GAR-BRO CONCRETE HOPPERS



FLOOR HOPPER

RECEIVING HOPPER



...serve a dual purpose!

For maximum utility, Gar-Bro Concrete Hoppers are made in three units—(1) a bin, (2) a leg stand and (3) a collar for increasing capacity. Thus, the leg stand converts the Receiving Hopper to a Floor Hopper. Gar-Bro Hoppers are used as supply bins for carts; they prevent delays of truck mixer and placing crew and have many other uses. Made in vertical front and center discharge types, there are single gate models ranging in capacity from 28 to 76 cu. ft. and double gate models ranging from 2 to 5.7 cu. yds.

Get these special Gar-Bro features: (patented) non-jamming, grout tight, double clamshell gates. Approved vertical discharge.

See your Gar-Bro dealer or write for catalog.

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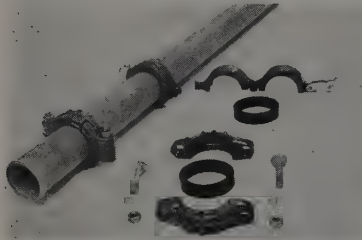


Prime-Mover Co. Transmission is full torque shifting, constant mesh with instant shift from forward to reverse. Model 15-B has a $\frac{3}{4}$ -ton capacity with 10-cu. ft. dump bucket. Powered with a 7-hp. Wisconsin engine it easily takes 20% inclines fully loaded. Only 31 $\frac{1}{2}$ in. wide, it goes through standard doorways and spots loads quickly in confined areas.

... Circle No. 239

Lightweight Swedish pipe

Atlas Copco Pacific Inc. will market Alvenius lightweight steel pipe throughout the 11 Western states. The Swedish pipe, a stand-



ard component for compressed air and water lines in European construction, is now available in the U.S. for the first time. Initially, Copco plans to stock diameters of

2 in., 4 in., and 6 in., in standard lengths of 5, 10 and 20 ft. Principal advantage of Alvenius pipe is its extremely light weight, approximately one-third that of standard U.S.-made steel pipe. It has a strength of 104,000 psi., corrosion-resistant hot galvanized finish and simplified couplings. Pipe ends are reinforced by a pressure-welded external ring which also serves to hold the coupling firmly in position. Two types of couplings are available, split unit fastened by side bolts, and single piece snap lock.

... Circle No. 240

Paving breaker muffler

Paving breaker noise is reduced 55% with a muffler cover made up of two jackets heavily lined with sound-proofing materials, introduced by W. A. Plummer Manufacturing Co. Covers fit pavement breakers using Thor, Ingersoll Rand, Joy, Gardner-Denver, and Chicago Pneumatic tools. Ideal for use in "quiet zones" surrounding



hospitals and other institutions, the muffler covers are zipped on in a few seconds, and their silencing effect produces long working hours of good will among both employees and community residents. The covers are endorsed by street maintenance and municipal officials.

... Circle No. 241

Heavy duty dipper bucket

High alloy, high carbon cast weld construction is featured in the new $\frac{3}{4}$ -yd. heavy duty dipper-



announced by Renner Mfg. Co. The 1,900-lb. bucket fits any make machine, and is available with drop forged teeth, or, at slight extra cost, the new Renner 2-piece shank and cap teeth. Built for fast digging and clean dumping, the dipper has been extensively field tested.

... Circle No. 242

Grate roller crushes, compacts

The 1959 model improved Twin Crusher-Pak grate roller announced by Eskridge Equipment Co., features complete peripheral cutting edge, alternate breaker bars, and baskets of high strength heat treated alloy steel. The grate-type

MODERN...

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M & S Ready Mix Co., Missoula, Montana
Messenger Masonry Supply, Idaho Falls, Idaho

... for more details, circle No. 99 on Reader Service Postcard

WESTERN CONSTRUCTION—June 1959

SOME THINGS YOU SHOULD KNOW ABOUT

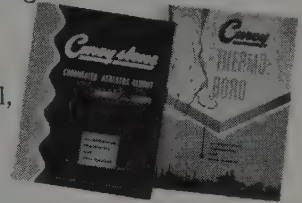
Carey® ASBESTOS-CEMENT CURTAIN-WALLS

Almost 30 years of experience in the manufacture of asbestos-cement panels for building enclosures has proved the superiority of Carey curtain-wall materials.

Architects specify these products because Carey asbestos-cement curtain-walls are so economical, so easy to install, and they are virtually maintenance-free. Furthermore, they are indestructible, being resistant to fire, hail, water, rust and rot.

There are three principal types of construction using Carey asbestos-cement curtain-wall products. Their advantages are illustrated in the detail sketches shown below.

Write for architectural, engineering and data manuals.

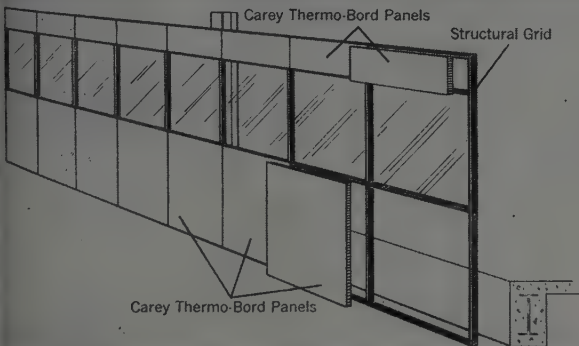


The Philip Carey Mfg. Company • Lockland, Cincinnati 15, Ohio • Better Products For Building Since 1873



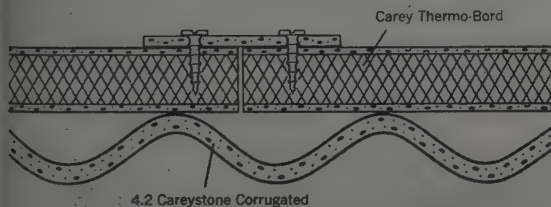
CAREYSTONE CORRUGATED WALL CONSTRUCTION

- can be installed with overlap joints or with battens
- needs no preservative surface treatment but can be painted any color
- does not require heavy framing or foundations
- ideal for simple structures where insulation is not required
- resistant to practically all atmospheric conditions existing in industrial areas



WINDOW-WALL CONSTRUCTION

- can be used with practically all types of window-wall designs
- used for schools, office buildings, commercial and industrial construction
- high insulation value
- deadens sound transmission through walls
- needs no surface finish but can be painted any color



THERMO-WALL CONSTRUCTION

- combines exterior and interior wall surfaces all in one
- has high insulating efficiency
- is quickly erected, requires no finishing
- can be used on all types of industrial buildings

... for more details, circle No. 100 on Reader Service Postcard

"Stand-by" operation on a trickle of current

NEW MOTOROLA "MOTRAC" * 2-WAY RADIO



* Motorola Transistorized Advanced Communications

Motorola marks another first...with a completely transistorized receiver and power supply!

Lower Battery Drain

MOTRAC cuts receiver current drain to 1/3... 1/10 with battery saver switch. Heavy duty batteries and generators are out!

Greater Reliability

Transistors, printed circuits and revolutionary new design set a new standard in reliability!

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Approximately 1/2 the weight, 1/3 the size of other models. Tight quarters mounting is easier than ever!

Here is the most reliable and efficient 2-way radio ever made. All tubes in the receiver and the vibrators in the power supply are *replaced* by dependable, long-life *transistors*. You no longer need to idle the vehicle to keep your radio operating! Savings in gasoline, engine and battery wear add up fast. See exactly how new MOTRAC radio can mean much lower radio operating costs... with a big bonus in never-before reliability. Write for full facts.



MOTOROLA 2-WAY RADIO

MOTOROLA COMMUNICATIONS & ELECTRONICS, INC.

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☐ Send full facts on MOTRAC radio ☐ Have representative call for appointment

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COMPANY _____

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CITY _____ ZONE _____ STATE _____

... for more details, circle No. 101 on Reader Service Postcard



compactor is used, following a motor grader or tractor with ripper teeth, to pulverize lumps of paving material in breaking up a road way. The unit also is recommended for compacting sub-base material and in some localities can be used instead of a sheepfoot roller. Standard unit includes internal cleaners, removable ballast tanks, rear towing eye, folding leg stands, adjustable draw bar and universal towing eye. ... Circle No. 24

Rotary drill rig

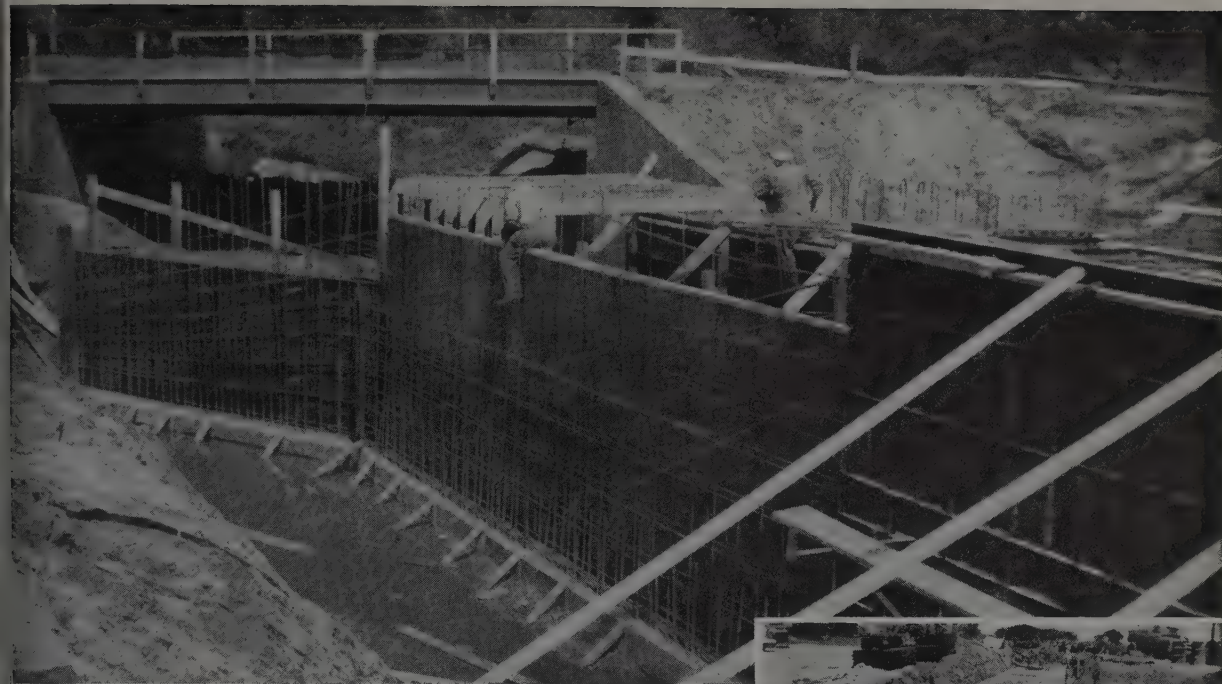
A rugged medium-sized rotary blast hole drill rig, Model 30-R has been introduced by Bucyrus Erie Co. Available with either crawler or truck mount, the 30-R will drill 6 1/4 to 7 7/8-in. diameter blast holes, and carries five lengths



of pipe, sufficient to drill 106-ft. depth. Unit has a 36-ft. derrick hydraulic levelling jacks, and enclosed cab. It has a hoisting speed of 113 fpm., drilling pressure of 30,000 lb., and hoist pull of 29,500 lb. Drill material is air-baled, utilizing output of a 667-cfm. compressor. Available with Caterpillar or GM diesel engine, drill weight 24 tons. ... Circle No. 25

Independent front-end suspension

Increased stability, comfort, steering and road feel is provided by the new GMC independent front suspension adopted for GMC Series



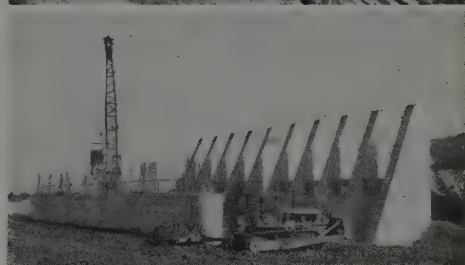
forming Bridges, Culverts, Piers?

UNI-FORM PANELS

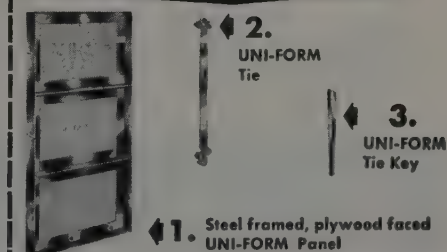
Save LABOR, MATERIAL, TIME!

Simple mechanical assembly and pre-engineered techniques for handling virtually any forming condition make UNI-FORM Panels your best bet for fast, low cost forming. Successful contractors everywhere are using the UNI-FORM system to form bridges, overpasses, culverts, piers and abutments, because their experience has shown that UNI-FORM Panels give them the speed, flexibility and economy required to handle this complex type of forming at the lowest possible cost.

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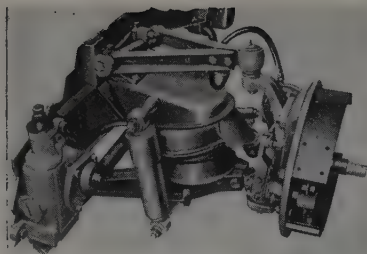
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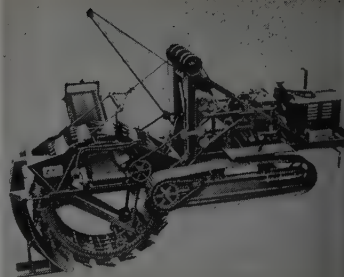
8000 trucks. Features of the system include use of air springs, 10-deg. inclination of king pins, and elimination of front axle weight. Sus-

pension is manufactured as a complete sub-assembly and secured to the frame as an entire unit. It produces ride characteristics which are practically the same whether the vehicle is loaded or empty.

... Circle No. 245

Compact pipeline ditcher

A compact pipeline ditcher which digs to a depth of 7 ft. in widths up to 44 in. and can be transported on standard trailers without special teardown is announced by Gar Wood Industries, Inc. Known as



the Buckeye 318, the new model embodies torque converter drive and complete hydraulic action. Digging wheel operates at constant speed through tailshaft governor which regulates engine torque required. Machine is equipped with hydraulic wheel hoist and hydraulic conveyor drive. All hydraulic functions are independent of wheel traction and conveyor speeds. All main drives are through transmissions and universal joint drive shafts. There are no open chain drives or jack shafts.

... Circle No. 246

ALL
THIS

100% DUTY CYCLE
225 Amperes Rated Output
5 KW 115/230v AC
1 KW 115v DC
12.9 HP ONAN ENGINE



AND
NOW

ELECTRIC
STARTER

The world-wide respect and demand for this original Miller gas engine driven welder/power plant has never been greater. To this established popularity has now been added the convenience of Bendix drive electric starting as optional equipment on models AEA-200-L and AEA-200. Model illustrated and headlined is AEA-200-LE.

As a welder, as a power plant, as a pipe thawer, indeed, as a top hand from Canadian uranium mines to Brazilian cattle ranches — and on highway construction jobs and repair ships between — the AEA-200-L stands quite alone as "the finest in the field." In addition to optional electric starter, road trailers and rubber tired running gear are also available.

Other Miller gas engine driven DC and AC-DC welder/power plants to 300 amperes at 100% duty cycle. Full particulars will be sent promptly upon request, or a demonstration can be arranged at your convenience.

Economy loader series

An economy loader series L-100 with adaptor brackets to fit eight makes of tractors has been announced by Henry Manufacturing Co. The L-100 series has a breakaway capacity of 2,500 lb. Model L-100 S has one bucket cylinder



and Model L-100 D has two. Double acting lift and bucket cylinders are standard on both models. Loader mounts on International Harvester 240 and 340; All Chalmers D-14; John Deere 430 and 430U; Ford 600-800; Ferguson 35; Massey-Ferguson 202; Oliver 550; and Case 310. Literature available.

... Circle No. 247

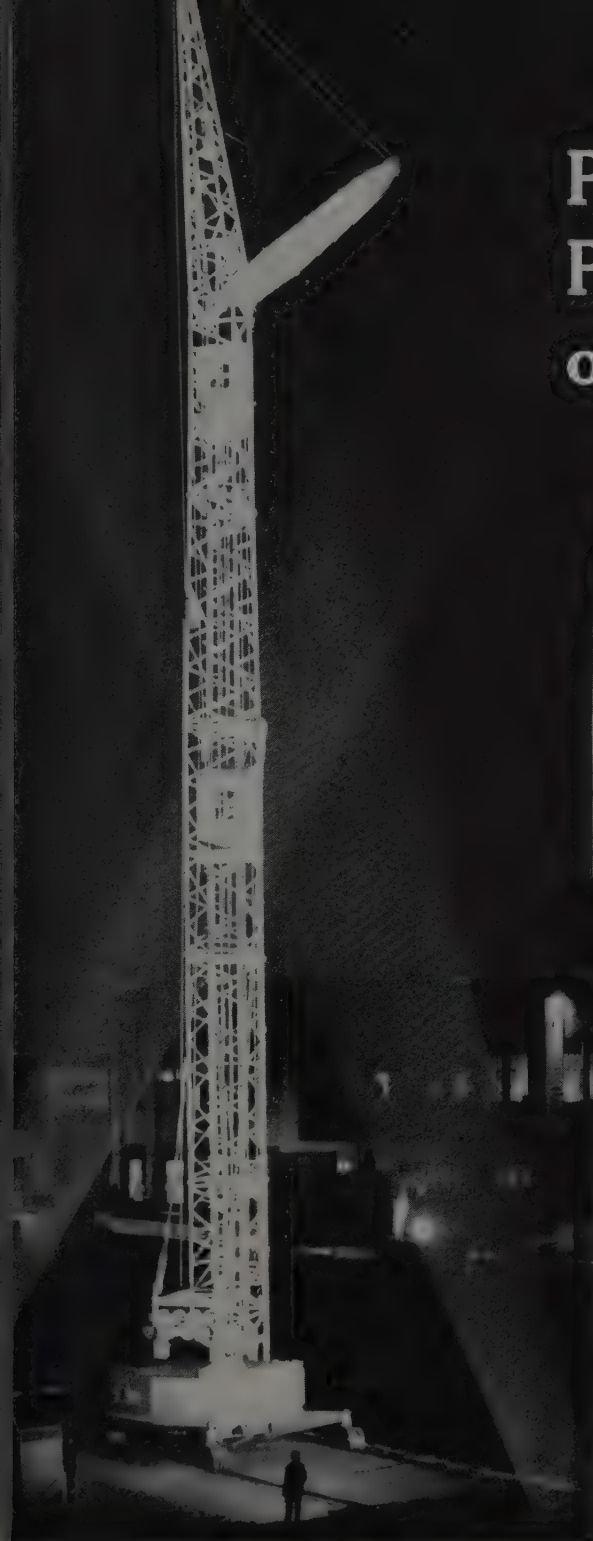
Lightweight safety cap

A safety cap weighing less than 8 oz., and available in a full range of colors is announced by Gent Corp. Designed for light and medium applications, it is made



... for more details, circle No. 103 on Reader Service Postcard

PREMIER PERFORMANCE of a giant....!



Now building the new West...the BEATTY-PECCO Construction Crane

Tonight, a spectacular tower of shimmering steel . . . stretching high above the city of Los Angeles. Tomorrow, the giant comes alive as a busy member of the McNeil Construction and Vinnell Steel Company team. See it lift, lower, luff, swing, turn, and smoothly travel its tracks . . . all in response to a *single operator* at only *two* control levers! And the Beatty-Pecco Crane performs one action at a time or simultaneously . . . with accuracy, speed, and safety that's assured by patented built-in cut-off devices.

Progressive contractors, architects and engineers have been waiting for a bold new approach to materials handling . . . and now it's here in the West. Not just a crane — but a precision engineered machine which can help you cut handling costs by as much as 40%. Jobs move *faster* with Beatty-Pecco because of tremendous reach, capability and maneuverability.

First Beatty-Pecco Construction Crane is now at work on new home office building of the Pacific Fidelity Life Insurance Company (Welton Beckett & Assoc., Architect and Engineers). Why not put one to work on your next job?

For complete details: WRITE, WIRE OR PHONE:

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2400 WILSON AVENUE & BEATTY ROAD
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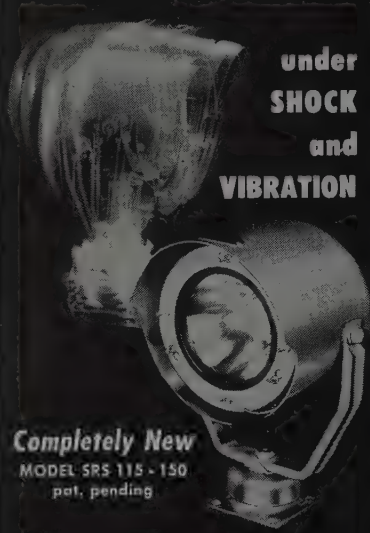
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NEVER BEFORE A LIGHT THAT LASTS SO LONG



Completely New
MODEL SRS 115-150
pat. pending

Super Rough Service

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FLOODLIGHT

*A radically new concept
in heavy duty lighting*

- ★ Free-floating, Diaphragm-action Lamp Suspension at the lens end!
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- ★ Synchro-Harmonic Filament-Fixture Positioning for low, low relamping cost.
- ★ Integrated Socket-clamp. Eliminates screw-socket problems.

In hundreds of scientific laboratory tests, the combination of revolutionary new components and lamp in Model SRS 115-150 averaged 6000 times longer lamp life than former floodlights. From a few days to months in field tests—that's the amazing record of extended lamp life of this STURDILITE over conventional lights.

MERRITT-CHAPMAN & SCOTT
uses STURDILITES on the

**3 BIGGEST CONSTRUCTION JOBS
IN AMERICA TODAY**

Glen Canyon Dam, Arizona	Niagara Power Project, N.Y.	Priest Rapids Dam, Washington
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High and low voltage models for all requirements in heavy construction, mining, quarrying, etc. Write for Literature.

PHOENIX PRODUCTS COMPANY

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... for more details, circle No. 105



contoured polyethylene with a shock absorbing acetate headband adjustable to fit all sizes, and a plastic foam cushion on the inside of the crown. Cap has an impact resistance of 20 lb. Winter liners are available.

... Circle No. 248

18-ton rubber tired crane

An 18-ton Moto-Crane on a brand new 180-in. 6x4 carrier which combines high capacity with low highway travel weight is announced by Thew Shovel Co. The Lorain MC-218 features stronger box-section side rails, 43-mph. highway speed and rocker arm bogie construction. Hydraulic steering is standard on the carrier which has



forged axle housings, double-reduction helical-hypoid gears, front bumper and outrigger boxes integral with frame, and telescopic outrigger beams. Crane turntable can be mounted in two positions of the carrier for maximum crane capacities or best digging position.

... Circle No. 249

Underwater concrete fastener

Development of a new tool for instant fastening to concrete of steel 300 ft. under water is announced by Ramset Fastening System, Olin Mathieson Chemical

"DITCH WITCH" Trencher "digs" WICO trouble-free ignition



The Charles Machine Works, Inc. of Perry, Oklahoma; manufacturers of this versatile equipment says:

"We find the WICO magneto gives the extra lunging power on these engines required for trenching applications. We have experimented with other types of ignition systems on our engines, but none gives us the stall free performance that we achieve with Wico."

Whether the job is digging trenches or sparking the starting engine on a diesel — the contractor on the job cannot afford faulty ignition interruptions... knows he can depend on Wico magnetos for trouble-free service!

Write for complete details and Form S-510 on Wico Heavy Duty Magneto Overhaul Parts Package K-11802.

WICO DISTRIBUTORS

Auto Electric Supply Co., San Francisco, Calif.	Oakley Wholesale, Inc., Boise, Idaho.
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Electric Equip. Co., Los Angeles, Calif.	Spitzer Elect'l Co., Albuquerque, N.M.
Charles C. Jones Batt. & Elec. Co., Phoenix, Ariz.	Spitzer Elect'l Co., Denver, Colo.



WICO ELECTRIC COMPANY

A DIVISION OF GLOBE-UNION INC.

West Springfield, Mass., U.S.A.

Powered by Wisconsin AENL engine with Wico magneto as original equipment.

WICO IGNITION... BEST IN THE LONG RUN!

... for more details, circle No. 106 on Reader Service Postcard

WESTERN CONSTRUCTION—June 1954



MY JOB FOLLOWS ME ... since I put my home on wheels!

This is the life! Now when I change jobs it's easy to change my home's location too. No more scrambling for a place to stay, worrying over how long it'll be before the wife and kids can follow along.

Where else and how else can a man keep his freedom to choose a job he likes, and still know the pleasures of home life? I've got roots, I'm as stable as any land—or job-bound citizen. And after a day sweating over a hot line or moving plenty of earth it's soul-satisfying to have my home close by to unwind in—a hot shower, a big easy chair to sink into, and seconds after I've got my feet propped up on the hassock, the wife's got a cold beer in my hand!

She's happy too, naturally. She's got as modern a kitchen as any we've ever seen, and as pretty decorated a house as she could wish for.

There's plenty of space for the kids (separate bedrooms!) and a living room large enough for partying. And we've saved so much since we've owned our mobile home that we've got a new car, plenty of insurance and a bank account that guarantees the kids a good education.

Our park neighbors got their information from a local dealer—found him in the yellow pages. We wrote the Mobile Home Division of the Trailer Coach Association. Step inside some mobile homes—our bet is you'll buy one.



CONTRACTORS: Your most dependable employee today is the man with the Mobile Home.

Within one day he can be completely and comfortably moved to the job site—no packing up, no furniture moving or storage problems, and no days wasted looking for a new place to live.

Best of all, his family moves with him, bringing all the comforts of his luxurious and modern mobile home.

A normal, stable and comfortable family life means fewer days lost to illness. He can devote all his energies to the job, undistracted by personal inconveniences.

If you have employees with housing problems, write for additional information and reprints of this ad.

TRAILER COACH ASSOCIATION  607 So. Hobart Blvd., Los Angeles 5, California

Look for the TCA seal—your guarantee of high construction standards.

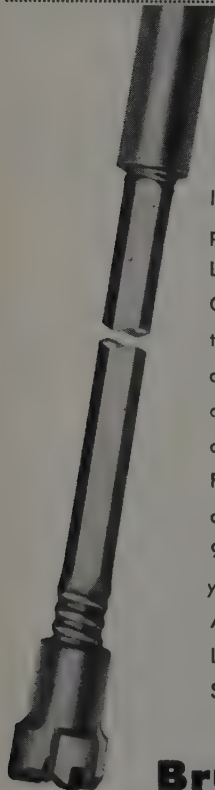
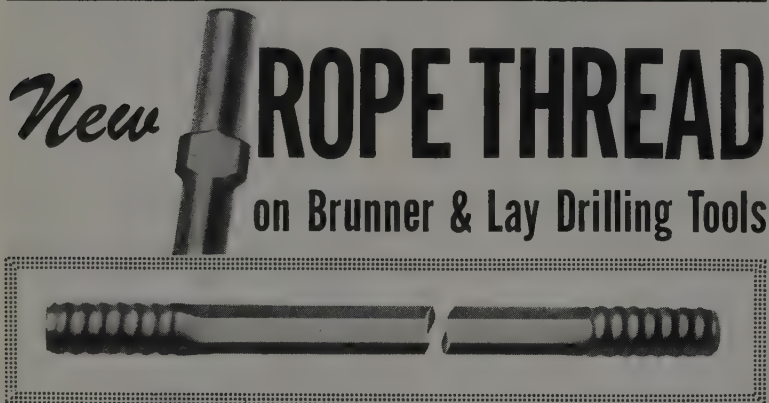
... for more details, circle No. 107 on Reader Service Postcard

Corp. Tool uses a capsule barrel containing fastener and power load sealed at the factory. After firing, entire barrel is discarded and replaced. It will drive a fastener into high strength concrete or 5/8-in. steel instantly and is easily cocked and loaded under water in complete darkness. . . . Circle No. 250

Light weight engine oil

A lubricating oil specifically developed for two-cycle engines used on pumps and other equipment has

been announced by Standard Oil Co., of California. The oil contains a non-metallic non-ash forming detergent developed by California Research Corp., to provide the advantages of a compounded oil without the disadvantages of metallic base detergents. Performance advantages include reduced sparkplug fouling, reduced piston ring and cylinder scoring and reduced combustion chamber deposition. In field tests the oil showed ability to improve performance in badly fouled engines. . . . Circle No. 251



New ROPE THREAD on Brunner & Lay Drilling Tools

.... makes long-hole drilling
EASIER • MORE PROFITABLE

If it's deeper holes you are after, you can't buy more productive tools than the rope thread Brunner & Lay assembly . . . carbide Rok-Bits, Couplings, Carbo-Rok Sectional Rods, Striking Bars. Solid rope thread connections ensure greater rod rigidity for deeper drilling. Rod life is extended—breakage costs reduced. Easy hand uncoupling. An unbeatable drilling unit designed and built to work together. For complete information call your Brunner & Lay dealer, or our nearest plant. Brunner & Lay, Inc., 9300 King St., Franklin Park, Ill. 77 progressive years. Plants & conversion shops: Albuquerque, Asheville, Birmingham, Denver, Dorchester (Boston), Los Angeles, Philadelphia, Portland, Sacramento, Seattle, Lachine, P. Q. Spokane, Vancouver, B.C.

Brunner & Lay Products

CARBIDE ROK-BITS • INTRASET STEEL • DRILL RODS • COUPLINGS, ADAPTERS & SECTIONAL STEEL
AIR TOOL ACCESSORIES—MOIL POINTS, CLAY SPADES, ASPHALT CUTTERS, etc.

. . . for more details, circle No. 108 on Reader Service Postcard

Rope thread drill line

A wide range of bit sizes is incorporated in the new line of Brunner & Lay rope-thread carbide Rok-Bits, Carbo-Rok sectional rods couplings and striking bars. Bit sizes are 2 1/2 in., 2 3/4 in., 3 in., 3 1/2 in., and 4 in. with 1 1/2-in. rope thread; 3 in., 3 1/2 in., and 4 in.



with 1 3/4-in. thread; and 4 in., 4 1/2 in. and 5 in. with 2-in. thread. All are available in both cross and X design with new heavy duty cut away body. . . . Circle No. 252

Cable-operated shovel loader

No hydraulic equipment is required for operating an all-cable shovel loader introduced by M. P. McCaffrey, Inc. The unit, which



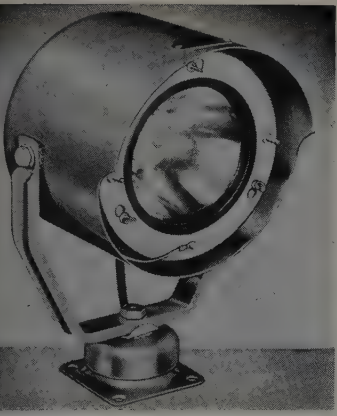
can be easily adapted to fit any 3/4-yd. machine, loads, swings and dumps without travel. Illustration shows a 2-yd. bucket on a 3/4-yd. machine. The attachment weighs 3,800 lb. and handles easily without additional counterweight. Loaders also available in 3 1/2-yd. size for 1 1/2-yd. machines.

. . . Circle No. 253

Rugged lamp resists shocks

A sealed-beam lamp designed to perform under the roughest conditions is announced by Phoenix Products Co. Called Sturdilite Model SRS-115-150, the new lamp has a filament which vibrates freely in one direction. This can be matched to the general vibration direction by rotating the lamp in any one of four positions in the housing, for added light life. Lamp housing itself contains a number of innovations. Lamp floats free a universal-action diaphragm suspension, gripped at the center gravity. There are no sockets unscrew. Base mount has high resilience rubber in compression in all directions, giving protection against heavy impact shock, and

ABACO Salutes Outstanding Service

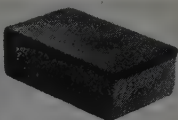


isolating vibration on higher frequencies. In fatigue tests it has lasted 18 hours where an ordinary lamp failed in 9 secs. Light unit is a 115-volt, 150-watt sealed beam lamp.

... Circle No. 254

Concrete preserver stops freeze damage

A deep-penetrating concrete preserver for high-traffic areas and freeze-thaw problem surfaces has been introduced by Watco Dennis Corp. Called "Watco Concrete Preserver," this oil and resin material has resisted freeze-thaw deterioration on bridge surfaces in cold weather area field tests as well as abrasion in high traffic wear con-



ditions. The preserver is not a surface coating, but a deep penetrating product. It is colorless and non-chemical in action, and will not react in any way on the concrete or material processed. It achieves its preservative and protective qualities through formation of a tough, resilient solid within the concrete itself. Watco preserver is easily applied. Bridge decks and parapets, high traffic and hard-wear areas to be processed require no pre-treatment other than being clean and dry. The liquid is then brushed or sprayed on the surface in saturation quantities and allowed to penetrate into the concrete for an hour.

... Circle No. 255

J.C. COMPTON CO.
GENERAL CONTRACTOR

MC MINNVILLE
OREGON

IN 1959, Mr. J. C. Compton, President of the J. C. Compton Co., will complete fifty-two years in the general contracting and roadbuilding business! A "pioneer" in the industry, Mr. Compton has been a leader in the development and application of methods, machines and materials for road construction. We are proud that, over the years, our plant in Portland has had many opportunities to supply much of the material used by the Compton Company.

We look forward to continuing our service to the Compton Company in the years ahead, and we salute the man who has guided this firm to the prominent position it enjoys today.

At your Service Throughout The Nation—to provide maximum service to you—our customers—we have set up a "network" of over fifty installations—refineries, plants, terminals and offices—in strategic locations from coast to coast. This is your assurance of on-time delivery of uniform products whenever or wherever, you order Chevron Asphalts, Chevron cut-backs, and Bitumuls emulsified asphalts.

Call our office nearest you for information or service.



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BITUMULS® Emulsified Asphalts • CHEVRON® Paving Asphalts
LAYKOLD® Asphalt Specialties • PETROLASTIC® Industrial Asphalts

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SUPERVISING

(Continued from page 153)

ing firm of S. S. Mullen, Inc., head the list of personnel constructing a reinforced box girder approach structure on the south end of Lake Washington ship canal bridge on the Seattle Freeway. Mullen started work on the \$2,479,211 project in April.

James Wylie, general superintendent for Morrison-Knudsen Co., Inc., is in charge of the company's \$1,329,641 contract near Grants Pass, Ore., for grading, surfacing, and related work on section of Pacific Highway. Superintending the job is **Ray Jones**. **Ralph Woolworth** is office manager on this work, which has been under way since February, scheduled for December closing.

Charles O. Prose is supervising a \$160,109 award to Heiskell Construction Co. covering placing of base course and bituminous road-mix surfacing on section of the Payson-Colcord highway in Tonto National Forest, Ariz. Principal foremen are **R. T. Moman** and **W. H. Howell**. Under way since Mar. 1, Heiskell expects to finish by Oct. 30.

Robert A. Millard, general grading superintendent for J. F. England's Sons, Inc., is in charge of highway job covering 6.3 mi. of grading and surfacing and structures on the Armells Creek-Hays-Harlem highway in Montana.

Rodney Forgey is acting as foreman for a \$579,365 contract awarded to Forgey Bros. Co., covering 6 mi. of grading, surfacing and related work on the Diversion Dam-Riverton road, Fremont County, Wyo. Other important supervisors are **Dan Carr**, grade foreman, **R. L. Cates**, labor foreman. **W. B. How** and **B. E. Carr** are mechanics on the job. According to **Russell Forgey**, partner in the construction firm, the job continued all last winter.

William R. Ervin is supervising construction of environmental simulation facility at Naval Missile Center, Point Mugu, Calif. Contract was awarded to Price McNemar on his low bid of \$1,472,000. Carpenter foreman is **Owen Sellers**; **Harmon H. Day** is timekeeper. **Sidney C. Moore** is job expeditor.

Shirley Grais, superintendent, and **Bruce Clyde**, assistant superintendent, are top supervisors on **Gibbons & Reed Co.**'s job of grading, surfacing and structures, and related work on 4.9 mi. of Highway 15 in Orem, Utah. The \$1,452,948 job started in March.

R. L. Dever is superintending a recent \$521,182 award to **Armstrong Construction Co.**, with the following acting as foremen: **T. C. Carr**, bridge; **Paul Taylor**, crusher, and **Clyde Rossow**, grading. Job consists of grading, surfacing and structures, with related work near Capitan, Lincoln County, N. Mex.

K. A. Madison, superintendent for **Dorman Construction Co.**, heads a highway construction crew working on 6.4 mi. of grading and surfacing, Ritzville to Coker, in Adams County, Wash. Foremen on the \$808,943 project are: **Lloyd Clark**, crushing; **Helge Hovland**, labor; **Isaac Farley**, truck, and **V. B. MacPherson**, electrician.

Robert F. Calou, superintendent, and assistant superintendents **Wayne D. Wilcoxon** (grade), and **Lloyd I. Erickson** (structures) is in charge of a recent award to **Fredrickson & Watson Construction Co.** and **Ransome Company** for grading and surfacing to construct 3.7 mi. of 4-lane freeway in Oakland, Calif. **Tom W. Bond** is office manager. This \$975,624 contract has been under way since March, scheduled for completion next January.

H. C. Ball, construction manager, **N. F. Barber**, project superintendent, **E. R. Nadasdy**, job manager, **H. S. Ball**, field engineer, and **R. T. Noel**, office manager, comprise the top personnel for **Twaits-Wittenberg Co.** and **Morrison-Knudsen Co., Inc.**, for recent award to construct new Los Angeles County Hall of Records in the city of Los Angeles. Costing \$11,464,000, the structure will be 8 floors plus basement and penthouse in main part, and 15 mezzanine type floors in the stack area, enclosing in all more than 460,000 sq. ft. Of structural steel and poured-in-place concrete construction, the exterior will be of ceramic veneer and granite. Contractor started work Mar. 23, with April 1, 1961, the target date.

Carl A. Pulsipher, superintendent, **Edmund W. Allen**, engineer, and **J. Odell Blain**, expeditor, are

the three top men named by **Alfred Brown Co.** to direct construction of the new State Office Building in Salt Lake City, Utah. The \$2,341,696 award got under way in March, with the structure earmarked for completion March 1961.

George Sprague, superintendent for **Cawdrey & Vemo, Inc.**, contractor, with the assistance of the following carpenter foremen: **R. G. Farley**, **Herman Oberg** and **Paul Bradshaw**, has charge of construction of a 2-story structural steel building for **Sears & Roebuck** in Renton, Wash. Work on the \$1,644,869 project got under way Mar. 23 and will be finished in November.

Joe W. Hunter, project manager; **Willis A. Saucerman**, project superintendent, and **J. Keith Ormond**, project engineer, are **Teller Construction Co.**'s top men on construction of a hot cell shop and maintenance building at the **AEC's** National Reactor Testing Station in Idaho. Office engineer for the \$666,500 project is **J. E. Kendrick**. April was the starting day, and January next year will be the finishing date.

Holger Johnson is superintending an award to **Husman Bros. Inc.**, for construction of two bridges over the Tongue River near Montarch, Wyo. **Husman** was awarded the contract on a low bid of \$297,320, started work Mar. 1, and expects to be finished about Nov. 1.

C. Vernon Glidden is superintending for **Pacific Concrete and Otis P. Jordan, Jr.** on a contract to construct 7 bridges in 140 working days. The \$533,333 job is on the Ontario-Idaho line section of Old Oregon Trail highway in Oregon. Engineer for the contractor is **Wayne Lowell**. **George Verschling** is carpenter foreman. Job will be finished the end of October.

Kent Slate, project manager for **Fred H. Slate Co., Oregon Ltd.**, in charge of a \$297,215 contract for grading, surfacing and related work on 3.3 mi. of the St. Regis Paradise road in Mineral County, Mont. **John Dever** is foreman, and **Harlan Nelson** is mechanic. Job started in April and will be finished in August.

Jim Humphries is supervising clearing, grading, draining and su

facing job for Eagle Construction Co. on the Elk City highway, Nez Perce National Forest, Idaho. The \$671,555 contract has been going since March, with July the probable finish date.

* * *

Harlen Roberts, Leroy Gray, and Gene Bazinet, carpenter, labor, and equipment foremen respectively for Pakar Construction Co., are key men on a \$150,932 bridge contract under the direction of **Frank J. Pakar**, superintendent-manager, and **Mat Pakar**, partner in the firm. Contract for the 240-ft. steel span and concrete approaches, located in Lewis County, Wash., was executed with the State Highway Commission April 6. Excavation for the bridge piers was completed April 13, and the next day Hart Construction Co. began driving the 60-ft. piling under a subcontract.

* * *

Charles Ptacek is superintending a \$203,307 contract covering 13 mi. of surfacing and seal coating on the Arrow-Creek-Brooks road in Fergus County, Mont., for **McLaughlin, Inc.** **John Clayton** is plant superintendent. This base gravel, cushion, and plant-mix job started in April and will be finished some time in July.

* * *

M. S. Gorton, manager of Puget Sound Dredging Co., with **B. H. Morton**, dredging superintendent, is handling a channel dredging contract recently awarded this company near Juneau, Alaska. The \$481,439 project is now getting under way and will be finished in September.

* * *

Bill Robbins, general superintendent for Givens Construction Co., is in charge of grading, surfacing and structure work north of Randolph in Arizona. **Archie Martin** is foreman, and **Cullen Thompson**, field office manager. Under construction since April, the job is now in the finishing stage. Contract price was \$228,657.

* * *

Bill Peach is superintendent, and **Ken Urban**, field engineer, employed on six 3-story masonry residence halls under construction by **Gothschild, Raffin & Weirick** and **Continental Construction Co., Inc.**, at San Jose State College in California. Started in April, the \$2,48,000 structures will be finished about August next year.

* * *

Theo Ellingford and **J. R. Ellingford** are acting as superinten-

dent and foreman respectively on a \$127,873 contract which recently went to **Ellingford Bros., Inc.**, for grading, two double interchange structures, surfacing and related work on 6.2 mi. of 4-lane freeway on the Rock Springs-Rawlins road in Wyoming. Earmarked for finish in August, work has been going on since April.

* * *

M. O. Mittry, project engineer and manager, and **R. N. Mittry**, project superintendent, head the list of personnel on a \$1,321,341 award to **O. K. Mittry & Sons** cov-

ering earthwork, structures and surfacing for relocation of Trinity county road, part of Trinity River Division of the Central Valley Project, Calif. Grade foreman is **Ed Lowry**, labor foreman is **Ed Johns**, and **Thomas Fraser** is master mechanic. August 1960 is target date.

* * *

Ernie Helsberg is superintending for **Husman Bros., Inc.**, construction of grade separation structure and other work on 4-lane divided highway on the Sheridan-Ranches road in Douglas County, Wyo.

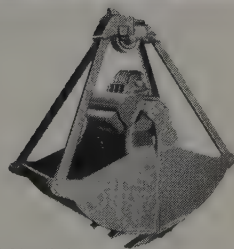
(Continued on page 206)

McCaffrey

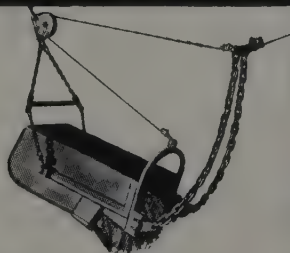
all-welded buckets are backed by over
30 years experience in bucket manufacturing



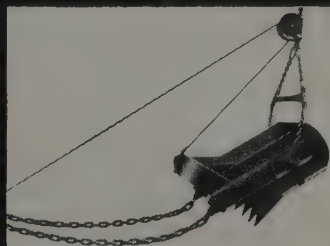
LIGHTWEIGHT CLAMSHELL, Type L, for loose sand, small gravel. **CLAMSHELL** Type R, available for rehandling work.



CLAMSHELL, Type D, for general purpose digging. Handles wide range of work.



NEW LIGHTWEIGHT DRAGLINE, Type A, up to one ton lighter in larger sizes.



MEDIUM WEIGHT DRAGLINE, Type M, balanced for easy digging and full payload.

McCaffrey know-how—built into every bucket—means rugged dependability, more yardage and more profit. Other popular models include McCaffrey Rock Tongs, with double center pin design permitting each tine to accommodate itself around odd shaped rocks, and the MacGrab Grapple, excellent for handling rip-rap. Write us your requirements. We have the precise bucket for your job.

M. P. McCaffrey, Inc.

2121 E. 25th Street, Los Angeles 58, California



... for more details, circle No. 110 on Reader Service Postcard

News of DISTRIBUTORS

Oscar Bjorge retires as president of Clyde Equipment Co.

Oscar Bjorge, widely known Northwest distributor, recently retired as president of Clyde Equipment Co., Portland. Bjorge began his machinery career more than forty years ago as chief engineer of the Clyde Iron Works in Duluth, Minn. Coming to Portland in the early 1920's, he became manager of the logging equipment division of Clyde Equipment Co.

Under the chairmanship of Freeman Sersanous, a testimonial banquet in Bjorge's honor was recently held by the Portland Machinery Dealers Association. During the evening's festivities Jack Hatten, director of Region 12 of Associated Equipment Distributors, presented Bjorge with a life membership in national AED. Bjorge is a past president of this organization, as well as a past president of the Portland Machinery Dealers Association currently headed by Frank Parker.

Calavar Corp. completes plant

Calavar Corporation, 2700 So. Broadway, Los Angeles, has expanded its present facilities with completion of a new building located on Santa Ana Freeway in Santa Fe Springs to house engineering and manufacturing and additional service facilities. Serv-

Eastman named general manager

J. E. Hall, executive vice president, Cook Bros. Construction Machinery Co., Los Angeles, distributor of heavy-duty machinery to the construction industry, announces

Lowell
Eastman



the appointment of Lowell F. Eastman to the position of general manager. He joined Cook Bros. in September 1955. Prior to this he was for several years in the construction field. Part of this time he spent with the contracting firm of E. L. Yeager Co., Riverside, where he gained valuable experience in all phases of construction work.

ing of the equipment distributed by the firm, and designing and manufacturing of custom engineered heavy-duty equipment for contractors will be performed at the new plant. New and used equipment will also be on display at this location. The parts department and general offices remain at the Los Angeles address.



New Eimco distributor in Portland

Appointment of Janzen Equipment Co., Portland, Ore., as distributor for the complete Eimco line of tractors, crawler-tractor units and air motors is announced by Joseph Rosenblatt, manager of The Eimco Corporation at the company's head offices in Salt Lake City. The Portland firm is operated as a partnership by Pete Janzen and his son, Norman L. Janzen.

Lang receives expanded territory

Lang Construction Equipment Co., Salt Lake City, has been appointed exclusive distributor for all of southern Idaho and southeast Oregon by eleven large manufacturers of construction equipment. The new territory includes 34 Idaho counties plus four in southeast Oregon. Lang has represented many of the eleven manufacturers the past year through its new branch at Idaho Falls. The branch territory consists of seven teen counties in southeast Idaho. The additional seventeen southwest counties and four southeast Oregon counties were awarded by the Construction Equipment Division of International Harvester Co., Drott Manufacturing Co., The Frank G. Hough Co., The Galio Iron Works & Manufacturing Co., Gorman-Rupp Co., Macwhyr Company, and Wain-Roy Corp.

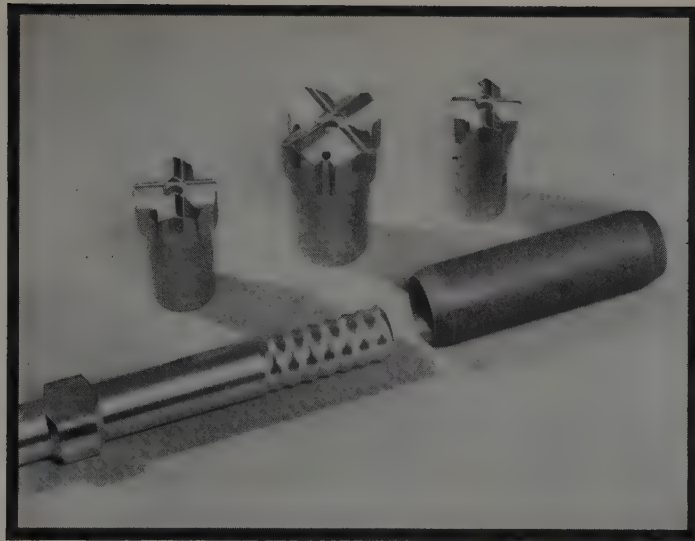
Four companies that Lang has not previously represented in Idaho awarded the entire 34 southern Idaho counties and the four southeast counties in Oregon. They are Barber-Greene, Gardner-Denver, Butler Bin, and Childers Manufacturing Co. President H. A. Christiansen, Vice President J. Robert Lang, and T. Kevin Best, branch manager at Idaho Falls, completed the negotiations with the manufacturers.

Diamond T names new dealer at Twin Falls

Diamond T. Motor Truck Co., Chicago, announces the appointment of a new dealer, Idaho Equipment Co., Twin Falls, who is now actively merchandising the manufacturer's line of heavy-duty motor trucks.

San Diego Tractor is Euclid dealer

Euclid Division of General Motors has appointed San Diego Tractor & Equipment Co. as authorized dealer for the complete line of Euclid earthmoving and other co-



Here's proof Coromant rope-thread bits and steels SAVE TIME AND MONEY

"Up to double the footage between sharpenings!"

"Premature rod breakage is almost non-existent!"

"40% more usable life—more resharpenings!"

"Bit and rod life are well above average!"

"Uncouple by hand all the time!"

*"More rigid—drills straighter holes!"**

**Names of men quoted available on request*

The comments above are actual quotes from project managers, job superintendents, and drill superintendents who have tested new Coromant rope-thread bits and steels. They've learned, on-the-job, the benefits they—and you—can expect!

For example: The new rope-thread (only two turns per inch) holds tight in use, yet permits hand uncoupling. Reports show that the time saved results in more footage drilled per shift. Bit footage is well above average too, with less loss of carbide inserts. Prime quality ore plus nickel-chrome alloy permits cold-rolling from billets for greater strength, life and rigidity. And only with Coromant rope-thread steels can you re-thread without heat treating, too. Do it yourself, or at any nearby machine shop.

Want to know more? There's no obligation on your part, but we'll be glad to help where we can. Just call your nearest Atlas Copco Office, or write to us at Dept. WC-7.

Atlas Copco

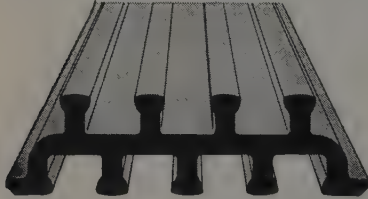
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930 Brittan Avenue
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**A SOUND INVESTMENT
FOR CONCRETE CONSTRUCTION!**



LABYRINTH AVAILABLE IN 2, 3 or 4 rib.

ON YOUR CONSTRUCTION:

1. Consider the investment in design, materials and labor (to mention a few).
2. Then consider how important safe, secure *watertight* concrete joints are.
3. Thorough watertightness *can* be secured by installing Labyrinth Waterstops—a dividend that makes the low initial cost of the product insignificant when compared to your total investment—and one that insures watertight concrete joints for years!

- Corrugated ribs grip concrete, insure an everlasting bond between joints.
- Finest polyvinyl plastic resists chemical action, aging, severe weather.
- Takes just seconds to nail to form ... easy to cut and splice on location (prefabricated fittings available).
- There's a Water Seal product for every type of concrete work!

If your aim is to stop water seepage, stop it effectively with Water Seals' Waterstops!

WATER SEALS, INC.

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THOMAS CONCRETE ACCESSORY CO.

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HYDRO PRODUCTS CO.

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4121 Sixth Ave., N.W.
Seattle, Wash.

PLASTI-SPRAY CO.

353 S. State
Orem, Utah

BAKER-THOMAS-WOOLSEY

300 S. Twelfth St.
Phoenix, Ariz.

E. W. ZUCK

1238 N.W. Glisan St.
Portland 9, Ore.

struction equipment in San Diego and Imperial counties, Calif. Harry Booth, president of San Diego Tractor, is well known to equipment users in the Southern California area, having been head of the machinery dealership for many years.

New distributors appointed by Yale & Towne

Announcement is made by The Yale & Towne Manufacturing Co., Trojan Division, Batavia, N. Y., of the appointment of several new distributors in the West: for the entire state of Arizona—Road Machinery Co., Phoenix; for the entire state of Colorado—MacDonald Equipment Co., Denver; for all of Oregon, and the five southern counties of Washington—Manitou Equipment Co., Portland.

Waco receives new account

Waco Scaffolding Co., Stockton, Calif., is named distributor for Pacific Mercury electric plants and flasher warning lights in the area they serve and will maintain a complete parts and service department for PM customers.

M-F area dealers named in two Western states

Farmers Union Trading Co., Butte, Mont., has been appointed by Massey-Ferguson Industrial Division to handle in their area the Work Bull industrial tractors, Davis loaders and backhoes, and other M-F power matched equipment. Likewise, Lyle E. Trimble, Inc., Mesa, Ariz., has been named area dealer for M-F equipment in the territory covered by them.

K&M pipe representative named

Republic Supply Co. of California, Los Angeles, has been named sales agent for Keasbey & Mattison Co.'s complete line of asbestos cement pressure pipe, gravity sewer pipe, building sewer pipe, and irrigation pipe. Republic has established a new water-works supplies department headed by Robert Muse.

Dealers view self-erecting plant

One of the features of the annual dealer-distributor sales and technical meeting of Standard Steel Corp. held at Palm Springs, Calif., was

EVER SEE A CONTINUOUS TRULY UNDISTURBED SOIL SAMPLE 15, 30 OR EVEN UP TO 60 FEET IN LENGTH

In addition to being able to secure conventional type soil samples, Sprague & Henwood, Inc., also has available the Swedish Soil Sampler to recover undisturbed samples 15, 30 or even up to 60 feet in length. With this device, slide resistance and wall friction are almost eliminated and thin critical layers of soil that usually go unnoticed are easily detected.

Let us help you in solving your foundation testing problems. We have the equipment, personnel, and drilling "know-how" necessary to undertake your particular project. Our complete drilling service is illustrated and described in the new S&H Contract Brochure, write for your copy today.



A Sprague & Henwood crew recovering a 30 foot sample of sensitive marine clay.

SPRAGUE & HENWOOD, Inc.

SCRANTON 2, PA.



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... for more details, circle No. 113 on Reader Service Postcard

WESTERN CONSTRUCTION—June 1964

the inspection by distributors and dealers of the new Model S-E, 5,000-lb., self-erecting, fully portable asphalt plant owned by C. H. Meyeroltz, Inc., in Beaumont, Calif. In introducing the new plant, M. B. Freeman, vice president, said that sales during the past year have been the highest in Standard's history and the entrance of the new plant into the field should mean further increases.

Bruschke joins Atlas Equipment

A. B. Bruschke, sales manager of Kramer Machinery Co. of Portland, has been named sales manager of Atlas Equipment Co., Salt Lake



A. B.
Bruschke

City, according to announcement. Atlas president James M. Walker. Bruschke has been in the heavy machinery field for the past thirteen years. Prior to 1947 he was associated with Thor Tool Co. in Salt Lake City. Walker said that sales manager Bruschke will spearhead a drive to promote sale of such lines as Buffalo-Springfield rollers, Cleveland trenchers, Lorain shovels, shovels and loaders.



ELSON D. PATTERSON, White Motor Company regional vice president, presents an inscribed wrist watch to R. W. "Dick" Cochran at the heavy-duty truck manufacturer's annual Western sales meeting in San Francisco. Cochran (right), who for 38 years has served with White Motor in various capacities—most recently as manager of the firm's Denver factory—has left the organization to serve in another role: as a White distributor. Cochran now operates the Truck Equipment Co. of Arizona out of Phoenix.

ESSICK

VIBRATING COMPACTORS



ESSICK VR-72 VIBRATING COMPACTOR
COLTON-RIVERSIDE FREEWAY—CALIFORNIA

SAVED \$2,400 PER MONTH IN RENTAL CUT COMPACTION COST.....

...FROM 9¢ TO 2½¢ PER YARD

E. L. Yeager Co., Altfillisch Const. Co., and Lowe and Watson (Joint Venture) "On the Colton-Riverside Freeway, compaction requirements were 90% of California AA-SHO on fill material made up of silty clay with occasional sand strata. We had been compacting 12,000 yards per 9 hour day for as high as 9¢ per yard with both a 75 ton and a 50 ton pneumatic tired roller, and two 5 x 5 sheepsfoot rollers pulled by D-8 Cats.

"We replaced the pneumatic rollers, sheepsfoot rollers and a D-8 with the Essick 72" VR-72-T Vibrating Compactor and compacted 8,000 cubic yards in a 9 hour day with the single roller, and cut our compaction cost to as low as 2½¢ per yard. We saved \$2,400 per month in rental alone and were able to meet or better the 90% specs in one pass*.

HIGH-FREQUENCY VIBRATION

"With our previous equipment, moisture had to be 11 - 12% or we did not meet some of the compaction tests. With the Essick VR-72, moisture content was not critical as we met the specs with moisture as little as 6 - 7%. The Essick VR-72 Vibrating Compactor was a big help in making this a profitable job for us."

* ESSICK HIGH-FREQUENCY VIBRATING COMPACTORS ARE CUTTING THOUSANDS OF DOLLARS DAILY FROM CONTRACTORS' COSTS! ASK FOR PROOF. SEE YOUR ESSICK DEALER NOW FOR A DEMONSTRATION

9 models of Vibrating Compactors from 13" to 72" widths



for compacting all types of fills, sub base, base materials, asphalt, and trenches

ALSO 14 MODELS OF TANDEM ROLLERS FROM 1/2 TO 14 TONS

ESSICK MANUFACTURING COMPANY

1950 Santa Fe Avenue
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850 Woodruff Lane
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Affiliated with THE T. L. SMITH CO., Milwaukee, Wisconsin

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Lubriplate No. 630-2 is a high temperature, extreme pressure, water-repellent, grease type lubricant. Ideal for the general lubrication of Industrial, Automotive, Construction, Farm and Marine Equipment. Lubriplate Grease Gun Cartridges provide an easy, quick, economical means of application. Prevent the waste and mess of hand filling. Packed 10 Cartridges in a handy carrying carton.

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE



LUBRIPLATE DIVISION, Fiske Brothers Refining Co.
Newark 5, N. J. or Toledo 5, Ohio

DISTRIBUTED BY

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Garlinghouse Brothers	Los Angeles, Calif.
Degen-Fiege Co.	Los Angeles, Calif.
Kenton Equipment Co.	San Diego, Calif.
Miller & Stern Supply Co.	San Francisco, Calif.
Handrie & Bolthoff Co.	Denver, Colo.
Sawtooth Company	Boise, Idaho
Paul Roberts Co.	Pocatello, Idaho
Moty & Van Dyke, Inc.	Klamath Falls, Ore.
Goodyear Rubber & Asbestos Co.	Portland, Ore.
Industrial Supply Co.	Billings, Mont.
Utah Bit & Steel Service Co.	Midvale, Utah
Western Sales Engineering Co.	Salt Lake City, Utah
Campbell Industrial Supply Co.	Seattle, Wash.
Nott-Atwater Company	Spokane, Wash.
Campbell Industrial Supply Co.	Tacoma, Wash.
Dodge-Yakima Supply Co.	Yakima, Wash.
Yukon Equipment Co.	Seattle, Wash.
Fleck Brothers Ltd.	Vancouver, B. C., Canada
Flury Supply	Roseburg, Oregon
George Murrie & Sons	Eugene, Oregon
Wilkinson & McClean, Ltd.	Calgary, Alberta, Can.



... for more details, circle No. 115

MANUFACTURERS

New marketing head at Massey-Ferguson Industrial Division

Appointment of Cornelius Whetstone, widely known equipment merchandising executive, as marketing manager for Massey-Ferguson Industrial Division is announced. Whetstone was formerly general sales manager of the Trojan Division of Yale & Towne Manufacturing Co. He will make his headquarters at the Massey-Ferguson offices in Wichita, Kans.

Black & Decker forms subsidiary

Announcement is made by Black & Decker Manufacturing Co., Towson, Md., of the formation of a subsidiary, Master Power Corp., which has acquired the operations of the Master Pneumatic Tool Co., Inc. Through this acquisition, Black & Decker will expand its wide range of electric tools with the complete Master line of diversified pneumatic tools for the construction industry. Operations of the subsidiary will be under the direction of Leonard J. Roll, vice president and general manager.

Top level management changes

Stuart R. Ives, president of Armco Drainage & Metal Products, Inc., a subsidiary of Armco Steel Corp., and one of the nation's largest manufacturers of steel products for the construction industry, recently announced his retirement. M. C. Patton, executive vice president, became chairman of the board, and W. O. Robertson, vice president of sales, succeeded Ives as president. Warren S. Mann, a division manager, took over Robertson's position. Ives' service with Armco spanned 42 years.

Sales director appointed

The appointment of Thomas C. Cribb as director of sales of the Surface Research Corp., Columbus, Ohio, is announced. The company manufactures white pigmented air-entraining agents, and concrete form release compounds. Nationwide distribution is now being completed.

Leadabrand in new position with PCA

Joseph A. Leadabrand, former manager of Portland Cement Association's soil-cement bureau, O

"BERG"

HIWAY SURFACERS



"BERG" Hiway Surfacers are extensively used for removing high spots and surface variations from concrete roads, streets, floors, airport runways and many other applications.

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THE CONCRETE SURFACING MACHINERY COMPANY

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Cincinnati 32, Ohio

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NEW! EFCO BRIDGE COLUMN FORMS

EFCO Bridge Column Forms used on New Orleans overpass save time and labor. Precision construction permits quick, easy stripping as shown. Adaptable to a wide range of uses. Ideal for forming pier nosings when combined with regular EFCO Forms.



MAIL COUPON TODAY

Economy Forms Corp.
Box 128-V
H. P. Station
Des Moines, Iowa

Please send information on EFCO Bridge Column Forms, and address of nearest sales office.

Name.....

Firm name.....

Address.....

City..... State.....

.....

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go, has been appointed assistant vice president for promotion, James D. Piper. He succeeds Thomas E. Long who was named eastern regional manager.

FDW creates new sales post

As a further step in its expanded marketing program, FDW Corporation, Clintonville, Wis., heavy-duty vehicle manufacturer, has named Hubert McCarthy to head its new formed market and distribution research department. McCarthy comes to FWD from the Raymond Corporation in New York where he has been marketing research analyst.

Bill Howe heads Sherman sales

President William A. Romain announces the promotion of Bill Howe from assistant sales manager to sales manager of Sherman Products, Inc., Royal Oak, Mich., a leading manufacturer of tractor-mounted earth-moving, soil preparing, and materials handling equipment. Howe joined Sherman in 1948 as a sales representative. In 1957 he was named service manager, and late last year he assumed additional responsibilities in sales.

Dow assigns epoxy specialist to West Coast

Assignment of W. W. McBlaine as an epoxy specialist for the growing West Coast market is announced by The Dow Chemical Co. McBlaine will serve Seattle, San Francisco, and Los Angeles territories. His appointment will assure close sales liaison with the recently expanded laboratory in Pittsburg, Calif., to meet the needs of Western epoxy users.

Monaghan replaces James Wetzel

James L. Wetzel has been named director of sales for the explosives operations, Energy Division, Olin Mathieson Chemical Corp. Wetzel succeeds Frank J. Monaghan, who is retiring. The new sales director comes to Olin Mathieson from Atlas Powder Co. He will make his headquarters at the East St. Louis, Ill., plant.

Chicago Pneumatic buys Reich

Chicago Pneumatic Tool Co. has acquired the assets of Reich Bros. Manufacturing Co., Inc., Terre Haute, Ind., producer of the internationally known Reich line of truck and crawler-mounted hydraulic

multiply manpower

WITH **watson-cmetco**

POWER BUGGIES



WATSON-CMETCO Power Buggies at work on Peter Kiewit Carquinez (Calif.) Bridge approach job.

YOU'LL PLACE MORE CONCRETE FASTER, AT LOWER COST, with job-proved CMETCO Power Buggies on the job. Here's why:

- * **UNEQUALLED MANEUVERABILITY**—51" turning radius, easy automotive-type steering and controls, and instant reversing make CMETCO Buggies fast and easy to handle even on narrow ramps and tight, tricky platforms.
- * **PLENTY OF POWER** to handle full loads on steep ramps. Load is centered over dual drive wheels for extra traction.
- * **EXTRA CAPACITY**—10½ cu. ft. struck, 13½ heaped.
- * **FAST, CLEAN, CONTROLLED DUMPING**—bucket is nicely balanced for easy, accurate dumping control and is designed for clean self-purging dumping that eliminates hand scrape-outs.
- * **NO OPERATOR TRAINING REQUIRED**—Anyone can handle CMETCO's simple automotive type steering and controls!

YOU'LL BE HOURS AND DOLLARS AHEAD with WATSON-CMETCO Power Buggies on your job. Why not get the facts now? Write today for complete information and name of your local WATSON-CMETCO distributor; please address Dept. W6

watson-cmetco

BETTER EQUIPMENT FOR PLACING AND FINISHING CONCRETE...

12
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Power Buggies • Telescoping and Economy Vibratory Screeds • Rola Pavers and Trench Boxes • Wood and Steel Tilt-Up Hardware • Bull Floats • Hoppers • Elephant Trunks and Chutes • Tampers • Hand Carts

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Contractors . . . Engineers!

You May Lease With Option To Buy

MOBILE FIELD OFFICES! DESIGNED FOR YOU!



WE WILL CUSTOM BUILD TO MEET YOUR INDIVIDUAL NEEDS
MOBILE FIELD OFFICES! From 30 to 50 ft.—8' to 10' Wide.

Check these outstanding features:

- Built-in desks plus
- Built-in drawing board
- Built-in drafting board
- Blue print racks
- Double wardrobes & gas wall heaters
- Lined Drapes
- Fluorescent lighting fixtures
- Asphalt tile floors
- Six double electric outlets, telephone jacks

GUS'ES TRAILER SALES, INC. NEW USED

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**NOW! FASTER
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TESTS . . .**



**. . . WITH
THE SAME
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WASHINGTON Dens-o-meter

THE KEY TO ACCURATE FIELD TESTS FOR MOISTURE-DENSITY IN EMBANKMENT AND FOUNDATION SOILS.

The DENS-O-METER is light in weight, compact, very portable, easy and economical to operate and maintain!

Developed after years of research by Department of Highways, State of Washington. Opens up entirely new possibilities for foundation and soils engineers and contractors who can now make accurate moisture-density and compaction tests, quickly and easily.

- in small or large holes up to 3 ft. deep
- in all types soils and granular base materials
- in approximately 3 minutes after hole is dug

CONTRACTORS AND ENGINEERS: Stop over-compaction, under-compaction . . . make moisture-density determinations many times daily with a DENS-O-METER.

GET FULL INFORMATION FROM EXCLUSIVE SALES AGENTS

Charles R. Watts Co.

4121 Sixth Avenue Northwest
Seattle 7, Washington

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draulic rotary blast hole drills and drilling rigs. The acquisition affords Chicago Pneumatic an excellent diversification in the field of drilling equipment, according to CP's president Guy J. Coffey who made the announcement. The acquired organization will be known as the REICHDRIILL Division of Chicago Pneumatic Tool Co.

District sales manager changes U. S. Rubber

United States Rubber Co. announces several changes in its branch sales departments of its mechanical goods division. E. G. Morrill, formerly district sales manager at the Denver branch, has replaced Donald L. Reid as district sales manager at the Los Angeles branch. Reid recently was named regional sales manager, West Coast branches, for the division and continues to operate out of Los Angeles. Morrill is replaced at Denver by W. E. Larson.

Leschen appoints two

Jack T. Dilke has been appointed sales representative for Leschen Wire Rope Division, H. K. Porter Co., Inc. His territory covers central and western California, Nevada, Utah and southeastern Idaho. Dilke comes to Leschen from John A. Roebbling's Sons Corp.

Also announced by Leschen is the appointment of William W. Davis as prestress planning engineer, making his headquarters at the Leschen offices in St. Louis, Mo. For the past five years Davis has been with Food Machinery Chemical Corp., Riverside, Calif.

Tidewater realigns marketing

Marketing of Tidewater Oil Co. complete line of Veedol automotive lubricants in Colorado, Montana, New Mexico, Wyoming, and Texas has been assigned to the firm's Western division. Arthur Beckner, formerly district sales supervisor at Minneapolis, has been named sales representative for realigned territory, making headquarters at Denver.

Distributors attend Link-Belt Speeder conference

An all new ¾-yd. shovel-craner made its first public appearance at Link-Belt Speeder's Marketing Conference and New Product Presentation at Cedar Rapids, Ia. But the LS-78 was only one high point in the two-day program attended by some 150 distributor management

men from all parts of the continent. One of the other features was a tour of what Link-Belt Speeder described as "The most modern manufacturing plant in the industry." This was climaxed by the Parade of Products. In addition to the new LS-78, there were demonstrations by such recently announced models as the 40-ton, crawler-mounted LS-108, the new 35 and 40-ton truck-cranes and other pieces of Link-Belt equipment. The parade ended with all crane booms raised high in a salute to the distributor men in attendance.

Thomas Flood joins Galion

Ralph E. Boyd, president of The Galion Iron Works & Mfg. Co., Galion, Ohio, manufacturer of road rollers and motor graders, announces the appointment of



Thomas F. Flood

Thomas F. Flood as executive vice president. Flood comes to Galion from Frank G. Hough Co., where he was vice president of sales and manufacturing for a number of years. The two companies have enjoyed close relations for many years and have common distributorships in most areas of the United States.

Gerwick expands Precast Prestressed Concrete Division

Russ Hughes was recently appointed division representative in Southern California for the Precast Prestressed Concrete Division of Ben C. Gerwick, Inc., according to announcement by Bob Singer, divisional manager. The Gerwick organization, with prestressed concrete plants in both Northern and Southern California, is one of the largest prestressed concrete companies in the West. The firm plans to widen the range of products produced at its San Pedro, Calif., plant to include all types of pre-



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authorized
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are on call
if and when
you need
service!**

Let's face it — even Wisconsin heavy-duty air-cooled engines need service and parts occasionally! This honest approach has an equally realistic stop-gap — the ever-ready network of authorized Wisconsin service stations where parts and service are available on a moment's notice. As a result, you're never caught with your engines down for long because Wisconsin service is as near as your telephone.

You can rely on expert service by Wisconsin-trained personnel. Most of them are graduates of periodic service clinics and are thoroughly familiar with the design, construction, and operation of Wisconsin engines. Each service station — whether it's in Fairbanks, Topeka, or Mozambique — has a stock of Wisconsin parts to assure fast delivery — to put your equipment back in service with minimum delay.

Wisconsin heavy-duty air-cooled engines are known, used, and respected throughout the world. So are the more than 2000 authorized Wisconsin service stations and their work. You can rely on both to keep your work loads "on-schedule" anywhere, at any time! Write for Form S-198 which lists all the authorized Wisconsin service stations throughout the world.

Sales and Service Supplied by these Distributors and their Service Stations:

CENTRAL EQUIP. CO.,
E. 45th at Garfield, Denver, Colo.
Distributor for Colorado and Southern Wyo.

CENTRAL AUTO ELECTRIC CO.
808 2nd St., N. W., Albuquerque, N. Mex.

PRATT-GILBERT HDW. CO.,
Phoenix, Ariz.

ARNOLD MACHY, CO., INC.
Salt Lake City, Utah
Distributor for Utah, Eastern Nev.,
Eastern Ida. and Western Wyo.

ARNOLD MACHINERY CO., INC.
5024 Gage Street, Boise, Idaho
Distributor for Southern Idaho

STAR MACHY. CO.
241 Lander St., Seattle;
East 415 Sprague Ave., Spokane
Distributor for Washington and North. Idaho

INDEPENDENT DISTRIBUTORS
27 N. E. Broadway, Portland, Ore.

E. E. RICHTER & SON, INC.
6598 Hollis St., Emeryville, Cal.
Distributor for Northern Cal. and West. Nev.

CONTINENTAL SALES & SERVICE CO.
3817 So. Santa Fe Ave., Los Angeles, Cal.
Distributor for South. Cal. and South. Nev.

MIDLAND IMPLEMENT CO., INC.
Billings, Mont.
Distributor for Montana and Northern Wyo.



WISCONSIN MOTOR

CORPORATION Milwaukee 46, Wisconsin

World's largest builders of Heavy-Duty Air-Cooled Engines

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**NOW! custom-made
V-BELTS
in any length with...**

**ALLIGATOR
BELT
FASTENERS**

SIMPLE AS A, B, C!

When an endless belt breaks, merely cut off the required length of belt from a roll of Open End V-Belting, apply an Alligator V-Fastener and the machine is ready to "roll" again.

DESIGN NEW DRIVES WITH THIS IN MIND . . .

V-belts can now be made to any length . . . center distances are no problem . . . eliminate need for special length belts.

ONE STRONG JOINT

Permits fast and easy installation on all types of drives, particularly fixed center drives and drives with outboard bearings.

**CUSTOM-MADE
V-BELTS SOLD IN
COMPLETE
PACKAGE KITS —
5 SIZES!**

ORDER FROM YOUR DISTRIBUTOR

SEND FOR NEW
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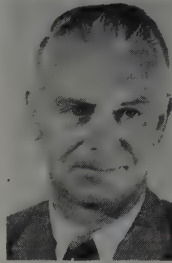
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cast prestressed concrete units. To date, most of the work in Southern California has been in the prestressed pile field. The company's Precast Prestressed Concrete Division will maintain an office at 3625 West Sixth St. besides the plant office at 2050 Wilmington-San Pedro Road in San Pedro.

Evan Prichard elevated to v.p.

Announcement of the appointment of Evan S. Prichard to the position of vice president in charge of engineering is made by J. E.



*Evan
Prichard*

Hall, executive vice president of Cook Bros. Equipment Co., Los Angeles, manufacturer of heavy-duty trucks, bottom-dump trailers and truck equipment for the construction industry. Prichard has been with the Cook organization since 1949 in the engineering department. Early in 1955 he was appointed chief engineer.

Market development manager

W. E. Galland has been named to the newly created position of market development manager for WEMCO, a division of Western Machinery Co., San Francisco, according to announcement by General Manager P. H. Mulcahy. Galland has been with the company since 1955.

Personnel changes at Bucyrus-Erie; research center planned

Three appointments in its sales department for commercial cranes and excavators are announced by Bucyrus-Erie Co. All stationed at the home office in South Milwaukee, Wis., the appointees and their positions are: Paul J. Thiel, sales administration supervisor; Byron A. "Bud" Haney, product development manager; and Frederick B. Shew, sales development manager. Haney, a member of B-E's organization since 1929, is well known in the Northwest where he recent-

ly served as sales manager at Seattle, Wash.

First of the structures planned in the establishment of a research center at its Oak Creek test ground, is now under way. With 7,200 sq. ft. of floor space, the company expects to transfer its research department from the main plant to the new building this summer.

Further expansion by John Deere

John Deere Industrial Equipment Works in Moline, Ill., is starting construction of an addition which will double the production capacity of its new manufacturing facility. When the addition is completed, the plant will have a total of 4 ac. of manufacturing space under one roof. Plant manager P. S. Mumford said the new construction is scheduled to be completed in the spring of 1960, and is needed to meet the rapidly expanding market for bulldozers, backhoes, loaders and other equipment manufactured for use with John Deere industrial tractors.

West Coast facilities expanded

A new warehouse at 317 Corey Way, South San Francisco, Calif., has been opened by Atkins Saw Division, Borg-Warner Corp. The new facility supplements Atkins facilities in Los Angeles, and in Portland, Ore., offering complete coverage of the West Coast area. President Frank G. Fisher named Robert Rabe to head the new operation.

Joseph L. Bunker promoted

Joseph L. Bunker has been promoted to manager of truck tire sales for The General Tire & Rubber Co.'s Los Angeles division. Bunker joined General Tire in 1955 as territory salesman. He was named top territory salesman of the year for obtaining the greatest amount of new business during 1958.

Activity at Omark Industries

Edward P. Skralskis has been appointed general manager of operations for Omark Industries, Inc. Portland, Ore., according to announcement by John D. Gray, president of the construction tool manufacturing firm. Skralskis, a graduate civil engineer, has been with Omark since 1954, serving as assistant general manager for the past three years.

Omark recently purchased controlling interest in the Graham

Manufacturing Co. of Boston, Mass. With the addition of the Graham stored-energy fastening system to its present powder-actuated and manual fastening equipment lines, Omark has considerably increased its activity in the fastening field.

Clark Equipment appoints two

Two appointments are announced by the Construction Machinery Division of Clark Equipment Co., Benton Harbor, Mich. Charles L. Ellis has been named chief field engineer. Before joining Clark in 1957 Ellis had been in excavating contractor and had spent three years in field engineering and product development at LeTourneau-Westinghouse. Appointed to the position of sales training manager is Parry Barnes. He will instruct Clark sales personnel and the sales personnel of distributors of "Michigan" construction machinery.

James Gleason made division sales manager

James E. Gleason has been named to the position of assistant sales manager of Barber-Greene Co.'s Conveyor Division which is headed by Sales Manager H. W. Newton. Gleason is returning to Aurora, Ill., from the company's New York office where he has been for more than four years.

Barber-Greene names five sales section managers

To provide a greater degree of specialization and concentration on the sales of its many products to the construction industry, Edward L. Holt, vice president and director of sales of Barber-Greene Co.,

announces the appointment of five sales section managers in the Construction Equipment Division at Aurora, headed by Sales Manager William C. Gifford.

Appointed manager of the ditcher section is John L. Root, a specialist on problems of underground excavation and construction for utilities distribution and pipeline fields. Robert "Scotty" McClure, a veteran of more than 27 years' service with Barber-Greene, has been named manager of the portable conveyor and loader section.

The spreading equipment section is headed by G. Richard Lundberg. Sales responsibilities here include the widely known B-G asphalt paving machines, as well as the newly developed Road Widener. Richard F. Jouannet has been appointed manager of the mixing plant section with over seventeen different models incorporating a wide range of separate components. Serving all of the construction equipment sections, as well as other Barber-Greene divisions, the sales and technical service training section is now headed by J. S. Drew.

Managerial appointments

E. J. Tribble, group vice president of Worthington Corporation, announces the appointment of B. R. McBath as general manager of the corporation's Plainfield division. He will be responsible for the engineering, manufacturing, and sales operations of this division which manufactures truck mixers, road pavers and other construction equipment. He succeeds K. W. Horsman who has resigned. Along with McBath, Joseph Goldsten is appointed manager of engi-

16 Working Days

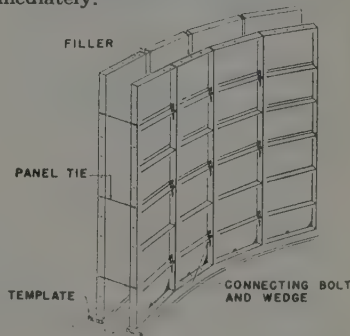


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F. H. Antrim Construction Company used 15,500 square feet of Symons Steel-Ply panels. An important factor in selecting Symons Forms was that they could be erected on one side of the circular tanks without installing ties immediately.



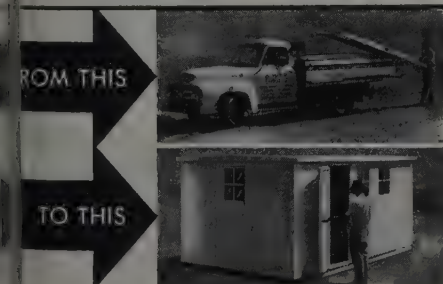
Forms were contracted for on a rental basis with an option to purchase. Later, Antrim decided that the forms were so well adapted to his work that he purchased 14,000 square feet of the panels.

Folder giving the complete Antrim story sent FREE upon request.

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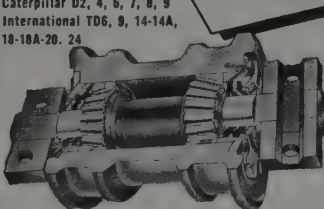


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neering at Plainfield, succeeding W. L. Gaya who is assigned to the headquarters engineering staff at Harrison, N. J.

Post-tensioning service by Ryerson

Prestressing of concrete by the post-tensioning method is now part of the service provided by the reinforcing division of Joseph T. Ryerson & Son, Inc. Facilities have been established at the Ryerson Chicago and Los Angeles plants for supplying post-tensioning tendons for shipment to job sites throughout the country.

New Western pipe facility

A new \$1,500,000 plant for the manufacture of welded pipe is under construction in Livermore, Calif., by Armco Drainage & Metal Products, Inc. The new plant will serve the Rocky Mountain and West Coast areas, and will replace existing manufacturing facilities in Berkeley, Calif. Armco Drainage, a subsidiary of Armco Steel Corp., is one of the nation's biggest manufacturers of construction products, such as metal pipe for drainage, sewer and water lines, highway guardrail, steel buildings, etc.

Package lease plan for contractors

A Special Package Lease Plan for the construction industry is announced by Nationwide Leasing Co., under which any combination of equipment can be considered one package and leased as a unit for three to five years. According to Robert Sheridan, Nationwide president, the plan permits contractors to acquire \$10,000, \$25,000, \$50,000 or more in equipment without capital investment. For a monthly payment of \$320, a contractor could lease \$10,000 worth of equipment for 3 years; for \$800 monthly, \$25,000 worth for 3 years, \$625 monthly for 4 years. A \$50,000 package lease features 3, 4, and 5-year terms. Three-year lease would cost \$1,600 monthly; 4-year, \$1,250; 5-year, \$1,050. A chart of the Package Lease Plan is available upon written request to Nationwide Leasing Co., 11 South LaSalle St., Chicago 3, Ill.

Name change

American Pipe & Construction Co., Los Angeles, announces that the name of its subsidiary in Phoenix, Ariz., the Hooper Concrete

Pipe Co., has been changed to American Concrete Pipe Co. The Phoenix firm, a wholly-owned subsidiary of American Pipe & Construction Co., is under the management of Gordon Marshall, recently elected its vice president.

Koehring names new head of Springfield Division

The promotion of R. E. Burton to the position of president and general manager of its Buffalo Springfield Division at Springfield



R. E.
Burton

Ohio, is announced by President Julien R. Steelman. Burton has been assistant director of marketing at Milwaukee. The Division currently manufacturing road rollers and earth-compaction equipment, and is being enlarged to include the operations of the Standard drill-Keystone Co. purchased by Koehring early this year.

NEW trademark by LeTourneau-Westinghouse Co. of Peoria, Ill., will appear on all earthmoving, construction, heavy materials handling, and other equipment manufactured by the company.



Sherman promotes Glenn Long

President William A. Roman announces the promotion of Glenn A. Long to the position of service manager of Sherman Products, Inc., Royal Oak, Mich., manufacturer of tractor-mounted earth-moving, preparing and materials handling equipment.

UNIT PRICES

Selected abstracts for Western projects

HIGHWAY—Trinidad Freeway in Colorado

Colorado—Las Animas County—State. A low bid of \$989,660 was submitted by Domenic Leone Construction Co. of Trinidad for 1.437 mi. of the Trinidad Freeway including a prestressed concrete bridge.

(1) Domenic Leone	\$ 989,660
(2) Shore Bailey	1,024,551
Colorado Const., Inc.	1,027,213
Z. H. Lowdermilk, Inc.	1,067,081
R. W. Construction Co.	1,089,028

	(1)	(2)
Lump sum Clear & grub entire project..	\$1,500.00	\$5,000.00
Lump sum Rem. re-erect parts str.		
sta. 3110+	2,500.00	5,000.00
Lump sum Rem. part present str.		
sta. 3184+	500.00	1,000.00
Lump sum Rem. of obstructions	500.00	500.00
52 ea. Rem. guard posts	2.00	.50
Lump sum Rem. 4 str.	200.00	150.00
1 ea. Reset metal aprons	25.00	35.00
1 ea. Reset met. embank. protectors ..	25.00	30.00
33 ea. Reset guard posts	5.00	2.00
18 ea. Rem. light standards	40.00	10.00
300 lin. ft. Rem. fence	.05	.10
1,000 lin. ft. Rem. and rebuild fence.....	.20	.20
2,467 lin. ft. Rem. and rebuild guard fence	1.00	2.00
10 ea. Line posts (metal)	1.50	1.50
600,000 cu. yd. Uncl. excavation	.19	.19
300 cu. yd. Stripping	.75	.40
1,000 cu. yd. Stripping	.15	.05
2,060 cu. yd. Uncl. str. excavation misc....	3.00	1.75
5,190 cu. yd. Backfill material (special)	1.25	.60
630,000 cu. yd. Compaction (modified)	.05	.0450
16,390 M gal. Wetting	.75	.75
42,000 ton mi. Ton mile overhaul	.07	.05
24,500 ton Sub base material (Class 1)..	.45	.45
15,400 ton Gravel or crushed rock		
surface (Grade C)	.80	.75

99,100 gal. Asphalt road material (MC)		
(prime processing)	.17	.16
60,190 sq. yd. Road mix asphalt processing...	.14	.09
5,090 lin. ft. Asphalt processing shoulder roll	.35	.30
1.20 Mb ft. Treated bridge timber	600.00	500.00
16 ea. Prestressed concrete beam		
70-74 ft., 11 in.	1,750.00	1,740.00
44 ea. Prestressed concrete beam		
75-79 ft., 11 in.	2,000.00	1,916.00
5 ea. Prestressed concrete beam		
85-89 ft., 11 in.	2,150.00	2,190.00
398,900 lb. Str. steel	.18	.1725
54 lin. ft. Relay 12 in. pipe (C.M.P.)...	1.00	2.00
146 lin. ft. Relay 18 in. pipe (C.M.P.)...	1.25	2.25
254 lin. ft. Relay 24 in. pipe (C.M.P.)...	2.00	2.50
144 lin. ft. Relay 30 in. pipe (C.M.P.)...	2.50	2.75
357 lin. ft. 12 in. CM culvert pipe....	3.60	4.00
546 lin. ft. 18 in. CM culvert pipe....	4.30	4.25
901 lin. ft. 24 in. CM culvert pipe....	6.50	6.50
115 lin. ft. 30 in. CM culvert pipe....	7.80	8.00
159 lin. ft. 48 in. CM culvert pipe....	16.00	17.50
199 lin. ft. 48 in. CM culvert pipe		
(pav. invert)	18.00	20.00
82 lin. ft. 84 in. CM culvert pipe....	50.00	49.00
1,296 lin. ft. Treated timber piling	2.70	2.40
48 ea. Metal pile shoes	5.00	5.00
18 cu. yd. Gr. rubble sl. & ditch paving.	20.00	25.00
121 cu. yd. Conc. slope ditch pav.		
(wire mesh)	24.00	30.00
9,740 cu. yd. Heavy riprap	4.00	5.50
18,550 cu. yd. Extra heavy riprap	6.00	8.50
810 lin. ft. Metal pl. guard fence		
(beam type)	4.20	4.00
300 lin. ft. B W fence metal posts....	.30	.65
55 lb. Sheet copper	5.00	3.00
2 ea. Row markers	10.00	15.00
1,235 lin. ft. Conc. curb gutter		
6 in. x 2 ft. - 0 in. - 1A.....	2.10	2.00

(Continued on page 204)

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ELECTRIC WARNING
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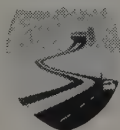
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580 lin. ft.	Conc. curb gutter		
	6 in. x 1 ft. - 0 in. - 1B.....	1.70	1.75
655 lin. ft.	Conc. curb gutter		
	6 in. x 2 ft. - 0 in. - 2A.....	2.90	2.25
1,105 lin. ft.	Conc. curb gutter		
	6 in. x 1 ft. - 0 in. - 2B.....	1.50	1.95
28 ea.	Dr. pipe (conc. fl.)		
	4 in. x 2 ft. - 0 in.....	14.00	9.00
12,666 lin. ft.	1½ in. elec. cond. with jct. box	1.15	1.25
570 lin. ft.	1½ in. elec. cond. jct. B		
	tr. ins.	.60	.80
244 ea.	Timber guard posts	8.00	6.00
11 ea.	12 in. met. emb. pro.		
	(Type No. 1)	75.00	80.00
1 ea.	24 in. met. apr. for CMPC.....	50.00	45.00
1 ea.	30 in. met. apr. for CMPC.....	75.00	70.00
41 ea.	Reset light stand. luminaire..	40.00	65.00
10 ea.	Hwy. luminaires (4,000 L)...	75.00	75.00
1 ea.	Manholes	250.00	100.00
6 ea.	Inlet grate and fr. No. 13....	50.00	100.00
14 ea.	Inlet grate and fr. (median)..	40.00	65.00
864 cu. yd.	Uncl. str. excav. bridges....	3.50	5.00
1,370 cu. yd.	Str. backfill (Class 1).....	4.00	2.00
5,234,900 sta. yd.	Station yard overhaul	.0050	.0060
214,400 yd. mi.	Yard mile overhaul	.10	.08
3,275 cu. yd.	Class A concrete	53.00	52.00
566,300 lb.	Reinf. steel	.13	.12
826 lin. ft.	Steel piling 12 in. BP at 53 lb.	6.50	6.00
1,233 lin. ft.	Drill holes for caissons.....	30.00	25.00

INTERSTATE HIGHWAYS

(Continued from page 52)

The dollar value of work under way is \$7,800,000 compared to \$4,300,000 a year ago. A year from now it is estimated that about \$22,000,000 worth of work will be under way.

Among the larger projects coming up for bid in the fall of this year is an estimated \$4,500,000 project near Golconda on Highway 40 and a \$4,000,000 project near Lovelock. Also on Highway 40 two jobs in the \$3,000,000 class will come up for bids in October near Reno.

New Mexico

The Interstate System in New Mexico includes 1,003 mi. of which 151 mi. are completed and 78 are under contract. The value of the work under contract is \$20,085,000 compared to \$24,800,000 a year ago. The estimated value of contracts to be under way a year from now is about \$25,000,000.

Major projects under contract and contemplated in the near future include portions of Interstate routes 25 and 40 in Albuquerque, route 10 east of Las Cruces, and urban project on route 25 in Raton, and further development of rural portions of routes 10, 25 and 40.

Oregon

Oregon has 94 mi. completed of its total of 731 mi. There are 139 mi. under contract now, at a dollar value of about \$50,000,000. The value of the work under contract a year ago was \$30,000,000 and the estimated value a year from now is \$70,000,000.

On Interstate Route 5 the major project under way is a 37-mi. section of entirely new alignment between Albany and Eugene. It is to be a 4-lane divided highway and will include the construction of 7 major interchange structures, two railroad grade separations, 15 county road grade separation structures, bridges over 2 large rivers and many smaller bridges.

On Interstate 80N a major project now under way is a 30-mi. section over the Blue Mountains from Meacham to La Grande. It is a 4-lane divided highway and is primarily a reconstruction of a present alignment. It should be completed during 1960. Also on Route 80N a 15-mi. section of the Old Oregon Trail, south from Baker will be put under contract this year.

Utah

Of the 965 mi. of the Interstate System in Utah, 2.3 mi. are completed (Beck's Springs overpass, North Salt Lake) and 69 mi. are under contract. The dollar value of work under contract as of May 1, 1959, is \$21,000,000. A year ago the value of the work under contract was only \$6,000,000 and next year it is anticipated to be \$30,000,000.

Some of the major projects include a 7-mi. job in Summit County, an 8.5-mi.-job in Beaver County, and a 6.5-mi. project in Grand County. These 3 projects alone will amount to nearly \$6,000,000.

In the metropolitan areas, strenuous efforts are being made to accelerate construction of the \$48,000,000 Salt Lake Freeway. Among the unusual items that will be used by the contractor to counteract high moisture content in the soil will be the construction of 53 mi. of vertical sand drains and the emplacement of a 55-ft. high, 710-ft. long sheet metal underground retaining wall.

Plans will be announced on June 1 for the location and design of the controversial Salt Lake Belt Route. The Belt Route extends 27 mi. in a wide arc circumventing the metropolitan area and linking with Interstate Highway 80 from the east and with Interstate Highway 15 north and south.

Washington

Washington has completed 28.9 mi. of its 672.5 mi. of the Interstate System. There are 119.7 mi. under contract at an approximate dollar value of \$36,500,000. Roughly, the dollar value of the work under contract a year ago was \$10,500,000, while the estimated dollar value a year from now is \$45,000,000 to \$50,000,000.

In 1960 the Bellingham Freeway will be completed, a project on which planning started 11 years ago. Rights-of-way are being bought for the Yakima Freeway and construction will begin within a year or two. Right-of-way purchases will begin soon on the Spokane Freeway.

Probably the outstanding project on which work is under way is the Seattle Freeway which runs from south of Tacoma through Seattle to Everett. Work has started on a \$14,000,000 bridge in Seattle. By 1965 this \$200,000,000 freeway will be open to traffic.

Snoqualmie Pass was 4-laned to a distance of about 15 mi. east of the summit of the Cascades last year and in the next 2 or 3 years another 8 mi. will have been opened. In eastern Washington around the Moses Lake about 22 mi. of new highway were opened last year and many more miles are being built from Ritzville toward Spokane. A brand new section was added to the Interstate System recently from Ellensburg through Yakima south to the Umatilla bridge.

Wyoming

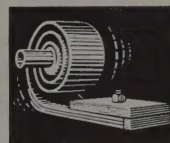
There are 1,006 mi. of the Interstate System in Wyoming of which 68.7 mi. are completed to Interstate standards. Another 112.2 mi. are under contract at a cost of \$26,900,000. The dollar value of the work under contract for 1958 was \$19,700,000 and the estimated value in 1960 will be \$23,000,000. Among the large contracts which will soon be awarded is one for 12 mi. of 4-lane divided Interstate highway on the Buffalo-Gillette road which features continuous welded steel plate girder bridge over Crazy Woman Creek.



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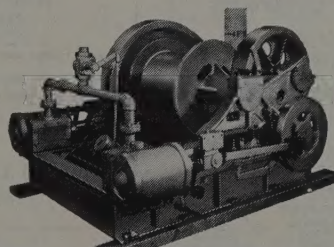
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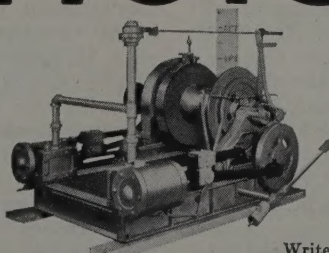
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475 West Minnehaha
St. Paul 3, Minnesota
Humboldt 8-2585

Offered for Quick Sale

Two LeTourneau 'C' Tournamatic
Tournapulls, with Budda engines;
excellent rubber. **\$30,000**

Oshkosh 5-ton unit with plow and
wing blade. **\$2,750**

SWEENEY BROTHERS
TRACTOR

1622 Main Avenue Fargo, N. D.
Phone: ADams 2-3305

FOR SALE

New Bulk Cement Trailers

3—Gravity 6—Auger

Designed for 50' O.A.L.
& 73,280 G.V.W.

Call or Write BILL BECKER

DAN DUGAN
OIL TRANSPORT COMPANY

Sioux Falls, South Dakota
Phone 4-6011

FOR SALE

1935 Bucyrus-Erie 10-B combination 3/4 yd. shovel
and crane with fairlead and tagline. Top condition.
'51 Ford Industrial engine. This machine has had
little use. \$3,600.00.

Neil Pipher Crane Service

Capistrano Beach, Calif. GY 6-5331

Available for immediate sale

5,075 lin. ft. Rex Two-Way 19"x21"

AIRPORT FORMS

Complete with pins.

These forms are drilled for 18" dowels.

These forms are oiled and stacked at railroad
siding, Seymour Johnson Air Base, Goldsboro,
N. C.

Price \$5.75 per lin. ft.

NELLO L. TEER COMPANY

Durham, North Carolina

POSITION AVAILABLE

ASSISTANT
CITY ENGINEER

Pocatello, Idaho

Starting salary \$450-500/
month. B.S.C.E. required.
Group hospital and life insur-
ance plans available and op-
tional. Regular established
vacation and sick leave plan.
Send applications to
W. B. Webb, City Manager,
Box 1489, Pocatello, Idaho

ham has running in Colorado as
this is being written, this contract
will be finished about Nov. 1.

Roper, Mauger and Rather are
also together on \$195,018 worth of
grading and plant-mix surfacing
between Naturita and Nucla which
Graham expects to have finished
by July 1. Howard Bowers is blade
operator here, M. Quick, shovel op-
erator, and D. Brochick, mechanic.

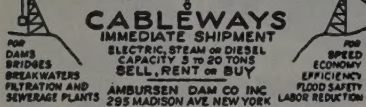
* * *

N. A. Nelson, Jr., is general su-
perintendent, Earl Haaby, superin-
tendent, and George Nay, concrete
foreman, for N. A. Nelson Con-
struction Co. on a \$443,728 project
on the Sheridan-Ranchester road
in Wyoming. Contract calls for
twin 4-continuous-span reinforced
rigid frame interchange structures,
twin 3-continuous-span reinforced
concrete rigid frame separation
structures, and grading.

* * *

D. L. Lucas, vice president of
Craftsmen Construction Co., Inc.,
as project manager, is in charge
of the company's recent award to
construct a large school project at
Leupp, Ariz.

LOW COST INSTALLATION AND OPERATION



CABLEWAYS
IMMEDIATE SHIPMENT
ELECTRIC, STEAM OR DIESEL
CAPACITY 5 TO 20 TONS
SELL, RENT OR BUY

FOR DAMS
BRIDGES
BREAKWATERS
FILTRATION AND
SEWERAGE PLANTS

FOR SPEED
ECONOMY
EFFICIENCY
FLOOD SAFETY
LABOR REDUCTION

AMBURSEN DAM CO. INC.
295 MADISON AVE. NEW YORK

SUPERVISING

(Continued from page 141)

William B. Riddle is supervising
Earl L. McNutt's contract for grad-
ing, structure and surfacing on 5.5
mi. of U.S. 95, John Day-Slate
Creek highway, in Idaho County,
Idaho. Foremen are Howard Kun-
kle and Oscar Bell. Chuck Conner
is master mechanic. The \$1,219,448
job has been under way since last
November and McNutt expects to
have it finished about Sept. 1, 1960.

* * *

T. H. Langworthy, general su-
perintendent, Sam Ellerman, su-
perintendent, and Truman Hart,
bridge superintendent, head the
job personnel working for R. E.
Hazard Contracting Co. and W. F.
Maxwell Co., successful bidder at

* * *

Claude Roper, superintendent
for Graham Construction Co.,
heads the list of job personnel
on a \$577,886 contract for a 4-mi.
stretch of grading, structures and
surfacing on S. H. 10 between
Chimney Rock and Bayfield, Colo.
About 500,000 cu. yd. of dirt are
being moved, with William E.
Mauger acting as foreman. Other
key personnel on this project are
Sam Rather, pipe foreman, Don
Mauger, timekeeper, Hugh Moore,
crusher foreman, George "Shorty"
Kuntz, welding foreman, Theron
Nelson, master mechanic, H. P.
Roberts, shovel operator, and Vir-
gil Iimes. One of four jobs Gra-

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BACKFILL, uncompacted



Bucyrus-Erie

"Go back to school, son, and don't bother your father while he's working."

The readers react

EDITOR: I was a little embarrassed that you had lifted so many of my specifications in the April issue . . . in the Backfill Uncompacted section.

Seriously, I want to commend you on an excellent job. I wonder how many of us engineers realize how our specifications must look to the average contractor.

ALBERT A. DORMAN
Civil Engineer
Hanford, Calif.

EDITOR: I read your splendid . . . "Backfill, Uncompacted" in the April issue . . . with growing enthusiasm for its sentiments. As a specification writer I agree wholeheartedly with your efforts to stop contractors from reading project specifications. It is not the refuting of the specification language that is so troublesome; it's those "morbidly curious" fellows who ask embarrassing questions. Unless this practice can be stopped, I intend to put a clause in the specifications stating that any evidence of "thinking" on the part of the contractor

will be considered a breach of contract . . .

Unfortunately, the "Selected Specifications" you chose were apparently written by a novice specification writer who did not provide enough safeguards for the client and the Engineer. Under the terms quoted there is still a possibility for the contractor to make a profit *ad libitum*, *ad nauseam*.

By the way, shouldn't the position of the Great Seal in the "Certification of Membership" have been indicated as rampant rather than prostrate?

B. D. RIGGS
Quinton Engineers, Ltd.
Los Angeles, Calif.

EDITOR: I read "Sad facts about Specifications" . . . with great glee. You hit the nail on the head, but you omitted the most important paragraph.

Extra work at Cost Minus

"If the superintendent and/or contractor should dare to suggest that the contractor be paid for doing any work that they claim is beyond the scope of the contract, the Engineer at his discretion may authorize that the work be done at . . . direct labor cost minus the time lost by the workmen while discussing hunting and fishing with the Engineer's representatives, minus the average hourly wage multiplied by the number of toilets on the job plus 10 (for the workers who only use isolated corners). . . . The contractor is bound to be on the job at least 2 hr. before starting time to lay out the work and have tools and materials at the place of work. Any claims by the contractor for equipment rental, fuel, tools, lumber, steel or other items will not be allowed as they are on the job anyway and if they are not they should have been."

It has happened to me.

JACK DOUGLAS
Mission, Texas

EDITOR: . . . most amusing. . . please forward six copies for framing. . .

JAMES L. INGELS
N. California Euclid, Inc.
Sacramento



"I carry these around all day so the boss thinks I'm working."